

PROJECT MANUAL

MARITIME INDUSTRIAL BASE RENOVATION BISHOP STATE COMMUNITY COLLEGE SOUTHWEST CAMPUS

Mobile, Alabama

for the

Bishop State Community College
Mobile, Alabama

ACCS Project No. 2025 144 BISHOP

October 26, 2026

Issued for Bid

Prepared By

GMC

Goodwyn Mills Cawood, LLC
11 North Water Street, Suite 19290
Mobile, AL 36602
T 251.460.4006
www.gmcnetwork.com

GMC PROJECT NUMBER: AMOB260006



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The Project Manual, Technical Specifications, Drawings, and all other documents relating to this project have been prepared for this individual and particular project, and for the exclusive use of the original Owner, developer or other party so indicated.

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Huntsville, Alabama
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ARCHITECTURE■ENGINEERING■ENVIRONMENTAL■GEOTECHNICAL■INTERIOR DESIGN
LANDSCAPE ARCHITECTURE■PLANNING■SURVEYING■TRANSPORTATION■DISASTER RECOVERY



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Goodwyn Mills Cawood, LLC (GMC) in cooperation with its Consultants may, at its sole discretion, provide electronic document and file conversion services to the prime entity holding, or intending to enter into, an Agreement with an Owner for construction of a Project. GMC will typically accept only one request per project from one entity, typically the General Contractor.

Consultants referred to herein are all consultants to GMC for or in connection with the Project, including but not limited to those listed below.

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When furnished, files will be transmitted electronically via FTP Site, or similar file transfer mechanism. It is the intent of GMC to furnish files in a timely manner, typically within two (2) weeks of receipt of payment of fees. However, the complexity and scale of the conversion is directly related to the requested file format and quantity of files requested. Where GMC believes a request will require additional time, we will notify the User and make reasonable effort to deliver files in phases if beneficial.

Please contact Doris Furr at (251) 338-6840 with any questions.

GOODWYN MILLS CAWOOD, LLC

PROJECT

Project Name:	MARITIME INDUSTRIAL BASE RENOVATION for BISHOP STATE COMMUNITY COLLEGE-Southwest Campus and the ALABAMA COMMUNITY COLLEGE SYSTEM
Project No.:	AMOB26006
Document Issue Date:	April ____, 2026
Prime Architect/ Engineer:	GMC/Jim Walker

Goodwyn Mills Cawood, LLC (hereafter "GMC"), for itself and its identified Consultants, hereby grants non-exclusive use of the requested electronic files to the party (User) listed below. User accepts that GMC and its Consultants reserve the right to convey or not convey electronic files at their sole discretion. User further agrees, as a precedent to transmittal of digital files to any other party, to require written agreement of equivalent confidentiality and indemnification provisions from any party that receives the digital files. The digital information furnished under this agreement is proprietary, is the property of GMC and/or its Consultants, and is protected by applicable copyright laws.

The information provided by GMC and/or its Consultants is solely for the convenience of the recipient. Neither GMC nor its Consultants make any warranty or guarantee, express or implied, as to the suitability of the files for any specific purpose. It is understood the files are (1) digital, (2) typically have been converted electronically into a format suitable to the User, (3) are inherently capable of being



manipulated and altered through intentional and unintentional means, (4) are partial and therefore inherently incomplete representations of the Contract Documents, and (5) may include inaccuracies clarified elsewhere in the Contract documents. Consequently, ONLY the COMPLETE Printed Contract Documents, as amended, shall serve as the basis for the scope, quantity, and quality of the work required for the Project. Under no circumstances whatsoever shall GMC and/or its Consultants be or become liable to anyone for the accuracy or completeness of information included in requested electronic files. The burden of, and responsibility for, determining the fitness of data included in electronic files falls solely and completely on the User.

LIMITED USE: The use of any digital file(s) is solely limited to the listed Project below. In no event shall files be utilized for any other Project, or any use beyond the use specifically listed herein. Further, under no circumstances may the General Contractor or and Sub-Contractor submit files furnished under this Agreement as required shop drawing submittals. By execution of this Agreement, the User acknowledges these limitations, and shall comply fully therewith.

CONFIDENTIALITY: User agrees to hold Project information strictly confidential, and User agrees it shall limit the use of transmitted electronic files solely to those applications necessary to perform work required for the Project.

INDEMNIFICATION: User hereby agrees to indemnify, defend, and hold harmless GMC, its directors, officers, and employees, and its Consultants, Consultant's directors, Consultants officers and employees, and the insurers, agents, and affiliates of both GMC and its Consultants, from any and all liability including claims for consequential damages or attorney's fees that may arise out of or relate in any matter to the authorized or unauthorized use, reuse, or alteration of this information by User, its employees or agents, vendors, contractors, sub-contractors, or any other party.

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			PER SHEET FEE
Civil	C		\$125
Architecture	A		\$150
Structural	S		\$125
Mechanical	M, P, FP		\$125
Electrical	E		\$125
Other	G, etc.		\$100



USER ACCEPTANCE OF AGREEMENT

Company Name: _____

By: _____

Its: _____

Date: _____

REQUESTED FILE FORMAT

User (Select ONE)	File Format
	Bound Auto CAD Release 2015
	Revit 23
	Bound Auto CAD (<i>Please indicate earlier version, if required -</i> _____)

SCHEDULE OF REQUESTED FILES (To be filled by User)

SHEET		INTENDED USE
No.	Name.	

(PRINT ADDITIONAL FORMS AS REQUIRED)

**The following specifications were prepared by
Barter & Associates, Inc.**

03 000 Cast In Place Concrete, 05 1200 Structural Steel Framing, 05 4000 Cold-Formed Metal Framing

STRUCTURAL SEAL

PROJECT DIRECTORY

OWNER:

**ALABAMA COMMUNITY COLLEGE SYSTEM
BISHOP STATE COMMUNITY COLLEGE**
351 N Broad Street
Mobile, Alabama 36603
Mark Salmon, ACCS Chief Facilities Officer
Harun Biswas, ACCS Regional Project/Facilities Director
Olivier Charles, Bishop President

ARCHITECTURE

GOODWYN MILLS CAWOOD, LLC
11 North Water Street, Suite 19290
Mobile, Alabama 36602
Phone: (251) 460-4006
Fax: (251) 460-4423
Jim Walker, AIA
Chris Lunsford, AIA

IN COLLABORATION WITH:

**MECHANICAL &
PLUMBING ENGINEER:**

MW/DAVIS DUMAS & ASSOCIATES, INC.
4500 Southlake Park, Suite 200
Hoover, AL 35244
Phone: (205)252-0246
Will Adams, PE, CPD
Adam Garrett

ELECTRICAL ENGINEER:

JACKSON, RENFRO & ASSOCIATES, INC.
31 Inverness Center Pkwy
Suite 300
Birmingham, AL 35242
Phone: (205) 995-1078
Bobby Renfro, PE
Kevin Rggiero, PE

STRUCTURAL ENGINEER:

BARTER & ASSOCIATES, INC.
1614 Government St.
Mobile, AL 36604-1102
Phone: (251) 473-8354
Fax: (251) 473-8356
James A. Russell, P.E., S.E.

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PREQUALIFICATION FOR BIDS

Sealed proposals will be received by Bishop State Community College, **at the Business Technology Center on the Main Campus of Bishop State Community College by the Dean of Finance and Administrative Services, Room 162. Bid Opening will be held in the ground floor auditorium, room 116,** at 351 North Broad Street, Mobile Alabama, 36603; on **October 20, 2026** at 2:00 p.m. at which time and place they will be publicly opened and read for:

Maritime Industrial Base Renovation for Bishop State Community College- Southwest Campus Mobile, Alabama

The Work of the project includes, but is not limited to: all associated demolition, interior build-out, mechanical, plumbing, and electrical systems as described in the contract documents at the Bishop State Community College Southwest Campus, Building 200.

Only General Contractors that are prequalified may attend the mandatory pre-bid meeting and be allowed to submit a bid proposal for this project. A copy of the prequalification package can be requested by contacting Doris Furr at doris.furr@gmcnetwork.com or by calling 251.460.4006. Prequalification packages are due by 2:00 p.m. CST September 16, 2026. They can be delivered via email to doris.furr@gmcnetwork.com or regular mail to Goodwyn Mills Cawood, LLC; Attn: Doris Furr, 11 North Water Street, Suite 19290, Mobile, AL 36602.

No proposals will be considered unless the bidder, whether resident or non-resident of Alabama, is properly licensed and qualified to submit a proposal for this construction in accordance with all applicable laws of the State of Alabama. This shall include evidence of holding a current license from the State Licensing Board for General Contractors, Montgomery, Alabama, as required by Chapter 8 of Title 34, of the Code of Alabama, 1975. In addition, non-residents of the State, if a corporation, shall show evidence of having qualified with the Secretary of State to do business in the State of Alabama.

Prior to the award of a competitively bid contract to a contractor having one or more employees in the state of Alabama, Alabama law requires that the contractor provide the county proof of enrolment in E-Verify (see www.uscis.gov/everify).

A cashier's check or bid bond payable to **BISHOP STATE COMMUNITY COLLEGE** in an amount not less than five (5) percent of the amount of the bid, but in no event more than \$10,000, must accompany the bidder's proposal. Performance and statutory Labor and Material Payment Bonds, insurance in compliance with requirements, **and verification of E-Verify enrollment** will be required at the signing of the Contract.

Bid Documents, Drawings and Specifications may be examined during normal business hours at the Office of the Architect; Digital Plan Rooms of Dodge, Construction Data Fax, and Construct Connect.

General Contractors may procure plans and specifications from the Architect upon payment of a deposit of **Twenty dollars (\$20.00)** for a one-time administrative fee for digital/file sharing access or **One Hundred dollars (\$100.00)** (printed) per set. Contractors are encouraged to use the digital plans. Refunds will be issued for printed sets only issued by the Architect to each **general contract bidder** on the first two (2) sets issued submitting a bonafide bid, upon return of documents in good and reusable condition within ten (10) days of bid date. Additional sets for General Contractors, and sets for subs and vendors, may be obtained

with the same deposit, which will be refunded as above, less cost of printing, reproduction, handling and distribution, which is estimated to be the same as the deposit amount.

To expedite distribution of bid documents email requests with a copy of the deposit check(s) referencing this project to doris.furr@gmcnetwork.com. Hard copy deposit checks referencing this project should be mailed to Goodwyn Mills Cawood, LLC; Attn: Doris Furr, 11 North Water Street, Suite 19290, Mobile, AL 36602.

Bids must be submitted on proposal forms furnished by the Architect or copies thereof. All bidders bidding in amounts exceeding that established by the State Licensing Board for General Contractors must be licensed under the Provision of Title 34, Chapter 8, Code of Alabama, 1975, as amended, and must show such evidence of license before bidding or bid will not be received or considered by Architect or Owner; The bidder shall show such evidence by clearly displaying their current license number on the outside of the sealed envelope in which the proposal is delivered; Bidder must also include their current license number on the Proposal Form. No bid may be withdrawn after the scheduled closing time for receipt of bids for a period of SIXTY (60) days.

A **Mandatory PRE-BID CONFERENCE** will be held, on **October 6, 2026** at 10:00 a.m. CST, at 925 Dauphin Island Parkway, in Room 110 at the Southwest Campus for the purpose of reviewing the project, answering Bidder's questions, and touring the work areas.

For the list of plan holders on this project visit <http://www.gmcnetwork.com/projectbids/>.

This project is being bid **EXCLUDING TAXES**, and requires the Contractor comply with the requirements of Act 2013-205, which was signed into law on May 9, 2013. The Contractor and the Owner will be required to apply for Certificates of Exemption with the Alabama Department of Revenue which will handle administration of the Certificates. The Contractor shall account for the tax savings on the Proposal Form.

Additional qualifications and requirements for General Contractor Bidders and separate Subcontractors are indicated in the Bid and Contract Documents.

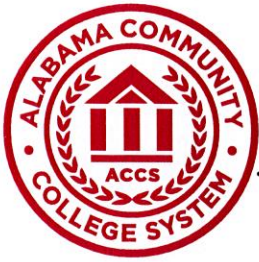
The Owner reserves the right to reject any or all proposals and to waive technical errors if, in their judgment, the best interests of the Owner will thereby be promoted.

BISHOP STATE COMMUNITY COLLEGE

*Mobile, Alabama
Olivier Charles, President*

GOODWYN MILLS CAWOOD, LLC
MEMBERS, AMERICAN INSTITUTE OF ARCHITECTS
11 North Water Street, Suite 19290
Mobile, AL 36602
Phone: (251) 460-4006

To advertise:
August 26, 2026
September 2, 2026
September 9, 2026



INSTRUCTIONS *to* BIDDERS

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1 BID DOCUMENTS:

The Bid Documents consist of the Advertisement for Bids, these Instructions to Bidders, any supplements to these Instructions to Bidders, the Proposal Form and the Accounting of Sales Tax, and the proposed Contract Documents. The proposed Contract Documents consist of the Construction Contract, the Performance Bond and Payment Bond, the Conditions of the Contract (General, Supplemental, and other Conditions), Drawings, Specifications and all addenda issued prior to execution of the Construction Contract. Bid Documents may be obtained or examined as set forth in the Advertisement for Bids.

2 GENERAL CONTRACTOR'S STATE LICENSING REQUIREMENTS:

When the amount bid for a contract exceeds \$100,000, the bidder must be licensed by the State Licensing Board for General Contractors and must show the Architect evidence of license before bidding or the bid will not be received by the Architect or considered by the Awarding Authority. A bid exceeding the bid limit stipulated in the bidder's license, or which is for work outside of the type or types of work stipulated in the bidder's license, will not be considered. 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.

3 QUALIFICATIONS of BIDDERS and PREQUALIFICATION PROCEDURES:

(a) Any special qualifications required of general contractors, subcontractors, material suppliers, or fabricators are set forth in the Bid Documents.

(B) The Awarding Authority may have elected to prequalify bidders. Parties interested in bidding for this contract are directed to the Advertisement for Bids and Supplemental Instructions to Bidders to determine whether bidders must be prequalified and how they may obtain copies of the Awarding Authority's published prequalification procedures and criteria.

(C) Release of Bid Documents by the Architect to a prospective bidder will not constitute any determination by the Awarding Authority or Architect that the bidder has been found to be qualified, prequalified, or responsible.

4 PREFERENCE to RESIDENT CONTRACTORS:

(If this project is federally funded in whole or in part, this Article shall not apply.)

(A) In awarding the Contract, preference will be given to Alabama resident contractors and a nonresident bidder domiciled in a state having laws granting preference to local contractors shall be awarded the Contract only on the same basis as the nonresident bidder's state awards contracts to Alabama contractors bidding under similar circumstances.

(B) A nonresident bidder is a contractor which is neither organized and existing under the laws of the State of Alabama, nor maintains its principal place of business in the State of Alabama. A nonresident contractor which has maintained a permanent office within the State of Alabama for at least five continuous years shall not thereafter be deemed to be a non-resident contractor so long as the contractor continues to maintain a branch office within Alabama.

5 EXAMINATION of BID DOCUMENTS and the SITE of the WORK:

Before submitting a bid for the Work, the bidders shall carefully examine the Bid 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 bids. The submission of a bid shall constitute a representation by the bidder that the bidder has made such examination and visit and has judged for and satisfied himself or herself 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 involved.

6 EXPLANATIONS and INTERPRETATIONS:

(A) Should any bidder observe any ambiguity, discrepancy, omission, or error in the drawings and specifications, or in any other bid document, or be in doubt as to the intention and meaning of these documents, the bidder should immediately report such to the Architect and request clarification.

(B) Clarification will be made only by written Addenda sent to all prospective bidders. Neither the Architect nor the Awarding Authority will be responsible in any manner for verbal answers or instructions regarding intent or meaning of the Bid Documents.

(C) In the case of inconsistency between drawings and specifications or within either document, a bidder will be deemed to have included in its bid the better quality or greater quantity of the work involved unless the bidder asked for and obtained the Architect's written clarification of the requirements before submission of a bid.

7 SUBSTITUTIONS:

(A) The identification of any product, material, system, item of equipment, or service in the Bid Documents by reference to a trade name, manufacturer's name, model number, etc. (hereinafter referred to as "source"), is intended to establish a required standard of performance, design, and quality and is not intended to limit competition unless the provisions of paragraph "d" below apply.

(B) When the Bid Documents identify only one or two sources, or three or more sources followed by "or approved equal" or similar wording, the bidder's proposal may be based on a source not identified but considered by the bidder to be equal to the standard of performance, design and quality as specified; however, such substitutions must ultimately be approved by the Architect. If the bidder elects to bid on a substitution without "Pre-bid Approval" as described below, then it will be understood that proof of compliance with specified requirements is the exclusive responsibility of the bidder.

(C) When the Bid Documents identify three or more sources and the list of sources is not followed by "or approved equal" or similar wording, the bidder's proposal shall be based upon one of the identified sources, unless the bidder obtains "Pre-bid Approval" of another source as described below. Under these conditions it will be expressly understood that no product, material, system, item of equipment, or service that is not

identified in the Bid Documents or granted “Pre-Bid Approval” will be incorporated into the Work unless such substitution is authorized and agreed upon through a Contract Change Order.

(D) If the Bid Documents identify only one source and expressly provide that it is an approved sole source for the product, material, system, item of equipment, or service, the bidder’s proposal must be based upon the identified sole source.

(E) Procedures for “Pre-bid Approval”. If it is desired that a product, material, system, piece of equipment, or service from a source different from those sources identified in the Bid Documents be approved as an acceptable source, application for the approval of such source must reach the hands of the Architect at least ten days prior to the date set for the opening of bids. At the Architect’s discretion, this ten day provision may be waived. The application for approval of a proposed source must be accompanied by technical data which the applicant desires to submit in support of the application. The Architect will give consideration to reports from reputable independent testing laboratories, verified experience records showing the reputation of the proposed source with previous users, evidence of reputation of the source for prompt delivery, evidence of reputation of the source for efficiency in servicing its products, or any other pertinent written information. The application to the Architect for approval of a proposed source must be accompanied by a schedule setting forth in which respects the materials or equipment submitted for consideration differ from the materials or equipment designated in the Bid Documents. The burden of proof of the merit of the proposed substitution is upon the proposer. To be approved, a proposed source must also meet or exceed all express requirements of the Bid Documents. Approval, if granted, shall not be effective until published by the Architect in an addendum to the Bid Documents.

8 PREPARATION and DELIVERY of BIDS:

(A) ACCS Form 5-E: Proposal Form:

(1) Bids must be submitted on the Proposal Form as contained in the Bid Documents; only one copy is required to be submitted. A completed ACCS Form 5-H: Accounting of Sales Tax must be submitted with the Proposal Form.

(2) All information requested of the bidder on the Proposal Form must be filled in. The form must be completed by typewriter or hand-printed in ink.

(3) Identification of Bidder: On the first page of the Proposal Form the bidder must be fully identified by completing the spaces provided for:

- a.** the legal name of the bidder,
- b.** the state under which laws the bidder’s business is organized and existing,
- c.** the city (and state) in which the bidder has its principal offices,
- d.** the bidder’s business organization, i.e., corporation, partnership, or individual (to be indicated by marking the applicable box and writing in the type of organization if it is not one of those listed), and
- e.** the partners or officers of the bidder’s organization, if the bidder is other than an individual. If the space provided on the Proposal Form is not adequate for this listing, the bidder may insert “See Attachment” in this space and provide the listing on an attachment to the Proposal Form.

(4) Where indicated by the format of the Proposal Form, the bidder must specify lump sum prices in both words and figures. In case of discrepancy between the prices shown in words and in figures, the words will govern.

(5) All bid items requested in the Proposal Form, including alternate bid prices and unit prices for separate items of the Work, must be bid. If a gross sum of bid items is requested in the Proposal Form, the gross sum shall be provided by the bidder.

(6) In the space provided in the Proposal Form under "Bidder's Alabama License", the bidder must insert his or her current general contractor's state license number, current bid limit, and type(s) of work for which bidder is licensed.

(7) The Proposal Form shall be properly signed by the bidder. If the bidder is:

- a. **an individual**, that individual or his or her "authorized representative" must sign the Proposal Form;
 - b. **a partnership**, the Proposal Form must be signed by one of the partners or an "authorized representative" of the Partnership;
 - c. **a corporation**, the president, vice-president, secretary, or "authorized representative" of the corporation shall sign and affix the corporate seal to the Proposal Form.
- As used in these Instructions to Bidders, "authorized representative" is defined as a person to whom the bidder has granted written authority to conduct business in the bidder's behalf by signing and/or modifying the bid. Such written authority shall be signed by the bidder (the individual proprietor, or a member of the Partnership, or an officer of the Corporation) and shall be attached to the Proposal Form.

(8) Interlineation, alterations or erasures on the Proposal Form must be initialed by the bidder or its "authorized representative".

(B) ACCS Form 5-H: Accounting of Sales Tax

A completed ACCS Form 5-H: Accounting of Sales Tax must be submitted with ACCS Form 5-E: Proposal Form. Submission of ACCS Form 5-H is required, it is not optional. A proposal shall be rendered non-responsive if an Accounting of Sales Tax is not provided.

(C) Bid Guaranty

(1) The Proposal Form must be accompanied by a cashier's check, drawn on an Alabama bank, or a Bid Bond, executed by a surety company duly authorized and qualified to make such bonds in the State of Alabama, payable to the Awarding Authority.

(2) If a Bid Bond is provided in lieu of a cashier's check, the bond shall be on the Bid Bond form as stipulated in the Bid Documents.

(3) The amount of the cashier's check or Bid Bond shall not be less than five percent of the contractor's bid, but is not required to be in an amount more than ten thousand dollars.

(D) Delivery of Bids:

- (1) Bids will be received until the time set, and at the location designated, in the Advertisement for Bids unless notice is given of postponement. Any bid not received prior to the time set for opening bids will be rejected absent extenuating circumstances and such bids shall be rejected in all cases where received after other bids are opened.
- (2) Each bid shall be placed, together with the bid guaranty, in a sealed envelope. On the outside of the envelope the bidder shall write in large letters "Proposal", below which the bidder shall identify the Project and the Work bid on, the name of the bidder, and the bidder's current general contractor's state license number.
- (3) Bids may be delivered in person, or by mail if ample time is allowed for delivery. When sent by mail, the sealed envelope containing the bid, marked as indicated above, shall be enclosed in another envelope for mailing.

9 WITHDRAWAL or REVISION of BIDS:

- (A) A bid may be withdrawn prior to the time set for opening of bids, provided a written request, executed by the bidder or the bidder's "authorized representative", is filed with the Architect prior to that time. The bid will then be returned to the bidder unopened.
- (B) A bid which has been sealed in its delivery envelope may be revised by writing the change in price on the outside of the delivery envelope over the signature of the bidder or the bidder's "authorized representative". In revising the bid in this manner, the bidder must only write the amount of the change in price on the envelope **and must not reveal the bid price.**
- (C) Written communications, signed by the bidder or its "authorized representative", to revise bids will be accepted if received by the Architect prior to the time set for opening bids. The Architect will record the instructed revision upon opening the bid. Such written communication may be by facsimile if so stipulated in Supplemental Instructions to Bidders. In revising the bid in this manner, the bidder must only write the amount of the change in price **and must not reveal the bid price.**
- (D) Except as provided in Article 12 of these Instructions to Bidders, no bid shall be withdrawn, modified, or corrected after the time set for opening bids.

10 OPENING of BIDS:

- (A) Bids will be opened and read publicly at the time and place indicated in the Advertisement for Bids. Bidders or their authorized representatives are invited to be present.
- (B) A list of all proposed major subcontractors and suppliers will be submitted by Bidders to the Architect at a time subsequent to the receipt of bids as established by the Architect in the Bid Documents but in no event shall this time exceed twenty-four (24) hours after receipt of bids. If the list includes a fire alarm contractor and/or fire sprinkler contractor, Bidders will also submit a copy of the fire alarm contractor's and/or fire sprinkler contractor's permits from the State of Alabama Fire Marshal's Office.

11 INCOMPLETE and IRREGULAR BIDS:

A bid that is not accompanied by data required by the Bid Documents, or a bid which is in any way incomplete, may be rejected. Any bid which contains any uninitialed alterations or erasures, or any bid which contains any additions, alternate bids, or conditions not called for, or any other irregularities of any kind, will be subject to rejection.

12 BID ERRORS:

(A) Errors and Discrepancies in the Proposal Form. In case of error in the extension of prices in bids, the unit price will govern. In case of discrepancy between the prices shown in the figures and in words, the words will govern.

(B) Mistakes within the Bid. If the low bidder discovers a mistake in its bid, the low bidder may seek withdrawal of its bid without forfeiture of its bid guaranty under the following conditions:

(1) Timely Notice: The low bidder must notify the Awarding Authority and Architect in writing, within three working days after the opening of bids, that a mistake was made. This notice must be given within this time frame whether or not award has been made.

(2) Substantial Mistake: The mistake must be of such significance as to render the bid price substantially out of proportion to the other bid prices.

(3) Type of Mistake: The mistake must be due to calculation or clerical error, an inadvertent omission, or a typographical error which results in an erroneous sum. A mistake of law, judgment, or opinion shall not constitute a valid ground for withdrawal without forfeiture.

(4) Documentary Evidence: Clear and convincing documentary evidence of the mistake must be presented to the Awarding Authority and the Architect as soon as possible, but no later than three working days after the opening of bids.

The Awarding Authority's decision regarding a low bidder's request to withdraw its bid without penalty shall be made within 10 days after receipt of the bidder's evidence or by the next regular meeting of the Awarding Authority. Upon withdrawal of bid without penalty, the low bidder shall be prohibited from (1) doing work on the project as a subcontractor or in any other capacity and (2) bidding on the same project if it is re-bid.

13 DISQUALIFICATION of BIDDERS:

Any bidder(s) may be disqualified from consideration for contract award for the following reasons:

(A) Collusion. Any agreement or collusion among bidders or prospective bidders in restraint of freedom of competition to bid at a fixed price or to refrain from bidding or otherwise shall render the bids void and shall cause the bidders or prospective bidders participating in such agreement or collusion to be disqualified from submitting further bids to the Awarding Authority on future lettings. (See § 39-2-6, Code of Alabama 1975, for possible criminal sanctions.)

(B) Advance Disclosure. Any disclosure in advance of the terms of a bid submitted in response to an Advertisement for Bids shall render the proceedings void and require re-advertisement and rebid.

(C) Failure to Settle Other Contracts. The Awarding Authority may reject a bid from a bidder who has not paid, or satisfactorily settled, all bills due for labor and material on other contracts in force at the time of letting.

14 CONSIDERATION of BIDS:

(A) After the bids are opened and read publicly, the bid prices will be compared and the results of this comparison will be available to the public. Until the final award of the contract, however, the Awarding Authority shall have the right to reject any or all bids, and it shall have the right to waive technical errors and irregularities if, in its judgment, the bidder will not have obtained a competitive advantage and the best interests of the Awarding Authority will be promoted.

(B) If the Bid Documents request bids for projects or parts of projects in combination or separately, the Bid Documents must include supplements to, these Instructions to Bidders setting forth applicable bid procedures. Award or awards will be made to the lowest responsible and responsive bidder or bidders in accordance with such bid procedures.

15 BID ALTERNATES:

(A) Bid Alternates: Additive alternate bids are preferred, and may be used in order to obtain prices for the addition of items not included in the base bid. The alternate bids shall be listed in the Proposal Form.

(B) Deductive Bid Alternates: Deductive alternate bids shall only be used with the prior approval of the Chief Facilities Officer.

(C) ACCS reserves the right to select or reject some, any, or all alternates in making the final determination of the lowest responsible and responsive bidder to whom the Construction Contract is awarded.

16 UNIT PRICES:

(A) Work Bid on a Unit Price Basis. Where all, or part(s), of the planned Work is bid on a unit price basis, both the unit prices and the extensions of the unit prices constitute a basis of determining the lowest responsible and responsive bidder. In cases of error in the extension of prices of bids, the unit price will govern. A bid may be rejected if any of the unit prices are obviously unbalanced or non-competitive. Each unit price is to include overhead, profit, and all other related costs.

(B) Unit Prices for Application to Change Orders. As a means of predetermining unit costs for changes in certain elements of the Work, the Bid Documents may require that the bidders furnish unit prices for those items in the Proposal Form. Unit prices for application to changes in the work are not a basis for determining the lowest bidder. Non-competitive unit prices proposed by the successful bidder may be rejected and competitive prices negotiated by the Awarding Authority prior to contract award. Unit prices for application to changes in the work are not effective unless specifically included and agreed upon in the Construction Contract. Each unit price is to include overhead, profit, and all other related costs.

17 AWARD of CONTRACT:

(A) The contract shall be awarded to the lowest responsible and responsive bidder unless the Awarding Authority finds that all the bids are unreasonable or that it is not in the best interest of the Awarding Authority to accept any of the bids. A responsible bidder is one who, among other qualities determined necessary for performance, is competent, experienced, and financially able to perform the contract. A responsive bidder is one who submits a bid that complies with the terms and conditions of the Advertisement for Bids and the Bid Documents. Minor irregularities in the bid shall not defeat responsiveness.

(B) A bidder to whom award is made will be notified by telegram, confirmed facsimile, or letter to the address shown on the Proposal Form at the earliest possible date. Unless other time frames are stipulated in Supplemental Instructions to Bidders, the maximum time frames allowed for each step of the process between the opening of bids and the issuance of an order to proceed with the work shall be as follows:

- (1)** Award of contract by Awarding Authority: 30 calendar days after the opening of bids
- (2)** Contractor's return of the fully executed contract, with bonds and evidence of insurance, to the Awarding Authority: 15 calendar days after the contract has been presented to the contractor for signature (from the Lead Design Professional)
- (3)** Awarding Authority's approval of the contractor's bonds and evidence of insurance and completion of contract execution: 20 calendar days after the contractor presents complete and acceptable documents to the Architect
- (4)** Notice To Proceed issued to the contractor along with distribution of the fully executed construction contract to all parties: 15 calendar days after final execution of contract by the Awarding Authority, by various State Agencies if required and by the Governor if his or her signature on the contract is required by law

The time frames stated above, or as otherwise specified in the Bid Documents, may be extended by written agreement between the parties. Failure by the Awarding Authority to comply with the time frames stated above or stipulated in Supplemental Instructions to Bidders, or agreed extensions thereof, shall be just cause for the withdrawal of the contractor's bid and contract without forfeiture of bid security.

Should the successful bidder or bidders to whom the contract is awarded fail to execute the Construction Contract and furnish acceptable Performance and Payment Bonds and satisfactory evidence of insurance within the specified period, the Awarding Authority shall retain from the bid guaranty, if it is a cashier's check, or recover from the principal or the sureties, if the guaranty is a bid bond, the difference between the amount of the contract as awarded and the amount of the bid of the next lowest responsible and responsive bidder, but not more than \$10,000. If no other bids are received, the full amount of the bid 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 Awarding Authority.

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 bids established. The bid guaranties 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. When the award is deferred for a period of time longer than 15 days after the opening of the bids, all bid guaranties, except those of the potentially successful bidders, shall be returned. If no award is made within the specified period, as it may by agreement be extended, all bids will be rejected, and all guaranties returned. If any potentially successful bidder agrees in writing to a stipulated extension in time for consideration of its bid and its bid was guaranteed with a cashier's check, the Awarding Authority may permit the potentially successful bidder to substitute a satisfactory bid bond for the cashier's check.

END OF INSTRUCTIONS TO BIDDERS

SECTION 00007: ATTACHMENT A
TO PROPOSAL FORM

1.1 UNIT PRICES:

- A. The following items of work are anticipated during the performance of this contract; however the exact quantity of each work item may not be determinable prior to bidding. The Contractor shall therefore, include in his Lump Sum Base Bid, an allowance for the following items in the quantities indicated. These Allowance Unit Prices include all charges for labor and materials, installation, shoring, fee, layout, supervision (field and home office), general expenses, taxes, insurance, overhead and profit, but not limited to, for the accomplishment of the Allowance item(s) installed in place. Where quantities of same items of work are defined and are quantified in the bid documents, the allowance quantities indicated hereinafter shall be in addition to those that are indicated. (Example: If the site grading plan indicated new and existing grades, the bidder shall compute the quantity of earthwork required and include that quantity of work in the bid the same as if no "allowance" quantity were specified. If an additional allowance quantity of earthwork is stipulated that stipulated allowance quantity of work shall also be included in addition to the quantity computed from the bidders earthwork "takeoff")

The following Unit Prices Quoted are for increases or decreases in the above quantities included in the Lump Sum Base Bid. These Unit Prices include all charges for labor, material, installation, and equipment, shoring, layout, supervision (field and home office), general expenses, taxes, insurance, overhead and profit, but not limited to for the accomplishment of the Allowance item(s) completely installed in place.

Clarification Note: the Unit Prices quoted by the Contractor shall apply to increases (additive change orders) and to decreases (deductive change orders). This requirement shall supplement the requirements of the General Conditions and Instruction to Bidders. Changes in the Contract amount that are computed using the Stated Allowances and Unit Prices shall be figured at the same unit price whether additive or deductive.

- B. Submit the following Unit Prices with the Proposal Form on Bid Date.

NO.	ITEM NAME	UNIT	UNIT PRICE
1	Electrical – Data and Phone Outlet in Wall	EA	\$
2	Electrical – Junction Box Above Ceiling	EA	\$
3	Electrical – Duplex Power Outlet in Wall (120V)	EA	\$
4	Electrical – Power Outlet in Wall (240V)	EA	\$
5	Electrical – Junction Box in Wall	EA	\$
6	Electrical – Exit Light	EA	\$
7	Fire Extinguisher and Cabinet	EA	\$
8	Welded Hollow Metal Door Frames – Single Door	EA	\$
9	Welded Hollow Metal Door Frames – Double Door		
10	LVT Flooring	SF	\$
11	Epoxy Flooring	SF	\$
12	Existing brick veneer system repair / re-finishing	SF	\$
13	Exterior Glazing in Existing Window Frames	EA	\$
14	Cable Tray	EA	\$
15	Industrial Cord Reel	EA	\$
16	Lighting Fixture Mark “C”	EA	\$
17	Lighting Fixture Mark “CE”	EA	\$
18	Lighting Fixture Mark “FE”	EA	\$
19	Lighting Fixture Mark “G”	EA	\$
20	Lighting Fixture Mark “X1”	EA	\$
21	Lighting Fixture Mark “X2”	EA	\$

(*) Legend to “Unit” quantity abbreviations: SF Square Foot
EA Each

Note: Failure to complete and submit this attachment with proposal shall be grounds for rejections of bid.

END OF ATTACHMENT A TO PROPOSAL FORM

ATTACHMENT B

TO PROPOSAL FORM

CERTIFICATION: I HEREBY CERTIFY THAT ALL SUBCONTRACTORS, SUPPLIERS AND MANUFACTURERS (INCLUDING IN PART, THOSE NAMED BELOW), ARE IN COMPLIANCE WITH THE MINIMUM EXPERIENCE REQUIREMENTS OF THE BID AND CONTRACT DOCUMENTS, AND WHERE STATED AS REQUIRED ARE EITHER PREAPPROVED FOR BIDDING BY THEIR BUSINESS NAME OR HAVE BEEN SUBMITTED AND PREAPPROVED FOR BIDDING IN WRITING OR BY ADDENDUM BY THE ARCHITECT; ALL STILL SUBJECT TO COMPLIANCE WITH REQUIREMENTS; THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY ADDITIONAL COST FOR COMPLIANCE.

SUBMITTED BY - GENERAL CONTRACTOR'S FIRM NAME:

DATE:

1.1 PRINCIPAL SUBCONTRACTORS AND SUPPLIERS LISTING:

- A. Submit the following Principal Subcontractors and Suppliers information with the Proposal Form on Bid Date, **OR at Contractor's option, turned in to the Owner within 24-hours after receipt of Bids, with a copy to the Architect:**

NO.:	SPECIFICATION SECTION:	PRINCIPAL SUBCONTRACTOR OR SUPPLIER - NAME and LOCATION:
1	024119 – SELECTIVE DEMOLITION	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
2	042000 – UNIT MASONRY	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
3	054000 – COLD FORMED METAL FRAMING	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)

NO.:	SPECIFICATION SECTION:	PRINCIPAL SUBCONTRACTOR OR SUPPLIER - NAME and LOCATION:
4	055000 – METAL FABRICATIONS	<div>_____;</div> <div>(FIRM NAME)</div> <div>_____.</div> <div>(LOCATION - CITY and STATE)</div>
5	061000 – ROUGH CARPENTRY	<div>_____;</div> <div>(FIRM NAME)</div> <div>_____.</div> <div>(LOCATION - CITY and STATE)</div>
6	062000 – FINISH CARPENTRY	<div>_____;</div> <div>(FIRM NAME)</div> <div>_____.</div> <div>(LOCATION - CITY and STATE)</div>
7	064000 – ARCHITECTURAL WOODWORK	<div>_____;</div> <div>(FIRM NAME)</div> <div>_____.</div> <div>(LOCATION - CITY and STATE)</div>
8	072100 – BUILDING INSULATION	<div>_____;</div> <div>(FIRM NAME)</div> <div>_____.</div> <div>(LOCATION - CITY and STATE)</div>
9	072700– FIRESTOPPING	<div>_____;</div> <div>(FIRM NAME)</div> <div>_____.</div> <div>(LOCATION - CITY and STATE)</div>
10	081213– HOLLOW METAL FRAMES	<div>_____;</div> <div>(FIRM NAME)</div> <div>_____.</div> <div>(LOCATION - CITY and STATE)</div>

11	083113- ACCESS DOORS	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
12	087100- DOOR HARDWARE	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
13	088100- GLASS AND GLAZING	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
14	088700- ARCHITECTURAL WINDOW FILMS	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
15	089119- FIXED LOUVERS	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
16	092116- GYPSUM DRYWALL	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
17	092216- NON STRUCTURAL METAL FRAMING	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)

18	093000– TILING	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
19	095153 – ACOUSTICAL PANEL CEILINGS	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
20	096513 – RESILIENT BASE AND ACCESSORIES	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
21	096519 – RESILIENT TILE FLOORING	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
22	099000 – PAINTING	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
23	102800 – TOILET ACCESSORIES	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
24	104416 – FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)

25	154000 – PLUMBING	<div></div> <div>(FIRM NAME)</div> <div></div> <div>(LOCATION - CITY and STATE)</div>
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END OF ATTACHMENT B TO PROPOSAL FORM



FACILITIES DIVISION

ACCS FORM 2-A

CONSTRUCTION CONTRACT

•Do not staple this form and/or attachments; use clips. Print single-sided; do not submit double-side printed documents.

1	ACCS PROJECT#:			
2	This Construction Contract is entered into this <day> day of <month> in the year of <year>			
3	between the OWNER , the Alabama Community College System on behalf of: <Select Client>			
	Address:			
	Email:		Phone:	
4	and the CONTRACTOR ,			
	Company Name:			
	Address:			
	Email:		Phone:	
5	for the WORK of the Project identified as:			
6	The CONTRACT DOCUMENTS are dated		and have been amended by	
7	ADDENDA:			

8 The **ARCHITECT** is

Firm Name:

Address:

Email:

Phone:

9 The **CONTRACT SUM** is:

Dollars \$

and is the sum of the Contractor's Base Bid for the Work and the following

10 **BID ALTERNATE PRICES:**

11 The **CONTRACT TIME** is () calendar days

THE OWNER AND THE CONTRACTOR AGREE AS FOLLOWS: The Contract Documents, as defined in the General Conditions of the Contract (ACCS Form 2-B), are incorporated herein by reference. The Contractor shall perform the Work in accordance with the Contract Documents. The Owner will pay and the Contractor will accept as full compensation for such performance of the Work, the Contract Sum subject to additions and deductions (including liquidated damages) as provided in the Contract Documents. The Work shall commence on a date to be specified in a Notice to Proceed issued by the Chief Facilities Officer, ACCS Facilities Division, and shall then be substantially completed within the Contract Time.

12 **LIQUIDATED DAMAGES** for which the Contractor and its Surety (if any) shall be liable and may be required to pay the Owner in accordance with the Contract Documents shall be equal to six percent interest per annum on the total Contract Sum unless a dollar amount is stipulated in the following space, in which case liquidated damages shall be determined at:

Dollars (\$) per calendar day

- 13 SPECIAL PROVISIONS:** (Special Provisions may be inserted here, such as acceptance or rejection of unit prices. If Special Provisions are continued in an attachment, identify the attachment below).

- 14 STATE GENERAL CONTRACTOR'S LICENSE:** The Contractor does hereby certify that Contractor is currently licensed by the Alabama State Licensing Board for General Contractors and that the certificate for such license bears the following:

License No.:		Expiration Date	
Bid Limit:		Classifications	

The Owner and Contractor have entered into this Construction Contract as of the date first written above and have executed this Construction Contract in sufficient counterparts to enable each contracting party to have an originally executed Construction Contract each of which shall, without proof or accounting for the other counterparts, be deemed an original thereof.

The Owner does hereby certify that this Construction Contract was let in accordance with the provisions of Title 39, Code of Alabama 1975, as amended, and all other applicable provisions of law, and that the terms and commitments of this Construction 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 No. 26.

15**APPROVALS****LOCAL COLLEGE OR TRADE SCHOOL**

BY: _____
AS PRESIDENT OF
<Select Client>

ALABAMA COMMUNITY COLLEGE SYSTEM (ACCS)

BY: _____ DATE: _____
CHIEF FACILITIES OFFICER

CONTRACTING PARTIES_____
CONTRACTOR COMPANY

BY: _____
SIGNATURE

NAME: _____
TITLE: _____

**ALABAMA COMMUNITY COLLEGE SYSTEM
(AS OWNER)**

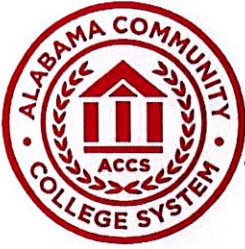
BY: _____
CHANCELLOR

ATTACHMENTS:

- ☐ Copy of Alabama General Contractor's License
- ☐ Proposal Form (ACCS Form 5-E)
- ☐ List of all proposed major subcontractors and suppliers
- ☐ Accounting of Sales Tax (ACCS Form 5-H)
- ☐ Bid Tabulation
- ☐ Schedule of Values
- ☐ Certificate of Liability Insurance
- ☐ Performance Bond (ACCS Form 2-C)
- ☐ Payment Bond (ACCS Form 2-D)
- ☐ State of Alabama Disclosure Statement
- ☐ E-Verify Memorandum of Understanding
- ☐ W-9 (Request for Taxpayer Identification Number and Certificate)

Review/Initial of Regional Facilities Director _____

VER:09032025



FACILITIES DIVISION

ACCS FORM 2-B

GENERAL CONDITIONS *of the* CONTRACT

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- | | |
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Article 1

DEFINITIONS

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

- A ACCS FACILITIES DIVISION:** The ACCS Facilities Division, which is responsible for oversight and management of all ACCS construction projects, pursuant to the policies and procedures adopted by the ACCS Board of Trustees.
- B ARCHITECT:** The Architect is the person or entity lawfully licensed to practice architecture in the State of Alabama, who is under contract with the Owner as the primary design professional for the Project and identified as the Architect in the Construction Contract. The term "Architect" means the Architect or the Architect's authorized representative. If the employment of the Architect is terminated, the Owner shall employ a new Architect whose status under the Contract Documents shall be that of the former Architect. If the primary design professional for the Project is a Professional Engineer, the term "Engineer" shall be substituted for the term "Architect" wherever it appears in this document.
- C CONTRACT:** The Contract is the embodiment of the Contract Documents. The Contract represents the entire and integrated agreement between the Owner and Contractor and supersedes any prior written or oral negotiations, representations or agreements that are not incorporated into the Contract Documents. The Contract may be amended only by a Contract Change Order or a Modification to the Construction Contract. The contractual relationship which the Contract creates between the Owner and the Contractor extends to no other persons or entities. The Contract consists of the following Contract Documents, including all additions, deletions, and modifications incorporated therein before the execution of the Construction Contract:
- (1) Construction Contract
 - (2) Performance and Payment Bonds
 - (3) Conditions of the Contract (General, Supplemental, and other Conditions)
 - (4) Specifications
 - (5) Drawings
 - (6) Contract Change Orders
 - (7) Modifications to the Construction Contract (applicable to PSCA Projects)
- D CONTRACT SUM:** The Contract Sum is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents. The term "Contract Sum" means the Contract Sum stated in the Construction Contract as may have been increased or decreased by Change Order(s) in accordance with the Contract Documents.
- E CONTRACT TIME:** The Contract Time is the period of time in which the Contractor must achieve Substantial Completion of the Work. The date on which the Contract Time begins is specified in the written Notice To Proceed issued to the Contractor by the Owner. The Date of Substantial Completion is the date established in accordance with Article 32. The term "Contract Time" means the Contract Time stated in the Construction Contract as may have been extended by Change Order(s) in accordance with the Contract Documents. The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

- F CONTRACTOR:** The Contractor is the person or persons, firm, partnership, joint venture, association, corporation, cooperative, limited liability company, or other legal entity, identified as such in the Construction Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.
- G DEFECTIVE WORK:** The term "Defective Work" shall apply to: (1) any product, material, system, equipment, or service, or its installation or performance, which does not conform to the requirements of the Contract Documents, (2) in-progress or completed Work the workmanship of which does not conform to the quality specified or, if not specified, to the quality produced by skilled workers performing work of a similar nature on similar projects in the state, (3) substitutions and deviations not properly submitted and approved or otherwise authorized, (4) temporary supports, structures, or construction which will not produce the results required by the Contract Documents, and (5) materials or equipment rendered unsuitable for incorporation into the Work due to improper storage or protection.
- H CHIEF FACILITIES OFFICER:** The Director of the ACCS Facilities Division.
- I DRAWINGS:** The Drawings are the portions of the Contract Documents showing graphically the design, location, layout, and dimensions of the Work, in the form of plans, elevations, sections, details, schedules, and diagrams.
- J NOTICE TO PROCEED:** A proceed order issued by the Owner, as applicable, fixing the date on which the Contractor shall begin the prosecution of the Work, which is also the date on which the Contract Time shall begin.
- K OWNER:** The Owner is the entity or entities identified as such in the Construction Contract and is referred to throughout the Contract Documents as if singular in number. The term "Owner" means the Owner or the Owner's authorized representative. The term "Owner" as used herein shall be synonymous with the term "Awarding Authority" as defined and used in Title 39 - Public Works, Code of Alabama, 1975, as amended.
- L THE PROJECT:** The Project is the total construction of which the Work required by these Contract Documents may be the entirety or only a part with other portions to be constructed by the Owner or separate contractors.
- M PROJECT MANUAL:** The Project Manual is the volume usually assembled for the Work which may include the Advertisement for Bids, Instructions to Bidders, sample forms, General Conditions of the Contract, Supplementary Conditions, and Specifications of the Work.
- N SPECIFICATIONS:** The Specifications are that portion of the Contract Documents which set forth in writing the standards of quality and performance of products, equipment, materials, systems, and services and workmanship required for acceptable performance of the Work.
- O SUBCONTRACTOR:** A Subcontractor is a person or entity who is undertaking the performance of any part of the Work by virtue of a contract with the Contractor. The term "Subcontractor" means a Subcontractor or its authorized representatives.
- P THE WORK:** The Work is the construction and services required by the Contract Documents and includes all labor, materials, supplies, equipment, and other items and services as are necessary to produce the required construction and to fulfill the Contractor's obligations under the Contract. The Work may constitute the entire Project or only a portion of it.

Article 2**INTENT *and* INTERPRETATION of the CONTRACT DOCUMENTS****A INTENT**

It is the intent of the Contract Documents that the Contractor shall properly execute and complete the Work described by the Contract Documents, and unless otherwise provided in the Contract, the Contractor shall provide all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work, in full accordance with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

B COMPLEMENTARY DOCUMENTS

The Contract Documents are complementary. If Work is required by one Contract Document, the Contractor shall perform the Work as if it were required by all of the Contract Documents. However, the Contractor shall be required to perform Work only to the extent that is consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

C ORDER of PRECEDENCE

Should any discrepancy arise between the various elements of the Contract Documents, precedence shall be given to them in the following order unless to do so would contravene the apparent Intent of the Contract Documents stated in preceding Paragraph A:

- (1) The Construction Contract.
- (2) Addenda, with those of later date having precedence over those of earlier date.
- (3) Supplementary Conditions (or other Conditions which modify the General Conditions of the Contract).
- (4) General Conditions of the Contract.
- (5) The Specifications.
- (6) Details appearing on the Drawings; large scale details shall take precedence over smaller scale details.
- (7) The Drawings; large scale drawings shall take precedence over smaller scale drawings.

D ORGANIZATION

Except as may be specifically stated within the technical specifications, neither the organization of the Specifications into divisions, sections, or otherwise, nor any arrangement of the Drawings shall control how the Contractor subcontracts portions of the Work or assigns Work to any trade.

E INTERPRETATION

(1) The Contract Documents shall be interpreted collectively, each part complementing the others and consistent with the Intent of the Contract Documents stated in preceding Paragraph A. Unless an item shown or described in the Contract Documents is specifically identified to be furnished or installed by the Owner or others or is identified as "Not In Contract" ("N.I.C."), the Contractor's obligation relative to that item shall be interpreted to include furnishing, assembling, installing, finishing, and/or connecting the item at the Contractor's expense to produce a product or system that is complete, appropriately tested, and in operative condition ready for use or subsequent construction or operation of the Owner or separate contractors. The omission of words or phrases for brevity of the Contract Documents, the inadvertent omission of words or phrases, or obvious typographical or written errors shall not defeat such interpretation as long as it is reasonably inferable from the Contract Documents as a whole.

(2) Words or phrases used in the Contract Documents which have well-known technical or construction industry meanings are to be interpreted consistent with such recognized meanings unless otherwise indicated.

(3) Except as noted otherwise, references to standard specifications or publications of associations, bureaus, or organizations shall mean the latest edition of the referenced standard specification or publication as of the date of the Advertisement for Bids.

(4) 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.

(5) Any portions of the Contract Documents written in longhand must be initialed by all parties.

(6) Any doubt as to the meaning of the Contract Documents or any obscurity as to the wording of them, shall be promptly submitted in writing to the Architect for written interpretation, explanation, or clarification.

F SEVERABILITY

The partial or complete invalidity of any one or more provision of this Contract shall not affect the validity or continuing force and effect of any other provision.

Article 3

CONTRACTOR'S REPRESENTATION

By executing the Construction Contract the Contractor represents to the Owner:

- A** The Contractor has visited the site of the Work to become familiar with local conditions under which the Work is to be performed and to evaluate reasonably observable conditions as compared with requirements of the Contract Documents.
- B** The Contractor shall use its best skill and attention to perform the Work in an expeditious manner consistent with the Contract Documents.
- C** The Contractor is an independent contractor and in performance of the Contract remains and shall act as an independent contractor having no authority to represent or obligate the Owner in any manner unless authorized by the Owner in writing.

Article 4

DOCUMENTS FURNISHED *to* CONTRACTOR

Unless otherwise provided in the Contract Documents, one readable standard PDF set of Drawings and Project Manuals will be furnished to the Contractor by the Architect without charge. Other copies requested will be furnished at reproduction cost.

Article 5

OWNERSHIP *of* DRAWINGS

All original or duplicated Drawings, Specifications, and other documents prepared by the Architect, and furnished to the Contractor are the property of the Architect and are to be used solely for this Project and not to be used in any manner for other work. Upon completion of the Work, all copies of Drawings and Specifications, with the exception of the Contractor's record set, shall be returned or accounted for by the Contractor to the Architect, on request.

Article 6**SUPERVISION, SUPERINTENDENT, *and* EMPLOYEES****A SUPERVISION and CONSTRUCTION METHODS**

(1) The term "Construction Methods" means the construction means, methods, techniques, sequences, and procedures utilized by the Contractor in performing the Work. The Contractor is solely responsible for supervising and coordinating the performance of the Work, including the selection of Construction Methods, unless the Contract Documents give other specific instructions concerning these matters.

(2) The Contractor is solely and completely responsible for job site safety, including the protection of persons and property in accordance with Article 14.

(3) The Contractor shall be responsible to the Owner for acts and omissions of not only the Contractor and its agents and employees, but all persons and entities, and their agents and employees, who are performing portions of the Work for or on behalf of the Contractor or any of its Subcontractors.

(4) The Contractor shall be responsible to inspect the in-progress and completed Work to verify its compliance with the Contract Documents and to insure that any element or portion of the Work upon which subsequent Work is to be applied or performed is in proper condition to receive the subsequent Work.

B SUPERINTENDENT

(1) The Contractor shall employ and maintain a competent level of supervision for the performance of the Work at the Project site, including a superintendent who shall:

- (a) have full authority to receive instructions from the Architect or Owner and to act on those instructions &
- (b) be present at the Project site at all times during which Work is being performed.

(2) Before beginning performance of the Work, the Contractor shall notify the Architect in writing of the name and qualifications of its proposed superintendent so that the Owner may review the individual's qualifications. If, for reasonable cause, the Owner refuses to approve the individual, or withdraws its approval after once giving it, the Contractor shall name a different superintendent for the Owner's review and approval. Any disapproved superintendent will not perform in that capacity thereafter at the Project site.

C EMPLOYEES

The Contractor shall permit only fit and skilled persons to perform the Work. The Contractor shall enforce safety procedures, strict discipline, and good order among persons performing the Work. The Contractor will remove from its employment on the Project any person who deliberately or persistently produces non-conforming Work or who fails or refuses to conform to reasonable rules of personal conduct contained in the Contract Documents or implemented by the Owner and delivered to the Contractor in writing during the course of the Work.

Article 7**REVIEW of CONTRACT DOCUMENTS *and* FIELD CONDITIONS by CONTRACTOR**

- A** In order to facilitate assembly and installation of the Work in accordance with the Contract Documents, before starting each portion of the Work, the Contractor shall examine and compare the relevant Contract Documents, and compare them to relevant field measurements made by the Contractor and any conditions at the site affecting that portion of the Work.

- B** If the Contractor discovers any errors, omissions, or inconsistencies in the Contract Documents, the Contractor shall promptly report them to the Architect as a written request for information that includes a detailed statement identifying the specific Drawings or Specifications that are in need of clarification and the error, omission, or inconsistency discovered in them.

(1) The Contractor shall not be expected to act as a licensed design professional and ascertain whether the Contract Documents comply with applicable laws, statutes, ordinances, building codes, and rules and regulations, but the Contractor shall be obligated to promptly notify the Architect of any such noncompliance discovered by or made known to the Contractor. If the Contractor performs Work without fulfilling this notification obligation, the Contractor shall pay the resulting costs and damages that would have been avoided by such notification.

(2) The Contractor shall not be liable to the Owner for errors, omissions, or inconsistencies that may exist in the Contract Documents, or between the Contract Documents and conditions at the site, unless the Contractor knowingly fails to report a discovered error, omission, or inconsistency to the Architect, in which case the Contractor shall pay the resulting costs and damages that would have been avoided by such notification.

- C** If the Contractor considers the Architect's response to a request for information to constitute a change to the Contract Documents involving additional costs and/or time, the Contractor shall follow the procedures of Article 20, Claims for Extra Cost or Extra Work.
- D** If, with undue frequency, the Contractor requests information that is obtainable through reasonable examination and comparison of the Contract Documents, site conditions, and previous correspondence, interpretations, or clarifications, the Contractor shall be liable to the Owner for reasonable charges from the Architect for the additional services required to review, research, and respond to such requests for information.

Article 8

SURVEYS *by* CONTRACTORS

- A** The Contractor shall provide competent engineering services to assure accurate execution of the Work in accordance with the Contract Documents. The Contractor shall verify the figures given for the contours, approaches and locations shown on the Drawings before starting any Work and be responsible for the accuracy of the finished Work. Without extra cost to the Owner, the Contractor 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.
- B** 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 grade stakes, batter boards and other working points, lines and elevations. If the Work involves alteration of or addition to existing structures or improvements, the Contractor shall locate and measure elements of the existing conditions as is necessary to facilitate accurate fabrication, assembly, and installation of new Work in the relationship, alignment, and/or connection to the existing structure or improvement as is shown in the Contract Documents.

Article 9

SUBMITTALS

- A** Where required by the Contract Documents, the Contractor shall submit shop drawings, product data, samples and other information (hereinafter referred to as Submittals) to the Architect for the purpose of demonstrating the way by which the Contractor proposes to conform to the requirements of the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Architect without action.
- B** The Contractor shall be responsible to the Owner for the accuracy of its Submittals and the conformity of its submitted information to the requirements of the Contract Documents. Each Submittal shall bear the Contractor's approval, evidencing that the Contractor has reviewed and found the information to be in compliance with the requirements of the Contract Documents. Submittals which are not marked as reviewed and approved by the Contractor may be returned by the Architect without action.
- C** The Contractor shall prepare and deliver its submittals to the Architect sufficiently in advance of construction requirements and in a sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. In coordinating the Submittal process with its construction schedule, the Contractor shall allow sufficient time to permit adequate review by the Architect. Within twenty-four (24) hours of the Bid Opening, the Contractor's Schedule of Values must be submitted to the Architect from the apparent low bidder
- D** By approving a Submittal the Contractor represents not only that the element of Work presented in the Submittal complies with the requirements of the Contract Documents, but also that the Contractor has:
- (1) found the layout and/or dimensions in the Submittal to be comparable with those in the Contract Documents and other relevant Submittals and has made field measurements as necessary to verify their accuracy, and
 - (2) determined that products, materials, systems, equipment and/or procedures presented in the Submittal are compatible with those presented, or being presented, in other relevant Submittals and with the Contractor's intended Construction Methods.
- E** The Contractor shall not fabricate or perform any portion of the Work for which the Contract Documents require Submittals until the respective Submittals have been approved by the Architect.
- F** In the case of a resubmission, the Contractor shall direct specific attention to all revisions in a Submittal. The Architect's approval of a resubmission shall not apply to any revisions that were not brought to the Architect's attention.
- G** If the Contract Documents specify that a Submittal is to be prepared and sealed by a registered architect or licensed engineer retained by the Contractor, all drawings, calculations, specifications, and certifications of the Submittal shall bear the Alabama seal of registration and signature of the registered/licensed design professional who prepared them or under whose supervision they were prepared. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of such a Submittal, provided that all performance and design criteria that such Submittal must satisfy are sufficiently specified in the Contract Documents. The Architect will review, approve or take other appropriate action on such a

Submittal only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance or design criteria specified in the Contract Documents.

H DEVIATIONS

(1) The Architect is authorized by the Owner to approve "minor" deviations from the requirements of the Contract Documents through the use of an Architect's Supplemental Instruction (ASI). These "minor" deviations, or ASIs, are defined as those which are in the interest of the Owner, do not materially alter the quality or performance of the finished Work, and do not affect the cost or time of performance of the Work. Deviations which are not "minor" may be authorized only by the Owner through the Change Order procedures of Article 19.

(2) Any deviation from the requirements of the Contract Documents contained in a Submittal shall be clearly identified as a "Deviation from Contract Requirements" (or by similar language) within the Submittal and, in a letter transmitting the Submittal to the Architect, the Contractor shall direct the Architect's attention to, and request specific approval of, the deviation. Otherwise, the Architect's approval of a Submittal does not constitute approval of deviations from the requirements of the Contract Documents contained in the Submittal.

(3) The Contractor shall bear all costs and expenses of any changes to the Work, changes to work performed by the Owner or separate contractors, or additional services by the Architect required to accommodate an approved deviation unless the Contractor has specifically informed the Architect in writing of the required changes and a Change Order has been issued authorizing the deviation and accounting for such resulting changes and costs.

I ARCHITECT'S REVIEW *and* APPROVAL

(1) The Architect will review the Contractor's Submittals for conformance with requirements of, and the design concept expressed in, the Contract Documents and will approve or take other appropriate action upon them. This review is not intended to verify the accuracy and completeness of details such as dimensions and quantities nor to substantiate installation instructions or performance of equipment or systems, all of which remain the responsibility of the Contractor. However, the Architect shall advise the Contractor of any errors or omissions which the Architect may detect during this review. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

(2) The Architect will review and respond to all Submittals with reasonable promptness to avoid delay in the Work or in the activities of the Owner, Contractor or separate contractors, while allowing sufficient time to permit adequate review.

(3) No corrections or changes to Submittals indicated by the Architect will be considered as authorizations to perform Extra Work. If the Contractor considers such correction or change of a Submittal to require Work which differs from the requirements of the Contract Documents, the Contractor shall promptly notify the Architect in writing in accordance with Article 20, Claims for Extra Cost or Extra Work.

J CONFORMANCE *with* SUBMITTALS

The Work shall be constructed in accordance with approved Submittals.

Article 10**DOCUMENTS *and* SAMPLES *at the* SITE****A “CONFORMANCE DOCUMENTS” SET**

The Contractor will be provided a Conformance Documents issue set of Drawings and Project Manual that incorporates all addenda items and all accepted alternates. The Contractor shall maintain at the Project site, in good order, at least one set of the Conformance Documents Drawings and Project Manual.

The Contractor shall assure that all sets of the Drawings and Project Manuals being used by the Contractor, Subcontractors, and suppliers are “Conformance Documents” with the current information to insure that updated Contract Documents are used for performance of the Work.

B RECORD SET

One set of the Drawings and Project Manual described in Paragraph A shall be the Contractor's record set in which the Contractor shall record all field changes, corrections, selections, final locations, and other information as will be duplicated on the “As-built” documents required under Article 11. The Contractor shall record such “as-built” information in its record set as it becomes available through progress of the Work. The Contractor's performance of this requirement shall be subject to confirmation by the Architect at any time as a prerequisite to approval of Progress Payments.

C The documents and samples required by this Article to be maintained at the Project site shall be readily available to the Architect, Owner, AHJ or other reviewing entity, and their representatives.

Article 11**“AS-BUILT” DOCUMENTS**

A Unless otherwise provided in the Contract Documents, the Contractor shall deliver two (2) sets or one reapeable standard PDF set of “As-built” documents, as described herein, to the Architect for submission to the Owner upon completion of the Work. Each set of “As-built” documents shall consist of a copy of the Drawings and Project Manual, in like-new condition, into which the Contractor has neatly incorporated all Addenda, Change Orders, supplemental drawings, clarifications, field changes, corrections, selections, actual locations of underground utilities, and other information as required herein or specified elsewhere in the Contract Documents.

B The Contractor shall use the following methods for incorporating information into the “As-built” documents:

(1) Drawings

(a) To the greatest extent practicable, information shall be carefully drawn and lettered, in ink, on the Drawings in the form of sketches, details, plans, notes, and dimensions as required to provide a fully dimensioned record of the Work. When required for clarity, sketches, details, or partial plans shall be drawn on supplemental sheets and bound into the Drawings and referenced on the drawing being revised.

(b) Where a revised drawing has been furnished by the Architect, the drawing of latest date shall be bound into the Drawings in the place of the superseded drawing.

(c) Where a supplemental drawing has been furnished by the Architect, the supplemental drawing shall be bound into the Drawings in an appropriate location and referred to by notes added to the drawing being supplemented.

(d) Where the Architect has furnished details, partial plans, or lengthy notes of which it would be impractical for the Contractor to redraw or letter on a drawing, such information may be affixed to the appropriate drawing with transparent tape if space is available on the drawing.

(e) Any entry of information made in the Drawings that is the result of an Addendum or Change Order, shall identify the Addendum or Change Order from which it originated.

(2) Project Manual

(a) A copy of all Addenda and Change Orders, excluding drawings thereof, shall be bound in the front of the Project Manual.

(b) Where a document, form, or entire specification section is revised, the latest issue shall be bound into the Project Manual in the place of the superseded issue.

(c) Where information within a specification section is revised, the deleted or revised information shall be drawn through in ink and an adjacent note added identifying the Addendum or Change Order containing the revised information.

C Within ten days after the Date of Substantial Completion of the Work, or the last completed portion of the Work, the Contractor shall submit the "As-built" documents to the Architect for approval. If the Architect requires that any corrections be made, the documents will be returned in a reasonable time for correction and resubmission.

Article 12
PROGRESS SCHEDULE

(Not applicable if the Contract Time is 60 days or less.)

A The Contractor shall within fifteen days after the date of commencement stated in the Notice to Proceed, or such other time as may be provided in the Contract Documents, prepare and submit to the Architect for review and approval a practicable construction schedule informing the Architect and Owner of the order in which the Contractor plans to carry on the Work within the Contract Time. The Architect's review and approval of the Contractor's construction schedule shall be only for compliance with the specified format, Contract Time, and suitability for monitoring progress of the Work and shall not be construed as a representation that the Architect has analyzed the schedule to form opinions of sequences or durations of time represented in the schedule.

B In conjunction with the construction schedule a progress schedule shall be prepared using ACCS Form 6-H "Progress Schedule and Report", (contained in the Project Manual) or similar format of suitable scale and detail to indicate the percentage of Work scheduled to be completed at the end of each month. ACCS Form 6-H shall not be used as the construction schedule. At the end of each month the Contractor shall enter the actual percentage of completion on the construction schedule submit two copies to the Architect, and attach one copy to each copy of the monthly Application for Payment. The construction schedule shall be revised to reflect any agreed extensions of the Contract Time or as required by conditions of the Work.

- C** The Contractor's construction schedule shall be used by the Contractor, Architect, and Owner to determine the adequacy of the Contractor's progress. The Contractor shall be responsible for maintaining progress in accordance with the currently approved construction schedule and shall increase the number of shifts, and/or overtime operations, days of work, and/or the amount of construction plant and equipment as may be necessary to do so. If the Contractor's progress falls materially behind the currently approved construction schedule, it is expected that the Architect formally notify the Contractor to produce a recovery schedule to meet the construction deadlines. If the Contractor is not taking sufficient steps to regain schedule, the Architect may, with the Owner's concurrence, issue the Contractor a Notice to Cure pursuant to Article 27. In such a Notice to Cure the Architect may require the Contractor to submit such supplementary or revised construction schedules as may be deemed necessary to demonstrate the manner in which schedule will be regained.

Article 13 **EQUIPMENT, MATERIALS, *and* SUBSTITUTIONS**

- A** Every part of the Work shall be executed in a workmanlike manner in accordance with the Contract Documents and approved Submittals. All materials used in the Work shall be furnished in sufficient quantities to facilitate the proper and expeditious execution of the Work and shall be new except such materials as may be expressly provided or allowed in the Contract Documents to be otherwise.
- B** Whenever a product, material, system, item of equipment, or service is identified in the Contract Documents by reference to a trade name, manufacturer's name, model number, etc.(hereinafter referred to as "source"), and only one or two sources are listed, or three or more sources are listed and followed by "or approved equal" or similar wording, it is intended to establish a required standard of performance, design, and quality, and the Contractor may submit, for the Architect's approval, products, materials, systems, equipment, or services of other sources which the Contractor can prove to the Architect's satisfaction are equal to, or exceed, the standard of performance, design and quality specified, unless the provisions of Paragraph D below apply. Such proposed substitutions are not to be purchased or installed without the Architect's written approval of the substitution.
- C** If the Contract Documents identify three or more sources for a product, material, system, item of equipment or service to be used and the list of sources is not followed by "or approved equal" or similar wording, the Contractor may make substitution only after evaluation by the Architect and execution of an appropriate Contract Change Order.
- D** If the Contract Documents identify only one source and expressly provide that it is an approved sole source for the product, material, system, item of equipment, or service, the Contractor must furnish the identified sole source.

Article 14 **SAFETY *and* PROTECTION of PERSONS *and* PROPERTY**

- A** The Contractor shall be solely and completely responsible for conditions at the Project site, including safety of all persons (including employees) and property. The Contractor shall create, maintain, and supervise conditions and programs to facilitate and promote safe execution of the Work, and shall supervise the Work with the attention and skill required to assure its safe performance. Safety provisions shall conform to OSHA requirements and all other federal, state, county, and local laws, ordinances, codes, and regulations.

- B** Where any of these are in conflict, the more stringent requirement shall be followed. Nothing contained in this Contract shall be construed to mean that the Owner has employed the Architect nor has the Architect employed its consultants to administer, supervise, inspect, or take action regarding safety programs or conditions at the Project site.

The Contractor shall employ Construction Methods, safety precautions, and protective measures that will reasonably prevent damage, injury or loss to:

(1) workers and other persons on the Project site and in adjacent and other areas that may be affected by the Contractor's operations;

(2) the Work and materials and equipment to be incorporated into the Work and stored by the Contractor on or off the Project site; and

(3) other property on, or adjacent to, the Project site, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and other improvements not designated in the Contract Documents to be removed, relocated, or replaced.

- C** The Contractor shall be responsible for the prompt remedy of damage and loss to property, including the filing of appropriate insurance claims, caused in whole or in part by the fault or negligence of the Contractor, a Subcontractor, or anyone for whose acts they may be liable.

- D** The Contractor shall comply with and give notices required by applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety and protection of persons or property, including without limitation notices to adjoining property owners of excavation or other construction activities that potentially could cause damage or injury to adjoining property or persons thereon.

- E** The Contractor shall erect and maintain barriers, danger signs, and any other reasonable safeguards and warnings against hazards as may be required for safety and protection during performance of the Contract and shall notify owners and users of adjacent sites and utilities of conditions that may exist or arise which may jeopardize their safety.

- F** If use or storage of explosives or other hazardous materials or equipment or unusual Construction Methods are necessary for execution of the Work, the Contractor shall exercise commensurate care and employ supervisors and workers properly qualified to perform such activity.

- G** The Contractor shall furnish a qualified safety representative at the Project site whose duties shall include the prevention of accidents. The safety representative shall be the Contractor's superintendent, unless the Contractor assigns this duty to another responsible member of its on-site staff and notifies the Owner and Architect in writing of such assignment.

- H** The Contractor shall not permit a load to be applied, or forces introduced, to any part of the 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.

- I** The Contractor shall have the right to act as it deems appropriate in emergency situations jeopardizing life or property. The Contractor shall be entitled to equitable adjustment of the Contract Sum or Contract Time for its efforts expended for the sole benefit of the Owner in an emergency. Such adjustment shall be determined as provided in Articles 19 and 20.

- J** The duty of the Architect and the Architect's consultants to visit the Project site to conduct periodic inspections of the Work or for other purposes shall not give rise to a duty to review or approve the adequacy of the Contractor's safety program, safety supervisor, or any safety measure which Contractor takes or fails to take in, on, or near the Project site.

Article 15

HAZARDOUS MATERIALS

- A** A Hazardous Material is any substance or material identified as hazardous under any federal, state, or local law or regulation, or any other substance or material which may be considered hazardous or otherwise subject to statutory or regulatory requirements governing its handling, disposal, and/or clean-up. Existing Hazardous Materials are Hazardous Materials discovered at the Project site and not introduced to the Project site by the Contractor, a Subcontractor, or anyone for whose acts they may be liable.
- B** If, during the performance of the Work, the Contractor encounters a suspected Existing Hazardous Material, the Contractor shall immediately stop work in the affected area, take measures appropriate to the condition to keep people away from the suspected Existing Hazardous Material, and immediately notify the Architect and Owner of the condition in writing.
- C** The Owner shall obtain the services of an independent laboratory or professional consultant, appropriately licensed and qualified, to determine whether the suspected material is a Hazardous Material requiring abatement and, if so, to certify after its abatement that it has been rendered harmless. Any abatement of Existing Hazardous Materials will be the responsibility of the Owner. The Owner will advise the Contractor in writing of the persons or entities who will determine the nature of the suspected material and those who will, if necessary, perform the abatement. The Owner will not employ persons or entities to perform these services to whom the Contractor or Architect has reasonable objection.
- D** After certification by the Owner's independent laboratory or professional consultant that the material is harmless or has been rendered harmless, work in the affected area shall resume upon written agreement between the Owner and Contractor. If the material is found to be an Existing Hazardous Material and the Contractor incurs additional cost or delay due to the presence and abatement of the material, the Contract Sum and/or Contract Time shall be appropriately adjusted by a Contract Change Order pursuant to Article 19.
- E** The Owner shall not be responsible for Hazardous Materials introduced to the Project site by the Contractor, a Subcontractor, or anyone for whose acts they may be liable unless such Hazardous Materials were required by the Contract Documents.

Article 16

INSPECTION *of the* WORK

- A GENERAL**
 - (1) The Contractor is solely responsible for the Work's compliance with the Contract Documents; therefore, the Contractor shall be responsible to inspect in-progress and completed Work, and shall verify its compliance with the Contract Documents and that any element or portion of the Work upon which subsequent Work is to be applied or performed is in proper condition to receive the subsequent Work. Neither the presence nor absence of inspections by the Architect, Owner, AHJ, any public authority having

jurisdiction, or their representatives shall relieve the Contractor of responsibility to inspect the Work, for responsibility for Construction Methods and safety precautions and programs in connection with the Work, or from any other requirement of the Contract Documents.

(2) The Architect, Owner, AHJ, any public authority 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 Contract Documents, shall be subject to inspection, examination, and test at any and all places where such manufacture and/or construction are being carried on. Such inspections will not unreasonably interfere with the Contractor's operations.

(3) The Architect will inspect the Work as a representative of the Owner. The Architect's inspections may be supplemented by inspections by an AHJ or other reviewing entity.

(4) The Contractor may be charged by the Owner for any extra cost of inspection incurred by the Owner or Architect on account of material and workmanship not being ready at the time of inspection set by the Contractor.

(5) It is the Contractor's responsibility to communicate to the Design Team the date and time of requested inspection(s). It is the Design Team's responsibility to coordinate the date and time of the requested inspection with the Contractor, AHJ or ICC, Owner (ACCS) and College (college designated representative).

(6) The following are the minimum participation requirements for inspections:

- (a) Required inspection without an AHJ or ICC - both the Contractor and Design Professional of record.
- (b) Required inspection with an AHJ or ICC - both the Contractor and Design Professional of record.

B TYPES of INSPECTIONS

(1) **SCHEDULED INSPECTIONS and CONFERENCES.** Scheduled Inspections and Conferences are conducted by the Architect, scheduled by the Architect in coordination with the Contractor and AHJ where applicable, and are attended by the Contractor and applicable Subcontractors, suppliers and manufacturers. Scheduled Inspections and Conferences of this Contract include:

- (a) Pre-construction Conference.
- (b) Pre-roofing Conference (not applicable if the Contract involves no roofing work)
- (c) Pre-Asphalt Paving Installation and Expectations Conference
- (d) Pre-Landscape Sod Installation and Expectations Conference
- (e) Pre-Flooring Installation and Expectations Conference
- (f) Below Slab/Underground Utility Inspection
- (g) Footings and Foundation Inspection
- (h) Concrete Slab Inspection
- (i) Waterproofing and Building Envelope Inspection
- (j) In-Wall Inspection
- (k) Gypsum Board Inspection
- (l) Roofing Inspection
- (m) Storm Shelter Inspection (if applicable)

(n) Above Ceiling Inspection(s): An above ceiling inspection of all spaces in the building is required before the ceiling material is installed. Above ceiling inspections are to be conducted at a time when all above ceiling systems are complete and tested to the greatest extent reasonable pending installation of the ceiling material. System identifications and markings are to be complete. All fire-rated construction including fire-stopping of penetrations and specified identification above the ceiling shall be complete. Ceiling framing and suspension systems shall be complete with lights, grilles and diffusers, access panels, fire protection drops for sprinkler heads, etc., installed in their final locations to the greatest extent reasonable. Above ceiling framing to support ceiling mounted equipment shall be complete. The above ceiling construction shall be complete to the extent that after the inspection the ceiling material can be installed without disturbance.

(o) Elevator Inspection

(p) Fire Suppression Systems Inspection

(q) Fire Alarm System Inspection

(r) Emergency Lights and Exit Signs Inspection

(s) ADA Inspection

(t) Substantial Completion

(u) Final Inspection(s): A Final Inspection shall establish that the Work, or a designated portion of the Work, is Substantially Complete in accordance with Article 32 and is accepted by the Architect, Owner, and AHJ or other reviewing entity as being ready for the Owner's occupancy or use. At the conclusion of this inspection, items requiring correction or completion ("punch list" items) shall be minimal. Punch list items shall contain only items that can be reasonably completed and inspected within 30 days so that the Owner can occupy without disruption or interference by the Contractor and to establish Final Acceptance of the Work. If punch list items and closeout documents are not completed within 45 days of issuance of Certificate of Substantial Completion, a Notice to Cure may be issued. If the Work, or designated portion of the Work, includes the installation, or modification, of a fire alarm system or other life safety systems essential to occupancy, such systems shall have been tested and appropriately certified before the Final Inspection.

(v) Year-End Inspection(s): An inspection of the Work, or each separately completed portion thereof, is required near the end of the Contractor's one year warranty period(s). The subsequent delivery of the Architect's report of this inspection will serve as confirmation that the Contractor was notified of Defective Work found within the warranty period in accordance with Article 35.

(2) PERIODIC INSPECTIONS. Periodic Inspections are conducted throughout the course of the Work by the Architect, the Architect's consultants, their representatives, or other reviewing entity at the direction of the Owner, jointly or independently, with or without advance notice to the Contractor.

(3) SPECIFIED INSPECTIONS and TESTS. Specified Inspections and Tests include inspections, tests, demonstrations, and approvals that are either specified in the Contract Documents or required by laws, ordinances, rules, regulations, or orders of public authorities having jurisdiction, to be performed by the Contractor, one of its Subcontractors, or an independent testing laboratory or firm (whether paid for by the Contractor or Owner).

C INSPECTIONS *by the* ARCHITECT

(1) The Architect is not authorized to revoke, alter, relax, or waive any requirements of the Contract Documents (other than "minor" deviations as defined in Article 9 and "minor" changes as defined in Article 19), to finally approve or accept any portion of the Work or to issue instructions contrary to the Contract Documents without concurrence of the Owner.

(2) The Architect will visit the site at intervals appropriate to the stage of the Contractor's operations and as otherwise necessary to:

- (a) become generally familiar with the in-progress and completed Work and the quality of the Work,
- (b) determine whether the Work is progressing in general accordance with the Contractor's schedule and is likely to be completed within the Contract Time,
- (c) visually compare readily accessible elements of the Work to the requirements of the Contract Documents to determine, in general, if the Contractor's performance of the Work indicates that the Work will conform to the requirements of the Contract Documents when completed,
- (d) endeavor to guard the Owner against Defective Work,
- (e) review and address with the Contractor any problems in implementing the requirements of the Contract Documents that the Contractor may have encountered, and
- (f) keep the Owner fully informed about the Project.

(3) The Architect shall have the authority to reject Defective Work or require its correction, but shall not be required to make exhaustive investigations or examinations of the in-progress or completed portions of the Work to expose the presence of Defective Work. However, it shall be an obligation of the Architect to report in writing, to the Owner, Contractor, and ACCS Facilities Division, any Defective Work recognized by the Architect.

(4) The Architect shall have the authority to require the Contractor to stop work only when, in the Architect's reasonable opinion, such stoppage is necessary to avoid Defective Work. The Architect shall not be liable to the Contractor or Owner for the consequences of any decisions made by the Architect in good faith either to exercise or not to exercise this authority.

(5) "Inspections by the Architect" includes appropriate inspections by the Architect's consultants as dictated by their respective disciplines of design and the stage of the Contractor's operations.

D INSPECTIONS BY THE LOCAL AHJ OR INDEPENDENT CODE CONSULTANTS

(1) The Local AHJ or Independent Code Consultant will:

- (a) participate in scheduled inspections and conferences as practicable,
- (b) perform periodic inspections of in-progress and completed Work to ensure code compliance of the Project and general conformance of the Work with the Contract Documents, and
- (c) monitor the Contractor's progress and performance of the Work.

(2) The Local AHJ or Independent Code Consultant shall have the authority to:

- (a) reject Work that is not in compliance with the State Building Code, unless the Work is in accordance with the Contract Documents in which case the Architect shall initiate appropriate corrective action, and
- (b) notify the Architect, Owner, and Contractor of Defective Work recognized by the Local AHJ or Independent Code Consultant.

(3) The Local AHJ or Independent Code Consultant's periodic inspections will usually be scheduled around key stages of construction based upon information reported by the Architect. As the Architect or Owner deems appropriate, the Local AHJ or Independent Code Consultants can be requested to schedule special inspections or meetings to address specific matters. The written findings of the Local AHJ or Independent Code Consultants will be transmitted to the Owner, Contractor, and Architect.

(4) The Local AHJ or Independent Code Consultant is not 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 Contract Documents without concurrence of the Owner. The Contractor shall not proceed with Work as a result of instructions or findings of the Local AHJ or Independent Code Consultant which the Contractor considers to be a change to the requirements of the Contract Documents without written authorization of the Owner through the Architect.

E UNCOVERING WORK

(1) If the Contractor covers a portion of the Work before it is examined by the Architect and this is contrary to the Architect's request or specific requirements in the Contract Documents, then, upon written request of the Architect, the Work must be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

(2) Without a prior request or specific requirement that Work be examined by the Architect before it is covered, the Architect may request that Work be uncovered for examination and the Contractor shall uncover it. If the Work is in accordance with the Contract Documents, the Contract Sum shall be equitably adjusted under Article 19 to compensate the Contractor for the costs of uncovering and replacement. If the Work is not in accordance with the Contract Documents, uncovering, correction, and replacement shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

F SPECIFIED INSPECTIONS *and* TESTS

(1) The Contractor shall schedule and coordinate Specified Inspections and Tests to be made at appropriate times so as not to delay the progress of the Work or the work of the Owner or separate contractors. If the Contract Documents require that a Specified Inspection or Test be witnessed or attended by the Architect or Architect's consultant, the Contractor shall give the Architect timely notice of the time and place of the Specified Inspection or Test. If a Specified Inspection or Test reveals that Work is not in compliance with requirements of the Contract Documents, the Contractor shall bear the costs of correction, repeating the Specified Inspection or Test, and any related costs incurred by the Owner, including reasonable charges, if any, by the Architect for additional services. Through appropriate Contract Change Order the Owner shall bear costs of tests, inspections or approvals which become Contract requirements subsequent to the receipt of bids.

(2) If the Architect, Owner, or public authority having jurisdiction determines that inspections, tests, demonstrations, or approvals in addition to Specified Inspections and Tests are required, the Contractor

shall, upon written instruction from the Architect, arrange for their performance by an entity acceptable to the Owner, giving timely notice to the architect of the time and place of their performance. Related costs shall be borne by the Owner unless the procedures reveal that Work is not in compliance with requirements of the Contract Documents, in which case the Contractor shall bear the costs of correction, repeating the procedures, and any related costs incurred by the Owner, including reasonable charges, if any, by the Architect for additional services.

(3) Unless otherwise required by the Contract Documents, required certificates of Specified Inspections and Tests shall be secured by the Contractor and promptly delivered to the Architect.

(4) Failure of any materials to pass Specified Inspections and 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.

Article 17

CORRECTION *of* DEFECTIVE WORK

- A** The Contractor shall, at the Contractor's expense, promptly correct Defective Work rejected by the Architect or which otherwise becomes known to the Contractor, removing the rejected or nonconforming materials and construction from the project site.
- B** Correction of Defective Work shall be performed in such a timely manner as will avoid delay of completion, use, or occupancy of the Work and the work of the Owner and separate contractors.
- C** The Contractor shall bear all expenses related to the correction of Defective Work, including but not limited to:
 - (1) additional testing and inspections, including repeating Specified Inspections and Tests,
 - (2) reasonable services and expenses of the Architect, and (3) the expense of making good all work of the Contractor, Owner, or separate contractors destroyed or damaged by the correction of Defective Work.
- D** All Defective Work, or Deficiencies, shall be tracked on a Project Deficiency Log that is reviewed and updated at least monthly at OAC meetings.

Article 18

DEDUCTIONS *for* UNCORRECTED WORK

If the Owner deems it advisable and in the Owner's interest to accept Defective Work, the Owner may allow part or all of such Work to remain in place, provided an equitable deduction from the Contract Sum, acceptable to the Owner, is offered by the Contractor.

Article 19

CHANGES *in* WORK

- A GENERAL**
 - (1) The Owner may at any time direct the Contractor to make changes in the Work which are within the general scope of the Contract, including changes in the Drawings, Specifications, or other portions of the Contract Documents to add, delete, or otherwise revise portions of the Work. The Architect is authorized by the Owner to direct "minor" changes in the Work by written order to the Contractor through the use of an

Architect's Supplemental Instruction (ASI). These "minor" changes, or ASIs, in the Work are defined as those which are in the interest of the Owner, do not materially alter the quality or performance of the finished Work, and do not affect the cost or time of performance of the Work. Changes in the Work which are not "minor" may be authorized only by the Owner.

(2) If the Owner directs a change in the Work, the change shall be incorporated into the Contract by a Contract Change Order prepared by the Architect and signed by the Contractor, Owner, and other signatories to the Construction Contract, stating their agreement upon the change or changes in the Work and the adjustments, if any, in the Contract Sum and the Contract Time.

(3) Subject to compliance with Alabama's Public Works Law, the Owner may, upon agreement by the Contractor, incorporate previously unawarded bid alternates into the Contract.

(4) In the event of a claim or dispute as to the appropriate adjustment to the Contract Sum or Contract Time due to a directive to make changes in the Work, the Work shall proceed as provided in this article subject to subsequent agreement of the parties or final resolution of the dispute pursuant to Article 24.

(5) Consent of surety will be obtained for all Contract Change Orders involving an increase in the Contract Sum.

(6) Changes in the Work shall be performed under applicable provisions of the Contract Documents and the Contractor shall proceed promptly to perform changes in the Work, unless otherwise directed by the Owner through the Architect.

(7) Liquidated damages are routed as Change Orders for work that the Contractor has failed to substantially complete within the Contract Time. Before the process of applying liquidated damages begins, communication and approval is required from the ACCS Chief Facilities Officer.

(8) All change orders require completion of ACCS Form 2-F Contract Change Order and ACCS Form 2-G Contract Change Order Justification forms. Only Change Orders 10% or greater of the current contract amount require the Owner's legal advisor's signature on the Change Order Justification form.

B DETERMINATION *of* ADJUSTMENT *of the* CONTRACT SUM

The adjustment of the Contract Sum resulting from a change in the Work shall be determined by one of the following methods, or a combination thereof, as selected by the Owner:

(1) Lump Sum. By mutual agreement to a lump sum based on or negotiated from an itemized cost proposal from the Contractor. This amount shall be all-inclusive, covering direct costs, as well as any fees. Contractor shall furnish to the Owner an itemized breakdown of the quantities and prices to be used in estimating the value of any changes that might be ordered. For the purposes of this method, Contractor and Subcontractors, shall furnish, at a minimum, the following on their own letterhead; all material or vendor quotes (with quantities and unit cost), labor hours, labor rates, labor burdens, equipment, and any other relevant information necessary to analyze the quote. Changes which involve a net credit to the Owner shall include fair and reasonable credits for overhead and profit on the deducted work, in no case less than 5%. For the purposes of this method of determining an adjustment of the Contract Sum, "overhead" shall cover the Contractor's indirect costs of the change, such as the cost of bonds, superintendent and other job office

personnel, watchman, job office, job office supplies and expenses, temporary facilities and utilities, and home office expenses.

- (a) For the Party performing the work, the cost of the work, less any credits, shall have a maximum markup for Overhead and Profit of 10%.
- (b) The prime contractor or upper-tier subcontractor's markup on work performed by lower-tier subcontractors shall not exceed 10%. No more than 10% shall be added by each successive lower-tier subcontractor, if applicable, for a maximum of 20%.
- (c) Article 19.B.1.a and 19.B.1.b shall also apply to Force Account changes.

(2) **Unit Price.** By application of Unit Prices included in the Contract or subsequently agreed to by the parties. However, if the character or quantity originally contemplated is materially changed so that application of such unit price to quantities of Work proposed will cause substantial inequity to either party, the applicable unit price shall be equitably adjusted. Each unit price is to include overhead, profit, and all other related costs.

(3) **Force Account.** By directing the Contractor to proceed with the change in the Work on a "force account" basis under which the Contractor shall be reimbursed for reasonable expenditures incurred by the Contractor and its Subcontractors in performing added Work and the Owner shall receive reasonable credit for any deleted Work. The Contractor shall keep and present, in such form as the Owner may prescribe, an itemized accounting of the cost of the change together with sufficient supporting data. Unless otherwise stated in the directive, the adjustment of the Contract Sum shall be limited to the following:

- (a) costs of labor and supervision, including employee benefits, social security, retirement, unemployment and workers' compensation insurance required by law, agreement, or under Contractor's or Subcontractor's standard personnel policy;
- (b) cost of materials, supplies and equipment, including cost of delivery, whether incorporated or consumed;
- (c) rental cost of machinery and equipment, not to exceed prevailing local rates if contractor-owned;
- (d) costs of premiums for insurance required by the Contract Documents, permit fees, and sales, use or similar taxes related to the change in the Work;
- (e) reasonable credits to the Owner for the value of deleted Work, without Contractor or Subcontractor mark-ups; and

C **ADJUSTMENT of the CONTRACT TIME due to CHANGES**

(1) Unless otherwise provided in the Contract Documents, the Contract Time shall be equitably adjusted for the performance of a change provided that the Contractor notifies the Architect in writing that the change will increase the time required to complete the Work. Such notice shall be provided no later than:

- (a) with the Contractor's cost proposal stating the number of days of extension requested, or
- (b) within ten days after the Contractor receives a directive to proceed with a change in advance of submitting a cost proposal, in which case the notice should provide an estimated number of days of extension to be requested, which may be subject to adjustment in the cost proposal.

(2) The Contract Time shall be extended only to the extent that the change affects the time required to complete the entire Work of the Contract, taking into account the concurrent performance of the changed and unchanged Work. All Contract Time extension requests will be considered in relation to the Critical Path of the Construction Schedule. For purposes of this section, the Critical Path of the Construction Schedule determines the sequence of dependent tasks for project completion and identifies the shortest possible duration for completing the project.

D CHANGE ORDER PROCEDURES

(1) If the Owner proposes to make a change in the Work, the Architect will request that the Contractor provide a cost proposal for making the change to the Work. The request shall be in writing and shall adequately describe the proposed change using drawings, specifications, narrative, or a combination thereof. Within 14 days after receiving such a request, or such other time as may be stated in the request, the Contractor shall prepare and submit a written proposal along with the Change Proposal Recap Sheet to the Architect, properly itemized and supported by sufficient substantiating data to facilitate evaluation. The stated time within which the Contractor must submit a proposal may be extended if, within that time, the Contractor makes a written request with reasonable justification thereof.

(2) The Contractor may voluntarily offer a change proposal which, in the Contractor's opinion, will reduce the cost of construction, maintenance, or operation or will improve the cost-effective performance of an element of the Project, in which case the Owner, through the Architect, will accept, reject, or respond otherwise within 21 days after receipt of the proposal, or such other reasonable time as the Contractor may state in the proposal.

(3) If the Contractor's proposal is acceptable to the Owner, or is negotiated to the mutual agreement of the Contractor and Owner, the Architect will prepare an appropriate Contract Change Order for execution. Upon receipt of the fully executed Contract Change Order, the Contractor shall proceed with the change.

(4) In advance of delivery of a fully executed Contract Change Order, the Architect may furnish to the Contractor a written authorization to proceed with an agreed change utilizing the Change Order Justification (ACCS Form 2-G). However, such an authorization shall be effective only if it:

- (a) identifies the Contractor's accepted or negotiated proposal for the change,
- (b) states the agreed adjustments, if any, in Contract Sum and Contract Time,
- (c) states that funds are available to pay for the change, and
- (d) is signed by the Owner.

(5) If the Contractor and Owner cannot agree on the amount of the adjustment in the Contract Sum for a change, the Owner, through the Architect, may order the Contractor to proceed with the change on a Force Account basis, but the net cost to the Owner shall not exceed the amount quoted in the Contractor's proposal. Such order shall state that funds are available to pay for the change.

(6) If the Contractor does not promptly respond to a request for a proposal, or the Owner determines that the change is essential to the final product of the Work and that the change must be effected immediately to avoid delay of the Project, the Owner may:

- (a) determine with the Contractor a sufficient maximum amount to be authorized for the change and

(b) direct the Contractor to proceed with the change on a Force Account basis pending delivery of the Contractor's proposal, stating the maximum increase in the Contract Sum that is authorized for the change.

(7) Pending agreement of the parties or final resolution of any dispute of the total amount due the Contractor for a change in the Work, amounts not in dispute for such changes in the Work may be included in Applications for Payment accompanied by an interim Change Order indicating the parties' agreement with part of all of such costs or time extension. Once a dispute is resolved, it shall be implemented by preparation and execution of an appropriate Change Order.

Article 20 **CLAIMS *for* EXTRA COST or EXTRA WORK**

- A** If the Contractor considers any instructions by the Architect, Owner, or public authority having jurisdiction or Independent Code Consultant, to be contrary to the requirements of the Contract Documents and will involve extra work and/or cost under the Contract, the Contractor shall give the Architect written notice thereof within ten days after receipt of such instructions, and in any event before proceeding to execute such work. As used in this Article, "instructions" shall include written or oral clarifications, directions, instructions, interpretations, or determinations.
- B** The Contractor's notification pursuant to Paragraph 20.A shall state: (1) the date, circumstances, and source of the instructions, (2) that the Contractor considers the instructions to constitute a change to the Contract Documents and why, and (3) an estimate of extra cost and time that may be involved to the extent an estimate may be reasonably made at that time.
- C** Except for claims relating to an emergency endangering life or property, no claim for extra cost or extra work shall be considered in the absence of prior notice required under Paragraph 20.A.
- D** Within ten days of receipt of a notice pursuant to Paragraph 20.A, the Architect will respond in writing to the Contractor, stating one of the following:
 - (1) The cited instruction is rescinded.
 - (2) The cited instruction is a change in the Work and in which manner the Contractor is to proceed with procedures of Article 19, Changes in the Work.
 - (3) The cited instruction is reconfirmed, is not considered by the Architect to be a change in the Contract Documents, and the Contractor is to proceed with Work as instructed.
- E** If the Architect's response to the Contractor is as in Paragraph 20.D(3), the Contractor shall proceed with the Work as instructed. If the Contractor continues to consider the instructions to constitute a change in the Contract Documents, the Contractor shall, within ten days after receiving the Architect's response, notify the Architect in writing that the Contractor intends to submit a claim pursuant to Article 24, Resolution of Claims and Disputes.

Article 21

DIFFERING SITE CONDITIONS

A DEFINITION

"Differing Site Conditions" are:

(1) subsurface or otherwise concealed physical conditions at the Project site which differ materially from those indicated in the Contract Documents, or

(2) unknown physical conditions at the Project site which are of an unusual nature, differing materially from conditions ordinarily encountered and generally recognized as inherent in construction activities of the character required by the Contract Documents.

B PROCEDURES

If Differing Site Conditions are encountered, then the party discovering the condition shall promptly notify the other party before the condition is disturbed and in no event later than ten days after discovering the condition. Upon such notice and verification that a Differing Site Condition exists, the Architect will, with reasonable promptness and with the Owner's concurrence, make changes in the Drawings and/or Specifications as are deemed necessary to conform to the Differing Site Condition. Any increase or decrease in the Contract Sum or Contract Time that is warranted by the changes will be made as provided under Article 19, Changes in the Work. If the Architect determines a Differing Site Condition has not been encountered, the Architect shall notify the Owner and Contractor in writing, stating the reason for that determination.

Article 22

CLAIMS *for* DAMAGES

If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time after the discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

Article 23

DELAYS

A A delay beyond the Contractor's control at any time in the commencement or progress of Work by an act or omission of the Owner, Architect, or any separate contractor or by labor disputes, unusual delay in deliveries, unavoidable casualties, fires, abnormal floods, tornadoes, or other cataclysmic events of nature, may entitle the Contractor to an extension of the Contract Time provided, however, that the Contractor shall, within ten days after the delay first occurs, give written notice to the Architect of the cause of the delay and its probable effect on progress of the entire Work.

B Adverse weather conditions that are more severe than anticipated for the locality of the Work during any given month may entitle the Contractor to an extension of Contract Time provided, however;

(1) the weather conditions had an adverse effect on construction scheduled to be performed during the period in which the adverse weather occurred, which in reasonable sequence would have an effect on completion of the entire Work,

(2) the Contractor shall, within twenty-one days after the end of the month in which the delay occurs, give the Architect written notice of the delay that occurred during that month and its probable effect on progress of the Work, and

(3) within a reasonable time after giving notice of the delay, the Contractor provides the Architect with sufficient data to document that the weather conditions experienced were unusually severe for the locality of the Work during the month in question. Unless otherwise provided in the Contract Documents, data documenting unusually severe weather conditions shall compare actual weather conditions to the average weather conditions for the month in question during the previous five years as recorded by the National Oceanic and Atmospheric Administration (NOAA) or similar record-keeping entities.

C Adjustments, if any, of the Contract Time pursuant to this Article shall be incorporated into the Contract by a Contract Change Order prepared by the Architect and signed by the Contractor, Owner, and other signatories to the Construction Contract or, at closeout of the Contract, by mutual written agreement between the Contractor and Owner. The adjustment of the Contract Time shall not exceed the extent to which the delay extends the time required to complete the entire Work of the Contract.

D The Contractor shall not be entitled to any adjustment of the Contract Sum for damage due to delays claimed pursuant to this Article unless the delay was caused by the Owner or Architect and was either:

(1) the result of bad faith or active interference or

(2) beyond the contemplation of the parties and not remedied within a reasonable time after notification by the Contractor of its presence.

Article 24 **RESOLUTION of CLAIMS and DISPUTES**

A **APPLICABILITY of ARTICLE**

(1) As used in this Article, "Claims and Disputes" include claims or disputes asserted by the Contractor, its Surety, or Owner arising out of or related to the Contract, or its breach, including without limitation claims seeking, under the provisions of the Contract, equitable adjustment of the Contract Sum or Contract Time and claims and disputes arising between the Contractor (or its Surety) and Owner regarding interpretation of the Contract Documents, performance of the Work, or breach of or compliance with the terms of the Contract.

(2) "Resolution" addressed in this Article applies only to Claims and Disputes arising between the Contractor (or its Surety) and Owner and asserted after execution of the Construction Contract and prior to the date upon which final payment is made. Upon making application for final payment the Contractor may reserve the right to subsequent Resolution of existing Claims by including a list of all Claims, in stated amounts, which remain to be resolved and specifically excluding them from any release of claims executed by the Contractor, and in that event Resolution may occur after final payment is made.

B **CONTINUANCE of PERFORMANCE**

An unresolved Claim or Dispute shall not be just cause for the Contractor to fail or refuse to proceed diligently with performance of the Contract or for the Owner to fail or refuse to continue to make payments in accordance with the Contract Documents.

C GOOD FAITH EFFORT *to* SETTLE

The Contractor and Owner agree that, upon the assertion of a Claim by the other, they will make a good faith effort, with the Architect's assistance and advice, to achieve mutual resolution of the Claim. If mutually agreed, the Contractor and Owner may endeavor to resolve a Claim through mediation. If efforts to settle are not successful, the Claim shall be resolved in accordance with paragraph D or E below, whichever applies.

D FINAL RESOLUTION for STATE-FUNDED CONTRACTS

(1) If the Contract is funded in whole or in part with state funds, the final Resolution of Claims and Disputes which cannot be resolved by the Contractor (or its Surety) and Owner shall be by the Chancellor, whose decision shall be final, binding, and conclusive upon the Contractor, its Surety, and the Owner.

(2) When it becomes apparent to the party asserting a Claim (the Claimant) that an impasse to mutual resolution has been reached, the Claimant may request in writing to the Chancellor that the Claim be resolved by decision of a Professional, with Alabama licensing if the profession requires it, appointed by the Chancellor to review and determine the Claim. Such request by the Contractor (or its Surety) shall be submitted through the Owner. Should the Owner fail or refuse to submit the Contractor's request within ten days of receipt of same, the Contractor may forward such request directly to the Chief Facilities Officer. Upon receipt of a request to resolve a Claim, the Chief Facilities Officer will instruct the parties as to procedures to be initiated and followed.

(3) If the respondent to a Claim fails or refuses to participate or cooperate in the Resolution procedures to the extent that the Claimant is compelled to initiate legal proceedings to induce the Respondent to participate or cooperate, the Claimant will be entitled to recover, and may amend its Claim to include, the expense of reasonable attorney's fees so incurred.

Article 25**OWNER'S RIGHT *to* CORRECT DEFECTIVE WORK**

If the Contractor fails or refuses to correct Defective Work in a timely manner that will avoid delay of completion, use, or occupancy of the Work or work by the Owner or separate contractors, the Architect may give the Contractor written Notice to Cure the Defective Work within a reasonable, stated time. If within ten days after receipt of the Notice to Cure the Contractor has not proceeded and satisfactorily continued to cure the Defective Work or provided the Architect with written verification that satisfactory positive action is in process to cure the Defective Work, the Owner may, without prejudice to any other remedy available to the Owner, correct the Defective Work and deduct the actual cost of the correction from payment then or thereafter due to the Contractor.

Article 26**OWNER'S RIGHT *to* STOP *and* SUSPEND *the* WORK****A STOPPING *the* WORK *for* CAUSE**

If the Contractor fails to correct Defective Work or persistently fails to carry out Work in accordance with the Contract Documents, the Owner may direct the Contractor in writing to stop the Work, or any part of the

Work, until the cause for the Owner's directive has been eliminated; however, the Owner's right to stop the Work shall not be construed as a duty of the Owner to be exercised for the benefit of the Contractor or any other person or entity.

B **SUSPENSION** *by the OWNER for CONVENIENCE*

(1) The Owner may, at any time and without cause, direct the Contractor in writing to suspend, delay or interrupt the Work, or any part of the Work, for a period of time as the Owner may determine.

(2) The Contract Sum and Contract Time shall be adjusted, pursuant to Article 19, for reasonable increases in the cost and time caused by an Owner-directed suspension, delay or interruption of Work for the Owner's convenience. However, no adjustment to the Contract Sum shall be made to the extent that the same or concurrent Work is, was or would have been likewise suspended, delayed or interrupted for other reasons not caused by the Owner.

Article 27

OWNER'S RIGHT to TERMINATE CONTRACT

A **TERMINATION** *by the OWNER for CAUSE*

(1) Causes: The Owner may terminate the Contractor's right to complete the Work, or any designated portion of the Work, if the Contractor:

- (a) should be adjudged bankrupt, or should make a general assignment for the benefit of the Contractor's creditors, or if a receiver should be appointed on account of the Contractor's insolvency to the extent termination for these reasons is permissible under applicable law;
- (b) refuses or fails to prosecute the Work, or any part of the Work, with the diligence that will insure its completion within the Contract Time, including any extensions, or fails to complete the Work within the Contract Time;
- (c) refuses or fails to perform the Work, including prompt correction of Defective Work, in a manner that will insure that the Work, when fully completed, will be in accordance with the Contract Documents;
- (d) fails to pay for labor or materials supplied for the Work or to pay Subcontractors in accordance with the respective Subcontract;
- (e) persistently disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction, or the instructions of the Architect or Owner; or
- (f) is otherwise guilty of a substantial breach of the Contract.

(2) Procedure for Unbonded Construction Contracts (Generally, contracts less than \$100,000):

- (a) Notice to Cure: In the presence of any of the above conditions the Architect may give the Contractor written notice to cure the condition within a reasonable, stated time, but not less than ten days after the Contractor receives the notice.

(b) Notice of Termination: If, at the expiration of the time stated in the Notice to Cure, the Contractor has not proceeded and satisfactorily continued to cure the condition or provided the Architect with written verification that satisfactory positive action is in process to cure the condition, the Owner may, without prejudice to any other rights or remedies of the Owner, give the Contractor written notice that the Contractor's right to complete the Work, or a designated portion of the Work, shall terminate seven days after the Contractor's receipt of the written Notice of Termination.

(c) If the Contractor satisfies a Notice to Cure, but the condition for which the notice was first given reoccurs, the Owner may give the Contractor a seven day Notice of Termination without giving the Contractor another Notice to Cure.

(d) At the expiration of the seven days of the termination notice, the Owner may:

- .1 take possession of the site, of all materials and equipment stored on and off site, and of all Contractor-owned tools, construction equipment and machinery, and facilities located at the site, and
- .2 finish the Work by whatever reasonable method the Owner may deem expedient.

(e) The Contractor shall not be entitled to receive further payment under the Contract until the Work is completed.

(f) If the Owner's cost of completing the Work, including correction of Defective Work, compensation for additional architectural, engineering, managerial, and administrative services, and reasonable attorneys' fees due to the default and termination, is less than the unpaid balance of the Contract Sum, the excess balance less liquidated damages for delay shall be paid to the Contractor. If such cost to the Owner including attorney's fees, plus liquidated damages, exceeds the unpaid balance of the Contract Sum, the Contractor shall pay the difference to the Owner. Final Resolution of any claim or Dispute involving the termination or any amount due any party as a result of the termination shall be pursuant to Article 24.

(g) Upon the Contractor's request, the Owner shall furnish to the Contractor a detailed accounting of the Owner's cost of completing the Work.

(3) Procedure for Bonded Construction Contracts (Generally, contracts over \$100,000):

(a) Notice to Cure: In the presence of any of the above conditions the Architect may give the Contractor and its Surety written Notice to Cure the condition within a reasonable, stated time, but not less than ten days after the Contractor receives the notice.

(b) Notice of Termination: If, at the expiration of the time stated in the Notice to Cure, the Contractor has not proceeded and satisfactorily continued to cure the condition or provided the Architect with written verification that satisfactory positive action is in process to cure the condition, the Owner may, without prejudice to any other rights or remedies of the Owner, give the Contractor and its Surety written notice declaring the Contractor to be in default under the Contract and stating that the Contractor's right to complete the Work, or a designated portion of the Work, shall terminate seven days after the Contractor's receipt of the written Notice of Termination.

(c) If the Contractor satisfies a Notice to Cure, but the condition for which the notice was first given reoccurs, the Owner may give the Contractor a Notice of Termination without giving the Contractor another Notice to Cure.

(d) Demand on the Performance Bond: With the Notice of Termination the Owner shall give the Surety a written demand that, upon the effective date of the Notice of Termination, the Surety promptly fulfill its obligation to take charge of and complete the Work in accordance with the terms of the Performance Bond.

(e) Surety Claims: Upon receiving the Owner's demand on the Performance Bond, the Surety shall assume all rights and obligations of the Contractor under the Contract. However, the Surety shall also have the right to assert "Surety Claims" to the Owner, which are defined as claims relating to acts or omissions of the Owner or Architect prior to termination of the Contractor which may have prejudiced its rights as Surety or its interest in the unpaid balance of the Contract Sum. If the Surety wishes to assert a Surety Claim, it shall give the Owner, through the Architect, written notice within twenty-one days after first recognizing the condition giving rise to the Surety Claim. The Surety Claim shall then be submitted to the Owner, through the Architect, no later than sixty days after giving notice thereof, but no such Surety Claims shall be considered if submitted after the date upon which final payment becomes due. Final resolution of Surety Claims shall be pursuant to Article 24, Resolution of Claims and Disputes. The presence or possibility of a Surety Claim shall not be just cause for the Surety to fail or refuse to take charge of and complete the Work or for the Owner to fail or refuse to continue to make payments in accordance with the Contract Documents.

(f) Payments to Surety: The Surety shall be paid for completing the Work in accordance with the Contract Documents as if the Surety were the Contractor. The Owner shall have the right to deduct from payments to the Surety any reasonable costs incurred by the Owner, including compensation for additional architectural, engineering, managerial, and administrative services, and attorneys' fees as necessitated by termination of the Contractor and completion of the Work by the Surety. No further payments shall be made to the Contractor by the Owner. The Surety shall be solely responsible for any accounting to the Contractor for the portion of the Contract Sum paid to Surety by Owner or for the costs and expenses of completing the Work.

(4) Wrongful Termination: If any notice of termination by the Owner for cause, made in good faith, is determined to have been wrongly given, such termination shall be effective and compensation therefore determined as if it had been a termination for convenience pursuant to Paragraph B below.

B **TERMINATION** *by the OWNER for CONVENIENCE*

(1) The Owner may, without cause and at any time, terminate the performance of Work under the Contract in whole, or in part, upon determination by the Owner that such termination is in the Owner's best interest. Such termination is referred to herein as Termination for Convenience.

(2) Upon receipt of a written notice of Termination for Convenience from the Owner, the Contractor shall:

(a) stop Work as specified in the notice;

(b) enter into no further subcontracts or purchase orders for materials, services, or facilities, except as may be necessary for Work directed to be performed prior to the effective date of the termination or to complete Work that is not terminated;

- (c) terminate all existing subcontracts and purchase orders to the extent they relate to the terminated Work;
- (d) take such actions as are necessary, or directed by the Architect or Owner, to protect, preserve, and make safe the terminated Work; and
- (e) complete performance of the Work that is not terminated.

(3) In the event of Termination for Convenience, the Contractor shall be entitled to receive payment for the Work performed prior to its termination, including materials and equipment purchased and delivered for incorporation into the terminated Work, and any reasonable costs incurred because of the termination. Such payment shall include reasonable mark-up of costs for overhead and profit, not to exceed the limits stated in Article 19, Changes in the Work. The Contractor shall be entitled to receive payment for reasonable anticipated overhead ("home office") and shall not be entitled to receive payment for any profits anticipated to have been gained from the terminated Work. A proposal for decreasing the Contract Sum shall be submitted to the Architect by the Contractor in such time and detail, and with such supporting documentation, as is reasonably directed by the Owner. Final modification of the Contract shall be by Contract Change Order pursuant to Article 19. Any Claim or Dispute involving the termination or any amount due a party as a result shall be resolved pursuant to Article 24.

Article 28

CONTRACTOR'S RIGHT to SUSPEND or TERMINATE the CONTRACT

A SUSPENSION by the OWNER

If all of the Work is suspended or delayed for the Owner's convenience or under an order of any court, or other public authority, for a period of sixty days, through no act or fault of the Contractor or a Subcontractor, or anyone for whose acts they may be liable, then the Contractor may give the Owner a written Notice of Termination which allows the Owner fourteen days after receiving the Notice in which to give the Contractor appropriate written authorization to resume the Work. Absent the Contractor's receipt of such authorization to resume the Work, the Contract shall terminate upon expiration of this fourteen day period and the Contractor will be compensated by the Owner as if the termination had been for the Owner's convenience pursuant to Article 27.B.

B NONPAYMENT

The Owner's failure to pay the undisputed amount of an Application for Payment within sixty days after receiving it from the Architect (Certified pursuant to Article 30) shall be just cause for the Contractor to give the Owner fourteen days' written notice that the Work will be suspended pending receipt of payment but that the Contract shall terminate if payment is not received within fourteen days (or a longer period stated by the Contractor) of the expiration of the fourteen day notice period.

(1) If the Work is then suspended for nonpayment, but resumed upon receipt of payment, the Contractor will be entitled to compensation as if the suspension had been by the Owner pursuant to Article 26, Paragraph B.

(2) If the Contract is then terminated for nonpayment, the Contractor will be entitled to compensation as if the termination had been by the Owner pursuant to Article 27, Paragraph B.

Article 29

PROGRESS PAYMENTS

A FREQUENCY of PROGRESS PAYMENTS

Unless otherwise provided in the Contract Documents, the Owner will make payments to the Contractor as the Work progresses based on monthly estimates prepared and certified by the Contractor, approved and certified by the Architect, and approved by the Owner and other authorities whose approval is required.

B SCHEDULE of VALUES

Within twenty-four (24) hours after the Bid Opening, the Contractor shall submit to the Architect ACCS Form 6-E, Schedule of Values, which is a breakdown of the Contract Sum showing the value of the various parts of the Work for billing purposes. The Schedule of Values shall divide the Contract Sum into as many parts ("line items") as the Architect and Owner determine necessary to permit evaluation and to show amounts attributable to Subcontractors. The Contractor's overhead and profit are to be proportionately distributed throughout the line items of the Schedule of Values. Upon approval, the Schedule of Values shall be used as a basis for monthly Applications for Payment, unless it is later found to be in error. Approved change order amounts shall be added to or incorporated into the Schedule of Values as mutually agreed by the Contractor and Architect.

C APPLICATIONS for PAYMENTS

(1) Based on the approved Schedule of Values, each Application and Certificate for Payment shall show the Contractor's estimate of the value of Work performed in each line item as of the end of the billing period. The Contractor's cost of materials and equipment not yet incorporated into the Work, but delivered and suitably stored on the site, may be considered in monthly Applications for Payment. One payment application per month may be submitted. Each Application and Certificate for Payment shall match to the penny and be accompanied by an attached Schedule of Values.

(2) The Contractor's estimate of the value of Work performed and stored materials must represent such reasonableness as to warrant certification by the Architect to the Owner in accordance with Article 30. Each monthly Application for Payment shall be supported by such data as will substantiate the Contractor's right to payment, including without limitation copies of requisitions from subcontractors and material suppliers.

(3) If no other date is stated in the Contract Documents or agreed upon by the parties, each Application for Payment shall be submitted to the Architect on or about the first day of each month and payment shall be issued to the Contractor within thirty days after an Application for Payment is Certified pursuant to Article 30 and delivered to the Owner.

(4) Application and Certificate for Payment shall be electronically submitted to ACCS Facilities Division for review following the Contractor's, Notary's, Architect's and Owner's signatures.

D MATERIALS STORED OFF SITE

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 the site, may also be considered in monthly Applications for Payment under the following conditions:

(1) the contractor has received written approval from the Architect and Owner to store the materials or equipment off site in advance of delivering the materials to the off site location;

- (2) a Certificate of Insurance is furnished to the Architect 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 the 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 Architect and 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.

E RETAINAGE

- (1) Retainage for ACCS Projects shall be governed by Title 39 of the Alabama Code.
- (2) "Retainage" is defined as that money belonging to the contractor which has been retained by ACCS conditioned on final completion and acceptance of all work in connection with a project or projects by the contractor. Retainage will not be reduced. Full retainage will only be released with the final payment after completion of all punch list items, receipt of Certificate of Occupancy from AHJ, submittal of all warranties, releases of claims are received, surety consent to final payment received, submittal of record documents and all other closeout documents required by contract. Retainage shall not be relied upon by Contractor (or Surety) to cover or off-set unearned monies attributable to uncompleted or uncorrected Work.
- (3) In making progress payments the Owner shall retain five percent of the estimated amount of work done and the value of materials stored on the site or suitably stored and insured off-site, and after 50 percent completion has been accomplished, no further retainage shall be withheld. The retainage as set out above shall be held until final completion and acceptance of all work covered by the contract.

F CONTRACTOR'S CERTIFICATION

- (1) Each Application for Payment shall bear the Contractor's notarized certification that, to the best of the Contractor's knowledge, information, and belief, the Work covered by the Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payments were issued and payments received from the Owner and that the current payment shown in the Application for Payment has not yet been received.
- (2) By making this certification the Contractor represents to the Architect and Owner that, upon receipt of previous progress payments from the Owner, the Contractor has promptly paid each Subcontractor, in accordance with the terms of its agreement with the Subcontractor, the amount due the Subcontractor from the amount included in the progress payment on account of the Subcontractor's Work and stored materials. The Architect and Owner may advise Subcontractors and suppliers regarding percentages of completion or amounts requested and/or approved in an Application for Payment on account of the Subcontractor's Work and stored materials.

G PAYMENT ESTABLISHES OWNERSHIP

All material and Work covered by progress payments shall become the sole property of the Owner, but the Contractor shall not be relieved from the sole responsibility for the care and protection of material and Work upon which payments have been made and for the restoration of any damaged material and Work.

Article 30**CERTIFICATION *and* APPROVALS *for* PAYMENT**

- A** The Architect's review, approval, and certification of Applications for Payment shall be based on the Architect's general knowledge of the Work obtained through site visits and the information provided by the Contractor with the Application. The Architect shall not be required to perform exhaustive examinations, evaluations, or estimates of the cost of completed or uncompleted Work or stored materials to verify the accuracy of amounts requested by the Contractor, but the Architect shall have the authority to adjust the Contractor's estimate when, in the Architect's reasonable opinion, such estimates are overstated or understated.

Within seven days after receiving the Contractor's monthly Application for Payment, or such other time as may be stated in the Contract Documents, the Architect will take one of the following actions:

- (1) The Architect will approve and certify the Application as submitted and forward it to the Owner as a Certification for Payment for approval by the Owner (and other approving authorities, if any) and payment.
- (2) If the Architect takes exception to any amounts claimed by the Contractor and the Contractor and Architect cannot agree on revised amounts, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to certify to the Owner, transmitting a copy of same to the Contractor.
- (3) To the extent the Architect determines may be necessary to protect the Owner from loss on account of any of the causes stated in Article 31, the Architect may subtract from the Contractor's estimates and will issue a Certificate for Payment to the Owner, with a copy to the Contractor, for such amount as the Architect determines is properly due and notify the Contractor and Owner in writing of the Architect's reasons for withholding payment in whole or in part.

- B** Neither the Architect's issuance of a Certificate for Payment nor the Owner's resulting progress payment shall be a representation to the Contractor that the Work in progress or completed at that time is accepted or deemed to be in conformance with the Contract Documents.
- C** The Architect shall not be required to determine that the Contractor has promptly or fully paid Subcontractors and suppliers or how or for what purpose the Contractor has used monies paid under the Construction Contract. However, the Architect may, upon request and if practical, inform any Subcontractor or supplier of the amount, or percentage of completion, approved or paid to the Contractor on account of the materials supplied or the Work performed by the Subcontractor.

Article 31**PAYMENTS WITHHELD**

- A** The Architect may nullify or revise a previously issued Certificate for Payment prior to Owner's payment thereunder to the extent as may be necessary in the Architect's opinion to protect the Owner from loss on

account of any of the following causes not discovered or fully accounted for at the time of the certification or approval of the Application for Payment:

- (1) Defective Work;
- (2) filed, or reasonable evidence indicating probable filing of, claims arising out of the Contract by other parties against the Contractor;
- (3) the Contractor's failure to pay for labor, materials or equipment or to pay Subcontractors;
- (4) reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- (5) damage suffered by the Owner or another contractor caused by the Contractor, a Subcontractor, or anyone for whose acts they may be liable;
- (6) reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance is insufficient to cover applicable liquidated damages; or
- (7) the Contractor's persistent failure to conform to the requirements of the Contract Documents.

B If the Owner deems it necessary to withhold payment pursuant to preceding Paragraph A, the Owner will notify the Contractor and Architect in writing of the amount to be withheld and the reason for same.

C The Architect shall not be required to withhold payment for completed or partially completed Work for which compliance with the Contract Documents remains to be determined by Specified Inspections or Final Inspections to be performed in their proper sequence. However, if Work for which payment has been approved, certified, or made under an Application for Payment is subsequently determined to be Defective Work, the Architect shall determine an appropriate amount that will protect the Owner's interest against the Defective Work.

(1) If payment has not been made against the Application for Payment first including the Defective Work, the Architect will notify the Owner and Contractor of the amount to be withheld from the payment until the Defective Work is brought into compliance with the Contract Documents.

(2) If payment has been made against the Application for Payment first including the Defective Work, the Architect will withhold the appropriate amount from the next Application for Payment submitted after the determination of noncompliance, such amount to then be withheld until the Defective Work is brought into compliance with the Contract Documents.

D The amount withheld will be paid with the next Application for Payment certified and approved after the condition for which the Owner has withheld payment is removed or otherwise resolved to the Owner's satisfaction.

E The Owner shall have the right to withhold from payments due the Contractor under this Contract an amount equal to any amount which the Contractor owes the Owner under another contract.

Article 32**SUBSTANTIAL COMPLETION**

- A** Substantial Completion is the stage in the progress of the Work when the Work or designated portion of the Work is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use without disruption or interference by the Contractor in completing or correcting any remaining unfinished Work ("punch list" items). Substantial Completion of the Work, or a designated portion of the Work, is not achieved until so agreed in a Certificate of Substantial Completion signed by the Contractor, Architect, Owner, and AHJ, where applicable.
- B** The Contractor shall notify the Architect in writing when it considers the Work, or a portion of the Work which the Owner has agreed to accept separately, to be substantially complete and ready for a Final Inspection pursuant to Article 16. In this notification the Contractor shall identify any items remaining to be completed or corrected for Final Acceptance prior to final payment.
- C** Substantial Completion is achieved and a Final Inspection, as specified in Article 16, is appropriate only when a minimal number of punch list items exists and only a short period of time will be required to correct or complete them. For the Certificate of Substantial Completion to be issued, the punch list of incomplete items must contain only items that the contractor can complete and reinspect within 30 days and will allow the Owner to occupy or utilize the Work for its intended use without disruption or interference by the Contractor completing or correcting the work. The contractor must submit a schedule that shows all punch list items completed in 30 days as an attachment to the Certificate of Substantial Completion. If punch list items are not completed within 45 days of issuance of Certificate of Substantial Completion, a Notice to Cure may be issued. Upon receipt of the Contractor's notice for a Final Inspection, the Architect will advise the Contractor in writing of any conditions of the Work which the Architect or Owner is aware do not constitute Substantial Completion, otherwise, a Final Inspection will proceed within a reasonable time after the Contractor's notice is given. However, the Architect will not be required to prepare lengthy listings of punch list items; therefore, if the Final Inspection discloses that Substantial Completion has not been achieved, the Architect may discontinue or suspend the inspection until the Contractor does achieve Substantial Completion.
- D CERTIFICATE of SUBSTANTIAL COMPLETION**
- (1) When the Work or a designated portion of the Work is substantially complete, the Architect will prepare and sign a Certificate of Substantial Completion to be signed in order by the Contractor and Owner.
- (2) When signed by all parties, the Certificate of Substantial Completion shall establish the Date of Substantial Completion which is the date upon which:
- (a) the Work, or designated portion of the Work, is accepted by the Architect and Owner,
 - (b) the Contractor's one-year and special warranties for the Work covered by the Certificate commence, unless stated otherwise in the Certificate (the one-year warranty for punch list items completed or corrected after the period allowed in the Certificate shall commence on the date of their Final Acceptance), and
 - (c) Owner becomes responsible for building security, maintenance, utility services, and insurance, unless stated otherwise in the Certificate.

(3) The Certificate of Substantial Completion shall set the time within which the Contractor shall finish all items on the "punch list" accompanying the Certificate. The completion of punch list items shall be a condition precedent to Final Payment.

(4) If the Work or designated portion covered by a ACCS Form 6-K, Certificate of Substantial Completion, includes roofing work, the General Contractor's (5-year) Roofing Guarantee form must be executed by the Contractor and attached to the Certificate of Substantial Completion. If the Contract Documents specify any other roofing warranties to be provided by the roofing manufacturer, Subcontractor, or Contractor, they must also be attached to the Certificate of Substantial Completion. Failure to do so voids any Certificate of Substantial Completion. This requirement cannot be waived.

(5) Other attachments to the Certificate of Substantial Completion shall include the Punch List, the schedule of when Punch List items will be complete, an executed Pre Close Out Meeting Checklist, and a Change Order log showing that there are no outstanding change orders.

E The Date of Substantial Completion of the Work, as set in the Certificate of Substantial Completion of the Work or of the last completed portion of the Work, establishes the extent to which the Contractor is liable for Liquidated Damages, if any; however, should the Contractor fail to complete all punch list items within thirty days, or such other time as may be stated in the respective Certificate of Substantial Completion, the Contractor shall bear any expenses, including additional Architectural services and expenses, incurred by the Owner as a result of such failure to complete punch list items in a timely manner.

F The Contractor shall complete or correct all items of any remaining Work ("punch list" items) , ready for re-inspection for Final Acceptance, within 30 days after the Date of Substantial Completion unless another date is specified in the Certificate of Substantial Completion. If completed or corrected within this period, warranties of these items commence on the Date of Substantial Completion, otherwise such warranties commence on the date of Final Acceptance of each item. Failure to complete or correct any items of remaining Work ("punch list" items) within 45 days will result in all warranties commencing on the Date of Final Acceptance.

G Nothing herein, including paragraph E above, shall limit or waive the Owner's rights under Article 27, including but not limited to issuance of Notices to Cure or Notice of Termination issued to Contractors and Sureties, to obtain completion, correction, or repair of any remaining unfinished Work ("punch list" items).

Article 33

OCCUPANCY *or* USE PRIOR *to* COMPLETION

A UPON SUBSTANTIAL COMPLETION

Prior to completion of the entire Work, the Owner may occupy or begin utilizing any designated portion of the Work on the agreed Date of Substantial Completion of that portion of the Work.

B BEFORE SUBSTANTIAL COMPLETION

(1) The Owner shall not occupy or utilize any portion of the Work before Substantial Completion of that portion has been achieved.

(2) The Owner may deliver furniture and equipment and store, or install it in place ready for occupancy and use, in any designated portion of the Work before it is substantially completed under the following conditions:

- (a) The Owner's storage or installation of furniture and equipment will not unreasonably disrupt or interfere with the Contractor's completion of the designated portion of the Work.
- (b) The Contractor consents to the Owner's planned action (such consent shall not be unreasonably withheld).
- (c) The Owner shall be responsible for insurance coverage of the Owner's furniture and equipment, and the Contractor's liability shall not be increased.
- (d) The Contractor, Architect, and Owner will jointly inspect and record the condition of the Work in the area before the Owner delivers and stores or installs furniture and equipment; the Owner will equitably compensate the Contractor for making any repairs to the Work that may subsequently be required due to the Owner's delivery and storage or installation of furniture and equipment.
- (e) The Owner's delivery and storage or installation of furniture and equipment shall not be deemed an acceptance of any Work not completed in accordance with the requirements of the Contract Documents.

Article 34

FINAL PAYMENT *and* PROJECT CLOSEOUT

A PREREQUISITES *to* FINAL PAYMENT

The following requirements must be accomplished before Owner issues Final Payment:

- (1) Full execution of a Certificate of Substantial Completion for the Work, or each designated portion of the Work.
- (2) Final Acceptance of the Work.
- (3) Final building cleaning completed and accepted by Architect and Owner.
- (4) Final punch list completed, reinspected and accepted by Architect and Owner.
- (5) The Contractor's completion, to the satisfaction of the Architect and Owner, of all documentary requirements of the Contract Documents; such as delivery of "as-built" documents, operating and maintenance manuals, owner training videos, warranties (Contractor's One-Year, General Contractor's Five-Year Roofing, etc.), schedule of attic stock including quantity, label, and storage location, etc.
- (6) Delivery to the Owner of a final Application for Payment, prepared by the Contractor and approved and certified by the Architect. The Architect will prepare the Final Payment Checklist and forward it to the Owner along with the final Application for Payment.
- (7) Completion of an Advertisement for Completion pursuant to Paragraph C below.
- (8) Delivery by the Contractor to the Owner through the Architect of a Release of Claims and such other documents as may be required by Owner, satisfactory in form to the Owner pursuant to Paragraph D below
- (9) Consent of Surety to Final Payment, if any, to Contractor. This Consent of Surety is required for projects which have Payment and Performance Bonds.

(10) Delivery by the Contractor to the Architect and Owner of other documents, if any, required by the Contract Documents as prerequisites to Final Payment.

B FINAL ACCEPTANCE *of the* WORK

"Final Acceptance of the Work" shall be achieved when all "punch list" items recorded with the Certificate(s) of Substantial Completion are accounted for by either: (1) their completion or correction by the Contractor and acceptance by the Architect, Owner, and AHJ if applicable, or (2) their resolution under Article 18, Deductions for Uncorrected Work.

C ADVERTISEMENT *for* COMPLETION

(1) If the Contract Sum is \$100,000 or less, there is no requirement for Advertisement for Completion.

(2) If the Contract Sum is more than \$100,000: The Contractor, immediately after being notified by the Architect that all other requirements of the Contract have been completed, shall give public notice of completion of the Contract by having an Advertisement for Completion, similar to the sample contained in the Project Manual, published for a period of three successive weeks in some newspaper of general circulation published within the city or county where the Work was performed. Proof of publication of the Advertisement for Completion shall be made by the Contractor to the Architect by affidavit of the publisher, in duplicate, and a printed copy of the Advertisement for Completion 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 days and proof of same made by Probate Judge or Sheriff and the Contractor. Final payment shall not be due until thirty days after this public notice is completed.

D RELEASE *of* CLAIMS

The Release of Claims and other documents referenced in Paragraph A(6) above are as follows:

(1) A release executed by Contractor of all claims and claims of lien against the Owner arising under and by virtue of the Contract, other than such claims of the Contractor, if any, as may have been previously made in writing and as may be specifically excepted by the Contractor from the operation of the release in stated amounts to be set forth therein.

(2) An affidavit under oath, if required, stating that so far as the Contractor has knowledge or information, there are no claims or claims of lien which have been or will be filed by any Subcontractor, Supplier or other party for labor or material for which a claim or claim of lien could be filed.

(3) A release, if required, of all claims and claims of lien made by any Subcontractor, Supplier or other party against the Owner or unpaid Contract funds held by the Owner arising under or related to the Work on the Project; provided, however, that if any Subcontractor, Supplier or others refuse to furnish a release of such claims or claims of lien, the Contractor may furnish a bond executed by Contractor and its Surety to the Owner to provide an unconditional obligation to defend, indemnify and hold harmless the Owner against any loss, cost or expense, including attorney's fees, arising out of or as a result of such claims, or claims of lien, in which event Owner may make Final Payment notwithstanding such claims or claims of lien. If Contractor and Surety fail to fulfill their obligations to Owner under the bond, the Owner shall be entitled to recover damages as a result of such failure, including all costs and reasonable attorney's fees incurred to recover such damages.

E EFFECT *of* FINAL PAYMENT

(1) The making of Final Payment shall constitute a waiver of Claims by the Owner except those arising from:

- (a) liens, claims, security interests or encumbrances arising out of the Contract and unsettled;
- (b) failure of the Work to comply with the requirements of the Contract Documents;
- (c) terms of warranties or indemnities required by the Contract Documents, or
- (d) latent defects.

(2) Acceptance of Final Payment by the Contractor shall constitute a waiver of claims by Contractor except those previously made in writing, identified by Contractor as unsettled at the time of final Application for Payment, and specifically excepted from the release provided for in Paragraph D(1), above.

Article 35

CONTRACTOR'S WARRANTY

A GENERAL WARRANTY

The Contractor warrants to the Owner and Architect that all materials and equipment furnished under the Contract will be of good quality and new, except such materials as may be expressly provided or allowed in the Contract Documents to be otherwise, and that none of the Work will be Defective Work as defined in Article 1.

B ONE-YEAR WARRANTY

(1) If, within one year after the date of Substantial Completion of the Work or each designated portion of the Work (or otherwise as agreed upon in a mutually-executed Certificate of Substantial Completion), any of the Work is found to be Defective Work, the Contractor shall promptly upon receipt of written notice from the Owner or Architect, and without expense to either, replace or correct the Defective Work to conform to the requirements of the Contract Documents, and repair all damage to the site, the building and its contents which is the result of Defective Work or its replacement or correction.

(2) The one-year warranty for punch list items shall begin on the Date of Substantial Completion if they are completed or corrected within the time period allowed in the Certificate of Substantial Completion in which they are recorded. The one-year warranty for punch list items that are not completed or corrected within the time period allowed in the Certificate of Substantial Completion, and other Work performed after Substantial Completion, shall begin on the date of Final Acceptance of the Work. The Contractor's correction of Work pursuant to this warranty does not extend the period of the warranty. The Contractor's one-year warranty does not apply to defects or damages due to improper or insufficient maintenance, improper operation, or wear and tear during normal usage.

(3) Upon recognizing a condition of Defective Work, the Owner shall promptly notify the Contractor of the condition. If the condition is causing damage to the building, its contents, equipment, or site, the Owner shall take reasonable actions to mitigate the damage or its continuation, if practical. If the Contractor fails to proceed promptly to comply with the terms of the warranty, or to provide the Owner with satisfactory written verification that positive action is in process, the Owner may have the Defective Work replaced or corrected and the Contractor and the Contractor's Surety shall be liable for all expense incurred.

(4) Year-end Inspection(s): An inspection of the Work, or each separately completed portion thereof, is required near the end of the Contractor's one-year warranty period(s). The inspection must be scheduled

with the Owner, Architect, and AHJ or an Independent Code Consultant, where applicable. The subsequent delivery of the Architect's report of a Year-end Inspection will serve as confirmation that the Contractor was notified of Defective Work found within the warranty period.

(5) The Contractor's warranty of one year is in addition to, and not a limitation of, any other remedy stated herein or available to the Owner under applicable law.

C GENERAL CONTRACTOR'S ROOFING GUARANTEE

(1) In addition to any other roof related warranties or guarantees that may be specified in the Contract Documents, the roof and associated work shall be guaranteed by the General Contractor against leaks and defects of materials and workmanship for a period of five (5) years, starting on the Date of Substantial Completion of the Project as stated in the Certificate of Substantial Completion. This guarantee for punch list items shall begin on the Date of Substantial Completion if they are completed or corrected within the time period allowed in the Certificate of Substantial Completion in which they are recorded. The guarantee for punch list items that are not completed or corrected within the time period allowed in the Certificate of Substantial Completion shall begin on the date of Final Acceptance of the Work.

(2) The "General Contractor's Roofing Guarantee", ACCS Form 6-L included in the Project Manual, shall be executed in triplicate, signed by the appropriate party and submitted to the Architect for submission with the Certificate of Substantial Completion to the Owner.

(3) This guarantee does not include costs which might be incurred by the General Contractor in making visits to the site requested by the Owner regarding roof problems that are due to lack of proper maintenance (keeping roof drains and/or gutters clear of debris that cause a stoppage of drainage which results in water ponding, overflowing of flashing, etc.), or damages caused by vandalism or misuse of roof areas. Should the contractor be required to return to the job to correct problems of this nature that are determined not to be related to faulty workmanship and materials in the installation of the roof, payment for actions taken by the Contractor in response to such request will be the responsibility of the Owner. A detailed written report shall be made by the General Contractor on each of these 'Service Calls' with copies to the Architect and Owner.

D SPECIAL WARRANTIES

(1) The Contractor shall deliver to the Owner through the Architect all special or extended warranties required by the Contract Documents from the Contractor, Subcontractors, and suppliers.

(2) The Contractor and the Contractor's Surety shall be liable to the Owner for such special warranties during the Contractor's one-year warranty; thereafter, the Contractor's obligations relative to such special warranties shall be to provide reasonable assistance to the Owner in their enforcement.

E ASSUMPTION of GUARANTEES of OTHERS

If the Contractor disturbs, alters, or damages any work guaranteed under a separate contract, thereby voiding the guarantee of that work, the Contractor shall restore the work to a condition satisfactory to the Owner and shall also guarantee it to the same extent that it was guaranteed under the separate contract.

Article 36 INDEMNIFICATION AGREEMENT

To the fullest extent permitted by law, the Contractor shall defend, indemnify, and hold harmless the Owner, Architect, Architect's consultants, ACCS Facilities Division, and their agents, employees, and consultants

(hereinafter collectively referred to as the "Indemnitees") from and against all claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of, related to, or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, including loss of use resulting therefrom, and is caused in whole or in part by negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether such claim, damage, loss or expense is caused in part, or is alleged but not legally established to have been caused in whole or in part by the negligence or other fault of a party indemnified hereunder.

(1) This indemnification shall extend to all claims, damages, losses and expenses for injury or damage to adjacent or neighboring property, or persons injured thereon, that arise out of, relate to, or result from performance of the Work.

(2) This indemnification does not extend to the liability of the Architect, or the Architect's Consultants, agents, or employees, arising out of (1) the preparation or approval of maps, shop drawings, opinions, reports, surveys, field orders, Change Orders, drawings or specifications, or (2) the giving of or the failure to give directions or instructions, provided such giving or failure to give instructions is the primary cause of the injury or damage.

(3) This indemnification does not apply to the extent of the sole negligence of the Indemnitees.

Article 37

CONTRACTOR'S *and* SUBCONTRACTORS' INSURANCE

(Provide entire Article 37 to Contractor's insurance representative.)

A GENERAL

(1) **RESPONSIBILITY.** The Contractor shall be responsible to the Owner from the time of the signing of the Construction Contract or from the beginning of the first work, whichever shall be earlier, for all injury or damage of any kind resulting from any negligent act or omission or breach, failure or other default regarding the work by the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of who may be the owner of the property.

(2) **PROOF OF INSURANCE.** The Contractor shall be responsible for providing proof of the insurance coverage required in this Article. Failure to provide proof of the insurance required in this Article will prevent a construction contract from being executed and may result in the Contractor's bid being deemed non-responsive. After execution of a Construction Contract, failure to provide proof of insurance required in this Article will prevent payment of all pending pay applications, will immediately result in a Project wide stop work order, and will result in termination of the Construction Contract if proof is not timely provided. If ACCS cannot determine whether insurance requirements have been met through the Contractor's Certificate of Insurance submission, it shall be the Contractor's responsibility to provide additional documentation that shows these insurance requirements are satisfied.

(3) **INSURANCE PROVIDERS.** Each of the insurance coverages required below shall be issued by an insurer licensed by the Insurance Commissioner to transact the business of insurance in the State of Alabama for the applicable line of insurance, and such insurer (or, for qualified self-insureds or group self-insureds, a specific excess insurer providing statutory limits) must have a Best Policyholders Rating of "A-" or better and a financial size rating of Class V or larger.

(4) NOTIFICATION ENDORSEMENT. Each policy shall be endorsed to provide that the insurance company agrees that the policy shall not be canceled, changed, allowed to lapse or allowed to expire for any reason until thirty days after the Owner has received written notice by certified mail as evidenced by return receipt or until such time as other insurance coverage providing protection equal to protection called for in the Contract Documents shall have been received, accepted and acknowledged by the Owner. Such notice shall be valid only as to the Project as shall have been designated by Project Name and Number in said notice.

(a.) If the Contractor's insurance carrier will not provide a 30 day cancellation notice for non-payment of premium, Contractor agrees that the following must be added to the Construction Contract:

- .1 Contractor or its insurance broker or other insurance representative will provide ACCS 30 day written notice by certified mail as evidenced by return receipt of any reasonably expected or known failure to make any premium payment(s) that could result in cancellation of any policy for non-payment of premium.
- .2 Contractor will provide proof of premium payment(s) with each Pay app submitted.
- .3 Contractor will provide proof of premium payment(s) if ever requested by ACCS. Contractor also understands that failure to provide proof of premium payment will prevent payment of all pending pay apps, will immediately result in a Project wide stop work order, and will result in termination of the Construction contract if proof is not timely provided.

(5) INSURANCE CERTIFICATES. The Contractor shall procure the insurance coverages identified below, or as otherwise required in the Contract Documents, at the Contractor's own expense, and to evidence that such insurance coverages are in effect, the Contractor shall furnish the Owner an insurance certificate(s) acceptable to the Owner and listing the Owner as the certificate holder. The insurance certificate(s) must be delivered to the Owner with the Construction Contract and Bonds for final approval and execution of the Construction Contract.

A replacement certificate must be provided to ACCS Facilities Division and the College accounting office at least 10 calendar days prior to the expiration of any policy. All renewed or replaced policies must meet the insurance requirements of ACCS.

The insurance certificate must provide the following:

- (a)** Name and address of authorized agent of the insurance company
- (b)** Name and address of insured
- (c)** Name of insurance company or companies
- (d)** Description of policies
- (e)** Policy Number(s)
- (f)** Policy Period(s)
- (g)** Limits of liability
- (h)** Name and address of Owner as certificate holder
- (i)** Project Name and Number, if any
- (j)** Signature of authorized agent of the insurance company
- (k)** Telephone number of authorized agent of the insurance company
- (l)** Mandatory thirty day notice of cancellation / non-renewal / change

(6) **MAXIMUM DEDUCTIBLE.** Self-insured retention, except for qualified self-insurers or group self-insurers, in any policy shall not exceed \$25,000.00.

B INSURANCE COVERAGES

Unless otherwise provided in the Contract Documents, the Contractor shall purchase the types of insurance coverages with liability limits not less than as follows:

(1) WORKERS' COMPENSATION and EMPLOYER'S LIABILITY INSURANCE

(a) Workers' Compensation coverage shall be provided in accordance with the statutory coverage required in Alabama. A group insurer must submit a certificate of authority from the Alabama Department of Industrial Relations approving the group insurance plan. A self-insurer must submit a certificate from the Alabama Department of Industrial Relations stating the Contractor qualifies to pay its own workers' compensation claims.

(b) Employer's Liability Insurance limits shall be at least:

- .1 Bodily Injury by Accident - \$1,000,000 each accident
- .2 Bodily Injury by Disease - \$1,000,000 each employee

(2) COMMERCIAL GENERAL LIABILITY INSURANCE

(a) Commercial General Liability Insurance, written on an ISO Occurrence Form (current edition as of the date of Advertisement for Bids) or equivalent, shall include, but need not be limited to, coverage for bodily injury and property damage arising from premises and operations liability, products and completed operations liability, blasting and explosion, collapse of structures, underground damage, personal injury liability and contractual liability. The Commercial General Liability Insurance shall provide at minimum the following limits:

Coverage Limit

- .1 General Aggregate \$2,000,000.00 per Project
- .2 Products, Completed Operations Aggregate \$2,000,000.00 per Project
- .3 Personal and Advertising Injury \$1,000,000.00 per Occurrence
- .4 Each Occurrence \$1,000,000.00

(b) Additional Requirements for Commercial General Liability Insurance:

- .1 The policy shall name the Owner, Architect, ACCS, and their agents, consultants and employees as additional insureds, state that this coverage shall be primary insurance for the additional insureds; and contain no exclusions of the additional insureds relative to job accidents.
- .2 The policy must include separate per project aggregate limits.

(3) COMMERCIAL BUSINESS AUTOMOBILE LIABILITY INSURANCE

(a) Commercial Business Automobile Liability Insurance which shall include coverage for bodily injury and property damage arising from the operation of any owned, non-owned or hired automobile. The Commercial Business Automobile Liability Insurance Policy shall provide not less than \$1,000,000 Combined Single Limits for each occurrence.

(b) The policy shall name the Owner, Architect, ACCS, and their agents, consultants, and employees as additional insureds.

(4) COMMERCIAL UMBRELLA LIABILITY INSURANCE

(a) Commercial Umbrella Liability Insurance to provide excess coverage above the Commercial General Liability, Commercial Business Automobile Liability and the Workers' Compensation and Employer's Liability to satisfy the minimum limits set forth herein.

(b) Minimum Commercial/Excess Umbrella Limits of:

- .1 \$5,000,000 per Occurrence
- .2 \$5,000,000 Aggregate

(c) Additional Requirements for Commercial Umbrella Liability Insurance:

- .1 The policy shall name the Owner, Architect, ACCS, and their agents, consultants, and employees as additional insureds.
- .2 The policy must be on an "occurrence" basis.

(5) BUILDER'S RISK INSURANCE

(a) The general contractor is required to purchase builder's risk coverage. Coverage should be "all-risk" including, but not limited to, the following perils: fire, windstorm, hail, water damage, flood, mold, earth movement (also known as "earthquake"), vehicle or equipment collision, paint overspray, collapse, vandalism and lightning. Coverage must be on a replacement cost basis. The carrier must be A- rated or better by AM Best and admitted in the State of Alabama. The coverage period must start on the first day of construction and must extend a minimum of 30 days after receipt of the Certificate of Substantial Completion. Property must be insured while in transit, while stored at an off-site location, while on the construction site but not yet attached to the building and after being attached to the building. The general contractor is responsible for absorbing the deductible in the event of a loss, and the deductible cannot exceed \$10,000. ACCS must be included on the policy as both an additional named insured and a loss payee. An Evidence of Property Insurance certificate must be provided showing both additional named insured and loss payee status, coverages and limits prior to the start of construction. Coverage limits must be as follows:

- .1 Hard Costs: insured to full value
- .2 Soft Costs: insured to full value
- .3 Furniture and Fixtures: insured to the full value of items being purchased and/or installed by the contractor under the construction contract.
- .4 Business Interruption: \$100,000

(b) On information technology projects or any other project approved in writing by the ACCS Chief of Facilities, an Installation Floater policy may be approved in place of a Builder's Risk policy described above. Coverage should be "all-risk." The Installation Floater policy must have a minimum policy limit to cover all material, equipment, or other property for which the Contractor is legally liable. The presumed minimum policy limit shall be \$2 Million unless a higher or lower limit is approved in writing prior to the opening of bids by the ACCS Facilities Division. With its COI, Contractor shall submit documentation from its insurance broker or agent confirming that ACCS's Installation Floater insurance requirements are met by Contractor's policy.

C SUBCONTRACTORS' INSURANCE

(1) **WORKERS' COMPENSATION and EMPLOYER'S LIABILITY INSURANCE.** The Contractor shall require each Subcontractor to obtain and maintain Workers' Compensation and Employer's Liability Insurance coverages as described in preceding Paragraph B, or to be covered by the Contractor's Workers' Compensation and Employer's Liability Insurance while performing Work under the Contract.

(2) **LIABILITY INSURANCE.** The Contractor shall require each Subcontractor to obtain and maintain adequate General Liability, Automobile Liability, and Umbrella Liability Insurance coverages similar to those described in preceding Paragraph B. Such coverage shall be in effect at all times that a Subcontractor is performing Work under the Contract.

(3) **ENFORCEMENT RESPONSIBILITY.** The Contractor shall have responsibility to enforce its Subcontractors' compliance with these or similar insurance requirements; however, the Contractor shall, upon request, provide the Architect or Owner acceptable evidence of insurance for any Subcontractor.

D TERMINATION of OBLIGATION to INSURE

Unless otherwise expressly provided in the Contract Documents, the obligation to insure as provided herein shall continue as follows:

(1) **BUILDER'S RISK INSURANCE.** The obligation to insure under Subparagraph B(5) shall remain in effect until the Date of Substantial Completion as shall be established in the Certificate of Substantial Completion. In the event that multiple Certificates of Substantial Completion covering designated portions of the Work are issued, Builder's Risk coverage shall remain in effect until the Date of Substantial Completion as shall be established in the last issued Certificate of Substantial Completion. However, in the case that the Work involves separate buildings, Builder's Risk coverage of each separate building may terminate on the Date of Substantial Completion as established in the Certificate of Substantial Completion issued for each building.

(2) **PRODUCTS and COMPLETED OPERATIONS.** The obligation to carry Products and Completed Operations coverage specified under Subparagraph B(2) shall remain in effect for two years after the Date(s) of Substantial Completion.

(3) **ALL OTHER INSURANCE.** The obligation to carry other insurance coverages specified under Subparagraphs B(1) through B(4) and Paragraph C shall remain in effect after the Date(s) of Substantial Completion until such time as all Work required by the Contract Documents is completed. Equal or similar insurance coverages shall remain in effect if, after completion of the Work, the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, returns to the Project to perform warranty or maintenance work pursuant to the terms of the Contract Documents.

E WAIVERS of SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors performing construction or operations related to the Project, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss. But said waiver shall apply only to the extent the loss or damage is covered by builder's risk insurance applicable to the Work or to other property located within or adjacent to the Project, except such rights as

they may have to proceeds of such insurance held by the Owner or Contractor as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors, if any, and the subcontractor, sub-subcontractors, suppliers, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The Policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to the person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged. The waivers provided for in this paragraph shall not be applicable to loss or damage that occurs after final acceptance of the Work.

Article 38

PERFORMANCE *and* PAYMENT BONDS

A GENERAL

Upon signing and returning the Construction Contract to the Owner for final approval and execution, the Contractor shall, at the Contractor's expense, furnish to the Owner a Performance Bond and a Payment Bond (P&P Bonds), ACCS Form 2-C and 2-D, as contained in the Project Manual, each in a penal sum equal to 100% of the Contract Sum. Each bond shall be on the form contained in the Project Manual, shall be executed by a surety company (Surety) acceptable to the Owner and duly authorized and qualified to make such bonds in the State of Alabama in the required amount. There shall be six original P&P Bonds submitted with original signatures for each of the six contracts required. The P&P bonds must be signed either on the same day or after the construction contract date. Each P&P Bond shall have attached thereto an original power of attorney (POA) of the signing official. The POA signature date must be the same day as the P&P Bond's signature date. All signatures must be present.

The provisions of this Article are not applicable to this Contract if the Contract Sum is less than \$100,000, unless bonds are required for this Contract in the Supplemental General Conditions.

B PERFORMANCE BOND

Through the Performance Bond, the Surety's obligation to the Owner shall be to assure the prompt and faithful performance of the Contract and Contract Change Orders. The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. In case of default on the part of the Contractor, the Surety shall take charge of and complete the Work in accordance with the terms of the Performance Bond. Any reasonable expenses incurred by the Owner as a result of default on the part of the Contractor, including architectural, engineering, administrative, and legal services, shall be recoverable under the Performance Bond.

C PAYMENT BOND

Through the Payment Bond the Surety's obligation to the Owner shall be to guarantee that the Contractor and its Subcontractors shall promptly make payment to all persons supplying 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 civil actions on the Bond. Any person or entity indicating that they have a claim of nonpayment under the Bond shall, upon written request, be promptly furnished a certified copy of the Bond and Construction Contract by the Contractor, Architect, Owner, or ACCS, whomever is recipient of the request.

D CHANGE ORDERS

The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. All Contract Change Orders involving an increase in the Contract Sum will require consent of Surety by endorsement of the Contract Change Order form. The Surety waives notification of any Contract Change Orders involving only extension of the Contract Time.

E EXPIRATION

The obligations of the Contractor's performance bond surety shall be coextensive with the contractor's performance obligations under the Contract Documents; provided, however, that the surety's obligation shall expire at the end of the one-year warranty period(s) of Article 35.

**Article 39
ASSIGNMENT**

The Contractor shall not assign the Contract or sublet it as a whole nor assign any moneys due or to become due to the Contractor thereunder without the previous written consent of the Owner (and of the Surety, in the case of a bonded Construction Contract). As prescribed by the Public Works Law, the Contract shall in no event be assigned to an unsuccessful bidder for the Contract whose bid was rejected because the bidder was not a responsible or responsive bidder.

**Article 40
CONTRACTION *by* OWNER *or* SEPARATE CONTRACTORS**

A OWNER'S RESERVATION *of* RIGHT

(1) The Owner reserves the right to self-perform, or to award separate contracts for, other portions of the Project and other Project related construction and operations on the site. The contractual conditions of such separate contracts shall be substantially similar to those of this Contract, including insurance requirements and the provisions of this Article. If the Contractor considers such actions to involve delay or additional cost under this Contract, notifications and assertion of claims shall be as provided in Article 20 and Article 23.

(2) When separate contracts are awarded, the term "Contractor" in the separate Contract Documents shall mean the Contractor who executes the respective Construction Contract.

B COORDINATION

Unless otherwise provided in the Contract Documents, the Owner shall be responsible for coordinating the activities of the Owner's forces and separate contractors with the Work of the Contractor. The Contractor shall cooperate with the Owner and separate contractors, shall participate in reviewing and comparing their construction schedules relative to that of the Contractor when directed to do so, and shall make and adhere to any revisions to the construction schedule resulting from a joint review and mutual agreement.

C CONDITIONS APPLICABLE *to* WORK PERFORMED *by* OWNER

Unless otherwise provided in the Contract Documents, when the Owner self-performs construction or operations related to the Project, the Owner shall be subject to the same obligations to Contractor as Contractor would have to a separate contractor under the provision of this Article 40.

D MUTUAL RESPONSIBILITY

(1) The Contractor shall reasonably accommodate the required introduction and storage of materials and equipment and performance of activities by the Owner and separate contractors and shall connect and coordinate the Contractor's Work with theirs as required by the Contract Documents.

(2) By proceeding with an element or portion of the Work that is applied to or performed on construction by the Owner or a separate contractor, or which relies upon their operations, the Contractor accepts the condition of such construction or operations as being suitable for the Contractor's Work, except for conditions that are not reasonably discoverable by the Contractor. If the Contractor discovers any condition in such construction or operations that is not suitable for the proper performance of the Work, the Contractor shall not proceed, but shall instead promptly notify the Architect in writing of the condition discovered.

(3) The Contractor shall reimburse the Owner for any costs incurred by a separate contractor and payable by the Owner because of acts or omissions of the Contractor. Likewise, the Owner shall be responsible to the Contractor for any costs incurred by the Contractor because of the acts or omissions of a separate contractor.

(4) The Contractor shall not cut or otherwise alter construction by the Owner or a separate contractor without the written consent of the Owner and separate contractor; such consent shall not be unreasonably withheld. Likewise, the Contractor shall not unreasonably withhold its consent allowing the Owner or a separate contractor to cut or otherwise alter the Work.

(5) The Contractor shall promptly remedy any damage caused by the Contractor to the construction or property of the Owner or separate contractors.

Article 41

SUBCONTRACTS

A AWARD of SUBCONTRACTS and OTHER CONTRACTS for PORTIONS of the WORK

(1) Unless otherwise provided in the Contract Documents, when delivering the executed Construction Contract, bonds, and evidence of insurance to the Architect, the Contractor shall also submit a listing of Subcontractors proposed for each principal portion of the Work and fabricators or suppliers proposed for furnishing materials or equipment fabricated to the design of the Contract Documents. This listing shall be in addition to any naming of Subcontractors, fabricators, or suppliers that may have been required in the bid process. The Architect will promptly reply to the Contractor in writing stating whether or not the Owner, after due investigation, has reasonable objection to any Subcontractor, fabricator, or supplier proposed by the Contractor. The issuance of the Notice to Proceed in the absence of such objection by the Owner shall constitute notice that no reasonable objection to them is made.

(2) The Contractor shall not contract with a proposed Subcontractor, fabricator, or supplier to whom the Owner has made reasonable and timely objection. Except in accordance with prequalification procedures as may be contained in the Contract Documents, through specified qualifications, or on the grounds of reasonable objection, the Owner may not restrict the Contractor's selection of Subcontractors, fabricators, or suppliers.

(3) Upon the Owner's reasonable objection to a proposed Subcontractor, fabricator, or supplier, the Contractor shall promptly propose another to whom the Owner has no reasonable objection. If the proposed Subcontractor, fabricator, or supplier to whom the Owner made reasonable objection was reasonably capable

of performing the Work, the Contract Sum and Contract Time shall be equitably adjusted by Contract Change Order for any resulting difference if the Contractor has acted promptly and responsively in this procedure.

(4) The Contractor shall not change previously selected Subcontractors, fabricators, or suppliers without notifying the Architect and Owner in writing of proposed substitute Subcontractors, fabricators, or suppliers. If the Owner does not make a reasonable objection to a proposed substitute within three working days, the substitute shall be deemed approved.

B SUBCONTRACTUAL RELATIONS

(1) The Contractor agrees to bind every Subcontractor and material supplier (and require every Subcontractor to so bind its subcontractors and material suppliers) to all the provisions of the Contract Documents as they apply to the Subcontractor's and material supplier's portion of the Work.

(2) Nothing contained in the Contract Documents shall be construed as creating any contractual relationship between any Subcontractor and the Owner, nor to create a duty of the Architect, Owner, or Director to resolve disputes between or among the Contractor or its Subcontractors and suppliers or any other duty to such Subcontractors or suppliers.

Article 42

ARCHITECT'S STATUS

A The Architect is an independent contractor performing, with respect to this Contract, pursuant to an agreement executed between the Owner and the Architect. The Architect has prepared the Drawings and Specifications and assembled the Contract Document and is, therefore, charged with their interpretation and clarification as described in the Contract Documents. As a representative of the Owner, the Architect will endeavor to guard the Owner against variances from the requirements of the Contract Documents by the Contractor. On behalf of the Owner, the Architect will administer the Contract as described in the Contract Documents during construction and the Contractor's one-year warranty.

So as to maintain continuity in administration of the Contract and performance of the Work, and to facilitate complete documentation of the project record, all communications between the Contractor and Owner regarding matters of or related to the Contract shall be directed through the Architect, unless direct communication is otherwise required to provide a legal notification. Unless otherwise authorized by the Architect, communications by and with the Architect's consultants shall be through the Architect. Unless otherwise authorized by the Contractor, communications by and with Subcontractors and material suppliers shall be through the Contractor.

B ARCHITECT'S AUTHORITY

Subject to other provisions of the Contract Documents, the following summarizes some of the authority vested in the Architect by the Owner with respect to the Construction Contract and as further described or conditioned in other Articles of these General Conditions of the Contract.

(1) The Architect is authorized to:

- (a) approve "minor" deviations through the use of Architect's Supplemental Instruction (ASI), as defined in Article 9, Submittals,
- (b) make "minor" changes, through the use of Architect's Supplemental Instruction (ASI), in the Work as defined in Article 19, Changes in the Work,

- (c) reject or require the correction of Defective Work,
- (d) require the Contractor to stop the performance of Defective Work,
- (e) adjust an Application for Payment by the Contractor pursuant to Article 30, Certification and Approval of payments, and
- (f) issue Notices to Cure pursuant to Article 27.

(2) The Architect is not authorized to:

- (a) revoke, alter, relax, or waive any requirements of the Contract Documents (other than "minor" deviations and changes) without concurrence of the Owner,
- (b) finally approve or accept any portion of the Work without concurrence of the Owner,
- (c) issue instructions contrary to the Contract Documents,
- (d) issue Notice of Termination or otherwise terminate the Contract, or
- (e) require the Contractor to stop the Work except only to avoid the performance of Defective Work.

C LIMITATIONS of RESPONSIBILITIES

(1) The Architect shall not be responsible to Contractors or to others for supervising or coordinating the performance of the Work or for the Construction Methods or safety of the Work, unless the Contract Documents give other specific instructions concerning these matters.

(2) The Architect will not be responsible to the Contractor (nor the Owner) for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents or for acts or omissions of the Contractor, a Subcontractor, or anyone for whose acts they may be liable. However, the Architect will report to the Owner and Contractor any Defective Work recognized by the Architect.

(3) The Architect will endeavor to secure faithful performance by Owner and Contractor, and the Architect will not show partiality to either or be liable to either for results of interpretations or decisions rendered in good faith.

(4) The Contractor's remedies for additional time or expense arising out of or related to this Contract, or the breach thereof, shall be solely as provided for in the Contract Documents. The Contractor shall have no claim or cause of action against the Owner, Architect, or its consultants for any actions or failures to act, whether such claim may be in contract, tort, strict liability, or otherwise, it being the agreement of the parties that the Contractor shall make no claim against the Owner or any agents of the Owner, including the Architect or its consultants, except as may be provided for claims or disputes submitted in accordance with Article 24. The Architect and Architect's consultants shall be considered third party beneficiaries of this provision of the Contract and entitled to enforce same.

D ARCHITECT'S DECISIONS

Decisions by the Architect shall be in writing. The Architect's decisions on matters relating to aesthetic effect will be final and binding if consistent with the intent expressed in the Contract Documents. The Architect's decisions regarding disputes arising between the Contractor and Owner shall be advisory.

Article 43
CASH ALLOWANCES

- A** All allowances stated in the Contract Documents shall be included in the Contract Sum. Items covered by allowances shall be supplied by the Contractor as directed by the Architect or Owner and the Contractor shall afford the Owner the economy of obtaining competitive pricing from responsible bidders for allowance items unless other purchasing procedures are specified in the Contract Documents.
- B** Unless otherwise provided in the Supplementary Conditions of the Contract Documents:
 - (1) allowances shall cover the cost to the Contractor of materials and equipment delivered to the Project site and all applicable taxes, less applicable trade discounts;
 - (2) the Contractor's costs for unloading, storing, protecting, and handling at the site, labor, installation, overhead, profit and other expenses related to materials or equipment covered by an allowance shall be included in the Contract Sum but not in the allowances;
 - (3) if required, the Contract Sum shall be adjusted by Change Order to reflect the actual costs of an allowance.
- C** Any selections of materials or equipment required of the Architect or Owner under an allowance shall be made in sufficient time to avoid delay of the Work.

Article 44
PERMITS, LAWS, *and* REGULATIONS

- A PERMITS, FEES AND NOTICES**
 - (1) Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit and other permits and governmental fees, licenses, and inspections (including all AHJ fees) necessary for proper execution and completion of the Work which are customarily secured after award of the Construction Contract and which are in effect on the date of receipt of bids.
 - (2) The Contractor shall comply with and give notices required by all laws, ordinances, rules, regulations, and lawful orders of public authorities applicable to performance of the Work.
- B TAXES**

Unless stated otherwise in the Contract Documents, materials incorporated into the Work are exempt from sales and use tax pursuant to Section 40-9-33, Code of Alabama, 1975 as amended. The Owner, Contractor and its subcontractors shall be responsible for complying with rules and regulations of the Sales, Use, & Business Tax Division of the Alabama Department of Revenue regarding certificates and other qualifications necessary to claim such exemption when making qualifying purchases from vendors. The Contractor shall pay all applicable taxes that are not covered by the exemption of Section 40-9-33 and which are imposed as of the date of receipt of bids, including those imposed as of the date of receipt of bids but scheduled to go into effect after that date.
- C COMPENSATION *for* INCREASES**

The Contractor shall be compensated for additional costs incurred because of increases in tax rates imposed after the date of receipt of bids.

D ALABAMA IMMIGRATION LAW

Per ACT 2011-535 as codified in Title 31, Chapter 13 of the Code of Alabama, 1975, as amended:

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.

E ALABAMA BOYCOTT LAW

Per Act 2016-312 as codified in Title 41, Chapter 16, Article 1, of the Code of Alabama, 1975, as amended:

The contracting parties affirm, for the duration of the agreement, that they are 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.

F ACCOUNTING of SALES TAX EXEMPT PROJECTS

Per Act 2013-205 as codified in Title 40, Chapter 9, Article 1, of the Code of Alabama, 1975, as amended:

In bidding the work on a tax exempt project, the bid form shall provide an accounting for the tax savings.

Article 45**ROYALTIES, PATENTS, *and* COPYRIGHTS**

The Contractor shall pay all royalties and license fees. The Contractor shall defend, indemnify and hold harmless the Owner, Architect, Architect's consultants, and their agents, employees, and consultants from and against all claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of, related to, or resulting from all suits or claims for infringement of any patent rights or copyrights arising out of the inclusion of any patented or copyrighted materials, methods, or systems selected by the Contractor and used during the execution of or incorporated into the Work. This indemnification does not apply to any suits or claims of infringement of any patent rights or copyrights arising out of any patented or copyrighted materials, methods, or systems specified in the Contract Documents. However, if the Contractor has information that a specified material, method, or system is or may constitute an infringement of a patent or copyright, the Contractor shall be responsible for any resulting loss unless such information is promptly furnished to the Architect.

Article 46**USE of the SITE**

A The Contractor shall confine its operations at the Project site to areas permitted by the Owner and by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials, equipment, employees' vehicles, or debris. The Contractor's operations at the site shall be restricted to the sole purpose of constructing the Work, use of the site as a staging, assembly, or storage area for other business which the Contractor may undertake shall not be permitted.

B Unless otherwise provided in the Contract Documents, temporary facilities, such as storage sheds, shops, and offices may be erected on the Project site with the approval of the Architect and Owner. Such temporary buildings and/or utilities shall remain the property of the Contractor, and be removed at the Contractor's expense upon completion of the Work, unless the Owner authorizes their abandonment without removal.

Article 47**CUTTING *and* PATCHING**

- A** The Contractor shall be responsible for all cutting, fitting, or patching that may be required to execute the Work to the results indicated in the Contract Documents or to make its parts fit together properly.
- B** Any cutting, patching, or excavation by the Contractor shall be supervised and performed in a manner that will not endanger persons nor damage or endanger the Work or any fully or partially completed construction of the Owner or separate contractors.

Article 48**IN-PROGRESS *and* FINAL CLEANUP****A IN-PROGRESS CLEAN-UP**

(1) The Contractor shall at all times during the progress of the Work keep the premises and surrounding area free from rubbish, scrap materials and debris resulting from the Work. 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. Burning of trash and debris on site is not permitted.

(2) The Contractor shall make provisions to minimize and confine dust and debris resulting from construction activities.

B FINAL CLEAN-UP

(1) Before Substantial Completion or Final Acceptance is achieved, the Contractor shall have removed from the Owner's property all construction equipment, tools, and machinery; temporary structures and/or utilities including the foundations thereof (except such as the Owner permits in writing to remain); rubbish, debris, and waste materials; and 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.

(2) In addition to the above, and unless otherwise provided in the Contract Documents, the Contractor shall be responsible for the following special cleaning for all trades as the Work is 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 or polishing of all hardware: Cleaning and polishing of all hardware.
- (d)** Cleaning all tile, floor finish of all kinds: Removal of all splatters, 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 equipment, piping, tanks, pumps, fans, motors, devices, switches, panels, fixtures, boilers, sanitizing potable water systems; and freeing identification plates on all equipment of excess paint and the polishing thereof.

C OWNER'S RIGHT to CLEAN-UP

If the Contractor fails to comply with these clean-up requirements and then fails to comply with a written directive by the Architect to clean-up the premises within a specified time, the Architect or Owner may implement appropriate clean-up measures and the cost thereof shall be deducted from any amounts due or to become due the Contractor.

Article 49

LIQUIDATED DAMAGES

- A** Time is the essence of the Contract. Any delay in the completion of the Work required by the Contract Documents may cause inconvenience to the public and loss and damage to the Owner including but not limited to interest and additional administrative, architectural, inspection and supervision charges. By executing the Construction Contract, the Contractor agrees that the Contract Time is sufficient for the achievement of Substantial Completion.
- B** The Contract Documents may provide in the Construction Contract or elsewhere for a certain dollar amount for which the Contractor and its Surety (if any) will be liable to the Owner as liquidated damages for each calendar day after expiration of the Contract Time that the Contractor fails to achieve Substantial Completion of the Work. If such daily liquidated damages are provided for, Owner and Contractor, and its Surety, agree that such amount is reasonable and agree to be bound thereby.
- C** If a daily liquidated damage amount is not otherwise provided for in the Contract Documents, a time charge equal to six percent interest per annum on the total Contract Sum may be made against the Contractor for the entire period after expiration of the Contract Time that the Contractor fails to achieve Substantial Completion of the Work.
- D** The amount of liquidated damages due under either paragraph B or C, above, may be deducted by the Owner from the moneys otherwise due the Contractor in the Final Payment, not as a penalty, but as liquidated damages sustained, or the amount may be recovered from Contractor or its Surety. If part of the Work is substantially completed within the Contract Time and part is not, the stated charge for liquidated damages shall be equitably prorated to that portion of the Work that the Contractor fails to substantially complete within the Contract Time. It is mutually understood and agreed between the parties hereto that such amount is reasonable as liquidated damages.
- E** Liquidated Damages use ACCS Form 2-F and are routed as Change Orders for work that the contractor has failed to substantially complete within the Contract Time. Before the process of applying liquidated damages begins, communication and approval is required from the ACCS Chief Facilities Officer. The Contractor's signature is not required for Liquidated Damages using ACCS Form 2-F.

Article 50

USE of FOREIGN MATERIALS

- A** In the performance of the Work the Contractor agrees to use materials, supplies, and products manufactured, mined, processed or otherwise produced in the United States or its territories, if same are available at

reasonable and competitive prices and are not contrary to any sole source specification implemented under the Public Works Law.

- B** In the performance of the Work the Contractor agrees to use steel produced in the United States if the Contract Documents require the use of steel and do not limit its supply to a sole source pursuant to the Public Works Law. If the Owner decides that the procurement of domestic steel products becomes impractical as a result of national emergency, national strike, or other cause, the Owner shall waive this restriction.
- C** If domestic steel or other domestic materials, supplies, and products are not used in accordance with preceding Paragraphs A and B, the Contract Sum shall be reduced by an amount equal to any savings or benefits realized by the Contractor.
- D** This Article applies only to Public Works projects financed entirely by the State of Alabama or any political subdivision of the state.

Article 51**PROJECT SIGN**

A project sign is not required for ACCS projects unless specifically indicated in the drawings or project manual.

END OF GENERAL CONDITIONS OF THE CONTRACT



PERFORMANCE BOND

VER: 07102025

1. WE, THE PRINCIPAL (hereinafter “Contractor”) AND THE SURETY, jointly and severally, hereby bind ourselves, our heirs, executors, administrators, successors, and assigns to the Owner in the Penal Sum stated above for the performance of the Contract, and Contract Change Orders, in accord with the requirements of the Contract Documents, which are incorporated herein by reference. If the Contractor performs the Contract, and Contract Change Orders, in accordance with the Contract Documents, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

2. The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. All Contract Change Orders involving an increase in the Contract Sum will require consent of Surety by endorsement of the Contract Change Order form. The Surety waives notification of any Contract Change Orders involving only extension of the Contract Time.

3. Whenever the Architect gives the Contractor and the Surety, at their addresses stated above, a written Notice to Cure a condition for which the Contract may be terminated in accordance with the Contract Documents, the Surety may, within the time stated in the notice, cure or provide the Architect with written verification that satisfactory positive action is in process to cure the condition.

4. The Surety’s obligation under this Bond becomes effective after the Contractor fails to satisfy a Notice to Cure and the Owner:

(a) gives the Contractor and the Surety, at their addresses stated above, a written Notice of Termination declaring the Contractor to be in default under the Contract and stating that the Contractor’s right to complete the Work, or a designated portion of the Work, shall terminate seven days after the Contractor’s receipt of the notice; and

(b) gives the Surety a written demand that, upon the effective date of the Notice of Termination, the Surety promptly fulfill its obligation under this Bond.

5. In the presence of the conditions described in Paragraph 4, the Surety shall, at its expense:

(a) On the effective date of the Notice of Termination, take charge of the Work and be responsible for the safety, security, and protection of the Work, including materials and equipment stored on and off the Project site, and

(b) Within twenty-one days after the effective date of the Notice of Termination, proceed, or provide the Owner with written verification that satisfactory positive action is in process to facilitate proceeding promptly, to complete the Work in accordance with the Contract Documents, either with the Surety’s resources or through a contract between the Surety and a qualified contractor to whom the Owner has no reasonable objection.

6. As conditions precedent to taking charge of and completing the Work pursuant to Paragraph 5, the Surety shall neither require, nor be entitled to, any agreements or conditions other than those of this Bond and the Contract Documents. In taking charge of and completing the Work, the Surety shall assume all rights and obligations of the Contractor under the Contract Documents; however, the Surety shall also have the right to assert "Surety Claims" to the Owner in accordance with the Contract Documents. The presence or possibility of a Surety Claim shall not be just cause for the Surety to fail or refuse to promptly take charge of and complete the Work or for the Owner to fail or refuse to continue to make payments in accordance with the Contract Documents.

7. By accepting this Bond as a condition of executing the Construction Contract, and by taking the actions described in Paragraph 4, the Owner agrees that:

(a) the Owner shall promptly advise the Surety of the unpaid balance of the Contract Sum and, upon request, shall make available or furnish to the Surety, at the cost of reproduction, any portions of the Project Record, and

(b) as the Surety completes the Work, or has it completed by a qualified contractor, the Owner shall pay the Surety, in accordance with terms of payment of the Contract Documents, the unpaid balance of the Contract Sum, less any amounts that may be or become due the Owner from the Contractor under the Construction Contract or from the Contractor or the Surety under this Bond.

8. In the presence of the conditions described in Paragraph 4, the Surety's obligation includes responsibility for the correction of Defective Work, liquidated damages, and reimbursement of any reasonable expenses incurred by the Owner as a result of the Contractor's default under the Contract, including architectural, engineering, administrative, and legal services.

9. Nothing contained in this Bond shall be construed to mean that the Surety shall be liable to the Owner for an amount exceeding the Penal Sum of this Bond, except in the event that the Surety should be in default under the Bond by failing or refusing to take charge of and complete the Work pursuant to Paragraph 5. If the Surety should fail or refuse to take charge of and complete the Work, the Owner shall have the authority to take charge of and complete the Work, or have it completed, and the following costs to the Owner, less the unpaid balance of the Contract Sum, shall be recoverable under this Bond:

(a) the cost of completing the Contractor's responsibilities under the Contract, including correction of Defective Work;

(b) additional architectural, engineering, managerial, and administrative services, and reasonable attorneys' fees incident to completing the Work;

(c) interest on, and the cost of obtaining, funds to supplement the unpaid balance of the Contract Sum as may be necessary to cover the foregoing costs;

(d) the fair market value of any reductions in the scope of the Work necessitated by insufficiency of the unpaid balance of the Contract Sum and available supplemental funds to cover the foregoing costs; and

(f) additional architectural, engineering, managerial, and administrative services, and reasonable attorneys' fees incident to ascertaining and collecting the Owner's losses under the Bond.

10. All claims and disputes arising out of or related to this bond, or its breach, shall be resolved in accordance with Article 24, General Conditions of the Contract.

8 **SIGNED AND SEALED** this -Day- of -Month- -Year-

9 **SURETY:**

SURETY COMPANY NAME

BY: _____
SIGNEE'S PRINTED NAME

TITLE: _____
SIGNEE'S TITLE

10 **CONTRACTOR as PRINCIPAL:**

CONTRACTOR COMPANY NAME

BY: _____
SIGNEE'S PRINTED NAME

TITLE: _____
SIGNEE'S TITLE

11 **NOTE:** Original power of attorney for the Surety's signatory shall be furnished with the original bond form to be attached to each of the contract forms per project.



PAYMENT BOND

VER: 07102025

- 1. WE, THE PRINCIPAL (hereinafter “Contractor”) AND THE SURETY**, jointly and severally, hereby bind ourselves, our heirs, executors, administrators, successors, and assigns to the Owner in the Penal Sum stated above to promptly pay all persons supplying labor, materials, or supplies for or in the prosecution of the Contract, which is incorporated herein by reference, and any modifications thereof by Contract Change Orders. If the Contractor and its Subcontractors promptly pay all persons supplying labor, materials, or supplies for or in the prosecution of the Contract and Contract Change Orders, then this obligation shall be null and void; otherwise to remain and be in full force and effect.
- 2.** The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. All Contract Change Orders involving an increase in the Contract Sum will require consent of Surety by endorsement of the Contract Change Order form. The Surety waives notification of any Contract Change Orders involving only extension of the Contract Time.
- 3.** Any person that has furnished labor, materials, or supplies for or in the prosecution of the Contract and Contract Change Orders for which payment has not been timely made may institute a civil action upon this Bond and have their rights and claims adjudicated in a civil action and judgment entered thereon. Notwithstanding the foregoing, a civil action may not be instituted on this bond until 45 days after written notice to the Surety of the amount claimed to be due and the nature of the claim. The civil action must commence not later than one year from the date of final settlement of the Contract. The giving of notice by registered or certified mail, postage prepaid, addressed to the Surety at any of its places of business or offices shall be deemed sufficient. In the event the Surety or Contractor fails to pay the claim in full within 45 days from the mailing of the notice, then the person or persons may recover from the Contractor and Surety, in addition to the amount of the claim, a reasonable attorney’s fee based on the result, together with interest on the claim from the date of the notice.
- 4.** Every person having a right of action on this bond shall, upon written application to the Owner indicating that labor, material, or supplies for the Work have been supplied and that payment has not been made, be promptly furnished a certified copy of this bond and the Construction Contract. The claimant may bring a civil action in the claimant’s name on this Bond against the Contractor and the Surety, or either of them, in the county in which the Work is to be or has been performed or in any other county where venue is otherwise allowed by law.
- 5.** This bond is furnished to comply with Code of Alabama, §39-1-1, and all provisions thereof shall be applicable to civil actions upon this bond.
- 6.** All claims and disputes between Owner and either the Contractor or Surety arising out of or related to this bond, or its breach, shall be resolved in accordance with Article 24, General Conditions of the Contract.

8 **SIGNED AND SEALED** this -Day- of -Month- -Year-

9 **SURETY:**

SURETY COMPANY NAME

BY:

SIGNEE'S PRINTED NAME

TITLE:

SIGNEE'S TITLE

10 **CONTRACTOR as PRINCIPAL:**

CONTRACTOR COMPANY NAME

BY:

SIGNEE'S PRINTED NAME

TITLE:

SIGNEE'S TITLE

11 **NOTE:** Original power of attorney for the Surety's signatory shall be furnished with the original bond form to be attached to each of the contract forms per project.



FACILITIES DIVISION

ACCS FORM 2-F

***NOTE:** Any Change Orders without documented ACCS Facilities Division approval will be at the expense of the Architect and/or the Contractor.

CONTRACT CHANGE ORDER

ACCS PROJECT#:	
CHANGE ORDER#:	
DATE:	
PROJECT:	
TO: <Contractor Company Name>	
Address:	

TERMS: You are hereby authorized, subject to the provisions of your Contract for this project, to make the following changes thereto in accordance with your proposal(s) dated:

FURNISH the necessary labor, materials, and equipment to:

(Description of work to be done or changes to be made. If the description is continued in an attachment, identify the attachment below.)

ACCS FORM 2-F

ORIGINAL CONTRACT SUM:		ORIGINAL SUBSTANTIAL COMPLETION DATE:	
NET TOTAL OF PREVIOUS CHANGE ORDERS:		ORIGINAL CONTRACT DURATION (DAYS):	
PREVIOUS REVISED CONTRACT SUM:	\$ 0.00	NET TOTAL OF DAYS FROM PREVIOUS CHANGE ORDERS:	0
THIS CHANGE ORDER WILL: ☐ INCREASE ☐ DECREASE ☐ USE ALLOWANCES		THIS CHANGE ORDER WILL: ☐ INCREASE ☐ DECREASE	
THE CONTRACT SUM BY:		THE CONTRACT DURATION BY (DAYS)	0
REVISED CONTRACT SUM, INCLUDING THIS CHANGE ORDER:	\$ 0.00	REVISED CONTRACT DURATION, INCLUDING THIS CHANGE ORDER:	
The amount of this Change Order will be the responsibility of: <Select Client>		REVISED SUBSTANTIAL COMPLETION DATE, INCLUDING THIS CHANGE ORDER:	

The **OWNER** does hereby certify that this **CHANGE ORDER** was executed per the provisions of Title 39, Code of Alabama, 1975, as amended.

RECOMMENDED BY	CONTRACTING PARTIES
<hr/> ARCHITECTURAL/ENGINEERING FIRM BY: <hr/> NAME: <hr/> TITLE: <hr/>	<hr/> CONTRACTOR COMPANY BY: <hr/> NAME: <hr/> TITLE: <hr/>
APPROVALS <hr/> COMMUNITY COLLEGE PRESIDENT BY: <hr/> SIGNATURE OF OFFICER NAME: <hr/> TITLE: <hr/>	ALABAMA COMMUNITY COLLEGE SYSTEM (AS OWNER) BY: <hr/> CHANCELLOR
ALABAMA COMMUNITY COLLEGE SYSTEM (ACCS) BY: <hr/> CHIEF FACILITIES OFFICER DATE: <hr/>	CONSENT OF SURETY <hr/> SURETY COMPANY BY: <hr/> (ATTACH CURRENT POWER OF ATTORNEY)

Review/Initial of Regional Facilities Director _____

VER: 10212025



FACILITIES DIVISION

ACCS FORM 2-G

***NOTE:** Any Change Order without documented ACCS Facilities Division approval is the expense of the Architect and/or the Contractor.

CHANGE ORDER JUSTIFICATION

**Purpose and instructions on next page. Do not staple this form and/or attachments; use clips*

CHANGE ORDER JUSTIFICATION #	ACCS PROJECT #	DATE:
A PROJECT NAME & LOCATION:		OWNER ENTITY NAME & ADDRESS:
CONTRACTOR COMPANY NAME & ADDRESS:		ARCHITECTURAL/ENGINEERING FIRM NAME & ADDRESS:
B DESCRIPTION OF PROPOSED CHANGE(S): <i>*Attach contractor's detailed cost proposal(s)</i>		
C THIS CHANGE ORDER WILL: ☐ INCREASE ☐ DECREASE		THE CONTRACT SUM BY:
THIS CHANGE ORDER WILL USE ALLOWANCES: ☐ YES ☐ NO		THE AMOUNT OF ALLOWANCES USED:
THIS CHANGE ORDER WILL: ☐ INCREASE ☐ DECREASE		THE CONTRACT DURATION BY (DAYS):
D THE CHANGE ORDER IS: ☐ Owner (ACCS) directed changes in the Work ☐ College requested changes in Work ☐ Differing (hidden) site conditions ☐ Other (please explain in Section D)	JUSTIFICATION FOR NEED OF CHANGE(S): Attach documented written approval from ACCS to proceed with change order.	
E JUSTIFICATION OF CHANGE ORDER vs. COMPETITIVE BID:		
F ARCHITECT/ENGINEER'S EVALUATION OF PROPOSED COST:		

Review/Initial of Regional Facilities Director _____

VER: 07242025

G CHANGER ORDER RECOMMENDED	CHANGE ORDER JUSTIFIED AND APPROVED
<p>_____</p> <p>ARCHITECTURAL/ENGINEERING FIRM NAME</p> <p>BY: _____</p> <p>ARCHITECT/ENGINEER'S SIGNATURE</p> <p>BY: _____</p> <p>OWNER'S DESIGNATED REPRESENTATIVE SIGNATURE</p>	<p>BY: _____</p> <p>ACCS CHIEF FACILITIES OFFICER</p> <p>BY: _____</p> <p>OWNER'S LEGAL COUNSEL'S SIGNATURE (FOR CHANGE ORDERS 10% OR GREATER)</p>

CHANGE ORDER JUSTIFICATION: PURPOSE and INSTRUCTIONS

The **CHANGE ORDER JUSTIFICATION** is to be prepared by the design professional, who has evaluated the fairness and reasonableness of the proposed cost of the change(s) and recommends that the proposed Change Order be executed. The fully executed Form **CHANGE ORDER JUSTIFICATION** must accompany the proposed Change Order. Instructions for completing the Change Order Justification form are:

1. Insert the proposed Change Order Number, date of the Justification, and ACCS Project Number in the spaces provided in the upper right-hand corner.
2. **Section (A):** Insert the complete name and address of the PROJECT, OWNER(S), CONTRACTOR, AND ARCHITECT/ENGINEER.
3. **Section (B):** Provide a complete description of the proposed changes in work, referring to and attaching revised specifications and/or drawings as appropriate. An attachment may be used if additional space is needed. **Attached a copy of the contractor's detailed cost proposal.**
4. **Section (C):** Insert the Contract Sum increase or decrease and the Contract Duration increase or decrease of Days of this Change Order request.
5. **Section (D):** Explain why it is necessary, or in the public's interest, to make the proposed change(s) to the Work. Select the type of Change Order. Attach documented written approval.
6. **Section (E):** Explain why award of the changed work to the existing contractor instead of awarding the work under the competitive bid process is justified.
7. **Section (F):** The design professional must state his or her evaluation of the reasonableness and fairness of the proposed costs based upon his or her review of the contractor's proposal.
8. **Section (G):** The design professional must recommend the Change Order to the Owner by signing the document; the Owner may require such recommendation from other individuals.



FACILITIES DIVISION

ACCS FORM 2-H

SUPPLY BOND

BOND NUMBER: _____

KNOW ALL BY THESE PRESENTS:

That _____, called the Principal, and _____, a _____, called the Surety, and _____, called the Oblige, in the amount of _____ U.S. Dollars(\$ _____), for payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein.

WHEREAS, Principal entered into that certain material and/or equipment contract ("Contract") with the Oblige dated _____ for _____, a copy of which is by reference made a part hereof ("Contract").

NOW, THEREFORE, if Principal shall faithfully comply with all terms and conditions of said Contract, or if the Principal or Surety shall pay, indemnify, and hold harmless the Oblige from all direct damages sustained by the Oblige as a result of any default by the Principal under the Contract, then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, however, that it is a condition precedent to recovery under this bond that written notice of any default claimed under the Contract be provided to Surety at the following address:

However, the failure to comply with this notice requirement shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or to release the Surety from its obligations, except to the extent that the Surety demonstrates actual prejudice;

PROVIDED, further, that any suit by the Oblige under this bond must be instituted before the later of (a) the expiration of one year from the date the Principal was obligated under the Contract, which may be extended by the agreement of Principal and Oblige, to deliver the materials and/or equipment to the Oblige, or (b) the expiration of one year from the date any other default by the Principal under the Contract;

PROVIDED, further, that notwithstanding anything herein to the contrary, the terms of this bond shall be read to be consistent with the requirements of Title 39 of the Code of Alabama relating to performance bonds required of persons contracting for public works, and

PROVIDED, further that no right of action shall accrue on this bond to or for the use of any person or corporation other than the Oblige named herein or its successor.

Sealed with our seals and dated this ____ day of _____, _____.

Witness _____

Witness _____

Agreed and acknowledged this ____ day of _____, _____.

By: _____

Oblige

PRINCIPAL:

Title: _____

SURETY:

Title: _____



FACILITIES MANAGEMENT

ACCS FORM 5-C

INSTRUCTIONS *to* BIDDERS

CONTENTS

1. Bid Documents
2. General Contractor's State Licensing Requirements
3. Qualifications of Bidders and Prequalification Procedures
4. Preference to Resident Contractors
5. Examination of Bid Documents and the Site of the Work
6. Explanations and Interpretations
7. Substitutions
8. Preparation and Delivery of Bids
9. Withdrawal or Revision of Bids
10. Opening of Bids
11. Incomplete and Irregular Bids
12. Bid Errors
13. Disqualification of Bidders
14. Consideration of Bids
15. Bid Alternatives
16. Unit Prices
17. Award of Contract

1 BID DOCUMENTS:

The Bid Documents consist of the Advertisement for Bids, these Instructions to Bidders, any supplements to these Instructions to Bidders, the Proposal Form and the Accounting of Sales Tax, and the proposed Contract Documents. The proposed Contract Documents consist of the Construction Contract, the Performance Bond and Payment Bond, the Conditions of the Contract (General, Supplemental, and other Conditions), Drawings, Specifications and all addenda issued prior to execution of the Construction Contract. Bid Documents may be obtained or examined as set forth in the Advertisement for Bids.

2 GENERAL CONTRACTOR'S STATE LICENSING REQUIREMENTS:

When the amount bid for a contract exceeds \$100,000, the bidder must be licensed by the State Licensing Board for General Contractors and must show the Architect evidence of license before bidding or the bid will not be received by the Architect or considered by the Awarding Authority. A bid exceeding the bid limit stipulated in the bidder's license, or which is for work outside of the type or types of work stipulated in the bidder's license, will not be considered. 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.

3 QUALIFICATIONS of BIDDERS and PREQUALIFICATION PROCEDURES:

(a) Any special qualifications required of general contractors, subcontractors, material suppliers, or fabricators are set forth in the Bid Documents.

(B) The Awarding Authority may have elected to prequalify bidders. Parties interested in bidding for this contract are directed to the Advertisement for Bids and Supplemental Instructions to Bidders to determine whether bidders must be prequalified and how they may obtain copies of the Awarding Authority's published prequalification procedures and criteria.

(C) Release of Bid Documents by the Architect to a prospective bidder will not constitute any determination by the Awarding Authority or Architect that the bidder has been found to be qualified, prequalified, or responsible.

4 PREFERENCE to RESIDENT CONTRACTORS:

(If this project is federally funded in whole or in part, this Article shall not apply.)

(A) In awarding the Contract, preference will be given to Alabama resident contractors and a nonresident bidder domiciled in a state having laws granting preference to local contractors shall be awarded the Contract only on the same basis as the nonresident bidder's state awards contracts to Alabama contractors bidding under similar circumstances.

(B) A nonresident bidder is a contractor which is neither organized and existing under the laws of the State of Alabama, nor maintains its principal place of business in the State of Alabama. A nonresident contractor which has maintained a permanent office within the State of Alabama for at least five continuous years shall not thereafter be deemed to be a non-resident contractor so long as the contractor continues to maintain a branch office within Alabama.

5 EXAMINATION of BID DOCUMENTS *and the SITE of the WORK:*

Before submitting a bid for the Work, the bidders shall carefully examine the Bid 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 bids. The submission of a bid shall constitute a representation by the bidder that the bidder has made such examination and visit and has judged for and satisfied himself or herself 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 involved.

6 EXPLANATIONS *and* INTERPRETATIONS:

(A) Should any bidder observe any ambiguity, discrepancy, omission, or error in the drawings and specifications, or in any other bid document, or be in doubt as to the intention and meaning of these documents, the bidder should immediately report such to the Architect and request clarification.

(B) Clarification will be made only by written Addenda sent to all prospective bidders. Neither the Architect nor the Awarding Authority will be responsible in any manner for verbal answers or instructions regarding intent or meaning of the Bid Documents.

(C) In the case of inconsistency between drawings and specifications or within either document, a bidder will be deemed to have included in its bid the better quality or greater quantity of the work involved unless the bidder asked for and obtained the Architect's written clarification of the requirements before submission of a bid.

7 SUBSTITUTIONS:

(A) The identification of any product, material, system, item of equipment, or service in the Bid Documents by reference to a trade name, manufacturer's name, model number, etc. (hereinafter referred to as "source"), is intended to establish a required standard of performance, design, and quality and is not intended to limit competition unless the provisions of paragraph "d" below apply.

(B) When the Bid Documents identify only one or two sources, or three or more sources followed by "or approved equal" or similar wording, the bidder's proposal may be based on a source not identified but considered by the bidder to be equal to the standard of performance, design and quality as specified; however, such substitutions must ultimately be approved by the Architect. If the bidder elects to bid on a substitution without "Pre-bid Approval" as described below, then it will be understood that proof of compliance with specified requirements is the exclusive responsibility of the bidder.

(C) When the Bid Documents identify three or more sources and the list of sources is not followed by "or approved equal" or similar wording, the bidder's proposal shall be based upon one of the identified sources, unless the bidder obtains "Pre-bid Approval" of another source as described below. Under these conditions it will be expressly understood that no product, material, system, item of equipment, or service that is not

identified in the Bid Documents or granted "Pre-Bid Approval" will be incorporated into the Work unless such substitution is authorized and agreed upon through a Contract Change Order.

(D) If the Bid Documents identify only one source and expressly provide that it is an approved sole source for the product, material, system, item of equipment, or service, the bidder's proposal must be based upon the identified sole source.

(E) Procedures for "Pre-bid Approval". If it is desired that a product, material, system, piece of equipment, or service from a source different from those sources identified in the Bid Documents be approved as an acceptable source, application for the approval of such source must reach the hands of the Architect at least ten days prior to the date set for the opening of bids. At the Architect's discretion, this ten day provision may be waived. The application for approval of a proposed source must be accompanied by technical data which the applicant desires to submit in support of the application. The Architect will give consideration to reports from reputable independent testing laboratories, verified experience records showing the reputation of the proposed source with previous users, evidence of reputation of the source for prompt delivery, evidence of reputation of the source for efficiency in servicing its products, or any other pertinent written information. The application to the Architect for approval of a proposed source must be accompanied by a schedule setting forth in which respects the materials or equipment submitted for consideration differ from the materials or equipment designated in the Bid Documents. The burden of proof of the merit of the proposed substitution is upon the proposer. To be approved, a proposed source must also meet or exceed all express requirements of the Bid Documents. Approval, if granted, shall not be effective until published by the Architect in an addendum to the Bid Documents.

8 PREPARATION and DELIVERY of BIDS:

(A) ACCS Form 5-E: Proposal Form:

(1) Bids must be submitted on the Proposal Form as contained in the Bid Documents; only one copy is required to be submitted. A completed ACCS Form 5-H: Accounting of Sales Tax must be submitted with the Proposal Form.

(2) All information requested of the bidder on the Proposal Form must be filled in. The form must be completed by typewriter or hand-printed in ink.

(3) Identification of Bidder: On the first page of the Proposal Form the bidder must be fully identified by completing the spaces provided for:

- a.** the legal name of the bidder,
- b.** the state under which laws the bidder's business is organized and existing,
- c.** the city (and state) in which the bidder has its principal offices,
- d.** the bidder's business organization, i.e., corporation, partnership, or individual (to be indicated by marking the applicable box and writing in the type of organization if it is not one of those listed), and
- e.** the partners or officers of the bidder's organization, if the bidder is other than an individual. If the space provided on the Proposal Form is not adequate for this listing, the bidder may insert "See Attachment" in this space and provide the listing on an attachment to the Proposal Form.

(4) Where indicated by the format of the Proposal Form, the bidder must specify lump sum prices in both words and figures. In case of discrepancy between the prices shown in words and in figures, the words will govern.

(5) All bid items requested in the Proposal Form, including alternate bid prices and unit prices for separate items of the Work, must be bid. If a gross sum of bid items is requested in the Proposal Form, the gross sum shall be provided by the bidder.

(6) In the space provided in the Proposal Form under "Bidder's Alabama License", the bidder must insert his or her current general contractor's state license number, current bid limit, and type(s) of work for which bidder is licensed.

(7) The Proposal Form shall be properly signed by the bidder. If the bidder is:

a. an individual, that individual or his or her "authorized representative" must sign the Proposal Form;

b. a partnership, the Proposal Form must be signed by one of the partners or an "authorized representative" of the Partnership;

c. a corporation, the president, vice-president, secretary, or "authorized representative" of the corporation shall sign and affix the corporate seal to the Proposal Form.

As used in these Instructions to Bidders, "authorized representative" is defined as a person to whom the bidder has granted written authority to conduct business in the bidder's behalf by signing and/or modifying the bid. Such written authority shall be signed by the bidder (the individual proprietor, or a member of the Partnership, or an officer of the Corporation) and shall be attached to the Proposal Form.

(8) Interlineation, alterations or erasures on the Proposal Form must be initialed by the bidder or its "authorized representative".

(B) ACCS Form 5-H: Accounting of Sales Tax

A completed ACCS Form 5-H: Accounting of Sales Tax must be submitted with ACCS Form 5-E: Proposal Form. Submission of ACCS Form 5-H is required, it is not optional. A proposal shall be rendered non-responsive if an Accounting of Sales Tax is not provided.

(C) Bid Guaranty

(1) The Proposal Form must be accompanied by a cashier's check, drawn on an Alabama bank, or a Bid Bond, executed by a surety company duly authorized and qualified to make such bonds in the State of Alabama, payable to the Awarding Authority.

(2) If a Bid Bond is provided in lieu of a cashier's check, the bond shall be on the Bid Bond form as stipulated in the Bid Documents.

(3) The amount of the cashier's check or Bid Bond shall not be less than five percent of the contractor's bid, but is not required to be in an amount more than ten thousand dollars.

(D) Delivery of Bids:

(1) Bids will be received until the time set, and at the location designated, in the Advertisement for Bids unless notice is given of postponement. Any bid not received prior to the time set for opening bids will be rejected absent extenuating circumstances and such bids shall be rejected in all cases where received after other bids are opened.

(2) Each bid shall be placed, together with the bid guaranty, in a sealed envelope. On the outside of the envelope the bidder shall write in large letters "Proposal", below which the bidder shall identify the Project and the Work bid on, the name of the bidder, and the bidder's current general contractor's state license number.

(3) Bids may be delivered in person, or by mail if ample time is allowed for delivery. When sent by mail, the sealed envelope containing the bid, marked as indicated above, shall be enclosed in another envelope for mailing.

9 WITHDRAWAL or REVISION of BIDS:

(A) A bid may be withdrawn prior to the time set for opening of bids, provided a written request, executed by the bidder or the bidder's "authorized representative", is filed with the Architect prior to that time. The bid will then be returned to the bidder unopened.

(B) A bid which has been sealed in its delivery envelope may be revised by writing the change in price on the outside of the delivery envelope over the signature of the bidder or the bidder's "authorized representative". In revising the bid in this manner, the bidder must only write the amount of the change in price on the envelope **and must not reveal the bid price**.

(C) Written communications, signed by the bidder or its "authorized representative", to revise bids will be accepted if received by the Architect prior to the time set for opening bids. The Architect will record the instructed revision upon opening the bid. Such written communication may be by facsimile if so stipulated in Supplemental Instructions to Bidders. In revising the bid in this manner, the bidder must only write the amount of the change in price **and must not reveal the bid price**.

(D) Except as provided in Article 12 of these Instructions to Bidders, no bid shall be withdrawn, modified, or corrected after the time set for opening bids.

10 OPENING of BIDS:

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

(B) A list of all proposed major subcontractors and suppliers will be submitted by Bidders to the Architect at a time subsequent to the receipt of bids as established by the Architect in the Bid Documents but in no event shall this time exceed twenty-four (24) hours after receipt of bids. If the list includes a fire alarm contractor and/or fire sprinkler contractor, Bidders will also submit a copy of the fire alarm contractor's and/or fire sprinkler contractor's permits from the State of Alabama Fire Marshal's Office.

11 INCOMPLETE and IRREGULAR BIDS:

A bid that is not accompanied by data required by the Bid Documents, or a bid which is in any way incomplete, may be rejected. Any bid which contains any uninitialed alterations or erasures, or any bid which contains any additions, alternate bids, or conditions not called for, or any other irregularities of any kind, will be subject to rejection.

12 BID ERRORS:

(A) Errors and Discrepancies in the Proposal Form. In case of error in the extension of prices in bids, the unit price will govern. In case of discrepancy between the prices shown in the figures and in words, the words will govern.

(B) Mistakes within the Bid. If the low bidder discovers a mistake in its bid, the low bidder may seek withdrawal of its bid without forfeiture of its bid guaranty under the following conditions:

- (1) Timely Notice:** The low bidder must notify the Awarding Authority and Architect in writing, within three working days after the opening of bids, that a mistake was made. This notice must be given within this time frame whether or not award has been made.
- (2) Substantial Mistake:** The mistake must be of such significance as to render the bid price substantially out of proportion to the other bid prices.
- (3) Type of Mistake:** The mistake must be due to calculation or clerical error, an inadvertent omission, or a typographical error which results in an erroneous sum. A mistake of law, judgment, or opinion shall not constitute a valid ground for withdrawal without forfeiture.
- (4) Documentary Evidence:** Clear and convincing documentary evidence of the mistake must be presented to the Awarding Authority and the Architect as soon as possible, but no later than three working days after the opening of bids.

The Awarding Authority's decision regarding a low bidder's request to withdraw its bid without penalty shall be made within 10 days after receipt of the bidder's evidence or by the next regular meeting of the Awarding Authority. Upon withdrawal of bid without penalty, the low bidder shall be prohibited from (1) doing work on the project as a subcontractor or in any other capacity and (2) bidding on the same project if it is re-bid.

13 DISQUALIFICATION of BIDDERS:

Any bidder(s) may be disqualified from consideration for contract award for the following reasons:

(A) Collusion. Any agreement or collusion among bidders or prospective bidders in restraint of freedom of competition to bid at a fixed price or to refrain from bidding or otherwise shall render the bids void and shall cause the bidders or prospective bidders participating in such agreement or collusion to be disqualified from submitting further bids to the Awarding Authority on future lettings. (See § 39-2-6, Code of Alabama 1975, for possible criminal sanctions.)

(B) Advance Disclosure. Any disclosure in advance of the terms of a bid submitted in response to an Advertisement for Bids shall render the proceedings void and require re-advertisement and rebid.

(C) Failure to Settle Other Contracts. The Awarding Authority may reject a bid from a bidder who has not paid, or satisfactorily settled, all bills due for labor and material on other contracts in force at the time of letting.

14 CONSIDERATION of BIDS:

(A) After the bids are opened and read publicly, the bid prices will be compared and the results of this comparison will be available to the public. Until the final award of the contract, however, the Awarding Authority shall have the right to reject any or all bids, and it shall have the right to waive technical errors and irregularities if, in its judgment, the bidder will not have obtained a competitive advantage and the best interests of the Awarding Authority will be promoted.

(B) If the Bid Documents request bids for projects or parts of projects in combination or separately, the Bid Documents must include supplements to, these Instructions to Bidders setting forth applicable bid procedures. Award or awards will be made to the lowest responsible and responsive bidder or bidders in accordance with such bid procedures.

15 BID ALTERNATES:

(A) Bid Alternates: Additive alternate bids are preferred, and may be used in order to obtain prices for the addition of items not included in the base bid. The alternate bids shall be listed in the Proposal Form.

(B) Deductive Bid Alternates: Deductive alternate bids shall only be used with the prior approval of the Chief Facilities Officer.

(C) ACCS reserves the right to select or reject some, any, or all alternates in making the final determination of the lowest responsible and responsive bidder to whom the Construction Contract is awarded.

16 UNIT PRICES:

(A) Work Bid on a Unit Price Basis. Where all, or part(s), of the planned Work is bid on a unit price basis, both the unit prices and the extensions of the unit prices constitute a basis of determining the lowest responsible and responsive bidder. In cases of error in the extension of prices of bids, the unit price will govern. A bid may be rejected if any of the unit prices are obviously unbalanced or non-competitive. Each unit price is to include overhead, profit, and all other related costs.

(B) Unit Prices for Application to Change Orders. As a means of predetermining unit costs for changes in certain elements of the Work, the Bid Documents may require that the bidders furnish unit prices for those items in the Proposal Form. Unit prices for application to changes in the work are not a basis for determining the lowest bidder. Non-competitive unit prices proposed by the successful bidder may be rejected and competitive prices negotiated by the Awarding Authority prior to contract award. Unit prices for application to changes in the work are not effective unless specifically included and agreed upon in the Construction Contract. Each unit price is to include overhead, profit, and all other related costs.

17 AWARD of CONTRACT:

(A) The contract shall be awarded to the lowest responsible and responsive bidder unless the Awarding Authority finds that all the bids are unreasonable or that it is not in the best interest of the Awarding Authority to accept any of the bids. A responsible bidder is one who, among other qualities determined necessary for performance, is competent, experienced, and financially able to perform the contract. A responsive bidder is one who submits a bid that complies with the terms and conditions of the Advertisement for Bids and the Bid Documents. Minor irregularities in the bid shall not defeat responsiveness.

(B) A bidder to whom award is made will be notified by telegram, confirmed facsimile, or letter to the address shown on the Proposal Form at the earliest possible date. Unless other time frames are stipulated in Supplemental Instructions to Bidders, the maximum time frames allowed for each step of the process between the opening of bids and the issuance of an order to proceed with the work shall be as follows:

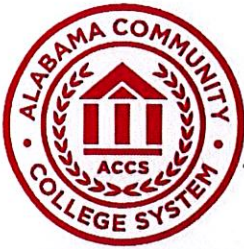
- (1) Award of contract by Awarding Authority: 30 calendar days after the opening of bids
- (2) Contractor's return of the fully executed contract, with bonds and evidence of insurance, to the Awarding Authority: 15 calendar days after the contract has been presented to the contractor for signature (from the Lead Design Professional)
- (3) Awarding Authority's approval of the contractor's bonds and evidence of insurance and completion of contract execution: 20 calendar days after the contractor presents complete and acceptable documents to the Architect
- (4) Notice To Proceed issued to the contractor along with distribution of the fully executed construction contract to all parties: 15 calendar days after final execution of contract by the Awarding Authority, by various State Agencies if required and by the Governor if his or her signature on the contract is required by law

The time frames stated above, or as otherwise specified in the Bid Documents, may be extended by written agreement between the parties. Failure by the Awarding Authority to comply with the time frames stated above or stipulated in Supplemental Instructions to Bidders, or agreed extensions thereof, shall be just cause for the withdrawal of the contractor's bid and contract without forfeiture of bid security.

Should the successful bidder or bidders to whom the contract is awarded fail to execute the Construction Contract and furnish acceptable Performance and Payment Bonds and satisfactory evidence of insurance within the specified period, the Awarding Authority shall retain from the bid guaranty, if it is a cashier's check, or recover from the principal or the sureties, if the guaranty is a bid bond, the difference between the amount of the contract as awarded and the amount of the bid of the next lowest responsible and responsive bidder, but not more than \$10,000. If no other bids are received, the full amount of the bid 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 Awarding Authority.

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 bids established. The bid guaranties 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. When the award is deferred for a period of time longer than 15 days after the opening of the bids, all bid guaranties, except those of the potentially successful bidders, shall be returned. If no award is made within the specified period, as it may by agreement be extended, all bids will be rejected, and all guaranties returned. If any potentially successful bidder agrees in writing to a stipulated extension in time for consideration of its bid and its bid was guaranteed with a cashier's check, the Awarding Authority may permit the potentially successful bidder to substitute a satisfactory bid bond for the cashier's check.

END OF INSTRUCTIONS TO BIDDERS



FACILITIES DIVISION

ACCS FORM 5-E

PROPOSAL FORM

To: Alabama Community College System

Date: _____

In compliance with the Advertisement for Bids and subject to all the conditions thereof, the undersigned

<Legal Name of Bidder>

hereby proposes to furnish all labor and materials and perform all work required for the construction of
WORK:

in accordance with Drawings and Specifications, dated _____, prepared by:
_____, Architect/Engineer

The Bidder, which is organized and existing under the laws of the State of: _____,

having its principal offices in the City of: _____,

is: ☐ a Corporation ☐ a Partnership ☐ an Individual ☐ Other: _____

LISTING OF PARTNERS OR OFFICERS:

If Bidder is a Partnership, list all partners and their addresses; if Bidder is a Corporation, list the names, titles, and business addresses of its officers:

BIDDER'S REPRESENTATION: The Bidder declares that it has examined the site of the Work, having become fully informed regarding all pertinent conditions, and that it has examined the Drawings and Specifications (including all Addenda received) for the Work and the other Bid and Contract Documents relative thereto, and that it has satisfied itself relative to the Work to be performed.

ADDENDA: The Bidder acknowledges receipt of Addenda Nos. _____ through _____ inclusively.

BASE BID: For construction complete as shown and specified, the sum of:

_____ Dollars (\$ _____)

ALTERNATES: If alternates as set forth in the Bid Documents are accepted, the following adjustments are to be made to the Base Bid:

For Alternate No. 1 (<Keyword for Amount>)	☐ add	☐ deduct \$
For Alternate No. 2 (<Keyword for Amount>)	☐ add	☐ deduct \$
For Alternate No. 3 (<Keyword for Amount>)	☐ add	☐ deduct \$
For Alternate No. 4 (<Keyword for Amount>)	☐ add	☐ deduct \$
For Alternate No. 5 (<Keyword for Amount>)	☐ add	☐ deduct \$
For Alternate No. 6 (<Keyword for Amount>)	☐ add	☐ deduct \$

UNIT PRICES - (Attach to this Proposal Form the unit prices, if any, on a separate sheet.)

BID SECURITY: The undersigned agrees to enter into a Construction Contract and furnish the prescribed Performance and Payment Bonds and evidence of insurance within fifteen calendar days, or such other period stated in the Bid Documents, after the contract forms have been presented for signature, provided such presentation is made within 30 calendar days after the opening of bids, or such other period stated in the Bid Documents. As security for this condition, the undersigned further agrees that the funds represented by the Bid Bond (or cashier's check) attached hereto may be called and paid into the account of the Awarding Authority as liquidated damages for failure to so comply.

Attached hereto is a (Mark the appropriate box and provide the applicable information):

- ☐ Bid Bond, executed by _____ as Surety,
- ☐ A cashier's check on the _____ Bank: _____,
for the sum of: _____
Dollars (\$ _____) made payable to the Awarding Authority.

BIDDER'S ALABAMA LICENSE:

State License for General Contracting: _____ / _____ / _____

License Number

Bid Limit

Type(s) of Work

CERTIFICATIONS: The undersigned certifies that he or she is authorized to execute contracts on behalf of the Bidder as legally named, that this proposal is submitted in good faith without fraud or collusion with any other bidder, that the information indicated in this document is true and complete, and that the bid is made in full accord with State law. Notice of acceptance may be sent to the undersigned at the address set forth below.

The Bidder also declares that a list of all proposed major subcontractors and suppliers will be submitted at a time subsequent to the receipt of bids as established by the Architect in the Bid Documents but in no event shall this time exceed twenty-four (24) hours after receipt of bids.

Legal Name of Bidder: _____

Mailing Address: _____

***By (Legal Signature):** _____

*Name & Title (Print): _____

Telephone Number: _____

(SEAL)

Email Address: _____

* If other than the individual proprietor, or an above named member of the Partnership, or the above named president, vice-president, or secretary of the Corporation, attach written authority to bind the Bidder. Any modification to a bid shall be over the initials of the person signing the bid, or of an authorized representative.

SECTION 00007: ATTACHMENT A

TO PROPOSAL FORM

1.1 UNIT PRICES:

- A. The following items of work are anticipated during the performance of this contract; however the exact quantity of each work item may not be determinable prior to bidding. The Contractor shall therefore, include in his Lump Sum Base Bid, an allowance for the following items in the quantities indicated. These Allowance Unit Prices include all charges for labor and materials, installation, shoring, fee, layout, supervision (field and home office), general expenses, taxes, insurance, overhead and profit, but not limited to, for the accomplishment of the Allowance item(s) installed in place. Where quantities of same items of work are defined and are quantified in the bid documents, the allowance quantities indicated hereinafter shall be in addition to those that are indicated. (Example: If the site grading plan indicated new and existing grades, the bidder shall compute the quantity of earthwork required and include that quantity of work in the bid the same as if no "allowance" quantity were specified. If an additional allowance quantity of earthwork is stipulated that stipulated allowance quantity of work shall also be included in addition to the quantity computed from the bidders earthwork "takeoff")

The following Unit Prices Quoted are for increases or decreases in the above quantities included in the Lump Sum Base Bid. These Unit Prices include all charges for labor, material, installation, and equipment, shoring, layout, supervision (field and home office), general expenses, taxes, insurance, overhead and profit, but not limited to for the accomplishment of the Allowance item(s) completely installed in place.

Clarification Note: the Unit Prices quoted by the Contractor shall apply to increases (additive change orders) and to decreases (deductive change orders). This requirement shall supplement the requirements of the General Conditions and Instruction to Bidders. Changes in the Contract amount that are computed using the Stated Allowances and Unit Prices shall be figured at the same unit price whether additive or deductive.

- B. Submit the following Unit Prices with the Proposal Form on Bid Date.

MARITIME INDUSTRIAL BASE RENOVATION
BISHOP STATE COMMUNITY COLLEGE-CARVER CAMPUS

MOBILE, ALABAMA

NO.	ITEM NAME	UNIT	UNIT PRICE
01	Sod	SY	\$
02	Seeding and Mulching	SY	\$
03	Silt Fencing	LF	\$
04	Temporary Construction Fencing	LF	\$
05	Electrical – Data and Phone Outlet in Wall	EA	\$
06	Electrical – Duplex Power Outlet in Wall (120)	EA	\$
07A	Electrical – Exit Light Single-Sided	EA	\$
07B	Electrical – Exit Light Double-Sided	EA	\$
08	Fire Extinguisher and Cabinet	EA	\$
09	Floor Patch/ Leveling Compound	SF	\$
10	3 5/8" Interior Walls	SF	\$
11	6" Metal Stud Interior Walls	SF	\$
12	Drywall	SF	\$
13	Moisture Resistant Board	SF	\$
14	Tile Backer Board	SF	\$
15	High Abuse Board	SF	\$

(*) Legend to "Unit" quantity abbreviations:

SY	Square Yards
CY	Cubic Yards
LF	Linear Foot
SF	Square Foot
EA	Each
LBS	Pounds

Note: Failure to complete and submit this attachment with proposal shall be grounds for rejections of bid.

END OF ATTACHMENT A TO PROPOSAL FORM

ATTACHMENT B

TO PROPOSAL FORM

CERTIFICATION: I HEREBY CERTIFY THAT ALL SUBCONTRACTORS, SUPPLIERS AND MANUFACTURERS (INCLUDING IN PART, THOSE NAMED BELOW), ARE IN COMPLIANCE WITH THE MINIMUM EXPERIENCE REQUIREMENTS OF THE BID AND CONTRACT DOCUMENTS, AND WHERE STATED AS REQUIRED ARE EITHER PREAPPROVED FOR BIDDING BY THEIR BUSINESS NAME OR HAVE BEEN SUBMITTED AND PREAPPROVED FOR BIDDING IN WRITING OR BY ADDENDUM BY THE ARCHITECT; ALL STILL SUBJECT TO COMPLIANCE WITH REQUIREMENTS; THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY ADDITIONAL COST FOR COMPLIANCE.

SUBMITTED BY - GENERAL CONTRACTOR'S FIRM NAME:

DATE:

1.1 PRINCIPAL SUBCONTRACTORS AND SUPPLIERS LISTING:

- A. Submit the following Principal Subcontractors and Suppliers information with the Proposal Form on Bid Date, OR at Contractor's option, turned in to the Owner within 24-hours after receipt of Bids, with a copy to the Architect:

NO.:	SPECIFICATION SECTION:	PRINCIPAL SUBCONTRACTOR OR SUPPLIER - NAME and LOCATION:
1	024119 - SELECTIVE DEMOLITION	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
2	042000 - UNIT MASONRY	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
3	054000 - COLD FORMED METAL FRAMING	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)

NO.:	SPECIFICATION SECTION:	PRINCIPAL SUBCONTRACTOR OR SUPPLIER - NAME and LOCATION:
4	055000 – METAL FABRICATIONS	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
5	061000 – ROUGH CARPENTRY	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
6	062000 – FINISH CARPENTRY	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
7	064000 – ARCHITECTURAL WOODWORK	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
8	072100 – BUILDING INSULATION	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
9	072700 – FIRESTOPPING	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
10	081213 – HOLLOW METAL FRAMES	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)

11	083113- ACCESS DOORS	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
12	087100- DOOR HARDWARE	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
13	088100- GLASS AND GLAZING	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
14	088700- ARCHITECTURAL WINDOW FILMS	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
15	089119- FIXED LOUVERS	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
16	092116- GYPSUM DRYWALL	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
17	092216- NON STRUCTURAL METAL FRAMING	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)

18	093000- TILING	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
19	095153 - ACOUSTICAL PANEL CEILINGS	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
20	096513 - RESILIENT BASE AND ACCESSORIES	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
21	096519 - RESILIENT TILE FLOORING	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
22	099000 - PAINTING	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
23	102800 - TOILET ACCESSORIES	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)
24	104416 - FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES	_____ (FIRM NAME) _____ (LOCATION - CITY and STATE)

25	154000 – PLUMBING	 _____ (FIRM NAME) _____ (LOCATION – CITY and STATE)
----	-------------------	--

END OF ATTACHMENT B TO PROPOSAL FORM



FACILITIES DIVISION

ACCS FORM 5-F

BID BOND

• Do not staple this form; use clips.

The **PRINCIPAL** (Bidder's Company Name and Address)

Name:

Address:

The **SURETY** (Company Name and Primary Place of Business)

Name:

Address:

The **OWNER**

Name: Alabama Community College System

Address: 135 S. Union Street, Montgomery, AL 36130

The **PROJECT** for which the Principal's Bid is submitted (Project name as it appears in the Bid Documents):

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned Principal and Surety, jointly and severally, hereby bind ourselves, our heirs, executors, administrators, successors, and assigns to the Owner in the **PENAL SUM of five percent (5%) of the amount of the Principal's bid, but in no event more than Ten-thousand Dollars (\$10,000.00).**

THE CONDITION OF THIS OBLIGATION is that the Principal has submitted to the Owner the attached bid, which is incorporated herein by reference, for the Project identified above.

NOW, THEREFORE, if, within the terms of the Bid Documents, the Owner accepts the Principal's bid and the Principal thereafter either:

(a) executes and delivers a Construction Contract with the required Performance and Payment Bonds (each in the form contained in the Bid Documents and properly completed in accordance with the bid) and delivers evidence of insurance as prescribed in the Bid Documents, or

(b) fails to execute and deliver such Construction Contract with such Bonds and evidence of insurance, but pays the Owner the difference, not to exceed the Penal Sum of this Bond, between the amount of the Principal's Bid and the larger amount for which the Owner may award a Construction Contract for the same Work to another bidder, **then**, this obligation shall be null and void, otherwise it shall remain in full force and effect.

The Surety, for value received, hereby stipulates and agrees that the obligation of the Surety under this Bond shall not in any manner be impaired or affected by any extension of the time within which the Owner may accept the Principal's bid, and the Surety does hereby waive notice of any such extension.

SIGNED AND SEALED this -Day-day of -Month- -Year-

PRINCIPAL: _____

ATTEST:

BY: _____

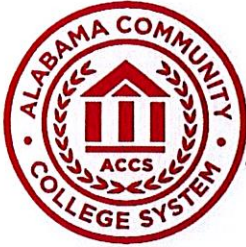
NAME AND TITLE

SURETY: _____

ATTEST:

BY: _____

NAME AND TITLE



FACILITIES DIVISION

ACCS FORM 5-H

(Must be submitted with ACCS Form 5-E)

ACCOUNTING OF SALES TAX

ATTACHMENT TO ACCS FORM 5-E: PROPOSAL FORM

TO:		DATE:	
NAME OF PROJECT:			

SALES TAX ACCOUNTING

Pursuant to Act 2013-205, Section 1(g) the Contractor accounts for the sales tax NOT included in the bid proposal form as follows:

BASE BID:		<u>ESTIMATED SALES TAX AMOUNT</u>	
		Dollars \$	
For Alternate No. 1 (<Keyword for Amount>)	☐ add	☐ deduct	\$
For Alternate No. 2 (<Keyword for Amount>)	☐ add	☐ deduct	\$
For Alternate No. 3 (<Keyword for Amount>)	☐ add	☐ deduct	\$
For Alternate No. 4 (<Keyword for Amount>)	☐ add	☐ deduct	\$
For Alternate No. 5 (<Keyword for Amount>)	☐ add	☐ deduct	\$
For Alternate No. 6 (<Keyword for Amount>)	☐ add	☐ deduct	\$

Failure to provide an accounting of sales tax shall render the bid non-responsive. Other than determining responsiveness, sales tax accounting shall not affect the bid pricing nor be considered in the determination of the lowest responsible and responsive bidder.

Legal Name of Bidder:

Mailing Address:

***By (Legal Signature):** _____

*Name (Print):

*Title (Print):

*Telephone Number:

Email Address:

(SEAL)

Note: A completed ACCS Form 5-H: Accounting of Sales Tax must be submitted with ACCS Form 5-E: Proposal Form. A proposal shall be rendered non-responsive if an Accounting of Sales Tax is not provided.



ACCS FORM 5-J

You may use your own form provided all requested information and signatures are on your form as well as the "I certify..." statement.

- DO NOT USE COLORED PRINT OR SHADED TABLES -

CERTIFIED TABULATION OF BIDS

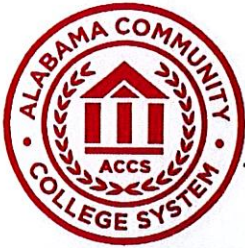
[illegible]

I certify that the above bids were advertised, were received sealed and were publicly opened and read aloud at the time and place indicated and that this is a true and correct tabulation of all bids received for this project.

Sworn and subscribed before me this 19th day of -Month-
-Year-
IN REPUBLIC
(SEAL)

BY:	SIGNATURE
NAME AND TITLE OF ARCHITECT/ENGINEER	

VER: 07152024



FACILITIES DIVISION

ACCS FORM 6-C

STATEMENT OF FIELD OBSERVATIONS

ACCS PROJECT#:		DATE:		TIME:	
PROJECT NAME:					
Address:					
OWNER ENTITY:					
Address:		Phone:			
		Email:			
CONTRACTOR COMPANY:					
Address:		Phone:			
		Email:			
ARCHITECTURAL/ENGINEERING FIRM:					
Address:		Phone:			
		Email:			
PROJECT DATA ON THE DATE OF OBSERVATION					
#OF WORKERS:		START DATE:			
WEATHER:					
SITE CONDITIONS:					
CONTRACT COMPLETION DATE:		CONTRACTOR COMPLETION DATE:			
SCHEDULED STATE OF COMPLETION:	%	ESTIMATED ACTUAL COMPLETION:	%		
CONTRACTOR'S SUPERINTENDENT:		JOB PHONE:			
COMMENTS/DEFICIENCIES:					
SIGNATURE:			REPORT#:		
CC: Owner, Architect/Engineer, Contractor					

INVENTORY OF STORED MATERIALS

Project:		Project No.			
Contractor:		For Estimate No.:			
		For Period Ending:			
A	B	C	D	E	F
DESCRIPTION	MATERIALS STORED LAST PERIOD	PURCHASED THIS PERIOD	TOTAL COLUMNS B + C	MATERIALS USED THIS PERIOD	MATERIALS PRESENTLY STORED

To be used as documentation to support value of Stored Materials reported on APPLICATION AND CERTIFICATE FOR PAYMENT.

SAMPLE PROGRESS SCHEDULE & REPORT										ACCS FORM 6-H	
PROJECT NO.		CONTRACTOR (Contractor may use own form):						DATE OF REPORT:			
PROJECT:		ARCHITECT/ENGINEER:						PROCEED DATE:			
PROJECT:		PROJECTED COMPLETION DATE:									
WORK DIVISION	%	AMOUNT									
1. GENERAL REQUIREMENTS											
2. SITEWORK											
3. CONCRETE											
4. MASONRY											
5. METALS											
6. WOOD AND PLASTIC									100%		
7. THERMAL AND MOISTURE PROTECTION									90%		
8. DOORS AND WINDOWS									80%		
9. FINISHES									70%		
10. SPECIALTIES									60%		
11. EQUIPMENT									50%		
12. FURNISHINGS									40%		
13. SPECIAL CONSTRUCTION									30%		
14. CONVEYING SYSTEMS									20%		
15. MECHANICAL									10%		
16. ELECTRICAL									0%		
TOTAL ORIG. CONTRACT	100%										
ANTICIPATED DRAW IN \$1,000											
ACTUAL DRAW IN \$1,000											

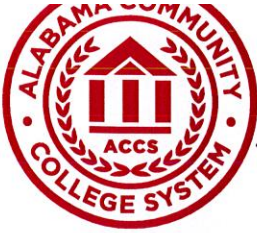
LEGEND: ANTICIPATED ACTIVITY

ACTUAL ACTIVITY

ANTICIPATED CASH FLOW

ACTUAL CASH FLOW

USE ADDITIONAL SHEETS IF JOB IS SCHEDULED OVER 12 MONTHS.



CERTIFICATION OF STRUCTURAL OBSERVATIONS

ACCS PROJECT#:			
PROJECT NAME:			
OWNER:			
CONTRACTING COMPANY:			

I _____, do hereby verify that I have personally conducted the visual Design Professional observations of the construction of the structural system for conformance to the approved construction documents for the referenced project. The visual observations of the structural systems were personally conducted by me at all significant construction stages and at the completion of the construction of the structural system. To the best of my knowledge, all structural deficiencies have been resolved except as noted below:

Signed on this date, _____

Design Professional's Seal

ARCHITECTURAL / ENGINEERING FIRM

SIGNATURE OF ARCHITECT OR
STRUCTURAL ENGINEER OF RECORD

PRINTED NAME: _____



FACILITIES DIVISION

ACCS FORM 6-K

CERTIFICATE OF SUBSTANTIAL COMPLETION

TO:
ACCS FACILITIES DIVISION
135 S. Union Street
Montgomery, AL 36130
(334) 293-4500

• Do not staple this form and/or attachments; use clips. Print single-sided; do not submit double-side printed documents

	ACCS PROJECT#:	
OWNER ENTITY NAME AND ADDRESS:	ARCHITECTURAL/ENGINEERING FIRM NAME & ADDRESS:	
Email to receive executed copy:	Email to receive executed copy:	
CONTRACTOR COMPANY NAME AND ADDRESS:	BONDING COMPANY NAME AND ADDRESS:	
Email to receive executed copy:	Email to receive executed copy:	

PROJECT:

Substantial Completion has been achieved for: ☐ the entire Work ☐ the following portion of the Work:

The **Date of Substantial Completion** of the Work covered by this certificate is established to be: _____

"Substantial Completion" means the designated Work is sufficiently complete, in accordance with the Contract Documents, such that the Owner may occupy or utilize the Work for its intended use without disruption or interference by the Contractor in completing or correcting any remaining unfinished Work. The Date of Substantial Completion is the date upon which all warranties for the designated Work commence, unless otherwise agreed and recorded herein.

Punch List: A _____ page list of items to be completed or corrected prior to the Owner's approval of Final Payment is attached hereto, but does not alter the Contractor's responsibility to complete or correct all Work in full compliance with the Contract Documents. The Contractor shall complete or correct all items on the attached list, ready for re-inspection for Final Acceptance, within 30 days after the above Date of Substantial Completion, unless another date is stated here: _____. If completed or corrected within this period, warranties of these items commence on the Date of Substantial Completion, otherwise such warranties commence on the date of Final Acceptance of each item. Failure to complete or correct any items of remaining Work ("punch list" items) within 60 days will result in all warranties commencing on the Date of Final Acceptance.

The **Year End Inspection Date** to help identify and address any construction defects or warranty issues shall be established as _____, which is 11 months after the **Date of Substantial Completion**.

Nothing herein shall limit or waive the Owner's rights under Article 27 of the General Conditions (ACCS Form 2-B), including but not limited to issuance of Notices to Cure or Notice of Termination issued to Contractors and Sureties, to obtain completion, correction, or repair of any remaining unfinished Work ("punch list" items).

Only one (1) originally executed substantial completion form shall be routed for signature. ACCS Facilities Division office will mail the fully-executed original to the Owner and email copies to all parties.

VER: 08112025

ACCS FORM 6-K

RECOMMENDED BY:	CONTRACTING PARTIES:
<div>_____</div> <div>ARCHITECT/ENGINEER DATE</div>	<div>_____</div> <div>CONTRACTOR DATE</div>
APPROVALS:	
<div>_____</div> <div>AHJ INSPECTOR (IF APPLICABLE) DATE</div>	<div>_____</div> <div>ACCS CHIEF FACILITIES OFFICER DATE</div>
<div>_____</div> <div>*A/E PEER REVIEWER(IF APPLICABLE) DATE</div>	
<div>_____</div> <div>OWNER'S DESIGNATED REPRESENTATIVE DATE</div>	
<div>_____</div> <div>ACCS REGIONAL FACILITIES DIRECTOR DATE</div>	

*ACCS Colleges are required to provide an A/E Peer Reviewer to review the A/E of Record's project design and to perform construction inspections when AHJ is not present in city/town where project's work is taking place.

Required Certification: The Certification of Structural Observations (ACCS Form 6-J) shall be prepared by the Structural Engineer of Record for all projects containing classrooms or dorm rooms on the grounds of public institutions of higher education as required by ACT#2012-554. Where applicable to the project, the certification must be attached to the Certificate of Substantial Completion.



FACILITIES DIVISION

ACCS FORM 6-M

SAMPLE FORM OF ADVERTISEMENT FOR COMPLETION

LEGAL NOTICE

In accordance with Chapter 1, Title 39, Code of Alabama, 1975, as amended, notice is hereby given that:

(Contractor Company Name)

Contractor, has completed the Contract for:

☐ CONSTRUCTION ☐ RENOVATION ☐ ALTERATION ☐ EQUIPMENT ☐ IMPROVEMENT

of:

at:

for the State of Alabama and the (County) (City) of: _____,
Owner(s), and have made request for final settlement of said Contract. All persons having any claim for
labor, materials, or otherwise in connection with this project should immediately notify:

(Architect/Engineer)

BUSINESS ADDRESS:

(Contractor)

NOTE: This notice must be run once a week for three successive weeks for projects exceeding \$100,000. For projects of \$100,000 or less, there is no requirement for Advertisement for Completion. A copy of the publisher's affidavit of publication (including a copy of the advertisement) shall be submitted by the Contractor to the Design Professional.



FACILITIES DIVISION

ACCS FORM 6-N

CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS

ACCS PROJECT#:			
DATE OF THE CONSTRUCTION CONTRACT:			
PROJECT (SAME AS APPEARS IN THE CONSTRUCTION CONTRACT):			
STATE OF:		COUNTY OF:	

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Construction Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:**CONTRACTOR****NAME :****ADDRESS :**_____
SIGNATURE OF AUTHORIZED REPRESENTATIVE**BY:** _____

SIGNEE'S PRINTED NAME

TITLE: _____

SIGNEE'S TITLE

Sworn to and subscribed before me this

_____ day of _____,

_____.

NOTARY PUBLIC'S SIGNATURE

My commission expires: _____

SEAL

SUPPORTING DOCUMENTS ATTACHED HERETO

1. Consent of Surety to Final Payment. Whenever Surety is involved, a Consent of Surety form is required.

INDICATE ATTACHMENT: ☐ YES ☐ NO

THE FOLLOWING SUPPORTING DOCUMENT SHOULD BE ATTACHED HERETO IF REQUIRED BY THE OWNER:

1. Contractor's Release of Waiver of Liens
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment supplies, to the extent required by the Owner, accompanied by the list thereof
3. Contractor's Affidavit of Release of Liens



FACILITIES DIVISION

ACCS FORM 6-P

CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS

ACCS PROJECT#:			
DATE OF THE CONSTRUCTION CONTRACT:			
PROJECT (SAME AS APPEARS IN THE CONSTRUCTION CONTRACT):			
STATE OF:		COUNTY OF:	

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Construction Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO

1. Contractor's Release of Waiver of Liens
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment supplies, to the extent required by the Owner, accompanied by the list thereof

CONTRACTOR

NAME :

ADDRESS :

SIGNATURE OF AUTHORIZED REPRESENTATIVE

BY:

SIGNEE'S PRINTED NAME

TITLE:

SIGNEE'S TITLE

Sworn to and subscribed before me this

_____ day of _____,
_____.

NOTARY PUBLIC'S SIGNATURE

My commission expires: _____

SEAL



FACILITIES MANAGEMENT

ACCS FORM 6-Q

CONSENT OF SURETY TO FINAL PAYMENT

ACCS PROJECT#:	
DATE OF THE CONSTRUCTION CONTRACT:	
SURETY'S BOND NUMBER:	
TO: OWNER (THE ALABAMA COMMUNITY COLLEGE SYSTEM)	
PROJECT: (SAME AS APPEARS IN THE CONSTRUCTION CONTRACT)	
In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the SURETY:	
on bond of CONTRACTOR:	
hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to the Owner.	
as set forth in said Surety's bond.	
SIGNED AND SEALED this _____ day of _____.	
SURETY: _____ COMPANY NAME	SEAL:
BY: _____ SIGNATURE OF AUTHORIZED REPRESENTATIVE	
_____ PRINTED NAME AND TITLE	

Note: Original Power of Attorney for the Surety's signatory shall be furnished with each original form.

IMMIGRATION STATUS VERIFICATION

1.1 GENERAL:

- A. Bidders are hereby reminded that they are required to comply with requirements of Alabama Immigration Law, Act 2011-535 (also referred to as the “Beason-Hammon Alabama Taxpayer and Citizen Protection Act”, or H.B. 658), as amended by Act No. 2012-491, including in part and effective January 1, 2012, **enrollment in the E-Verify Program of the United States Department of Homeland Security:**
1. Contractor’s signed “E-Verify Memorandum of Understanding” will be required to be attached to any Contract awarded.
 2. General Contractors and Subcontractors shall be enrolled in, participate in and maintain compliance for the duration of this contract, and as otherwise required by statute.
- B. The following statement shall and will be included in the Contract for Construction:
- “By signing this contract, 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.”***
- C. Additional information and Guidance is available at the following websites:
1. E-Verify portal maintained by State of Alabama: <http://immigration.alabama.gov>
 2. Alabama Office of the Attorney General Website:
<http://www.ago.alabama.gov/Page-Immigration>
 3. Alabama Division of Construction Management:
<http://www.bc.state.al.us/PDFs/Bulletins/GuidanceonAct2012-491-DatedMay-29-2012.pdf>
 4. US Department of Homeland Security, E-Verify:
www.dhs.gov/E-Verify

END OF SECTION



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, SERVICES, OR IS RESPONSIBLE FOR GRANT AWARD

ADDRESS

CITY, STATE, ZIP

TELEPHONE NUMBER

This form is provided with:

☐ Contract ☐ Proposal ☐ Request for Proposal ☐ Invitation to Bid ☐ Grant Proposal

Have you or any of your partners, divisions, or any related business units previously performed work or provided goods to any State Agency/Department in the current or last fiscal year?

☐ Yes ☐ No

If yes, identify below the State Agency/Department that received the goods or services, the type(s) of goods or services previously provided, and the amount received for the provision of such goods or services.

STATE AGENCY/DEPARTMENT	TYPE OF GOODS/SERVICES	AMOUNT RECEIVED
-------------------------	------------------------	-----------------

Have you or any of your partners, divisions, or any related business units previously applied and received any grants from any State Agency/Department in the current or last fiscal year?

☐ Yes ☐ No

If yes, identify the State Agency/Department that awarded the grant, the date such grant was awarded, and the amount of the grant.

STATE AGENCY/DEPARTMENT	DATE GRANT AWARDED	AMOUNT OF GRANT
-------------------------	--------------------	-----------------

1. List below the name(s) and address(es) of all 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 proposed transaction. Identify the State Department/Agency for which the public officials/public employees work. (Attach additional sheets if necessary.)

NAME OF PUBLIC OFFICIAL/EMPLOYEE	ADDRESS	STATE DEPARTMENT/AGENCY
----------------------------------	---------	-------------------------

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 proposed transaction. Identify the public officials/public employees and State Department/Agency for which the public officials/public employees work. (Attach additional sheets if necessary.)

NAME OF FAMILY MEMBER	ADDRESS	NAME OF PUBLIC OFFICIAL/ PUBLIC EMPLOYEE	STATE DEPARTMENT/ AGENCY WHERE EMPLOYED
-----------------------	---------	---	--

If you identified individuals in items one and/or two above, describe in detail below the direct financial benefit to be gained by the public officials, public employees, and/or their family members as the result of the contract, proposal, request for proposal, invitation to bid, or grant proposal. (Attach additional sheets if necessary.)

Describe in detail below any indirect financial benefits to be gained by any public official, public employee, and/or family members of the public official or public employee as the result of the contract, proposal, request for proposal, invitation to bid, or grant proposal. (Attach additional sheets if necessary.)

List below the name(s) and address(es) of all paid consultants and/or lobbyists utilized to obtain the contract, proposal, request for proposal, invitation to bid, or grant proposal:

NAME OF PAID CONSULTANT/LOBBYIST	ADDRESS
----------------------------------	---------

By signing below, I certify under oath and penalty of perjury that all statements on or attached to this form are true and correct to the best of my knowledge. I further understand that a civil penalty of ten percent (10%) of the amount of the transaction, not to exceed \$10,000.00, is applied for knowingly providing incorrect or misleading information.

Signature	Date
-----------	------

Notary's Signature	Date	Date Notary Expires
--------------------	------	---------------------

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.

SECTION 01030

ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF REQUIREMENTS:

- A. Definition: An alternate is an amount proposed by Bidders and stated on the Bid Form that will be added to or deducted from Base Bid amount if the Owner decides to accept a corresponding change in either scope of work or in products, materials, equipment, systems or installation methods described in Contract Documents.
- B. Coordination: Coordinate related work and modify or adjust adjacent work as required to ensure that work affected by each accepted alternate is complete and fully integrated into the project.
- C. Notification: Immediately following award of Contract, prepare and distribute to each party involved, notification of the status of each alternate. Indicate whether alternates have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to alternates, if any.
- D. Schedule:
 - 1. A "Schedule of Alternates" is included at the end of this section. Specification sections referenced in the Schedule contain requirements for materials and methods necessary to achieve the work described under each alternate.
 - 2. Include as part of each alternate, miscellaneous devices, appurtenances and similar items incidental to or required for a complete and warrantable installation whether or not mentioned as part of the alternate.

PART 2 - PRODUCTS

- 2.1** Not Applicable.

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES:

A. Alternate No. 1 – Hull Trainer

All materials and labor associated with the purchase, delivery, unloading, and installation of the Hull Trainer. See attached exhibit in the specifications

B. Alternate No. 2 – Exterior Painting

All materials and labor associated with painting the exterior steel post columns and horizontal and vertical steel framing located on the west side of the building

C. Alternate No. 3 – Chain Link Gate

All materials and labor associated with removing the existing gate and providing and installing a new 6' high black vinyl chain link gate at Hurtel Street.

END OF ALTERNATES

SECTION 01030a

SPECIAL PROJECT REQUIREMENTS

The Instructions to Bidders, General Conditions, Modified General Conditions and Special Project Requirements as set forth herein are applicable to the work under every Division and Section of these Specifications.

1.0 TIME FOR COMPLETION

All work under this Contract shall be complete and ready for Owner occupancy within One Hundred Eighty consecutive calendar days. The work under this contract shall commence within Ten (10) calendar days from date of Notice to Proceed or Notice of Award.

- A. The Contractor may proceed to award sub-contracts, assemble materials, etc., at any time after award of Contract and "Notice to Proceed" with Work is given by the Owner. The contractor's official time for construction to start on work shall be the earlier of either the date of the Owner's "Notice to Proceed" with Work or receipt of the fully executed Contract for the Work; and completion of the Work shall be within the stipulations indicated and the number of consecutive calendar days or by the date(s) indicated on the Contractor's Proposal Form.
 - 1. Properly supervised work, per requirements, will be permitted on Saturdays and Sundays, subject to at least 72 hours prior notice and approval of the Owner.
 - 2. Work will not be permitted during testing and/or examination time periods. The Contractor shall coordinate timing of testing and any other special activities with the Owner.
- B. Acceptance of the completed Work of this Contract will be at a single date, and not in phases, unless otherwise indicated.
- C. Nothing in the Contract Documents shall permit or be construed to permit payment to the Contractor for any extended overhead or profit due to completion of the project extending beyond the Contractual completion date. In no event shall the Owner or Architect be liable to the Contractor for damage due to any delay to any portion of the Work of this Contract.
- D. Delays of exterior work due to inclement weather will be considered, only if the number of rain days is in excess of the National Weather Service 5-year average for this project's location, and proof of same is submitted along with any such claim.
 - 1. On-site records of daily rain and/or temperature readings kept by the Contractor may be accepted to verify weather and/or temperature variations

which prevent exterior, earthwork, foundations, and slabs, and/or roofing materials installation.

1.1 TIME IS OF THE ESSENCE

The Owner must occupy the work within the completion time indicated herein. Delivery time for equipment and material provided under this contract shall include lead time for storage and ready installation within time limits of the work. Coordination of Owner furnished / Contractor installed equipment and/or materials shall be considered within time limits of the work.

1.2 BID GUARANTY

The base bid proposal shall be guaranteed for a period of Sixty (60) days after date of proposal. Alternate proposals (additive or deductive), if requested, shall be guaranteed for a period of Ninety (90) days after date of signing contract. Unit prices, if requested, shall be guaranteed until the date of final acceptance of the project by the Owner.

1.3 OWNER

All papers shall be delivered to the Owner, unless otherwise specified in writing to the Contractor. Wherever the term "Owner" is used in the Specification it shall refer to:

Bishop State Community College
351 N Broad Street
Mobile, Alabama 36603

1.4 ARCHITECT

Wherever the term "Architect" is used in the Specifications, it shall refer to:

GOODWYN MILLS CAWOOD, LLC
11 NORTH WATER STREET, SUITE 19290
MOBILE, AL 36602

who by contract with the Owner, is authorized to prepare all drawings, details, and specifications for this work.

After the award of this contract, supervision of the work will be performed by the aforementioned Architect, his duly authorized representatives, or his duly appointed successor as may be designated in writing to the Contractor by the Owner.

1.5 APPLICABLE CODES AND AUTHORITIES

- A. Codes
 - 1. The work of this project shall be in accordance with the 2021 Edition, International Building Code,

2021 International Existing Building Code,
2021 International Mechanical Code,
2021 International Plumbing Code,
2021 International Fire Code,
2020 National Electrical Code, (NFPA 70)
ANSI/ASHRAE/IES Standard 90.1-2013 Energy Standard for Buildings Except
Low-Rise Residential Buildings, with exceptions permitted to:

- 6.5.1 – Economizers
- 8.4.2 – Automatic Receptacle Control
- 8.4.3 – Electrical Energy Monitoring

2010 ADA Standards for Accessible Design

As well as with other applicable codes, laws, and ordinances.

2. Promptly notify the Architect, in writing, if any of the contract documents are in conflict or variance with applicable codes, laws and ordinances. All changes will be made by written addenda or modifications.

B. Authorities having jurisdiction, may include but shall not be limited to:

1. Alabama Community College System (ACCS)
2. City of Mobile
3. Alabama Department of Public Health
4. City and/ or County Health Department
5. Alabama Department of Environmental Management (ADEM)
6. US Army Corps of Engineers
7. Secure and pay for permits, impact fees, government fees, and licenses. This will include, but not be limited to, all permits and/or fees required by ADEM, and the U.S. Army Corp of Engineers.

C. If any work is performed knowing it to be contrary to such codes, law, ordinances, rules and regulations and without notice to the Architect, the Contractor assumes full responsibility therefore and shall bear all costs for compliance thereto.

1.6 NONRESIDENT BIDDERS

Nonresident bidders must accompany any written bid documents with a written opinion of an attorney at law licensed to practice law in such nonresident bidders' state of domicile, as to the preferences, if any or none, granted by the law of that state to its own business entities whose principal places of business are in that state in the letting of any or all public contracts.

1.7 PRE-BID CONFERENCE

A conference of intended bidders may be held by the Owner prior to the time for the opening of bids for the purpose of presenting and explaining the policies of the Board. Notification of date and place for conference shall be given by written addenda.

1.8 PRE-CONSTRUCTION CONFERENCE

A conference shall be held at the job site no later than two weeks following the date of "NOTICE TO PROCEED". The purpose of this conference is to define the duties and responsibilities of the Architect, Owner, and Contractor. All forms, procedures, schedules, and other pertinent requirements will be discussed. Mandatory attendance will be required of the General Contractor and representative of all specialty and principal subcontractors involved in the project. Time and date of said conference shall be established by the Architect after award of construction contract.

1.9 LIST OF SUBCONTRACTORS AND PRINCIPAL MATERIAL SUPPLIERS

Five (5) copies shall be prepared by the successful Contractor and delivered to Architect within Twenty-Four (24) hours after bid. List shall show following information on each Subcontractor and/or Supplier:

- A. Name of Subcontractor and/or Supplier
- B. Complete mailing address
- C. Telephone Number
- D. Person to contact and position in organization
- E. Scope of Work to be performed by Subcontractor and percent of total contract

1.10 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart type Contractor's construction schedule. Submit within 30 days of the date established for "Commencement of the Work".
 - 1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the work as indicated in the "Schedule of Values".
 - 2. Within each time bar indicate estimated completion percentage in 10 percent increments. As work progresses, place a contrasting mark in each bar to indicate Actual Completion.
 - 3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
 - 4. Secure time commitments for performing critical elements of the work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the

- work. Show each activity in proper sequence. Indicated graphically sequences necessary for completion of related portions of the work.
5. Coordinate the Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests and other schedules.
 6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Architect's procedures necessary for certification of Substantial Completion.
- B. Work Stages
Indicate important stages of construction for each major portion of the work, including testing and installation.
- C. Cost Correlation
At the head of the schedule, provide a two item cost correlation line, indicating "precalculated" and "actual" costs. On the line show dollar-volume of work performed as of the dates used for preparation of payment requests.
- D. Distribution
Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.
- E. Schedule Updating and Progress Photographs
Revise the schedule after each bi-weekly meeting or activity, where revisions have been recognized or made. Issue the copies of updated schedule concurrently with progress photographs and report of each meeting to the Owner and Architect.

1.10 NOTICE OF SALES AND USE TAX EXEMPTION

The Owner is a tax-exempt agency. Materials incorporated into the Work are exempt from sales and use tax, therefore Contractor shall NOT include sales and use taxes in his Bid. Pursuant to Alabama Act No. 2013-205 (effective 5/9/2013), Contractors bidding the Work shall be required to attach "Accounting of Sales Tax" (ACCS Form 5-H) to their Bid. **FAILURE OF THE CONTRACTOR TO COMPLETE THIS ATTACHMENT TO BID PROPOSAL FORM INDICATING THE SALES TAX AS REQUIRED BY ACT 2013-205, SECTION 1(g) SHALL RENDER THE BID NON-RESPONSIVE.**

It shall be the responsibility of the successful Contractor and any Subcontractor working under the same contract to apply for a Certificate of Exemption from the Alabama Department of Revenue for this specific project and to comply with all ADOR rules and regulations. The Owner shall not consider claims for additional costs resultant of the Contractor's or its subcontractors' failure to comply with such rules and regulations.

However, the Owner may elect to issue Form ST:PAA1 Purchasing Agent Appointment which appoints the Contractor as Agent to purchase materials Tax-Exempt. In this case, invoices must be transmitted for direct payment by the Owner.

1.11 **PERMIT FEE**

Per City of Mobile Permitting requirements; the permit fee and all associated costs is to be included in the contractor's bid and paid by the Contractor.

The Pre-construction Conference cannot be held until both (1) the permit fee and (2) the signed construction contract have been received by ACCS.

1.12 **INSPECTIONS**

Scheduling - The contractor will contact the Architects project manager Jim Walker, AIA, by e-mail at jim.walker@gmcnetwork.com of the date the project will be ready for an inspection.

- The Contractor will contact the City of Mobile (COM) Inspector to schedule the first available date for the inspection. Inspections must be requested minimum 14 days in advance.

Minimum Requirements - The following minimum requirements listed below are provided to aid the contractors and architect in determining if a project is ready for a required inspection.

- Pre-Construction Conference
 - Required Attendees: Contractor, Owner, Architect, Major Subcontractors, Building Commission Inspector
 - Inspection Requirements:
 - Signed construction contract
 - Verification of payment of permit fee
 - Contractor's Statement of Responsibility and Quality Assurance Plan (for storm shelter)
- Life Safety Inspections and Final Inspections
 - Required Attendees: Contractor, Owner, Architect, Major Subcontractors, Building Commission Inspector
 - Inspection Requirements:
 - Emergency and exit lighting tests
 - State of Alabama Department of Labor
 - Must have clear egress/access and emergency (for first responders) access to building
 - Must have ADA access completed
- Year-End Inspections
 - Required Attendees: Contractor, Owner, Architect, Engineers, Building Commission Inspector and /or Major subcontractors may also be required to attend
 - Inspection Requirements:
 - Owner's list of documented warranty items

1.14 **MATERIALS**

ALL MATERIALS FOR THIS PROJECT SHALL BE ASBESTOS FREE

1.14 PROTECTION OF WORK AND PROPERTY

Contractor shall confine his operations to the project work limits of this contract and shall maintain required exit and fire safety requirements as well as Owner's security requirements. Protect adjoining spaces and cause no damage to same; any damage to be immediately repaired at the contractors expense.

A Protection of Work and the Public

Provide adequate protection, in full accordance with local, State and Federal regulations, for the work in progress as well as for the public and others using the site, until the completion of all work.

Provide suitable signs, signals and barricades against trespassing by individual and take whatever steps necessary or required by law to protect workers and public from harm. Protect the work and the public from damage of any kind during all operations. Methods described herein are minimum standards acceptable except where exceeded by Federal, State or local requirements.

B. Safety and Traffic Control Devices During Construction (if required)

1. Within the limits of area designated for work under this contract, and any staging or traffic areas, this Contractor shall furnish, install and maintain all safety and traffic control devices during the construction period as described herein, and as required by law.
2. All safety and traffic control devices shall be in compliance with Federal, State and local laws and regulations, and to the requirements and approval of applicable local officials, State Highway Department and the Architect.
3. Wherever the work affects the normal flow of vehicular or pedestrian traffic, traffic control devices shall be in accordance with requirements and standards as set forth in the "Manual on the Uniform Traffic Control Devices for Streets and Highways", latest edition, as published by U.S. Department of Transportation, Federal Highway Administration, and Section "G" of the Alabama Manual on Uniform Traffic Control Devices, Volumes I and II, latest edition.
4. Traffic Control Devices. Traffic control devices shall be installed at the inception of the construction operations and shall be properly maintained during the periods of construction. They shall remain in place only as long as they are needed and shall be removed immediately thereafter.
5. All traffic control devices must be approved by the City, County and by all affected enforcing agencies.
6. Protective Construction Site Barricade.
 - a. Requirements: Contractor shall furnish, install and maintain throughout the life of the Contract, all necessary barricades, covers, scaffold guards, warning signs, warning lights, channelization markers and other protective devices, all as required by Owner, local rules, regulations and ordinances, and as necessary to protect the work from trespassing.

- b. Barricades, enclosing devices and warning lights may be standard rental items of equipment in compliance with these requirements; and shall be of a type that affords security, is quite visible and is easily moved.
- c. Materials for use in construction of site barricades and other protective devices shall be of new exterior plywood and not less than #2 pine structural lumber, all of good appearance, sound, square, straight, in line, braced and well-constructed. All materials, except those to be walked on, shall be painted.
- d. Move barricades from one area to the next as the work progresses. Remove all upon completion.
- e. Lighting on Barricades: Furnish and install traffic warning lights or barricades, in areas of vehicular traffic. Install yellow traffic signal lamps complete with all wiring, switches, disconnects, fusing, sockets, guards and hanging provisions. These lights shall be turned on during all hours of darkness (dusk to dawn). Maintain in service during the construction period; move forward as site of work moves. Remove all upon completion of work.
- f. See also erosion control requirements of Earthwork Section 02300.
- g. **Unauthorized visitors not permitted within working and storage areas** - OSHA approved suitable personal safety devices are to be provided for authorized visitors within working areas. Suitable fire extinguishing equipment, readily accessible from any part of the work, to be provided and maintained. Erect any and all required additional protective barriers, lights, etc., as necessary for safety and protection. Keep area of work closed off when not in use.

C. Utilities

- 1. The Owner shall pay for electricity and water usage required for normal construction purposes.
- 2. Other utility bills caused by work of the contract are to be paid by Contractor as outlined in the SUMMARY OF THE WORK. Contractor to provide own telephone, temporary heat and pay costs for same. Contractor to pay for any sewer impact fee as related to this project. All project related sanitary conditions are the responsibility of the Contractor.
- 3. Contractor must investigate and verify the existence and location of all site utilities in the field before starting work. Flag on site all underground service lines in the construction area. Notify the Architect of any condition which, in the Contractor's opinion, may interfere with the completion of work as designated. Excavating in the vicinity of existing utilities shall be done carefully and by hand. Maintain and protect existing utilities.
- 4. The Contractor is responsible for all temporary utility connections to utilities.

D. Protection of Materials

Properly and effectively protect all materials and equipment, before, during and after their installation. Contractor will be allowed to store materials, equipment, etc., on the site. Security of the area(s) will be the sole responsibility of the Contractor. Protect materials such as Insulation and insulated duct from rain exposure.

E. Watchman

The Contractor, at his own expense and option, may employ a watchman at such time as he deems necessary to protect his work and/or materials.

1.15 DAMAGE TO PROPERTY

The contractor will be responsible for, and insure against, any damage to property, furnishings, and/or loss of revenue resulting from any damage to any part of the existing property caused by the work of this Contract. Any damage to existing conditions shall be replaced with new materials or equipment at the contractor expense.

1.16 SPECIAL SAFETY REQUIREMENTS

All exit ways shall be maintained free and clear of all stored materials, debris, etc.

No combustible construction materials shall be stored in the Project area after the day's work is complete. Remove any potentially hazardous materials immediately to prevent any fire hazards which may result from the construction of this Project. In addition, precautions shall be made by the General Contractor to prevent any other activities at the site which may constitute a fire hazard.

In addition to any portable fire extinguishers existing in the building, the General Contractor shall provide additional fire extinguishers during the construction as required.

Refer to the General Conditions for additional safety requirements.

1.17 USE OF PREMISES. SANITARY PROVISIONS

Refer to SECTION 01035, SPECIAL PROJECT PROCEDURES, for use of premises, sanitary provisions which are specifically related to this project. Note that sanitary conditions are the responsibility of the Contractor.

All personnel required on the job site must at all times be in possession of state issued photo identification subject to examination by Owner or their representative. Other security requirements may also be in place and is the responsibility of the General Contractor to abide by all school rules.

1.18 USE OF OCCUPIED PREMISES

During execution of this Contract, clear passages must be maintained as described along corridors. Owner will endeavor to keep personnel and visitors from work areas, but it will be the Contractor's responsibility to enforce all safety precautions.

1.19 CUTTING AND PATCHING

All excavation and cutting of new work to accomplish the work shall be by the respective trades. It is to be noted that Divisions 15 and 16 each are required to perform the necessary cutting of floors, walls, ceilings as necessary to install the work of their trade, all under the direct supervision of the General Contractor and in accordance with the construction schedule. The General Contractor is responsible

for the repair, replacement and finish of pavement, roofs, floors, walls and ceiling (all finish work); and same shall be accomplished by competent workmen and finish up in a neat manner, by craftsmen skilled in their work, all to be equal in quality and appearance of adjacent work. Finished installation shall comply with specified tolerances and finishes. The Contractor 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.

In acceptance or rejection of the work of the Sections involved in the application of finish materials, the Architect will make no allowance for lack of skill on the part of the workmen.

When necessary to cut or alter completed work to accommodate subsequent work, the Contractor performing the work previously in place shall do such cutting and repairing.

Cost of cutting and repairs necessitated by fault of negligence, or for other reasons, shall be borne by the Contractor at fault in requiring such work.

If a Contractor or Subcontractor fails to do necessary cutting or fails to have restored any work of others damaged by him, for a period of time causing delay in project construction, the Owner may do so and cost thereof shall be charged to the General Contractor.

Cutting of structural members will not be permitted.

1.20 FIRE INTEGRITY OF CONSTRUCTION

Shall be maintained whenever components of rated assemblies are penetrated, jointed, cracked or compromised in any way either intentionally or unintentionally; including, but not limited to: walls, floors, ceilings and caps. Rated walls shall extend and key to floor, cap assembly or roof deck above using consistent materials.

Openings for "poke-through" pipe, conduit, etc., penetrations shall be of minimum size in accordance with UL published requirements for maintaining integrity of rated construction and fire sealed properly. Mortar or concrete in contact with copper will not be accepted. Expansive spray foam fill which is combustible shall not be allowed.

Opening shall be sealed full thickness of penetration, (i.e., grout solid up to within one (1) inch of finish surface then seal with rated sealant material). Any and all pipe and conduit penetrations of a finished wall, floor or ceiling materials shall be finished out with an approved escutcheon plate. Any penetration of rated walls or ceilings by mechanical ductwork shall be protected by use of rated fire damper system at point of penetration. Provide for collars as required at point of penetration through rated construction. Contractor shall provide fire integrity sign on rated wall construction (above ceiling) lines in accordance with the building code, and as outlined in PAINTING - SECTION 09910.

If specified under FIRESTOP CAULKING AND SEALING - SECTION 07840, fire caulking and sealing shall be **single source** provided using same approved materials and certified technicians throughout the project. All applicable trades shall coordinate accordingly and make their work ready to properly receive fire sealant. If fire sealing is not specified under a separate section, then all applicable trades

shall fire seal their own work using the same mutually agreed upon fire sealing materials consistently throughout the project installed by manufacturer's certified technician(s) . Acceptable fire sealing materials include, but are not limited to: Dow-Coming, 3-M Brand, Tremco meeting ASTM 3-119, ASTM 3-814 and mineral wool fiber sating.

USE AND OCCUPANCY PRIOR TO ACCEPTANCE BY OWNER

- A. Contractor agrees to permit Owner to use and occupy portions of building or Project before formal acceptance by Owner, provided that Owner:
 - 1. Secures written consent of Contractor (except in event that in the opinion of Architect, Contractor is chargeable with unwarranted delay in final completion of contract requirements).
 - 2. Secures endorsement from insurance carrier and consent of the surety, permitting occupancy and use of portions of project during remaining period of construction.
- B. Use and occupancy prior to formal acceptance shall not relieve Contractor of his responsibility to maintain insurance coverage, as called for in specifications, for benefit of Owner, Owner's Agent, Contractor and all Subcontractors until Project is completed and accepted by Owner. However, use and occupancy of any area by the Owner prior to project completion shall mean partial acceptance of that area and any equipment within that area used by the Owner, thereby requiring a substantial completion agreement between the Owner and the Contractor for said area and equipment.

2.1 REQUIREMENTS

As set forth herein are applicable to the Work under every Section or Division of this Specification, of the General Contractor and all Subcontractors.

2.2 COMPLETION DATE

Work under this contract shall be sufficiently completed to permit Owner to occupy the building, or a designated portion thereof, on or before One Hundred Eighty Calendar Days after an official Notice To Proceed has been issued or the date of the Owner Contractor Agreement has been fully executed. Whichever is first. See Paragraph entitled Time for Completion under SPECIAL PROJECT REQUIREMENTS, SECTION 01030.

2.2 ACCEPTANCE OF PRECEDING WORK

Before starting any operation, Contractor and each Subcontractor shall examine existing work performed by others to which his work adjoins. Failure to remedy faults in or notify Architect of deficiencies or faults in preceding work will constitute acceptance thereof and waiver of any claim of its unsuitability.

2.3 LAYOUTS AND LEVELS

General Contractor shall establish principal lines, grades, levels and corners, and shall set and maintain adequate reference points therefore. Contractor shall lay out own work to dimension from principal lines and shall be responsible for layout of his subcontractor's work.

2.4 PRODUCT APPROVAL

- A In addition to items submitted for approval by Shop Drawings, Contractor to submit for approval within ten (10) days after receipt of Notice to Proceed a list of all products proposed for use in the work, listing manufacturer, make, model number, catalog listing subcontractors' and / or vendors' names, and other manufacturers' identification for each particular product for each particular use. Submit in letter form in 3 copies, and approval obtained before material is ordered. Submit list of products requiring color selection.
- Approved list of products manufacturer and / or vendor will be returned promptly in order to avoid any delay of ordering materials specified. General Contractor shall review with Architect and the Owner the actual status of availability of all materials and schedule of work in the building, (including Alternates).
- B. Submit complete Product Data and testing results, if requested.

2.5 WEATHER PROTECTION

Contractor shall provide, maintain, and pay all cost for all weather protection required to properly protect all parts of structure from damage during construction. Note that portions of the building heating and cooling system will remain in operation throughout the contract period.

2.6 MANUFACTURER'S DIRECTIONS

- A. Apply, install, connect and erect manufactured items or materials according to recommendations of manufacturer when such recommendations are not in conflict with Contract Documents.
- B. Furnish to Architect, on request, copies of manufacturer's recommendations. Secure approval of recommendations before proceeding with work.

2.7 COORDINATION BETWEEN TRADES: CONTRACTOR'S PRE-CONSTRUCTION COORDINATION MEETING

- A Plumbing, Heating, Ventilating, Air Conditioning and Electrical Drawings are diagrammatic.
- B. BEFORE COMMENCING WORK UNDER THIS CONTRACT, GENERAL CONTRACTOR IS TO ARRANGE FOR A MEETING OF ALL MAJOR SUBCONTRACTORS (AND SEPARATE CONTRACTS AS APPLICABLE) TO DETERMINE THAT ALL ITEMS WILL FIT

INTO SPACES PROVIDED, HEADROOMS MAINTAINED. CONCEALMENT REQUIRED. WALL THICKNESS SUFFICIENT FOR RECESS OF ITEMS, PRIORITIES ESTABLISHED IN INSTALLATION OF DUCTS.PIPING, ETC. EACH SUBCONTRACTOR MUST HAVE THEIR RESPECTIVE ON-SITE JOB FOREMAN PRESENT. Each Subcontractor to have drawings of all trades, and to be completely aware of and fully informed of, requirements and locations of work to be installed by other Subcontractors. In case of disagreements in locations, General Contractor is to settle same, giving preference to ductwork and larger items, except where grading of pipe may require preference. All decisions to be recorded on each Subcontractor's drawings and on jobsite set of drawings and fully inform all Subcontractors. No changes to be made which affect finish locations or alter requirements of contract without approval of the Architect. Do not cover or block previously installed alarm devices, valves, etc., without providing for access to same.

- C. If, in any location, it is impossible to install required items and maintain requirements as to ceiling heights, clearances dimensions, etc., or due to structural interference, General Contractor is to advise Architect for a decision.

2.8 CITY ORDINANCES (WHERE APPLICABLE)

- A. Comply with all City rules, regulations and ordinances in regard to parking, unloading, blocking of street, sidewalk or alley; and provide all lights, barriers, temporary walkways, protection, etc., as necessary for complete compliance.
- B. Comply with applicable Code and all local and Federal laws and ordinances in regard to safeguards during construction and fire protection, and all governing regulations pertaining to requirements during construction.

2.9 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Contractor shall instruct Owner's operating personnel in proper operation, lubrication and maintenance of all equipment items installed under this contract.
- B. At completion of job, Contractor shall provide three (3) copies of a brochure containing manufacturer's operating, lubricating and maintenance instructions and parts lists for each item of equipment furnished under this contract. Each copy shall be assembled and bound under a substantial hardboard cover with title and index. Provide a complete set of approved manufacturer's and contractor's shop and equipment "setting" drawings for major systems and equipment furnished under this contract.

One (1) copy of the Operating and Maintenance instructions shall be hand delivered to the Architect at the final inspection and the remaining copies shall be provided to the Owner prior to issuance of the Certificate of Substantial Completion.

2.10 SITE LIMITATION AND USE

- A. General Contractor and each Subcontractor shall note the extent of site available for access and storage. Contractor restricted to those limits.
- B. All personnel required on the job site must at all times be in possession of **state issued** photo identification subject to examination by Owner or their representative. Other security requirements may also be in place and is the responsibility of the General Contractor to abide by all school rules.
- C. Contractor and Subcontractors are further cautioned that the traffic on adjacent streets may place strict limitations on the rates and means of delivery of materials, equipment and supplies, the removal of rubbish, and, in some cases, the hours during which deliveries are made.

2.11 PROTECTION OF EXISTING PROPERTY ADJACENT

- A. Protect and cause no damage to adjacent area and site.
During progress of work, Contractor will be responsible for full and complete protection of property which the work is being done, insofar as related to work under this Contract.
Any damage to adjacent property, or contents caused by failure in performance with these requirements must be made good by Contractor at his own expense and to the satisfaction of Owner. Any damage to existing adjacent areas outside contract work limits shall be replaced with exact same materials as that damaged.
- B. Provide for means to prevent objectionable dust and debris blowing onto adjacent property or streets from work being accomplished under this contract.

2.12 DIMENSIONS

Contractor and each Subcontractor shall verify dimensions at site for built-in work, for work adjoining that of other trades and for dimensions shown to existing structures or installations. Notify Architect of any discrepancies.

2.13 SECURITY OF CONSTRUCTION AREA

Contractor shall secure on-site storage of materials and equipment. Storage of materials shall be within the Contractor's limit of construction at the site. This General Contractor shall adhere to Owner's requirements for security of work area and under all conditions shall be subject to these security regulations and requirements. Off-site storage of materials and equipment that are to be installed in the project shall be in a bonded storage area as outlined in the General Conditions.

2.14 DELIVERING AND STORAGE

- A. Deliver packaged materials to site in manufacturer's original, unopened and labeled containers. Do not open containers until approximate time for use.

- B. Store materials in a manner that will prevent damage to materials or structure, and that will prevent injury to persons. No materials will be stored outside of contract work area by this Contractor.
- C. Store cementitious materials in dry, weathertight, ventilated spaces. Store ferrous materials to prevent contact with ground and to avoid rusting and damage from weather.

2.15 FIRE PROTECTION

Contractor to take all necessary steps to ensure prevention of fire. Contractor to have portable extinguishers on hand at site throughout the period of construction. Flammable and combustible materials shall be kept in metal cans with tight covers and removed from building at end of each working day.

Fire protection systems within existing buildings must be maintained in full operation during construction.

2.16 HOIST, RAMPS, ELEVATOR ACCESS, ETC (IF ANY).

Furnish and Maintain as Necessary: Hoists, ramps, railings, platforms, etc., required in conformance with local applicable regulations. Hoists shall be operated by qualified and experienced mechanics. Space for hoist shall be coordinated with Architect and Owner's assigned project representative.

2.17 CHASES AND OPENINGS

Provide all proper chases, openings and recesses as indicated for work under this Contract. Build in all sleeves, anchors, etc., for proper engagement of work to be installed. All post piercing of slabs and masonry shall be core drilling.

2.18 PROJECT SIGNS:

- A. Project sign – One Project Sign shall be required. Install in location as directed by the Owner.
- B. Provide, securely install and maintain prefinished metal signs on each side of each gate leaf and at 50'-0" o.c. maximum on street/public side of all construction fencing provided (if any).

- 1. Copy: "NO TRESPASSING
DANGER

CONSTRUCTION AREA"

- 2. Size: Approximately 1'-6" wide x 1'-0" high.
- C. Provide other pedestrian and vehicular signs as necessary and required, in compliance with requirements of authorities having jurisdiction. Signs shall remain on site for duration of this Contract.
- D. General Contractor may have a sign on their Construction Office and as needed for delivery directions only.
- E. Subcontractors will not be allowed to post signs.

END OF SPECIAL PROJECT REQUIREMENTS

SECTION 01 0050

PROJECT SAFETY

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Enforcement of OSHA regulation.
- B. Reporting of accidents.
- C. Responsibility for safety.
- D. Hot work permits.

1.2 ENFORCEMENT OF OSHA REGULATIONS

- A. Contractor and all Subcontractors shall adhere to OSHA regulations as they apply to safety of working conditions, conditions of personnel, and environmental contaminations.
- B. Contractor shall maintain on the project site a copy of OSHA regulations. Sections pertaining to safety as applied to the construction industry should be 'highlighted'.

1.3 REPORTING OF ACCIDENTS

- A. Contractor shall report any accident or injury in writing to the Owner's Project Manager.
- B. Report to identify persons involved, (name, addresses, phone number, title, etc.) work being performed, extent of injury, witnesses, time and circumstances of accident.
- C. Injuries requiring hospitalization, medical evaluation report shall be submitted to Contractor, Owner, and Architect.
- D. Provide copies of claims for Workman's Compensation insurance to Contractor and Owner.

1.4 RESPONSIBILITY FOR SAFETY - SUBCONTRACTOR

- A. The Subcontractor or Tradesmen are solely responsible for the safety of working conditions and performance condition of personnel whom he has employed while present on the project site.

- B. No Subcontractor shall commence work after another trade or proceed with work if unsafe conditions exist upon his arrival.
- C. Drug testing of Subcontractors' personnel may be requested if persons who are suspect of being under the influence of drugs or alcohol. Cost of such testing to be at tested party's employer's expense.

1.5 RESPONSIBILITY FOR SAFETY - GENERAL CONTRACTOR

- A. The Contractor is responsible for the safety of his personnel and the working conditions of the tradesmen he employs.
- B. The Contractor is responsible for the total site working conditions and to monitor Subcontractors and other trades in their maintenance of safe working conditions.
- C. Drug testing of Contractor's personnel if requested to be at employer's expense.

1.6 HOT WORK PERMITS

PART 2 - PRODUCTS (Not Used.)

PART 3 - EXECUTION (Not Used.)

END OF PROJECT SAFETY

SECTION 01 0100

SUMMARY OF THE WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS AND GENERAL INFORMATION:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.2 PROJECT/WORK IDENTIFICATION:

- A. General: Project name is "**MARITIME TRAINING CENTER RENOVATION**"; **Mobile, Alabama**; as shown on the Contract Documents prepared by Goodwyn Mills Cawood, LLC, dated, **October 26, 2026**.
- B. Contract Documents: Indicate the work of the Contract and related requirements and conditions that have an impact on the project. Related requirements and conditions that are indicated on the Contract Documents include, but are not necessarily limited to the following:
1. Renovations of the existing Building 200 approximately 17,734 square feet.
 2. Preparation of existing concrete slabs for installation of new LVT and epoxy floor finish.
 3. Patch, sand, prep, and paint of existing walls and new walls.
 4. Installation of new interior windows and doors and some exterior doors.
 5. Paint existing exterior steel as noted on exterior elevations.
 6. New wall tiles on walls with plumbing as noted on interior elevations.
 7. Replace exterior overhead doors.
 8. New millwork and residential appliances.
 9. New restroom and accessories.
 10. New HVAC, plumbing, and electrical. Coordinate with drawings.
 11. All permits and fees associated with the project
- C. Summary by References: Work of the Contract can be summarized by references to the Contract, General Conditions, Supplementary Conditions (if any), the Project Manual, Technical Specification Sections, Drawings, Addenda, and modifications to the Contract Documents issued after the initial printing of this Project Manual and the Drawings, and including but not necessarily limited to printed material referenced by any of these. It is recognized that the Work of the Contract is also unavoidably affected or influenced by governing regulations, natural phenomenon including weather conditions, and other forces outside the contract documents.
- D. Abbreviated Written Summary: Briefly and without force and effect upon the contract documents, the Work of the Contract can be summarized as follows:

1. Refer to Paragraph 1.2-B above.

1.3 CONTRACTOR USE OF PREMISES:

- A. General: During the construction period the Contractor shall have use of the premises for construction operations, including use of the site as shown on the Drawings.

1. Limitations of use of the site:

- a. Confine operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to applicable rules and regulations affecting the work while engaged in project construction. See site plan for egress and ingress to site, or if not indicated, same shall be as designated by the Owner. This Contractor shall coordinate and work with other contractors and sub-contractor's ongoing construction in other parts of the building.
- b. Keep existing public roads, driveways and entrances serving the premises clear and available at all times. Do not use these areas for parking or storage of materials. Remove dirt, mud, debris, etc., from site, sidewalks, streets, and public right-of-way as it occurs.
- c. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas indicated. If additional storage is necessary, obtain and pay for such storage off site in a fully bonded and insured facility acceptable to the Owner, with all items stored clearly identified as being assigned to this project.
- d. Lock automotive type vehicles, such as passenger cars and trucks and other mechanized or motorized construction equipment, when parked and unattended, to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running, or the ignition key in place.
- e. The Owner, and their representatives, the Architect, and their consultants, as well as authorities having jurisdiction will require site accessibility for inspections, observations, and perhaps other purposes, related to the planned new construction. The Contractor shall assist in such accessibility, to at least the point of providing and maintaining reasonably accessible dry paths to work in progress.
- f. Provide secure temporary barricades, fencing, etc., as indicated or otherwise required, to restrict pedestrian and vehicular traffic from construction operations, including in part, the public, students, children, and users of the immediately adjacent facilities.
- g. Minimum construction fencing required (if any) shall be at locations indicated on the Drawings, or if not indicated, as required by the Contractor and with gates as required by the Contractor and/or authorities having jurisdiction, and all related safety and warning signs, etc. Removal of any

temporary fencing, refilling post holes, etc., shall also be the responsibility of the Contractor.

- h. Construction operations shall not affect in any manner, the on-going operations of the Owner, immediately adjacent facilities, adjacent property owners or businesses, or others. Refer to Division 1 Section "Special Conditions" for additional information and requirements.
 - i. Construction equipment shall not come in contact with or swing over any existing facilities to remain, public areas, occupied buildings, right-of-ways, etc., which are to remain.
 - j. The Contractor and their employees shall limit any discussion of the Work of this project to the Owner's representatives named in the front of this Project Manual, Consultants employed, inspecting authorities with jurisdiction, and the Architect. In no instance shall this project be discussed with others, except as may otherwise be indicated herein.
 - k. Parking on-site, if any, shall be limited to the "staging areas" indicated on the Drawings, or if not indicated, as mutually agreed between the Owner, Architect, and Contractor at the Pre-Construction Conference.
 - l. Smoking or other use of tobacco products shall not be permitted within the Owner's facilities or on roofs.
 - m. The use or presence of alcohol and/or other debilitating substances shall not be permitted on the project site.
 - n. Firearms and/or other weapons shall not be permitted on the project site.
- B. It is ACCS and the College's policy to maintain a working environment free from all forms of sexual harassment or intimidation. All contractor personnel are expected to comply with this policy. Any form of sexual harassment or discrimination of any individual will not be tolerated. This includes all actions that are explicitly or implicitly demeaning or intimidating to any individual and includes sexual harassment as well as discrimination or harassment due to race, color, national origin, religion, sexual preference, age or disability. Violation of this policy will result in contractor/subcontractor personnel removal from the property, and possible termination of the contract.
- C. Clothing – Proper clothing must be worn while working on school premises. Improper clothing includes tank tops, shorts, and sandals. Shirts must be worn at all times.
- D. Meals and Breaks – Meals and breaks should be confined to designated areas. Foods and beverages may not be brought in to any interior building areas. All food waste and related refuse must be disposed of in designated waste containers.

1.4 COMPLIANCES

- A. All Work shall comply with Federal, and State codes and regulations, and the requirements of the Owner.

END OF SUMMARY OF THE WORK

SECTION 010260

UNIT PRICES

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

1. A unit price is an amount proposed by Bidders, as a price per unit of measurement for materials and/or services that will be added to or deducted from the Contract Sum by Change Order in the event the estimated quantities of Work required by the Contract Documents are increased or decreased, in accordance with the General Conditions and/or other provisions of the Bid and Contract Documents.
2. Unit prices shall include all necessary material, labor, fees, layout, supervision (field and home office), general expenses, insurance, bonds, overhead, profit and applicable taxes, for unit item of work in place.
3. Refer to other Division 1 Sections and individual Specification Sections for construction activities requiring the establishment of unit prices. Methods of approval, verification, measurement and payment for unit prices are specified in those sections.

B. Related Work specified elsewhere herein includes:

1. Section 01015 – “Special Conditions”
2. Section 03310 - "Concrete"

C. Schedule

1. A "Unit Price Schedule" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials and methods described under each unit price.
2. The Owner reserves the right to reject the Contractor's measurement of work-in-place that involves use of established unit prices, and to have this work measured by an independent surveyor acceptable to the Contractor at the Owner's expense.

PART 2 – PRODUCTS

2.1 NOT APPLICABLE

PART 3 – EXECUTION

3.1 ITEMIZED UNIT PRICE SCHEDULE:

A. Item No. 1 - Electrical - Data and Phone Outlet in Wall

1. Description: Provide and install typical data/phone outlet in wall at location as directed, complete with junction box, 50-feet of conduit and typical wiring, cover plate, connections to device indicated or as directed, in accordance with Division 16 - "Electrical", Drawings, and all related work.
2. Unit of Measure: Each (EA)

B. Item No. 2 - Electrical - Junction Box Above Ceiling

1. Description: Provide and install typical electrical junction box at location as directed, complete with 50-feet of conduit and typical 120-volt wiring, cover plate, connections to power and device indicated or as directed, in accordance with Division 16 - "Electrical", Drawings, and all related work.
2. Unit of Measure: Each (EA)

C. Item No. 3 - Electrical - Duplex Power Outlet In Wall (120V)

1. Description: Provide and install typical duplex electrical outlet at location as directed, complete with junction box, 50-feet of conduit and typical 120-volt wiring, cover plate, connections to power and device indicated or as directed, in accordance with Division 16 - "Electrical", Drawings, and all related work.
2. Unit of Measure: Each (EA)

D. Item No. 4 - Electrical - Power Outlet in Wall (240V)

1. Description: Provide and install electrical outlet at location as directed, complete with junction box, 50-feet of conduit and typical 240 volt wiring, cover plate, connections to power and device indicated or as directed (plug face to match equipment pigtail/plug), in accordance with Division 16 - "Electrical", Drawings, and all related work.
2. Unit of Measure: Each (EA)

E. Item No. 5 - Electrical - Junction Box in Wall

1. Description: Provide and install typical electrical junction box at location as directed, complete with 50-feet of conduit and typical 120 volt wiring, cover plate, connections to power and device indicated or as directed, in accordance with Division 16 - "Electrical", Drawings, and all related work
2. Unit of Measure: Each (EA)

F. Item No. 6 - Electrical – Exit Light

1. Description: Provide and install exit light at location as directed, complete with junction box, 50-feet of conduit and typical 240-volt wiring, cover plate,

connections to power and device indicated or as directed in accordance with Division 16 - "Electrical", Drawings, and all related work.

2. Unit of Measure: Each (EA)

G. Item No. 7 – Fire Extinguisher and Cabinet

1. Description: Provide and install Fire Extinguisher and Cabinet at location as directed including all anchorage and mounting hardware as needed or as directed.
2. Unit of Measure: Each (EA)

H. Item No. 8 – Welded Hollow Metal Door Frames – Single Door

1. Furnish and install welded hollow metal door frames-single door – Rough Opening of 40"x86" (Single 3'-0" x 7'-0" door)
2. Unit of Cost – (1) Each (EA)

I. Item No. 9 – Welded Hollow Metal Door Frames – Double Door

1. Furnish and install welded hollow metal door frames – double door – rough opening of approximately 76"x86" (double 3'-0" x 7'-0" doors)
2. Unit of Cost – (1) Each (EA)

J. Item No. 10 – LVT Flooring

1. Furnish and install LVT Flooring to be complete and as specified and scheduled.
2. Unit of Cost – Per Square Foot (SF)

K. Item No. 11 - Epoxy Flooring

1. Furnish and install Epoxy Flooring to be complete and as specified and scheduled.
2. Unit of Cost – Per Square Foot (SF)

L. Item No. 12 – Existing brick veneer system repair/ re-finishing

1. Existing brick veneer system patching, repair, repointing, cleaning prep and refinishing per drawings and in accordance with Division 04 Sections.
2. Unit of Measure – Per 1000 Square Feet (SF)

M. Item No. 13 – Exterior Glazing in Existing Window Frames.

1. Furnish and install impact resistant glazing to match existing glazing color to repair existing broken glazing or replace louvers that are removed.
2. Unit of Cost – (1) Each (EA)

N. Item No. 14 – Cable Tray; Division 26 – Electrical.

1. Description: Include all costs associated to furnish one (1) 10'-0" length of the specified cable tray (ladder type, 12-inch wide, 9-inch rung spacing, 4-inch depth).
2. Unit of Cost – (1) Each (EA)

O. Item No. 15 – Industrial Cord Reel; Division 26 – Electrical.

1. Description: Include all costs associated to furnish one (1) industrial cord reel – Hubbell HBLI45123R220 with 45-feet of 12/3 SJO pendant cable.
2. Unit of Cost – (1) Each (EA)

P. Item No. 16 – Lighting Fixture Mark “C”; Division 26 – Electrical.

1. Description: Include all costs associated to furnish one (1) lighting fixture mark “FE” – Lithonia CLX-L48-10000LM-SEF-L/LENS-EZ1-35K-80CRI-LUGR-WGCLX48.
2. Unit of Cost – (1) Each (EA)

Q. Item No. 17 – Lighting Fixture Mark “CE”; Division 26 – Electrical.

1. Description: Include all costs associated to furnish one (1) lighting fixture mark “FE” – Lithonia CLX-L48-10000LM-SEF-L/LENS-EZ1-35K-80CRI-LUGR-WGCLX48-E10WLCP.
2. Unit of Cost – (1) Each (EA)

R. Item No. 18 – Lighting Fixture Mark “FE”; Division 26 – Electrical.

1. Description: Include all costs associated to furnish one (1) lighting fixture mark “FE” – Lithonia WST LED-P2-40K-VW-MVOLT-E7WH-DNAXD.
2. Unit of Cost – (1) Each (EA)

S. Item No. 19 – Lighting Fixture Mark “G”; Division 26 – Electrical.

1. Description: Include all costs associated to furnish one (1) lighting fixture mark “G” – Lithonia TWH LED-ALO-40K-T3M-MVOLT-DNATXD.
2. Unit of Cost – (1) Each (EA)

T. Item No. 20 – Lighting Fixture Mark “X1”; Division 26 – Electrical.

1. Description: Include all costs associated to furnish one (1) lighting fixture mark “X1” – Lithonia LE-S-1-G-ELN.
2. Unit of Cost – (1) Each (EA)

U. Item No. 21 – Lighting Fixture Mark “X2”; Division 26 – Electrical.

1. Description: Include all costs associated to furnish one (1) lighting fixture mark “X2” – Lithonia LE-S-2-G-ELN.
2. Unit of Cost – (1) Each (EA)

END OF UNIT PRICES

SECTION 01 0610

REGULATORY REQUIREMENTS & TAX EXEMPTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections apply to work of this Section.
- B. References, Websites for additional information and requirements:
 - 1. Alabama Building Commission, Memo on Sales Tax Certificate 10-28-2013: <http://www.bc.state.al.us/>, and ADOR references included therein.

1.2 DESCRIPTION OF REQUIREMENTS:

- A. This project is being bid EXCLUDING TAXES, and requires the Contractor comply with the requirements of Act 2013-205, which was signed into law on May 9, 2013. The Contractor and the Owner will be required to apply for Certificates of Exemption with the Alabama Department of Revenue (ADOR) which will handle administration of the Certificates. The Contractor shall account for the tax savings for Base Bid and Alternates on "Attachment C To Proposal Form", and as otherwise may be required by the Alabama Department of Revenue during the course of the project.
- B. Base Bid and all Alternate Bids *shall exclude* the cost of all required taxes, including in part, sales and use tax, and/or as otherwise required by the Alabama Department of Revenue.
- C. Forms required to be completed and submitted shall be those included in the Bid and Contract Documents, those required by the Alabama Department of Revenue; and any others is required by the financing authority and/or Owner.
 - 1. The previously used "Agency Agreement" and/or similar provisions in the Construction Contract are not required.
- D. The purchase of tools, equipment and similar items, which do not become the Owner's property, are specifically excluded from the Owner's tax exemptions, and any additional exclusions as required by the Alabama Department of Revenue's Rules and Regulations for implementation of this new law.

1.3 GENERAL PROCEDURES:

- A. The provisions of this Section shall take precedence over applicable portions of the Contract and Bid Documents, including in part, "Instructions to Bidders," "General

Conditions of the Contract,” and “Supplementary Conditions”; Unaltered provisions of those documents shall remain in effect.

- B. The Contractor, subcontractors, and all material dealers are hereby made aware of the Intent of the Owner to reduce the cost of the project by the purchase of property, materials, etc., in the manner described herein, and neither they nor the Contractor shall withhold their consent to this arrangement.
- C. Administrative Costs: Any and all administrative costs incurred by the Contractor’s administering the tax savings shall be considered to be included in the Base Bid Proposal and each Alternate for the Work. No additional amount shall be added to the Contract because of the service provided by Contractor in the purchase of property, materials, etc., in the name of the Contractor, Owner, or as otherwise described herein.
- D. Administration: The administration of the sale and use tax savings shall be in accordance with the terms indicated. The procedure will be administered as indicated herein and as otherwise required or directed by the Alabama Department of Revenue.
- E. Limitations and Liability:
 - 1. Responsibility: The Contractor, notwithstanding this special purchase arrangement, shall select, describe, order, obtain approvals, submit samples, coordinate, process, prepare shop drawings, pursue, receive, inspect, store, protect, insure, guarantee, warrantee, provide, and otherwise be responsible for all materials and systems, the same as if this tax savings procedure were not implemented.
 - 2. Any necessary or required Purchase Orders shall be used only for materials for the Work of this project.
 - 3. The Contractor shall be liable for any taxes due to failure to implement this procedure and due to any unauthorized use of Purchase Orders.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

END OF REGULATORY REQUIREMENTS & TAX EXEMPTIONS

ATTACHMENT:

“Purchasing Agent Appointment”, ADR Form ST:PAA1 (*Owner’s Option*)

SECTION 01 0950

REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 DEFINITIONS:

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. Indicated: The term "indicated" refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.
- C. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean "directed by the Architect," "requested by the Architect," and similar phrases.
- D. Approve: The term "approved," where used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.
- E. Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. Furnish: The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."
- G. Install: The term "install" is used to describe operations at project site including the actual "unloading, temporary storage, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."
- H. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."
- I. Installer:
 - 1. An "Installer" is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular

construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

2. The term “experienced,” when used with the term “Installer,” means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.
3. Trades: Use of titles such as “carpentry” is not intended to 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 tradespersons of the corresponding generic name.

J. Project Site is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings, and may or may not be identical with the description of the land on which the Project is to be built.

1. If areas available are not indicated, they will be as mutually agreed by Owner and Contractor at Preconstruction Conference and as modified during construction.

K. Testing Laboratories: A “testing laboratory” is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION:

A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute’s 16-Division format and MASTERFORMAT numbering system.

B. Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Abbreviated Language:
 - a. Language used in Specifications and other Contract Documents is the abbreviated type. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated shall be interpolated as the sense required. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the context of the Contract Documents so indicates.
2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to

describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

1.4 INDUSTRY STANDARDS:

- A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with the standard in effect as of the date of the Contract Documents.
- C. Conflicting Requirements:
 - 1. Where compliance with two or more standards is specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels. Refer requirements that are different, but apparently equal, and uncertainties to the Architect for a decision before proceeding.
 - 2. 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. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.
- D. Copies of Standards:
 - 1. Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 2. Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.

1.5 DRAWING SYMBOLS:

- A. General: Except as otherwise indicated, graphic symbols used on drawings are those symbols recognized in the construction industry for purposes indicated. Where not otherwise noted, symbols are defined by "Architectural Graphic Standards", published by John Wiley & Sons, Inc., tenth edition.
- B. Mechanical/Electrical Drawings: Graphic symbols used on mechanical and electrical drawings are generally aligned with symbols recommended by ASHRAE. Where appropriate, these symbols are supplemented by more specific symbols as recommended by other recognized technical associations including ASME, ASPE, IEEE and similar organizations. Refer instances of uncertainty to the Architect/Engineer for clarification before proceeding.

1.6 SUBMITTALS:

- A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 2 - PRODUCTS: Not Applicable.

PART 3 - EXECUTION Not Applicable.

END OF REFERENCE STANDARDS AND DEFINITIONS

SECTION 012100

ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General Conditions and Division-1 Specification sections, apply to work of this section.
 - 1. Coordinate allowance work with related work to ensure that it is completely integrated and interfaced with related work.
 - 2. **Include in Base Bid.**

1.2 DESCRIPTION OF REQUIREMENTS:

- A. Definitions and Explanations: Certain requirements of the work related to each allowance are shown and specified in contract documents. The allowance has been established in lieu of additional requirements for that work, and further requirements thereof (if any) will be issued by change order.
- B. Types of allowances scheduled herein for the work included the following:
 - 1. Quantity allowances.
 - 2. Lump sum allowances.
- C. Selection and Purchase:
 - 1. At earliest feasible date after award of Contract, advise Architect/Engineer of scheduled date when final selection and purchase of each product or system described by each allowance must be accomplished in order to avoid delays in performance of the work.
 - 2. As requested by the Architect/Engineer, obtain and submit proposals for the work of each allowance for use in making final selections; include recommendations for selection which are relevant to the proper performance of the work.
 - 3. Purchase products and systems as specified, and as selected (in writing) by the Architect/Engineer.
 - 4. Submit proposals and recommendations, for purchase of products or systems of allowances, in form specified for change orders.
- D. Change Order Data: Include in each change order proposal both the quantities of products being purchased and unit costs, along with total amount of purchases to be made. Where requested, furnish survey-of-requirements data to substantiate quantities. Indicate applicable taxes, delivery charges, amounts of applicable trade discounts, and other relevant details as requested by the Architect.
 - 1. Each change order amount for allowances shall be based on the unit price difference between the actual purchase amount and the allowance, multiplied by the final

measure or count of work-in-place, with reasonable allowances, where applicable, for cutting losses, tolerances, mixing wastes, normal product imperfections and similar margins.

2. When requested, prepare explanations and documentation to substantiate the quantities, costs, and margins as claimed.

E. Change Order Mark-Up:

1. Except as otherwise indicated, comply with provisions of General Conditions. For each allowance, Contractor's claims for increased costs (for either purchase amount or Contractor's handling, labor, installation, overhead, and profit), because of a change in scope or nature of the allowance work as described in contract documents, must be submitted within 60 days of initial change order authorizing work to proceed on that allowance; otherwise, such claims will be rejected.
2. Where it is not economically feasible to return unused material to the manufacturer/supplier for credit, prepare unused material for the Owner's storage, and deliver to the Owner's storage space as directed. Otherwise, disposal of excess material is the Contractor's responsibility.

F. Time and Allowance Amounts:

1. Nothing in the Bid or Contract Documents shall be so constructed or interpreted as to provide a Contract time extension, due to use or non-use of any Allowance amount.
2. Nothing in the Bid or Contract Documents shall be so constructed or interpreted as to allow unused Allowances or any portion thereof, nor any overhead and profit therefor to be retained by or paid to the Contractor.
 - a. Amount of unused allowances to be returned shall include unused amount plus 10% overhead and profit.

PART 2 - PRODUCT

Not Applicable.

PART 3 - EXECUTION

3.1 SCHEDULE OF ALLOWANCES - INCLUDE IN BASE BID:

A. Allowance No. 1 – Owner Contingency Allowance:

1. Allow a lump sum of \$150,000.00 for Owner Contingency Allowance.
2. Include overhead and profit in Base Bid, and not as part of Allowance.

B. Allowance No. 2 – Emergency Responder Communications Enhancement System :

1. Allow a lump sum price of SIXTY THOUSAND DOLLARS (\$60,000) for work associated with the purchase and installation of an Emergency Responder Communications Enhancement System if found to be required after testing of the facility.
2. See Section 28 7800 - Emergency Responder Communications Enhancement System for requirements. Costs associated with testing to identify if the system is required shall be included in the Base Bid, and NOT as part of Allowance.
3. Include overhead and profit in Base Bid, and not as part of Allowance.

C. Allowance No. 3 – Low Voltage Allowance:

1. Allow a lump sum price of FIFTY THOUSAND DOLLARS (\$50,000) for work associated with the purchase and installation of Low Voltage System.
2. See Specifications and electrical drawings for more information.
3. Include overhead and profit in Base Bid, and not as part of Allowance.

D. Allowance No. 4 – Exterior Decals:

1. Allow a lump sum price of TWENTY THOUSAND DOLLARS (\$20,000) for work associated with the purchase and installation of exterior decals to be installed on the existing storefront glazing.
2. Include overhead and profit in Base Bid, and not as part of Allowance.

E. Allowance No. 5 – Lightning Protection Repairs and Recertification:

3. Allow a lump sum price of FOURTY THOUSAND DOLLARS (\$40,000) for work associated with the investigation, repair and recertification of the existing lightning protection system.
4. Include overhead and profit in Base Bid, and not as part of Allowance.

END OF ALLOWANCES

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SECTION 01 3000

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 DESCRIPTION OF SCOPE AND INTENT

- A. The intent of this section is to define requirements and procedures for submittal and reviews of products and fabricated items. Owner will not be held responsible for initial issuance and final approvals. Owner will review submittal for quality only. Contractor is responsible for quantities and dimensions. Conflict between items will be the responsibility of the contractor.

1.2 SECTION INCLUDES

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Proposed products list.
- D. Shop drawings.
- E. Product data.
- F. Samples.
- G. Manufacturers' instructions.
- H. Manufacturers' certificates.
- I. Submittal Review Schedule.

1.3 RELATED SECTIONS

- A. Contractor is responsible for coordination of work included in this specification with all other specification sections related to furnishing of all materials, labor, permit, fees and services necessary for completion of work in this section.

1.4 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Architect/Engineer accepted form. Fax submittals not accepted.

- B. Sequentially number the transmittal forms. Re-submittals to have original number with an alphabetic suffix.
- C. Identify Project, Contractor, Subcontractor or supplier; pertinent Drawing sheet and detail number(s), and specification Section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite the Project, and deliver to Architect/Engineer at business address. Coordinate submission of related items.
- F. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- G. Provide space for Contractor and Owner review stamps.
- H. Revise and resubmit submittals as required, identify all changes made since previous submittal.
- I. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.
- J. When multiple submittals are made to the Owner, the contractor is to prioritize items for review based on critical nature of delivery. Refer to approval duration schedule at end of this section.
- K. All submittals will be reviewed for quality and design compliance of documents. Any and all dimensions will be verified by contractor for field control.
- L. Item quantities required by documents to be verified by contractor.

1.5 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial progress schedule in duplicate within 15 days after date established in Notice to Proceed for Owner review.
- B. Revise and resubmit as required.
- C. Submit revised schedules with each Application for Payment, identifying changes since previous version.
- D. Submit a horizontal bar chart with separate line for each section of Work, identifying first work day of each week.

- E. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
- F. Indicate estimated percentage of completion for each item of Work at each submission.
- G. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and under Allowances.

1.6 PROPOSED PRODUCTS LIST

- A. Within 15 days after date of Notice to Proceed, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.7 SHOP DRAWINGS

- A. Submit the number of opaque reproductions which Contractor requires, plus two copies which will be retained by Owner.
- B. After review, distribute in accordance with Article on Procedures above and for Record Documents described in Section 01700 - Contract Closeout.

1.8 PRODUCT DATA

- A. Submit the number of copies which the Contractor requires, plus two copies which will be retained by the Owner.
- B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.
- C. After review, distribute in accordance with Article on Procedures above and provide copies for Record Documents described in Section 01770 - Closeout Procedures.

1.9 SAMPLES

- A. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- B. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Owner's selection.
- C. Include identification on each sample, with full Project information.

- D. Submit the number or samples specified in individual specification Sections; one of which will be retained by Owner.
- E. Reviewed samples which may be used in the Work are indicated in individual specification Sections.

1.10 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.
- B. Identify conflicts between manufacturers' instructions and Contract Documents.

1.11 MANUFACTURER'S CERTIFICATES

- A. When specified in individual specification Sections, submit manufacturers' certificate to Owner for review, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Owner.

1.12 SUBMITTAL REVIEW DURATION SCHEDULE

- A. Review duration time:
 - 1. All submittals will be reviewed within 7 working days upon arrival to Owner and returned by the 7th day unless otherwise scheduled hereinafter.
 - 2. Issuance of multiple submittals to Owner will extend duration as determined by Owner and without any right of damage claims by contractor. Contractor to prioritize submittal items.
 - 3. Review duration schedule for items exceeding 7 working days.
 - a. Structural 10 days
 - b. Millwork 10 days
 - c. Mechanical 14 days
 - d. Electrical 14 days
 - 4. Owner and contractor to work toward expediting submittal approvals by establishing submittal logs and tracking.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not used)

END OF SUBMITTAL PROCEDURES

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SECTION 014001

QUALITY ASSURANCE, CONTROL & DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY

- A. This section includes administrative and procedural requirements for quality assurance and quality control.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Control System: The Contractor shall establish and maintain a system for documenting, monitoring, inspecting, verifying, and testing of the work and that of his subcontractors to ensure that all applicable requirements of the contract documents are met. The Contractor shall be diligent to ensure that the quality of workmanship is satisfactory, that the installation meets all manufacturer requirements, that dimensional requirements are met, that defective materials are not used, and that all required protection and control and laboratory testing procedures are affected. Where specific testing procedures are not stipulated, the Contractor shall establish and conduct a test procedure to ensure adherence to specified quality.
- B. Chain of Control: The Contractor shall plan, coordinate, execute, and examine the work to ensure the complete, workmanlike, and warrantable installation of all materials in a system or element of the construction.
 - 1. The Contractor shall plan, coordinate, execute, and examine the work to ensure that all underlying, substrate, or contiguous work is installed as required to meet the tolerances and requirements for the correct installation of subsequent work.
 - a. It is the responsibility of the Contractor to advise the Architect no later than the submittal phase of any discrepancies in the requirements or tolerances of materials or components in a system or element of the construction.

PART 3 - EXECUTION

3.1 GENERAL PROCEDURES:

- A. Documentation: The documentation shall be by specification section or by system or element of the construction. The documentation shall be formatted in a comprehensive and collated manner to ensure ease of use and reference. A Table of Contents shall be provided. The Contractor's system shall include, but is not limited to the following:
 - 1. Pre-Installation Conference Meeting Minutes
 - a. Review of b through m below
 - b. Inspection and Testing requirements
 - c. Correct environmental conditions for execution of the work and protection of the completed installation.
 - d. Schedule including required inspections
 - e. Requirements and tolerances of underlying, substrate, or contiguous work
 - f. Review of requirements to ensure an enforceable warranty
* Manufacturers should be present whenever possible *
 - g. Specifications
 - h. Submittals, Product Data, and Shop Drawings
 - i. Test Results
 - j. Manufacturer's Recommendations, Requirements, and Instructions
 - k. Packaging labels from Materials where possible
 - l. Periodic, Dated Photos of the work being performed and any other documentation that pertains to the warranty of the material or structure
 - m. Samples of the material when reasonable
- B. Pre-Work Quality Control Meeting: The Contractor shall setup a meeting with the Awarding Authority, and Architect to review the contractor's proposed QA/QC system and requirements for compliance.
- C. Submittal of QAQC Program:
 - 1. The Contractor shall submit for approval to the Architect their program format 10 (ten) days from Notice to Proceed.
 - 2. Once work has begun, the QAQC manual must be kept up-to-date and approved by the Architect or Project Manager prior to the current Pay Application being approved.
- D. Inspections: 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 follow-up inspections as required, to ensure that an acceptable quality of work is established and maintained.

1. The Contractor shall perform a pre-final inspection, prepare a punch list, and work off all items prior to Architect/Engineer and/or Owner inspection.
 2. Contractor shall provide copy of completed report, certifying it's completion to the Architect prior to the Architect/Engineer and/or Owner beginning their inspections.
 3. The Contractor shall coordinate and plan inspections by the Architect/Engineer and/or Owner in a timely manner to ensure that all parties can be scheduled so as not to impede the flow of the work.
- E. Closeout: The documents generated through this process are to be turned in as part of the closeout documents.
1. Provide a list of following for all equipment including but not limited to the following:
 - a. Model Number
 - b. Serial Number
 - c. Description
 - d. Contract Document Reference
 2. Filter and Belt list for each air handler

END OF QUALITY ASSURANCE, CONTROL & DOCUMENTATION

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STATEMENT OF SPECIAL INSPECTIONS

Project: Bishop State Community College – Maritime Industrial Base Renovation

Project Address: Southwest Campus – 925 Dauphin Island Pkwy, Mobile, AL 36605

Permit Applicant:

Applicant Address:

Owner: Alabama Community College System – Bishop State Community College

Owner Address: 351 N. Broad Street, Mobile, AL 36603

Registered Design Professionals (RDP):

Architect: Goodwyn Mills Cawood, LLC (GMC)

Geotechnical Engineer:

Mechanical Engineer:

Electrical Engineer:

This statement of special inspections is submitted as a condition for permit issuance in accordance with Chapter 17 of the International Building Code. It includes a *Schedule of Special Inspections* applicable to the above referenced project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections.

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the building official and to the registered design professional in responsible charge at a frequency agreed upon by the design professionals and the building official prior to the start of work. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the building official and the registered design professional in responsible charge prior to completion of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted to the building official and the registered design professional in responsible charge at the completion of that phase of work.

Maximum frequency of interim report submittals shall not be less than_____.

The Special Inspection program does not relieve the contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Owner's Acknowledgement:

Signature

Date

Building Official's Acceptance:

Signature

Date

Permit No.

Frequency of interim report submittals to building official:

☐ Monthly

☐ Bi-Monthly

☐ Upon Completion

☐ Per Attached Schedule

RDP in Responsible Charge



FINAL REPORT OF SPECIAL INSPECTIONS

Project: Bishop State Community College - Maritime Industrial Base Renovation

Project Address: Southwest Campus – 925 Dauphin Island Pkwy, Mobile, AL 36605

Testing / Inspection Agent:

Testing / Inspection Agent Address:

Scope of Testing / Inspections:

(To be completed by Testing / Inspection Agent)

To the best of my information, knowledge, and belief, the special inspections or testing required for this project, and designated for this Agent in the *Schedule of Special Inspections* submitted for permit, have been completed in accordance with the contract documents.

Interim reports submitted prior to this final report and numbered [] to [], form a basis for, and are to be considered an integral part of this final report. The following discrepancies that were outstanding since the last interim report dated [] have been corrected:

(Attach 8 1/2" x 11" continuation sheet(s) if required to complete the description of corrections)

Prepared By:

Type or print name

Signature

Date

Special Inspector's Seal

(Licensed Professional Engineer)



SECTION 01 4200

REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

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

1.3 INDUSTRY STANDARDS

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

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
 - 1. AA – Aluminum Association (The); www.aluminum.org.
 - 2. AABC – Associated Air Balance Council; www.aabc.com.
 - 3. AAMA – American Architectural Manufacturers Association; www.aamanet.org.
 - 4. AAN – American Nursery and Landscape Association; www.anla.org.
 - 5. AASHTO – American Association of State Highway and Transportation Officials; www.transportation.org.
 - 6. AATCC – American Association of Textile Chemists and Colorists; www.aatcc.org.
 - 7. ABAA – Air Barrier Association of America; www.airbarrier.org.
 - 8. ABMA – American Bearing Manufacturers Association; www.americanbearings.org.
 - 9. ACI – American Concrete Institute; (Formerly: ACI International); www.concrete.org.
 - 10. ACIL – American Council of Independent Laboratories; www.acil.org.
 - 11. ACPA – American Concrete Pipe Association; www.concrete-pipe.org.
 - 12. ADC – Air Diffusion Council; www.flexibleduct.org.
 - 13. AEIC – Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
 - 14. AF&PA – American Forest & Paper Association; www.afandpa.org.
 - 15. AGA – American Gas Association; www.aga.org.
 - 16. AHAM – Association of Home Appliance Manufacturers; www.aham.org.
 - 17. AHRI – Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
 - 18. AI – Asphalt Institute; www.asphaltinstitute.org.

19. AIA - American Institute of Architects (The); www.aia.org.
20. AISC - American Institute of Steel Construction; www.aisc.org.
21. AISI - American Iron and Steel Institute; www.steel.org.
22. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
23. ALSC - American Lumber Standard Committee; www.alsc.org.
24. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
25. ANSI - American National Standards Institute; www.ansi.org.
26. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
27. APA - APA - The Engineered Wood Association; www.apawood.org.
28. APA - Architectural Precast Association; www.archprecast.org.
29. API - American Petroleum Institute; www.api.org.
30. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
31. ARI - American Refrigeration Institute; (See AHRI).
32. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
33. ASC - Adhesive and Sealant Council; www.ascouncil.org.
34. ASCE - American Society of Civil Engineers; www.asce.org.
35. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
36. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
37. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
38. ASPE - American Society for Plumbing Engineers; www.aspe.org.
39. ASSE - American Society of Safety Engineers (The); www.asse.org.
40. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
41. ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
42. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
43. AWCI - Association of the Wall and Ceiling Industry; www.awci.org.
44. AWEA - American Wind Energy Association; www.awea.org.
45. AWI - Architectural Woodwork Institute; www.awinet.org.
46. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
47. AWPAA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
48. AWS - American Welding Society; www.aws.org.
49. AWWA - American Water Works Association; www.awwa.org.
50. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
51. BIA - Brick Industry Association (The); www.gobrick.com.
52. BICSI - BICSI, Inc.; www.bicsi.org.
53. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
54. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
55. BOCA - BOCA; (Building Officials and Code Administrators International Inc.); (See ICC).
56. CCC - Carpet Cushion Council; www.carpetcushion.org.

57. CDA - Copper Development Association; www.copper.org.
58. CE – Corps of Engineers (US Department of the Army); www.usace.army.mil.
59. CEA - Canadian Electricity Association; www.electricity.ca.
60. CEA - Consumer Electronics Association; www.ce.org.
61. CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
62. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
63. CGA - Compressed Gas Association; www.cganet.com.
64. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
65. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
66. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
67. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
68. CPA - Composite Panel Association; www.pbmdf.com.
69. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
70. CRRC - Cool Roof Rating Council; www.coolroofs.org.
71. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
72. CSA - Canadian Standards Association; www.csa.ca.
73. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
74. CSI - Construction Specifications Institute (The); www.csinet.org.
75. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
76. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
77. CWC - Composite Wood Council; (See CPA).
78. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
79. DHI - Door and Hardware Institute; www.dhi.org.
80. ECA - Electronic Components Association; www.ec-central.org.
81. ECAMA - Electronic Components Assemblies & Materials Association; (See ECA).
82. EIA - Electronic Industries Alliance; (See TIA).
83. EIMA - EIFS Industry Members Association; www.eima.com.
84. EJCDC – Engineers Joint Contract Documents Committee’ www.ejcdc.org.
85. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
86. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
87. ESTA - Entertainment Services and Technology Association; (See PLASA).
88. ETL SEMCO – Intertek ETL SEMCO (Formerly: ITS-Intertek Testing Service NA); www.intertek-etlsemko.com.
89. EVO - Efficiency Valuation Organization; www.evo-world.org.
90. FAA – Federal Aviation Administration; www.faa.gov.
91. FCC – Federal Communications Commission; www.fcc.gov.
92. FCIA – Firestopping Contractors International Organization; www.fcia.org.
93. FHA – Federal Housing Administration; www.hud.gov/fha.
94. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
95. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
96. FM - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
97. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridarroof.com.

98. FSA - Fluid Sealing Association; www.fluidsealing.com.
99. FSC - Forest Stewardship Council U.S.; www.fscus.org.
100. FTI - Facing Tile Institute; www
101. GA - Gypsum Association; www.gypsum.org.
102. GANA - Glass Association of North America; www.glasswebsite.com.
103. GS - Green Seal; www.greenseal.org.
104. GSI - Geosynthetic Institute; www.geosynthetic-institute.org.
105. HI - Hydraulic Institute; www.pumps.org.
106. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
107. HMA - Hardwood Manufacturers Association; wwwlhardwood.org.
108. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
109. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
110. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
111. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
112. IAS - International Approval Services; (See CSA).
113. ICBO - International Conference of Building Officials; (See ICC).
114. ICC - International Code Council; www.iccsafe.org.
115. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
116. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
117. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
118. ICPA - International Cast Polymer Association; www.icpa-hq.org.
119. IEC - International Electrotechnical Commission; www.iec.ch.
120. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
121. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
122. IESNA - Illuminating Engineering Society of North America; (See IES).
123. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
124. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
125. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
126. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
127. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
128. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
129. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
130. ISO - International Organization for Standardization; www.iso.org.
131. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
132. ITS - (Now: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
133. ITU - International Telecommunication Union; www.itu.int/home.
134. JOINT COMMISSION - (formerly JCAHO, Joint Commission on Accreditation of Healthcare Organizations); www.jointcommission.org.
135. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
136. LGSEA - Light Gauge Steel Engineers Association; www.lgsea.com.

137. LMA - Laminating Materials Association; (See CPA).
138. LPI - Lightning Protection Institute; www.lightning.org.
139. MBMA - Metal Building Manufacturers Association; www.mbma.com.
140. MCA - Metal Construction Association; www.metalconstruction.org.
141. MCAA - Mechanical Contractors Association of America; www.mcaa.org.
142. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
143. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
144. MHIA - Material Handling Industry of America; www.mhia.org.
145. MIA - Marble Institute of America; www.marble-institute.com.
146. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
147. MPI - Master Painters Institute; www.paintinfo.com.
148. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
149. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
150. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
151. NADCA - National Air Duct Cleaners Association; www.nadca.com.
152. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
153. NAPA - National Asphalt Pavement Association; www.hotmix.org.
154. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
155. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
156. NCMA - National Concrete Masonry Association; www.ncma.org.
157. NCTA - National Cable & Telecommunications Association; www.ncta.com.
158. NEBB - National Environmental Balancing Bureau; www.nebb.org.
159. NEC - National Electrical Code; www.nfpa.org.
160. NECA - National Electrical Contractors Association; www.necanet.org.
161. NEII - National Elevator Industry, Inc.; www.neii.org.
162. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
163. NEMA - National Electrical Manufacturers Association; www.nema.org.
164. NETA - InterNational Electrical Testing Association; www.netaworld.org.
165. NFHS - National Federation of State High School Associations; www.nfhs.org.
166. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
167. NFRC - National Fenestration Rating Council; www.nfrc.org.
168. NGA - National Glass Association; www.glass.org.
169. NHLA - National Hardwood Lumber Association; www.nhla.com.
170. NLGA - National Lumber Grades Authority; www.nlga.org.
171. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
172. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
173. NRCA - National Roofing Contractors Association; www.nrca.net.
174. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
175. NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.
176. NSPE - National Society of Professional Engineers; www.nspe.org.
177. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.

178. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
179. NWFA - National Wood Flooring Association; www.nwfa.org.
180. NWWDA - National Wood Window and Door Association; www.nwwda.org.
181. PCA - Portland Cement Association; www.portcement.org.
182. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
183. PDI - Plumbing & Drainage Institute; www.pdionline.org.
184. PEI - Porcelain Enamel Institute; www.porcelainenamel.com.
185. PGI - PVC Geomembrane Institute; www.pvcgeomembrane.com.
186. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
187. PTI - Post-Tensioning Institute; www.post-tensioning.org.
188. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
189. RFCI - Resilient Floor Covering Institute; www.rfci.com.
190. RIS - Redwood Inspection Service; www.redwoodinspection.com.
191. SAE - SAE International; (Society of Automotive Engineers); www.sae.org.
192. SCAQMD - South Coast Air Quality Management District; www.aqmd.com.
193. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
194. SDI - Steel Deck Institute; www.sdi.org.
195. SDI - Steel Door Institute; www.steeldoor.org.
196. SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
197. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
198. SIA - Security Industry Association; www.siaonline.org.
199. SJI - Steel Joist Institute; www.steeljoist.org.
200. SMA - Screen Manufacturers Association; www.smainfo.org.
201. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
202. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
203. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
204. SPIB - Southern Pine Inspection Bureau; www.spib.org.
205. SPRI - Single Ply Roofing Industry; www.spri.org.
206. SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
207. SSINA - Specialty Steel Industry of North America; www.ssina.com.
208. SSPC - Steel Structures Painting Council; www.sspc.org.
209. STI - Steel Tank Institute; www.steeltank.com.
210. SWI - Steel Window Institute; www.steelwindows.com.
211. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
212. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
213. TCNA - Tile Council of North America, Inc.; (Formerly: TCA); www.tileusa.com.
214. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
215. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
216. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
217. TMS - The Masonry Society; www.masonrysociety.org.

218. TPI - Truss Plate Institute; www.tpinst.org.
 219. TPI - Turfgrass Producers International; www.turfgrasssod.org.
 220. TRI - Tile Roofing Institute; www.tilerroofing.org.
 221. UBC - Uniform Building Code; (See ICC).
 222. UL - Underwriters Laboratories Inc.; www.ul.com.
 223. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
 224. USAV - USA Volleyball; www.usavolleyball.org.
 225. USGBC - U.S. Green Building Council; www.usgbc.org.
 226. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
 227. WASTEC - Waste Equipment Technology Association; www.wastec.org.
 228. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
 229. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
 230. WDMA - Window & Door Manufacturers Association; www.wdma.com.
 231. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.
 232. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
 233. WRI - Wire Reinforcement Institute; www.wirereinforcementinstitute.org.
 234. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
 235. WWPA - Western Wood Products Association; www.wwpa.org.
- C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
1. DIN - Deutsches Institute fur Normung e.V.; www.din.de.
 2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
 3. ICC - International Code Council; www.iccsafe.org.
 4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.
- D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up-to-date as of the date of the Contract Documents.
1. COE - Army Corps of Engineers; www.usace.army.mil.
 2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
 3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
 4. DOD - Department of Defense; <http://dodssp.daps.dla.mil>.
 5. DOE - Department of Energy; www.energy.gov.
 6. EPA - Environmental Protection Agency; www.epa.gov.
 7. FAA - Federal Aviation Administration; www.faa.gov.
 8. FCC - Federal Communications Commission; www.fcc.gov.
 9. FDA - Food and Drug Administration; www.fda.gov.
 10. FEMA - Federal Emergency Management Agency; www.fema.gov.
 11. FG - Federal Government Publications; www.gpo.gov.
 12. GSA - General Services Administration; www.gsa.gov.
 13. HUD - Department of Housing and Urban Development; www.hud.gov.

14. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; <http://eetd.lbl.gov>.
 15. NIST - National Institute of Standards and Technology; www.nist.gov.
 16. OSHA - Occupational Safety & Health Administration; www.osha.gov.
 17. SD - Department of State; www.state.gov.
 18. TRB - Transportation Research Board; National Cooperative Highway Research Program; www.trb.org.
 19. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
 20. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
 21. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
 22. USP - U.S. Pharmacopeia; www.usp.org.
 23. USPS - United States Postal Service; www.usps.com.
- E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. ADAAG - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; www.access-board.gov.
 2. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
 3. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; <http://dodssp.daps.dla.mil>.
 4. DSCC - Defense Supply Center Columbus; (See FS).
 5. FED-STD - Federal Standard; (See FS).
 6. FS - Federal Specification; Available from Department of Defense Single Stock Point; <http://dodssp.daps.dla.mil>.
 - a. Available from Defense Standardization Program; www.dsp.dla.mil.
 - b. Available from General Services Administration; www.gsa.gov.
 - c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
 7. MILSPEC - Military Specification and Standards; (See DOD).
 8. UFAS - Uniform Federal Accessibility Standards; www.access-board.gov.
 9. USAB - United States Access Board; www.access-board.gov.
 10. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
- F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. ABC - State of Alabama Building Commission; www.bc.state.al.us.
 2. ACHA - Agency for Health Care Administration; www.acha.myflorida.com.
 3. ADEM - Alabama Dept. of Environmental Management; www.adem.alabama.gov

4. ADPH – Alabama Department of Public Health; www.adph.org.
5. DCH – Georgia Department of Community Health; www.dch.georgia.gov

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF REFERENCES

SECTION 01 5000

TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 TEMPORARY FACILITIES:

- A. Proper provision shall be made for storage of bulk materials, parking of construction vehicles and direct access to the building site as acceptable to the Owner and approved by the Architect.
 - 1. On-site parking may or may not be available to the Contractor with the “staging areas” indicated, or if not indicated, as agreed to and designated by the Owner.
 - 2. In the event that the Owner does not have parking available, the Contractor shall be responsible for providing their own parking facilities.
- B. Field Offices: Provide temporary field offices at the project site at location designated by or acceptable to the Owner, of sufficient size, to accommodate required office personnel at the site, with at least finished interiors, heating, air conditioning, lighting, and one toilet room.
 - 1. Furnish suitably with not less than a desk and chairs, file cabinet, plan table and plan rack and a bookcase for use by Contractor.
 - 2. Water cooler or dispenser.
 - 3. Modern PC computer equipment with Windows operating platform, and at least word processing, photo storage and printing, and email capabilities; wireless Internet connection; printer and copy machine.
 - 4. Note: Office area shall be cleaned daily.
- C. Digital Camera: Provide no less than 5 megapixels resolution, with 5x zoom, for daily construction documentation at the site, including flash, memory cards, charger and rechargeable batteries, standard batteries as back-up or for primary use, and all standard accessories and hardware for complete and proper operation, and for downloading and emailing.

1.2 TOILET FACILITIES:

- A. Contractor shall provide temporary toilet(s) on site for the duration of the project, for construction personnel use. They shall be enclosed weatherproof and sanitary toilets.
 - 1. Toilet facilities in the Owner’s buildings are not available to and shall not be used by the Contractor, Subcontractors, etc.

- B. Maintain toilets in sanitary condition at all times. Remove outside toilets when no longer required, and leave site in clean condition.
- C. Conform to local ordinances and regulations.

1.3 TEMPORARY TELEPHONES:

- A. Provide telephone for Contractor and Architect in the Contractor's job office at the project site, and provide a portable or cellular telephone to the Contractor's Superintendent. Cost of service and local calls shall be paid by General Contractor. Long distance and toll calls shall be paid by the party making such calls.
- B. Provide telephone answering machine or service, and "voice mail" for cellular phone, to facilitate communication with the Contractor's Superintendent.
- C. The Owner's telephones are not available to and shall not be used by the Contractor, except in an emergency situation.

1.4 TEMPORARY BARRIERS AND FENCES:

- A. Contractor shall provide and maintain adequate fencing, barricades and protective walkways where required to provide suitable protection for employees, children, and the public at all times until completion of the work, acceptable to authorities having jurisdiction.
- B. The Contractor shall confine the activities of work on this project to within the protected areas, unless otherwise directed by the Architect or Owner.
- C. Refer to Section 01015 - "Special Conditions," and the Drawings, for additional requirements for temporary fencing and gates, signage, and related requirements.

1.5 ELECTRIC POWER:

- A. The Contractor shall obtain electrical service from the local power company. Cost of temporary power from the local power company and related billings shall be paid by the Contractor from their Contract amount.
- B. Where need for electricity exists for use of other than 110V/120V hand tools or lighting, the Contractor shall provide temporary non-vibrating or vibration isolated portable generator with muffler in compliance with local noise ordinances, or other acceptable power source.
- C. The Contractor shall be responsible for all extensions, connections, etc., as necessary for the Work. Contractor shall remove all temporary wiring, extensions, connections, etc., prior to Substantial Completion.

1.6 WATER:

- A. The Contractor shall obtain the service from the local utility company. Cost of temporary water from the utility company and related billings shall be paid by the Contractor from their Contract amount.
 - B. The Contractor shall provide temporary stub-up, hose bib, etc., as necessary for the Work. Contractor shall remove all temporary piping, valves, etc., prior to substantial completion.
- 1.7 TEMPORARY HEAT:
- A. Contractor shall furnish temporary heat as required for uninterrupted construction and other operations, protection of new work, for drying out buildings, etc.
- 1.8 ENCLOSURES AND PROTECTION:
- A. Provide and maintain for the duration of construction of scaffolds, tarpaulins, canopies, warning signs, steps, platforms, bridges and other temporary construction necessary for proper completion and observation of the work, in compliance with pertinent safety and other regulations, and authorities having jurisdiction. Refer to Section 01015 - "Special Conditions," and the Drawings for additional information and requirements.
- 1.9 CLEAN UP:
- A. The Contractor or his agent, upon completion of the work shall immediately remove all temporary fences, temporary utility lines, debris or any other obstructions and leave such property in as good a condition as it was before such work was commenced.
 - B. The Contractor, upon completion of the work, shall remove all other temporary structures and facilities from the site.
 - C. The Contractor shall legally dispose of all trash, debris, etc., off site, on a regular basis.
 - D. Items salvaged by Contractor for his own purposes or for the Owner where indicated, may be stored temporarily on site and removed as soon as possible, unless directed otherwise by Architect, or Owner.
 - 1. The sale or advertising for sale of salvaged or other materials *shall not be permitted* on site under any circumstances.
 - E. Control dust on site and clean mud and/or debris from on site and city streets and sidewalks, as it occurs.
 - 1. Provide facilities to wash mud off of truck tires, equipment, etc., before it can be tracked onto streets, etc.

- F. Maintain new landscape work, as well as shrubs and trees to remain, including trimming and raking leaves. Keep grass and weeds cut around fencing, and within the project site.

END OF TEMPORARY FACILITIES

SECTION 01 6000

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION OF SCOPE AND INTENT

- A. The intent of this section is basic requirements for standards and procedures identified. Good business practices may indicate additional or supplemental requirement procedures identified.

1.2 SECTION INCLUDES

- A. Products.
- B. Transportation and handling.
- C. Storage and protection.
- D. Product options.
- E. Substitutions.

1.3 PRODUCTS

- A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. It does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.
- B. Do not re-use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- C. Provide interchangeable components of the same manufacturer, for similar components.

1.4 TRANSPORTATION AND HANDLING

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.5 STORAGE AND PROTECTION

- A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.
- B. For exterior storage of fabricated products, place on sloped supports, above ground.
- C. Provide off-site storage and protection when site does not permit on-site storage or protection.
- D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
- E. Store loose granular materials on solid flat surfaces in a well-drained area. Provide mixing with foreign matter.
- F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- G. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

1.6 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

1.7 SUBSTITUTIONS

- A. Owner will consider requests for Substitutions only up to 5 days prior to bidding.
- B. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.
- C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- D. A request constitutes a representation that the Bidder:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.

2. Will provide the same warranty for the Substitution as for the specified product.
 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 4. Waives claims for additional costs or time extension which may subsequently become apparent.
- E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- F. Substitution Submittal Procedure:
1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.
 3. The Owner will notify Contractor of decision to accept or reject request.

PART 2 – PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF PRODUCT REQUIREMENTS

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SECTION 017000

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 DESCRIPTION OF SCOPE AND INTENT

- A. The intent of this section is to define minimum requirements to be satisfied and/or delivered in contract closeout procedures. Other items may be requested by Owner to supplement required data.

1.2 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Adjusting.
- D. Project record documents.
- E. Operation and maintenance data.
- F. Warranties.
- G. Spare parts and maintenance materials.

1.3 RELATED SECTIONS

- A. Contractor is responsible for coordination of work included in this specification with all other specification sections related to furnishing of all materials, labor, permit, fees and services necessary for completion of work in this section.

1.4 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer's inspection.
- B. Provide submittals to Owner that are required by governing or other authorities.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.5 FINAL CLEANING

- A. Execute final cleaning prior to final inspection.

- B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Clean equipment and fixtures to a sanitary condition.
- D. Replace filters of operating equipment.
- E. Clean site and premises; sweep paved areas, clean landscaped surfaces.
- F. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.6 ADJUSTING

- A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

PROJECT RECORD DOCUMENTS

- B. Maintain on site, one set of the following record documents; record actual revisions to the Work:
 - 1. Contract Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other Modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.
- C. Store Record Documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and Modifications.
- F. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured depths of foundations in relation to first floor datum.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

4. Field changes of dimension and detail.
 5. Details not on original Contract Drawings.
- G. Submit lien and claims release as provided in specifications.
- H. Submit documents to Owner with claim for final Application for Payment.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit two sets prior to final inspection, bound in 8-1/2 x 11 inch text pages, three D side ring binders with durable plastic covers.
- B. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project.
- C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- D. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified type on white paper.
- E. Part 1: Directory, listing names, addresses, and telephone numbers of Contractor, Subcontractors, and major equipment suppliers.
- F. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
 1. Significant design criteria.
 2. List of equipment.
 3. Parts list for each component.
 4. Operating instructions.
 5. Maintenance instructions for equipment and systems.
 6. Maintenance instructions for finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.
- G. Part 3: Project documents and certificates, including the following:
 1. Shop drawings and product data.
 2. Air and water balance reports.
 3. Certificates.
 4. Photocopies of warranties.
- H. Submit one copy of completed volumes in final form 15 days prior to final inspection. This copy will be returned after final inspection, with

Architect/Engineer comments. Revise content of documents as required prior to final submittal.

- I. Submit final volumes revised, within ten days after final inspection.
- J. Provide on-site instruction of Owner's maintenance or engineering staff of all equipment operations and procedures.

1.8 WARRANTIES

- A. Provide duplicate notarized copies.
- B. Execute and assemble documents from subcontractors, suppliers, and manufacturers.
- C. Provide Table of Contents and assemble in three D side ring binder with durable plastic cover.
- D. Submit prior to final Application for Payment.
- E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.9 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.
- B. Deliver to and place in location as directed.

1.10 WAIVER OF CLAIMS

- A. Submit waiver of claims in accordance with General Conditions of the Contract for Construction.
- B. Utilize Alabama Building Commission, Contractor's Affidavit of Payment of Debts and Claims and Consent of Surety to Final Payment.

1.11 ADVERTISEMENT FOR COMPLETION

- A. Upon Substantial Completion run advertisement of completion of the project as per State of Alabama and Alabama Building Commission requirements.
- B. Format for the advertisement shall be the ABC, "Form of Advertisement for Completion".

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION (Not used)

END OF CLOSEOUT PROCEDURES

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SECTION 01 7200

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this section.

1.2 DOCUMENTS:

- A. Maintain at least one (1) copy of all drawings, specifications, addenda, approved shop drawings, change orders, filed orders, other contract modifications and other reviewed documents submitted by the Contractor in compliance with various sections of the specifications.

1.3 IDENTIFICATION AND MAINTENANCE:

- A. Each of these project record documents shall be clearly marked "Project Record Copy," maintained in good condition, available for inspection by the Architect or Owner, and not used for construction purposes.

1.4 RECORDS:

- A. Mark up the most appropriate documents with permanent red ink pen or red pencil to show:
 - 1. Significant changes made during the construction progress.
 - 2. Significant detail not shown in the original contract documents.
- B. The information given shall include, but not be limited to: The location of underground utilities and appurtenances, referenced to permanent surface improvements by dimensions(s) and description(s).
- C. Keep project record documents current. Do not permanently conceal any work until the required information has been recorded.
- D. As-built Drawings: At completion of project, the Contractor shall submit to Architect complete sets of marked-up Project Record Drawings, as follows:
 - 1. One (1) Original Set.
 - 2. One (1) set, blueline or blackline prints or copies.
 - 3. Two (2) sets of digital copies in latest edition of ISO/Adobe compliant "Portable Document Format" ("PDF") saved as "Read Only" on compact discs (CD's), clearly and permanently labeled as to their contents. MINIMUM RESOLUTION shall be 300

dpi for small format documents and 600 dpi for large format documents ("large format" is defined as larger than 11" x 17"). Original documents which include color, colored markings, etc., shall be scanned and saved as color documents. Documents may be saved in a non-proprietary ISO compliant self-extracting compressed file format, and no documents shall be password protected. Deliver in standard CD cases or sleeves which are free of any PVC content, also clearly and permanently labeled.

- E. As-built Project Manual and Specifications: At completion of project, the Contractor shall submit to Architect complete sets of marked-up Project Record Specifications, in same quantities and formats as required for the As-built Drawings.

1.5 SUBMITTALS:

- A. Submit project record documents and as-built drawings within ten (10) days of acceptance of the entire completed project.

END OF PROJECT RECORD DOCUMENTS

SECTION 017300

EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Coordination of Owner-installed products.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for limits on use of Project site.
 - 2. Section 017329 "Cutting and Patching" for cutting and patching requirements as necessary for the installation or performance of other components of the Work.
 - 3. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.
 - 4. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction if such structures or appurtenances are not included in the scope of Work described in the Contract Documents. Coordinate with Authorities Having Jurisdiction.

- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a professional engineer to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

- A. Identification: Identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 96 inches in spaces without a finished 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 Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned

with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.
- C. Refer to "General Conditions for the Contract", for further provisions relative to the right of the Owner to perform construction, award separate contracts, mutual responsibilities and remedies should delays, improperly timed activities, or defective construction occur on the part of either party.

3.7 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.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not necessarily limited to:

1. Excessive static or dynamic loading
2. Excessive internal or external pressures
3. Excessively high or low temperatures
4. Thermal shock
5. Excessively high or low humidity
6. Pollution and air contamination
7. Water or ice
8. Chemicals and solvents
9. Light
10. Radiation
11. Puncture
12. Abrasion
13. Heavy traffic
14. Soiling or staining
15. Corrosion
16. Bacteria
17. Rodent and insect infestation
18. Combustion
19. Electrical current
20. High-speed operation
21. Improper lubrication
22. Unusual wear or other misuse
23. Contact between incompatible materials
24. Destructive testing
25. Misalignment
26. Excessive weathering
27. Unprotected storage
28. Improper shipping or handling
29. Theft or vandalism

- K. Provide rodent-proof containers on each floor level of construction.

3.8 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components as scheduled with, and in cooperation with, Owner's commissioning agent.
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

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

3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements of Section 017329 "Cutting and Patching".
 - 1. 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.

END OF EXECUTION

SECTION 01 7329

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements for Cutting and Patching.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting proposed cutting and patching information.
 - 2. Section 017000 "Execution" for procedural requirements for coordination with the installation or performance of other components of the Work.
 - 3. Section 024119 "Selective Demolition" for the demolition of selected portions of the building for alterations.
 - 4. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.
 - 5. Divisions 02 through 49 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.
- C. Selective Demolition: The systematic removal of a portion of an existing structure, which often includes removing major structural elements to provide for the enlargement and alteration of the structure. Selective demolition may require the performance of cutting and patching as a part of the Work.

1.4 SUBMITTALS

- A. Certification of Compliance: Submit all information necessary to indicate full compliance to all requirements specified herein, otherwise submittal will be returned marked "Rejected".

- B. Submit in accordance with the requirements specified in Section 013300 "Submittal Procedures".
- C. Action Submittals: (refer to Section 016000 "Product Requirements" in its entirety with particular attention to "Submittals" Article)
 - 1. Cutting and Patching Proposal: Submit a proposal describing methods, procedures, and locations of cutting and patching any structural element as defined herein. Submit proposal a minimum of fourteen (14) calendar days prior to scheduled date cutting and patching will be performed, requesting approval to proceed. Include the following information:
 - a. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
 - b. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operation components as well as changes in building's appearance and other significant visual elements.
 - c. Products: List products to be used and firms or entities that will perform the Work.
 - d. Dates: Indicate when cutting and patching will be performed.
 - e. Utility Services and Mechanical or Electrical Systems: List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
 - f. Drawings: Where cutting and patching involve cutting cutouts in and/or adding reinforcement to structural elements, submit fully dimensioned drawings, details, and engineering calculations showing integration of cutouts and/or reinforcement with original structure.
 - g. Architect/Engineer Approval: Obtain approval of cutting and patching proposal before cutting and patching activities begin. Approval does not waive right to later require removal and replacement of unsatisfactory work.
 - 2. Product Schedule: Descriptive list of all materials proposed for use as described in Section 013300 "Submittal Procedures".

1.5 QUALITY ASSURANCE

- A. Structural Elements: do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio. Structural elements include, but are not necessarily limited to, columns, beams, girders, headers, joists, bar joists, rafters, shear walls, bearing walls, tilt-up wall panels, precast floor/wall/roof panels, precast columns, hangers, haunches, bearing plates, bearing angles, braces, kickers, anchor bolts, rods, steel reinforcing, stair stringers, pan floor systems, and any prestressed column, beams, girders, headers, and joists.
 - 1. Cutting of any structural element requires the prior approval of the Engineer of Record.

- B. 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. Operating elements include, but are not necessarily limited to, primary operational systems and equipment; air or smoke barriers; fire-suppression systems; mechanical systems piping and ducts; control system; communication systems; conveying systems; electrical wiring systems; operating systems of special construction in Division 13 Sections.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operation al life or safety. Miscellaneous elements include, but are not necessarily limited to, water, moisture, or vapor barriers; membranes and flashings; exterior curtain-wall construction; equipment supports; piping, ductwork, vessels, and equipment; noise and vibration control elements and systems.
- D. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- E. Cutting and Patching Conference: Before proceeding, conduct conference at Project site. Comply with requirements in Section 013100 "Project Management and Coordination". Meet with parties involved in cutting and patching, including mechanical and electrical trades, to review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- F. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

1.6 WARRANTY

- A. Existing Warranties: Includes warranties associated with existing construction or with those associated with the Work of this contract.
- B. Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials as directed by the Architect that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.
- C. Salvaged Materials: Salvage sufficient quantities of cut or removed material to replace damaged work of existing construction when material is not readily obtainable on the current market.
1. Use particular care in removal and salvage of the following items:
 - a. Door frames
 - b. Existing OFE equipment
 - c. Structural O.R. framing
 - d. Mechanical duct work
 - e. Light fixtures
 2. Store salvaged items in a dry, secure place on the Project site.
 3. Do not incorporate salvaged or used material in new construction except with permission of the Architect
 4. Serviceable items not required for use in repair of existing work shall become the property of the Owner and shall be delivered to a location as directed by the Owner.
 5. Serviceable material not wanted by the Owner shall be removed from the project site and disposed of in a lawful manner.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction (adjacent work, existing finishes, and equipment) which is scheduled to remain during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Work that might be exposed during cutting and patching operations.
1. Maintain existing interior work above 60 degrees F.
 2. Provide weather protection, waterproofing, heat and humidity control as needed to prevent damage to remaining existing work and to new work.

- C. Adjacent Occupied Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas. Where interference is unavoidable, coordinate cutting and patching to occur at pre-arranged time/s acceptable to Owner.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize or prevent interruption to occupied areas.

3.3 CUTTING AND PATCHING

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations. Breaking, chipping, denting, deforming, and/or otherwise damaging materials and/or surfaces to be cut and patched is not allowed.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 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 only after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation, including fire-resistance ratings.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

- a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, overspray, and evidence of any spillage, mortar, oils, putty, and similar materials from all finished surfaces.

END OF SECTION 01 7329

SECTION 017823

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.0 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.

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.2 DEFINITIONS

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

1.3 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Construction Manager will comment on whether content of operations and maintenance submittals are acceptable.

2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Construction Manager.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
 2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Construction Manager will return two copies.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Construction Manager will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Construction Manager will return copy with comments.
1. Correct or revise each manual to comply with Construction Manager's comments. Submit copies of each corrected manual within 15 days of receipt of Construction Manager's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
1. List of documents.
 2. List of systems.
 3. List of equipment.
 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name and contact information for Contractor.
 - 6. Name and contact information for Construction Manager.
 - 7. Name and contact information for Architect.
 - 8. Name and contact information for Commissioning Authority.
 - 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 - 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
 4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- A. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
 2. Flood.
 3. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- B. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- C. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor has delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.

4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.

5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."
- G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

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SECTION 017900

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.0 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.

1.1 SUMMARY

A. Section includes:

- 1. Demonstration of operation of systems, subsystems, and equipment.
- 2. Training in operation and maintenance of systems, subsystems, and equipment.

B. Related Requirements:

- 1. 013100 "Project Management and Coordination" for requirements for preinstruction conferences.
- 2. Divisions 02 through 33 Sections for specific requirements for demonstration and training for products in those Sections.

1.2 SUBMITTALS

A. Informational Submittals:

- 1. Instruction Program: Submit two (2) copies to the Construction Manager, of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module.
- 2. Qualification Data: For facilitator and instructor.
- 3. Attendance Record: For each training module, submit list of participants and length of instruction time.

B. Closeout Submittals:

- 1. Demonstration and Training Manual
 - a. At completion of training, submit one (1) hard copy of complete training manual(s) for Owner's use prepared and bound in format matching operation and maintenance manuals and, submit one (1) copy in PDF electronic file format on compact disc or, flash drive.

1.3 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- B. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.4 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.

PART 2 - PRODUCTS

2.0 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, instruction may include but not necessarily be limited to:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.

- e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
2. Documentation: Review the following items in detail:
- a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
- a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
- a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.0 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

3.1 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 1. Schedule training with Owner with at least fourteen (14) days' advance notice and inform Construction Manager of same.

- C. 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.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, written, or demonstration performance-based test.
- E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 017900

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SECTION 02 2000

EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
 - 1. Section 01720 - "Project Record Documents"
 - 2. Section 02110 - "Site Clearing"
 - 3. Section 02520 - "Portland Cement Concrete Paving"
 - 4. Section 02668 - "Water Service Piping"
 - 5. Section 02730 - "Sanitary Sewerage"
 - 6. Section 02900 - "Landscape Work"
 - 7. Section 03310 - "Concrete"

1.2 SUMMARY:

- A. This Section includes the following:
 - 1. Preparing of subgrade for building slabs, walks, and pavements.
 - a. Note that it is anticipated that work under Division 2 Section "Site Clearing" will result in removal of 3" to 5" of existing topsoil, organic material, existing paving and/or concrete sidewalks, and any additional earth, unsuitable existing fill materials and other existing material and/or paving as required for the Work of this project to be properly completed, as specified and/or as required by actual project conditions, and as further indicated in the written recommendations and additional information on the Drawings.
 - 1) The work of this Section shall also include complete removal of all existing utilities and relocation where indicated, as well as any existing footings, foundations and debris from any previously existing building(s) and improvements which occur within the "controlled areas".
 - 2) Stripping of exposed grade shall extend at least 5-feet beyond the limits of construction cut and fill.

- b. In “controlled areas”, at least the top 6-inches of existing exposed subgrade remaining after stripping, and verified by proofrolling and testing as acceptable to remain, shall be scarified, moisture-conditioned, and processed in place, and compacted to 98% standard density, prior to adding any paving base material or “structural fill” placed as “engineered fill” or performing any other excavation to establish subgrades required for new work.
- c. “Controlled Areas” include utility and storm drainage structures and piping, and 5-feet beyond, and below and 5-feet beyond all walks and pavements.
- d. “Building Controlled Areas” and other “Controlled Areas” include building footprint, areas below roofs, canopies and covered porches, and 5-feet beyond, and below and 5-feet beyond all walks and pavements.
- e. “Building controlled area” and all other “controlled areas” shall have a minimum layer of tested, approved, and compacted, acceptable on-site or acceptable off-site “structural fill” building pad (compacted to minimum 98-percent standard density), at least to the minimum depth indicated below, **and any ADDITIONAL DEPTH as required by actual excavation and/or fill depths and subgrade elevations indicated (a minimum of 24” of structural fill from approved on-site or off-site soil materials as a building pad on prepared subgrade is required).**
 - 1) **All backfill shall be “structural fill” (from on site ONLY if acceptable after testing, or off-site material) placed as “engineered fill” in building and other “controlled areas”, over minimum of 6-inches conditioned and properly prepared subgrade, as indicated.**
 - 2) Refer to Drawings and Section 02520 - “Portland Cement Concrete Paving” for additional information and requirements
- f. **Perform excavation by hand within 5'-0” of existing buildings and structures to remain.** Design and provide all necessary supports, shoring, etc., as required to prevent settlement, collapse, and/or other damage to existing buildings and structures to remain.
 - 1) **DO NOT EXCAVATE BELOW THE EFFECTIVE BEARING AREA OF EXISTING BUILDING FOUNDATIONS AND STRUCTURES TO REMAIN.** In the event of conflict during construction, notify Architect prior to proceeding with work in the effected area.
- h. Compaction of backfill at any below grade walls, structures and/or basements shall only be by hand-directed compaction equipment. Heavy construction equipment and/or heavy trucks shall not be allowed within 10-feet of any basement walls, and within 5-feet of foundation walls.

2. Drainage fill course (porous fill) for support of any structural or slabs related to utilities is included as part of this work; compacted in place.
 3. Excavating and backfilling of trenches within construction lines, limits of work, and "controlled areas".
 4. Stripping and stockpiling of topsoil (if any) is specified in Division 2 Section "Site Clearing."
 5. The extent of earthwork is indicated on the Drawings.
 6. Removal of existing improvements may also be further specified under various Division 2 Sections.
- B. Placement and compaction of at least 4-inches of topsoil up to finish grades is included in the work of Division 2 Section "Landscape Work", not the work of this Section.
1. Coordination with the work of other subcontractors is required.
 2. Allow for thickness of 4-inches of topsoil and thickness of sod.

1.3 **DEFINITIONS:**

- A. "Excavation" consists of removal of materials and existing improvements encountered to subgrade elevations indicated and subsequent disposal of materials removed.
- B. "Unauthorized" excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be at Contractor's expense.
1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Architect.
 2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Architect.
- C. "Additional Excavation": When excavation has reached required subgrade elevations, notify Architect, who will inspect conditions. If Architect determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Architect.
1. The Contract Sum will be adjusted by Change Order, or as provided in General Conditions, for additional excavation and its replacement appropriately authorized in writing prior to beginning the work, and for which the Contractor is due payment from the Owner.

- D. "Subgrade": The undisturbed earth or the compacted soil layer immediately below pavement base course, drainage fill, or topsoil materials.
- E. "Structure": Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.
- F. "Building Control Area" and/or "Controlled Area": Below and 5-feet beyond building footprint or exterior walls, and below roofs, to include covered porches and canopies, and below and 5-feet beyond all walks and pavements.
- G. "Mud Footings" (or "mud mats", or "mud sills"): The 4-inches of lean 2,000 psi (minimum) concrete placed in the bottom of footing and foundation trenches and excavations, which is required if permanent or structural concrete cannot be placed the same day they are excavated.
 - 1. Unless mud footings are indicated on Structural Drawings, their depth shall be compensated for by over-excavation.
 - 2. Mud footings (if any) shall be completely clean prior to placement of any reinforcing and/or permanent or structural concrete.
 - 3. Refer to the Owner's "Geotechnical Report", and Structural Drawings for additional information and requirements for other "mud footings" (or "mud mats", or "mud seals").
- H. Rock (or similar existing concrete; if any): Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. (0.76 cu. m) for bulk excavation or 3/4 cu. yd. (0.57 cu. m) for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
 - 1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- (1065-mm-) wide, short-tip-radius rock bucket; rated at not less than 120-hp (89-kW) flywheel power with bucket-curling force of not less than 25,000 lbf (111 kN) and stick-crowd force of not less than 18,700 lbf (83 kN); measured according to SAE J-1179.
 - 2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp (157-kW) flywheel power and developing a minimum of 45,000-lbf (200-kN) breakout force; measured according to SAE J-732.

1.4 SUBMITTALS:

- A. Test results shall be reported in writing to Architect, Civil Engineer, and Contractor within one day of when tests are made.
 - 1. Test reports on fill and borrow material; On-site as well as off-site materials.

2. Verification of suitability of each foundation, slab and subgrade condition and material, in accordance with specified requirements.
3. Field reports; and in-place soil density tests.

1.5 QUALITY ASSURANCE:

- A. Codes and Standards: Perform excavation work on site and in right-of-ways in compliance with applicable requirements of authorities having jurisdiction.
- B. Testing and Inspection Service: All required soil testing and inspection services during earthwork operations shall be performed by a qualified independent geotechnical testing laboratory.
 1. Refer to Division 1 Section "Special Conditions", for additional information and requirements.

1.6 PROJECT CONDITIONS:

- A. Site Information: Refer to Division 2 Section "Site Clearing", and Civil Drawings, for additional information and recommendations.
- B. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations in the vicinity, and as may also be required for other construction work.
 1. Notify the Alabama Line Location Center at 1-800-292-8525 at least 2-full working days (48 hours), excluding weekends and holidays, prior to any excavation work. This organization will contact its member utility companies to locate and mark all of their own underground facilities.
 - a. Notify non-member companies directly, for them to perform this service.
 2. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions and record locations on as-built record drawings. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
 3. Do not interrupt existing utilities serving facilities occupied by Owner or others, during occupied hours, except when permitted in writing by Architect and then only after acceptable temporary utility services have been provided.
 - a. Provide minimum of 48-hour notice to Owner and copy Architect, and receive written notice to proceed before interrupting any utility.

4. Demolish and completely remove from the site any existing underground utilities indicated to be removed, and all existing underground utilities in “controlled areas”. Coordinate with utility companies for shutoff and any required relocation of services if lines are active.
- C. Use of Explosives: Use of explosives *is not* permitted without the prior approval of the Owner, Engineer and Architect, protections to persons and property being in place, and all statutory licenses and permits.
- D. Protection of Persons and Property:
 1. Barricade open excavations occurring as part of this work and post with warning lights.
 2. Operate warning lights as recommended by authorities having jurisdiction.
 3. Comply with requirements of current regulations of OSHA, applicable Codes, ordinances, and authorities having jurisdiction.
 4. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
 5. Perform excavation by hand within 5'-0" of existing buildings and structures to remain, and within dripline of large trees to remain. Protect root systems from damage or dry-out to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap. Paint root cuts of 1-inch and larger with emulsified asphalt tree paint.
 - a. Do not under-mine or excavate below footings and/or foundations which are to remain.
 6. CAUTION: Vibratory compaction equipment should not be used within 15-feet of existing buildings.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS - DEFINITIONS:

- A. Satisfactory soil materials are defined as clean, non-saturated, non-organic sections of earth taken from on-site cuts (if allowed), and complying with ASTM D2487 soil classification groups, and as recommended by the Owner's Geotechnical Consultant, or if not included, as directed at the time of earthwork operations and/or acceptance resulting from acceptable test results obtained on soil materials proposed by the Contractor and tested by the project Geotechnical Engineer, as required by the Bid and Contract Documents.

1. **Note: On-site soils shall only be used as structural fill in building or any controlled areas after tested and found acceptable to the Project Geotechnical Engineer.**
- B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups other than those indicated above.
- C. Drainage Fill (or “porous fill” or “drainage aggregate”): Clean, washed, evenly graded mixture of dense-graded base material (ALDOT 825B), **subject to approval by the project Geotechnical Engineer and testing laboratory**, and as follows:
- D. Backfill and Fill Materials (Grassed areas only; Cuts and fills outside “controlled areas”, during general grading): Satisfactory soil materials from on-site excavations, free of clay, rock or gravel larger than 2-inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.
 1. All fill soils must be compatible with existing soils, so they can bond together.
- E. Offsite Borrow Material, Unless Otherwise Indicated in the “Report” (“Select” and/or “Structural Fill”): Clean, non-saturated, non-organic, non-expansive clayey soils; Clayey Sand (SC), Silty Sand (SM), Clayey Gravel (GC), or Sandy Clay (CL), **acceptable to project Geotechnical Engineer and testing laboratory**, from an off-site borrow source, free of rocks larger than 3-inches, debris, organics, vegetation, and other deleterious matter, and at least as follows:

“SELECT FILL” - OFF-SITE BORROW:	
Liquid Limit (LL):	35% maximum
Plasticity Index (PI):	5% to 28% maximum
Dry Unit Weight (ASTM D-698):	100 pcf minimum

Compaction: 98% S.P.D.	

1. All fill soils must be compatible with existing soils, so they can bond together.
- F. Topsoil: Refer to Division 2 Section “Site Clearing.”

PART 3 - EXECUTION

3.1 PROOFROLLING:

- A. Areas throughout significant slopes and beneath and 5'-0" beyond any new structures, building and covered areas, and beneath and 5'-0" beyond any new walk and pavement areas (back-of-curb or other paving edge termination) shall be designated as "controlled areas." Prior to placement of fill earth and following removal of cut earth, the controlled areas shall be proofrolled. Areas to be filled shall be proofrolled prior to any fill placement; cut areas shall be proofrolled after they are brought to subgrade level. Proofrolling shall be performed with a partially loaded truck with a rear single axle weight of 8 to 10 tons, or similarly weighted construction equipment. The proofroller shall make at least two passes over each section in perpendicular directions over the "controlled areas". Soft, organic, or excessively wet soils found during the proofrolling operations shall be excavated and replaced with suitable compacted fill. The exposed subgrade must be well drained to prevent the accumulation of water.
1. Proofrolling shall be conducted in the presence of project testing lab's Geotechnical Engineer.
 2. Do not proofroll when the ground surface is wet or saturated with water.

3.2 EXCAVATION:

- A. Earth Excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as structures, foundations, rock or unauthorized excavation.
- B. Perform excavation by hand within 5'-0" of existing buildings and structures to remain.
1. Do not under-mine or excavate below footings and/or foundations which are to remain.
- C. Refer to "Definitions" paragraph above and Structural Drawings for any "mud footings" required.

3.3 STABILITY OF EXCAVATIONS:

- A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.
- B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of

space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

- C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time excavations will be open. Extend shoring and bracing as excavation progresses.

3.4 DEWATERING:

- A. Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.
 - 1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
 - 2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rainwater and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

3.5 STORAGE OF EXCAVATED MATERIALS:

- A. Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, and shape stockpiles for proper drainage. Install erosion control measures as necessary to prevent siltation onto adjacent properties or onto the project area.
 - 1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
 - 2. Dispose of clean excess excavated soil material by spreading at on-site location as directed by Owner, and materials not wanted by the Owner and/or not acceptable for use as backfill or fill by removal and legal disposal off site.

3.6 EXCAVATION FOR STRUCTURES:

- A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed.

Trim bottoms to required lines and grades to leave solid base to receive other work.

2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Structures: Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot; plus a sufficient distance to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection. Do not disturb bottom of excavations, intended for bearing surface.

3.7 EXCAVATION FOR WALKS AND PAVEMENTS:

- A. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

3.8 TRENCH EXCAVATION FOR PIPES AND CONDUIT:

- A. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 6-inches to 9-inches of clearance on both sides of pipe or conduit.
- B. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on minimum of 4-inches of compacted "select fill" bedding. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- C. Except as otherwise indicated, excavate for exterior water-bearing piping (water, steam, condensate, drainage, etc.) so top of piping is not less than 2'-6" below finished grade and/or paving.
- D. Unless specifically indicated otherwise, where rock or concrete is encountered, carry excavation 6" below required elevation and backfill with a 6" layer of crushed stone or gravel, prior to installation of pipe.

3.9 COLD WEATHER PROTECTION:

- A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.10 BACKFILL AND FILL:

- A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.
 1. Under all areas, use satisfactory excavated or borrow material; Refer to Drawings and this Section 02200 for minimum testing requirements.
 2. Under structures, slabs, building slabs, use drainage fill material of compacted and finished depth indicated, or if not indicated, at least 4-inches compacted and completed thickness.

3. Backfill trenches with concrete where trench excavations pass within 18-inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.
 - a. Concrete is specified in Division 3.
 - b. Do not backfill trenches until inspections and any required testing have been made and backfilling is authorized by Architect based on test results. Use care in backfilling to avoid damage or displacement of pipe systems.
- B. Backfill excavations as promptly as work permits, but not until completion of the following:
 1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, etc.
 2. Inspections, testing, approval, and recording locations of underground utilities have been performed and recorded.
 3. Removal of concrete formwork, if any.
 4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.
 - a. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
 5. Removal of trash and debris from excavation.
 6. Permanent or temporary horizontal bracing is in place on horizontally supported walls, where necessary.

3.11 PLACEMENT AND COMPACTION:

- A. Ground Surface Preparation:
 1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow strip, or break up sloped surfaces steeper than 1-vertical to 4-horizontal so that fill material will bond with existing surface.
 2. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.
- B. Place backfill and fill 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.

1. CAUTION: Vibratory compaction equipment should not be used within 15-feet of existing buildings.
- C. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- D. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.
- E. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Architect if soil density tests indicate inadequate compaction.
 1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density, in accordance with ASTM D 698 A:
 - a. Under structures, covered areas, building slabs and steps, sidewalks, pads, and in all "controlled areas", and 5-feet beyond, compact at least the top 6-inches of subgrade at 98-percent maximum density, and each layer of backfill or fill material at 98-percent maximum density. Compact the top 6-inches of the exposed subgrade in both cut and fill areas to at least 98-percent maximum density.
 - 1) Refer to Paragraph 1.2 above and "Geotechnical Report" and Drawings, for areas where additional depth(s) of preparation and compaction of exposed subgrades are or may be required.
 - b. Under pavements and 5-feet beyond (measured from back-of-curb or edge of paving, where occurs), process and compact top 6" of subgrade and each layer of backfill or fill material at 98-percent maximum density; Refer to Civil and Structural Drawings for additional information and requirements.
 - 1) Modified roadbed, crushed stone, and any other base material indicated below vehicular concrete pavement: 98-percent S.P.D. Refer to Drawings and Division 2 Section "Portland Cement Concrete Paving" for additional information and requirements.
 - c. Under lawn or unpaved areas beyond "controlled areas", compact each layer of backfill or fill material at 85-percent maximum density.

- d. On-site Borrow (where allowed): 98-percent standard density.
 - e. Select and/or Structural Fill: 98-percent standard density.
 - f. Porous Fill (drainage course): 98-percent standard density.
2. Moisture Control:
- a. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.
 - b. Remove and replace, or scarify and moisture condition, soil material that is too wet to permit compaction to specified density.
 - c. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist moisture conditioning by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.
 - d. At the time of placement and densification, the moisture content of "engineered fill", "structural fill", "select fill", and "retaining wall backfill" shall be within -3% to +3% of the materials' ASTM D-698 optimum moisture content for native clay, "select fill", "structural fill", and "retaining wall backfill".
 - e. Structural fill areas exposed to excessive wetting, drying or otherwise disturbed by the construction following acceptance for moisture and density should be retested followed by the correction of deficient areas just prior to the installation of additional fill or structures.
 - f. In no instance should placement of structural fill or ground supported structures be permitted if the ground surface soils contain a moisture content in excess of 3% of the materials optimum moisture content.
 - g. In no case shall porous drainage backfill (except as specifically indicated at foundation drains only) or masonry sand material be used adjacent to foundations or utility trenches. Care shall be taken to prevent masonry brick/block debris from falling or being pushed into foundation and/or trench excavations.

3.12 **GRADING:**

- A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.
- B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10-foot above-or-below required subgrade elevations.
 2. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10-foot above-or-below required subgrade elevation.
 3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 1/2-inch above or below required subgrade elevation.
 4. Connection of Existing and New Work: Provide flush transition, unless specifically indicated otherwise.
- C. Grading Surface of Fill under Structures, Building Slabs and "Building Control Areas": Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2-inch when tested with a 10-foot straightedge.
- D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.13 BUILDING SLAB AND STRUCTURES DRAINAGE COURSE:

- A. General: Drainage course consists of placement of drainage fill material, in layers of indicated thickness, over subgrade surface to support concrete building slabs, sidewalks, pads, and below canopies and covered porches, and elsewhere as indicated.
1. Minimum Completed Thickness: 4-inches.
- B. Placing: Place drainage fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.
1. When a compacted drainage course is indicated to be 6-inches thick or less, place material in a single layer. When indicated to be more than 6-inches thick, place material in equal layers, except no single layer more than 6-inches or less than 3-inches in thickness when compacted.

3.14 FIELD QUALITY CONTROL:

- A. Quality Control Testing During Construction:
1. Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.
 2. Perform field density tests in accordance with ASTM D 698 (sand cone method), or acceptable nuclear testing method, as applicable.
 3. New Footing Subgrade: For each strata of soil on which footings will be placed, perform at least one test per concrete pour (minimum) and one test per 50-feet

of footing length, to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata when acceptable to Architect.

4. New Paved Areas, New Structures or Building Slab and "Building Control Areas" Subgrade: Perform at least one field density test of subgrade for every 2,000-square feet of fill area for each foot of vertical thickness of fill placed in "controlled areas", with a minimum of four (4) tests per lift.
5. Foundation Wall Backfill: Perform at least 1-field density test for every 50-linear feet, at locations and elevations as directed, with a minimum of 2-field density tests for each retaining wall.
6. Trenches: Perform at least one field density test for every 50-linear feet for each 24-inches of vertical thickness of fill placed in utility or similar trenches, which extend through the "controlled areas".
 - a. Retaining walls, if any, same as for "Trenches", as indicated above.
7. A laboratory soil particle size, Atterberg limit, and Proctor density test shall be performed on each different type of fill soil used in the "controlled areas".
8. If in opinion of Architect - based on Project Geotechnical Engineer's testing reports, inspection, and recommendations - subgrade or fills that have been placed are below specified density, perform additional earthwork, compaction, and/or other operations, and re-testing, until specified density is obtained.

3.15 EROSION CONTROL:

- A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction.

3.16 MAINTENANCE:

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Repair edges of existing pavements, sidewalks, etc., and other existing and/or new improvements flush with and to match existing materials and thicknesses, subject to acceptance by Owner and Architect.
- D. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

- E. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.17 DISPOSAL OF EXCESS AND WASTE MATERIALS:

- A. Burning on Owner's Property: Burning is not permitted on Owner's property.
- B. Removal from Owner's Property: Remove unacceptable soils materials, waste materials, trash, and debris, and legally dispose of off Owner's property.
 - 1. Clean excess soil material without any construction debris, trash, tree roots over 1-inch in diameter, stumps, etc., shall be neatly spread and graded on site, as directed by the Architect and Owner.
 - 2. Soil materials unsuitable for use in building and paving areas may be disposed of on site and graded to drain storm water, at location(s) as directed by the Owner.
 - 3. Excess soil materials unwanted by the Owner shall be removed from the project site and legally disposed of by the Contractor.

END OF EARTHWORK

SECTION 02 4119

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Demolition and removal of selected portions of building or structure.
- 2. Demolition and removal of selected site elements.

B. Related Requirements:

- 1. Section 011000 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
- 2. Section 017329 "Cutting and Patching" for cutting and patching requirements as necessary for the installation or performance of other components of the Work.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- C. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 PREINSTALLATION MEETINGS

- A. Pre-demolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- C. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- D. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.
- E. Predemolition Photographs or Video: Submit before Work begins.
- F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- G. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

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

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

1.8 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.9 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

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

- 1. Before selective demolition, Owner will remove the following items:

- a. All materials currently stored in storage rooms.

- b. All materials currently in Project Scope.

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

- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

- 1. Hazardous materials will be removed by Owner before start of the Work.

- 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

- E. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

- 1. Hazardous material remediation is specified elsewhere in the Contract Documents.

- 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

- 3. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.

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

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

- 1. Maintain fire-protection facilities in service during selective demolition operations.

1.10 WARRANTY

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review record documents of existing construction. Owner does not guarantee that existing conditions are same as those indicated in record documents.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate, and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
 - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

2. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs and/or preconstruction videotapes.
1. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned (if any): Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
1. Owner will arrange to shut off indicated services/systems when requested by Contractor (if required).
 2. Arrange to shut off indicated utilities with utility companies.
 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
 5. Maintain adequate ventilation when using cutting torches.
 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of demolished items and materials promptly.
- B. Removed and Salvaged Items:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.

4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
- C. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.
- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- E. Floor Coverings: Remove floor coverings and grout according to recommendations in TCNA's "Tile Council of North America Handbook." Protect existing flooring to remain.
- F. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. Protect existing roof to remain. Only remove what is necessary for added utilities.
1. Remove existing roof membrane, flashings, copings, and roof accessories.
 2. Remove existing roofing system down to substrate.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

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

END OF SECTION 02 4119

SECTION 02 70 10

GLASS, STOREFRONT AND METAL CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of exterior glass, storefront, louvers, metal panels, painted metal structural components, concrete, stucco, and other surfaces to be cleaned; cleaning out and resealing of joints and related work is further indicated on the Drawings.
 - 1. Provide complete protection for all adjacent exterior and interior areas, to prevent any unintentional contact with chemicals, strippers, water, sealants, etc., and to prevent any damage from occurring to existing construction and improvements, vehicles, etc., on or adjacent to Owner's property. It is anticipated this will include in part, temporarily covering materials and exterior openings, other than exterior materials, metal, glass and other surfaces which are to be cleaned, and other protection materials as necessary to prevent damage and/or discoloration to any other adjacent existing materials, glass, vehicles, etc.
 - 2. Temporarily relocate any on-site items (i.e.: any benches, metal trash cans, etc.) which can be moved by hand; and re-set back in place after cleaning.
 - 3. Only use cleaning materials and methods appropriate for surfaces to be cleaned.
- B. Cleaning work includes in part, the following, and as otherwise indicated on the Drawings:
 - 1. Removal by cleaning any oil/grease, discoloration, rust and similar markings/coatings on existing materials (prior to pressure washing the entire area where such stains occur.)
 - 2. Removal by cleaning of any earth stains, and mold, mildew, plant and any similar growth.
 - a. Removal of roots which have grown into joints, below and on top of materials to be cleaned and their contiguous joints.
 - 3. Removal of existing joint sealants where they have become loose and unadhered at all exterior locations (vertical and horizontal) of granite panels, windows, storefront, curtain wall, stucco, concrete and metal wall panels and resealing of sealant joints to match existing sealant, color and tooling. Joint sealants are specified in Division 7 Section "Joint Sealers".

1.3 QUALITY ASSURANCE:

- A. Cleaning and Restoration Specialist: Work must be performed by a firm having not less than 5 verifiable years successful experience in comparable cleaning and restoration projects and employing personnel trained and skilled in the processes, operations, and products indicated.
 - 1. Refer to Division 1 Section "Special Conditions" for additional information and minimum experience requirements.
- B. Source of Materials:
 - 1. Obtain materials for cleaning and restoration from a single source for each type material required, to ensure match of quality, color and texture.

1.4 SUBMITTALS:

- A. Product Data:
 - 1. Submit manufacturers' technical data for each product indicated including recommendations for their application and use for this project. Include test reports and certifications substantiating that products comply with requirements.
- B. Samples:
 - 1. Submit, for verification purposes, each type and color of sealant, in form of 6" long by ½" wide sample strips of mortar set in aluminum or plastic channels, and sealant in either ¼" beads on neutral color hardboard or as fill in between masonry or concrete masonry on their sample boards.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver materials to site in manufacturer's original and unopened containers and packaging, bearing labels as to type and names of products and manufacturers.
- B. Protect cleaning and restoration materials during storage and construction from wetting by rain, snow or ground water, and from staining or intermixture with other types of materials.
- C. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and minimum requirements for stored materials.

1.6 PROJECT CONDITIONS:

- A. Clean metal, glass and other surfaces only when air temperatures are 40 deg. F. (4 deg. C) and above and will remain so until they have dried out, but for not less than 7 days after completion of cleaning.

- B. Protect sills, ledges, projections, and all adjacent materials and finishes from sealant droppings and residue.

1.7 SEQUENCING/SCHEDULING

- A. Perform metal, glass and other restoration work in the following sequence:
 - 1. Temporarily relocate any on-site items (i.e.: any benches, metal trash cans, etc.,) which can be moved by hand; and re-set back in place after cleaning.
 - 2. Install required pedestrian tunnels
 - 3. Rake-out existing sealant from joints that is loose or has become unadhered, resealed, clean and prepare for new backer rod and sealant.
 - 4. Remove rust and other stains.
 - 5. Clean existing surfaces utilizing pressure-washer and specified cleaner appropriate and approved for material to be cleaned.
 - 6. Install backer rod and sealant joints where required.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS AND EQUIPMENT:

- A. Water for Cleaning: Clean, potable, and free of oils, acids, alkalis, salts, and organic matter.
- B. Light Pressure Water Wash: Lightly pressure water wash as needed to remove dirt, stains, efflorescence, and mold, mildew, plant and any similar growth, and any cleaners and residue.
 - 1. **Care shall be taken not to damage existing metal, windows, glass, louvers, and sealant installations**, or any other surrounding materials, which are to remain, and not to allow any moisture or water penetration through existing materials, including in part, stone, metal and glass.
- D. Exterior Restoration Cleaner - Typical: Provide preapproved equivalent to "Sure Klean Light Duty Restoration Cleaner", as manufactured by PROSOCO, Inc.; Lawrence, Kansas. Or other cleaners as appropriate for the surface or surfaces to be cleaned.

2.2 ADDITIONAL MATERIALS:

- A. Sealant: Refer to Division 7 Section "Joint Sealers".

PART 3 - EXECUTION

3.1 PREPARATION:

- A. General: Comply with current written instructions and recommendations of manufacturers of cleaners, pressure washers; concrete, metal, glass and other surfaces products, and sealants - for preparation, application and protection of finished work, as well as for protection of buildings and other adjacent surfaces against damage from exposure to their products.
- B. Protect persons, motor vehicles, surrounding materials and surfaces of buildings which could be affected by the Work of this project and the work of this Section, which shall include the buildings' sites, and surrounding buildings and improvements from damage or injury resulting from this cleaning and restoration work.
 - 1. Prevent water cleaning solutions from coming into contact with pedestrians, motor vehicles, landscaping, buildings and other interior and exterior materials, finishes and surfaces which could be damaged by such contact.
 - 2. Do not clean metal, glass and other surfaces during winds of sufficient force to spread cleaning materials to unprotected surfaces.
 - 3. Dispose of run-off from cleaning operations by legal means and in manner which prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.
- C. Protect glass, painted and unpainted metal and trim, finishes, concrete, and stone, from contact with any acidic chemical cleaners by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape. Apply any films and masking tape to comply with manufacturer's recommendations.
- D. Temporarily relocate any on-site items (i.e.: any benches, metal trash cans, etc.,) which can be moved by hand; and re-set back in place after cleaning.

3.2 CLEANING EXISTING METAL, GLASS AND OTHER SURFACES, GENERAL:

- A. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other.
- B. Use only those cleaning methods indicated for each material and location.
- C. Perform each cleaning method indicated in a manner which results in uniform coverage of all surfaces, including corners, moldings, interstices and which produces an even effect without streaking or damage to metal, glass or other surfaces.
- D. Rinse off chemical residue and soil by working upwards from bottom to top of each treated area at each stage or scaffold setting.
- E. Removal of Stains, Earth Stains, Rust Stains, Mold, Mildew and Plant Growth:
 - 1. Remove mold, mildew, plant and moss growth completely from metal, glass, louvers and any surfaces to be cleaned. Carefully remove plants, creepers and vegetation

by cutting at roots and allowing to dry as long as possible prior to removal. Remove loose soil or debris from open joints to whatever depth it occurs.

3.3 CLEANING METAL, GLASS AND OTHER SURFACES:

- A. Warm Water Wash: At locations indicated, clean metals, glass, louvers and any surfaces to be cleaned, joints and other surfaces, with warm water applied as follows:
 - 1. Unless preapproved as the result of sample panels/mock-ups that existing mortar, grout and sealant; and concrete, masonry, stone, windows, glass, louvers and other surfaces to be cleaned; and/or adjacent materials will sustain light pressure washing without damage, clean with brush by hand.
 - 2. Clean metal surfaces with light pressure wash or by hand.

3.4 JOINT SEALERS:

- A. Remove existing joint sealants, backer rods, and sealant residue which has become loose or un-adhered.
- B. Clean joint surfaces, mask-off adjacent surfaces, install backer rods and bond breakers, and reseal all existing sealant joints as required, and any joints where sealant is missing from originally sealed joints, water-tight, as specified in Division 7 Section "Joint Sealers", and in strict accordance with sealant manufacturer's current written instructions and recommendations. Tool joints to match similar and adjacent existing.

3.5 PROTECTIONS:

- A. Protection: Provide final protection and maintain conditions, in a manner acceptable to Contractor/Subcontractor, that ensure cleaning and restoration work is without soiling, damage and deterioration at time of Substantial Completion.

END OF GLASS, CURTAINWALL & METAL CLEANING

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SECTION 03 3000

CAST-IN-PLACE CONCRETE

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 cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
 - 1. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.
 - 2. Section 321313 "Concrete Paving" for concrete pavement and walks.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar

diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - a. Form release agent does not interfere with or adversely affect the adhesion of the waterproofing.
 - 4. Steel reinforcement and accessories including rebar couplers
 - 5. Fiber reinforcement.
 - 6. Waterstops.
 - 7. Curing compounds.
 - a. Curing compound does not interfere with bonding of floor covering, waterproofing, or roofing system used on Project.
 - 8. Floor and slab treatments.
 - 9. Bonding agents.
 - 10. Adhesives.
 - 11. Vapor retarders.
 - 12. Semirigid joint filler.
 - 13. Joint-filler strips.
 - 14. Repair materials.
- C. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Aggregates
- D. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that which is required for this project and whose work has resulted in construction with a record of successful in-service performance. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed 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."

- B. Testing Agency Qualifications: An independent agency 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.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage

1.9 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and as follows:
 - 1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301 (ACI 301M).
 - 2. ACI 117 (ACI 117M).

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - b. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
 - 3. For exposed Painted surfaces use any approved form-facing panels appropriate to providing the Specified final finish. Use form-facing panels that do not leave residue detrimental to the function or visual appearance of the coating applied to the finished concrete.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces. Product should not adversely affect the adhesion of the perimeter foundation waterproofing.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

- F. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150/C 150M, Type I/II
 - 2. Fly Ash: ASTM C 618, Class F or C.
- C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source

1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Air-Entraining Admixture: ASTM C 260/C 260M.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 3. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
- F. Water: ASTM C 94/C 94M and potable.

2.6 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A, except with water-vapor permeance, not more than 0.012 perms in accordance with ASTM E 154 Sections 8,11, 12, 13 . Provide vapor retarder manufacturer's adhesive, sealants, mastics, pressure-sensitive tape and other accessories recommended by manufacturer.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Fortifiber Building Systems Group; Moistop Ultra 15.
 - b. Insulation Solutions, Inc.; Viper VaporCheck 15 mils.
 - c. Meadows, W. R., Inc.; Perminator 15 mil.
 - d. Raven Industries Inc.; Vapor Block VB15
 - e. Stego Industries, LLC; Stego Wrap 15 mil Class A.

2.7 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
 1. Provide a product approved by the waterproofing manufacturer to assure that the product does not adversely affect the adherence of the waterproofing.

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

2.8 RELATED MATERIALS AND ACCESSORIES

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, according to ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Metal Keyways: 24-gauge, hot dipped galvanized steel with dowel rod knockouts; removable cap that holds metal component of keyway below surface of slab allowing clear depth between top of metal and top of concrete to install of sealant and backer.

2.9 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash: 20 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability and as specified on drawings and schedules.

2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings and Foundation Walls: Normal-weight concrete.

1. Minimum Compressive Strength: 3,000 psi (20.7 MPa) at 28 days.
2. Maximum W/C Ratio: 0.51
3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch (38-mm) nominal maximum aggregate size.

B. Slabs on Grade: Normal-weight concrete.

1. Minimum Compressive Strength: 3,000 psi (20.7 MPa) at 28 days.
2. Maximum W/C Ratio: 0.49
3. Minimum Cementitious Materials Content: 470 lb/cu. yd. (279 kg/cu. m).
4. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.11 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
 - 2. Class C, 1/2 inch (13 mm) for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing materials are not acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Provide sheet vapor retarders under all slabs on grade interior to the building perimeter and on vertical walls where indicated.
 - 2. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

3. Seal all openings, penetrations, and perimeter edges. Use only manufacturer's recommended tape, sealant or mastic. Openings, penetrations and perimeter edges that become unsealed shall be repaired to provide uninterrupted vapor-retarder membrane.
 4. Adjust sheet flat to receive tape at joints without allowing fishmouths in tape or sheet.
 5. Do not allow dirt or debris between tape and sheet.
 6. Using a hard roller or other suitable method firmly seal tape to substrate.
- B. Vertical installation of sheet vapor retarders:
1. Prepare wall surface free of projections, rough surfaces or other materials that could cause penetration of the sheet.
 2. Provide fill material against sheet vapor retarder that is free of material or objects that could cause damage or other penetration of the sheet.
 3. Control fill and compaction against sheet allowing sheet to maintain shape against wall surface without dislodgement or damage.

3.5 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 - 3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 4. Space vertical joints in walls at 60-ft on center maximum. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
 - 3. Metal key way: Where shown on the drawings form contraction joints with metal key way provided with removable cap. Set metal portion below surface of the concrete such that when the removable cap is removed the remaining void can be filled with sealant and backer material.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.8 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view, or to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated to receive Paint Finish:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 - 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1-part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in one direction.

1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings, to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
 1. Apply float finish to surfaces indicated to receive trowel finish
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 1. Apply a trowel finish to surfaces indicated or exposed to view or to be covered with resilient flooring, carpet, paint, or another thin-film-finish coating system
 - a. For resinous flooring apply surface finish and profile in accordance with resin manufacturer's recommendations.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated, where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
 1. Coordinate sizes and locations of concrete bases with actual equipment provided.

2. Construct concrete bases 6 inches ((150 mm)) high unless otherwise indicated, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated.
3. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.11 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 (ACI 301M) for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m 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.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 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 (300-mm) lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends

lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

- a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
- a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless curing compound manufacturer certifies, and flooring manufacturer accepts such certification, that curing compound does not interfere with bonding of floor covering used on Project.
 - b. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless curing compound manufacturer certifies, and waterproofing manufacturer accepts such certification, that curing compound does not interfere with bonding of waterproofing covering used on Project.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 1. Defer joint filling until concrete has aged at least one month(s) but not less than recommended by sealant manufacturer. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's

written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish blending with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
1. Steel reinforcement placement.
 2. Headed bolts and studs.
 3. Verification of use of required design mixture.
 4. Concrete placement, including conveying and depositing.
 5. Curing procedures and maintenance of curing temperature.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing provides 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.
3. 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.
4. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
6. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
9. 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 28-day tests.
10. 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.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting

agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.

12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 03 3000

SECTION 03 3100

SITE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY:

- A. Section Includes:
 - 1. Formwork.
 - 2. Reinforcing.
 - 3. Cast-in place concrete including mix design, placement procedures, and finishes.
- B. Cast-in-place concrete includes the following:
 - 1. Foundations and footings.
 - 2. Slabs-on-grade.
 - 3. Equipment pads and bases.
- C. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- D. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 31 2000, "Earthwork": Drainage fill under slabs on grade.
 - 2. Section 32 1313, "Concrete Paving": Concrete paving and walks.
 - 3. Section 07 9200, "Joint Sealants": Sealants and joint fillers in concrete work.

1.2 SUBMITTALS:

- A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others if requested by Architect.
- C. Shop drawings for reinforcement detailing fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, bent bar diagrams, and arrangement of concrete reinforcement. Include special reinforcing required for openings through concrete structures.

- D. Samples of materials as requested by Architect, including names, sources, and descriptions, as follows:
 - 1. Color finishes.
 - 2. Normal weight aggregates.
- E. Laboratory test reports for concrete materials and mix design test.
- F. Minutes of pre-installation conference.

1.3 **QUALITY ASSURANCE:**

- A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 - 1. ACI 301, "Specifications for Structural Concrete for Buildings".
 - 2. ACI 302, "Guide for Concrete Floor and Slab Construction".
 - 3. ACI 304, "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".
 - 4. ACI 305, "Hot Weather Concreting".
 - 5. ACI 306, "Cold Weather Concreting".
 - 6. ACI 309, "Guide for Consolidation of Concrete".
 - 7. ACI 311, "Recommended Practice for Concrete Inspection".
 - 8. ACI 318, "Building Code Requirements for Reinforced Concrete".
 - 9. ACI 347, "Recommended Practice for Concrete Formwork".
 - 10. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice."
 - 11. American Welding Society, AWS D1.4 "Structural Welding Code - Reinforcing Steel".
- B. Concrete Testing Service: Engage a testing agency acceptable to Architect to perform material evaluation tests and to design concrete mixes.
- C. Materials and installed work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed Work, shall be done at Contractor's expense.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings" and the following:
 - 1. At least 35 days prior to submitting design mixes, conduct a meeting to review detailed requirements for preparing concrete design mixes and to determine procedures for satisfactory concrete operations. Review requirements for submittals, status of coordinating work, and availability of materials. Establish preliminary work progress schedule and procedures for materials inspection, testing, and certifications. Require representatives of each entity directly concerned with cast-in-place concrete to attend conference, including, but not limited to, the following:

- a. Contractor's superintendent.
- b. Agency responsible for concrete design mixes.
- c. Agency responsible for field quality control.
- d. Ready-mix concrete producer.
- e. Concrete subcontractor.
- f. Primary admixture manufacturers.

PART 2 - PRODUCTS

2.1 FORM MATERIALS:

- A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
 1. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form," Class I.
 2. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood," Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
- B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Form Liner: Pattern 16020 Rough Sawn Plank, Rough Grain Plank, horizontal orientation by Fitzgerald Formliners, or equal – Concrete walls at monumental stair. Coordinate location with architectural drawings.
- D. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- E. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches to the plane of the exposed concrete surface.
- F. Provide ties that, when removed, will leave holes not larger than 1 inch in diameter in the concrete surface.

2.2 **REINFORCING MATERIALS:**

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Steel Wire: ASTM A 82, plain, cold-drawn steel.
- C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.
- D. Deformed-Steel Welded Wire Fabric: ASTM A 497.
- E. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.
 - 1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are protected by plastic (CRSI, Class 1) or stainless steel (CRSI, Class 2).
- F. Threaded Dowels: Continuous threaded high-strength steel bars equal to "Lasstud" by Richmond Screw Anchor Co., Inc. Provide inserts compatible with dowels, designed for ultimate pull-out force indicated on the drawings.
- G. Mechanical Splices: Equal to "Cadweld Rebar Splices", as manufactured by Erico Products, Inc., "C" Series, for developing 125% of minimum ASTM specified yield strengths, unless otherwise noted on drawings.
- H. Steel Shapes, Plates and Rods: Conform to ASTM A 36, "Specification for Structural Steel".
- I. Do Not Weld Reinforcing Steel: Unless specifically noted on drawings. If welding is shown, conform to latest revision of AWS D12.1, "Reinforcing Steel Welding Code of the American Welding Society". Perform all welding with certified welders qualified per AWS.

2.3 **CONCRETE MATERIALS:**

- A. Portland Cement: ASTM C 150, Type I.
 - 1. Use one brand of cement throughout Project unless otherwise acceptable to Architect.
- B. Fly Ash: ASTM C 618, Type F or C.
 - 1. Limit use of fly ash to not exceed 20 percent of cement content by weight.

- C. Normal-Weight Aggregates: ASTM C 33 and as specified. Provide aggregates from a single source for exposed concrete.
 - 1. For exposed exterior surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.
 - 2. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Architect.
- D. Water: Potable.
- E. Admixtures, General: Provide concrete admixtures that contain not more than 0.1 percent chloride ions.
- F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Air-Tite, Cormix Construction Chemicals.
 - b. Air-Mix or Perma-Air, Euclid Chemical Co.
 - c. Darex AEA or Daravair, W.R. Grace & Co.
 - d. MB-VR or Micro-Air, Master Builders, Inc.
 - e. Sealtight AEA, W.R. Meadows, Inc.
 - f. Sika AER, Sika Corp.
- G. Water-Reducing Admixture: ASTM C 494, Type A.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. PSI N, Cormix Construction Chemicals.
 - b. Eucon WR-75, Euclid Chemical Co.
 - c. WRDA, W.R. Grace & Co.
 - d. Pozzolith Normal or Polyheed, Master Builders, Inc.
 - e. Plastocrete 161, Sika Corp.
- H. High-Range Water-Reducing Admixture: ASTM C 494, Type F or Type G.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Eucon 37, Euclid Chemical Co.
 - b. WRDA 19 or Daracem, W.R. Grace & Co.
 - c. Rheobuild or Polyheed, Master Builders, Inc.
 - d. Sikament 300, Sika Corp.

- I. Water-Reducing, Accelerating Admixture: ASTM C 494, Type E.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Accelguard 80, Euclid Chemical Co.
 - b. Daraset, W.R. Grace & Co.
 - c. Pozzutec 20, Master Builders, Inc.
- J. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Eucon Retarder 75, Euclid Chemical Co.
 - b. Daratard-17, W.R. Grace & Co.
 - c. Pozzolith R, Master Builders, Inc.
 - d. Protard, Prokrete Industries.
 - e. Plastiment, Sika Corporation.

2.4 **PROPORTIONING AND DESIGNING MIXES:**

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial mixtures or field experience methods as specified in ACI 318-89 Section 5.3. If trial mixtures method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing, unless otherwise acceptable to Architect.
- B. Trial mix designs and strength tests, made by qualified independent material laboratory, in accordance with ACI 318-89 Section 5.3 are required for the following types of concrete:
 - 1. Normal weight concrete with specified strength in excess of 4000 psi.
 - 2. All concrete designs for which a suitable experience record is not available.
- C. Mix design based on a record of past performance in accordance with ACI 318-89 Section 5.3, may be provided by qualified concrete supplier or precast concrete manufacturer for concrete designs. Mix design shall be certified by an independent testing laboratory.
- D. All concrete mix designs shall include the following information:
 - 1. Proportions of cement, fine and coarse aggregate and water.
 - 2. Water/cement ratio, design strength, slump and air content.
 - 3. Type of cement and aggregates.
 - 4. Type and dosage of all admixtures.
 - 5. Type, color and dosage of integral coloring compounds, where applicable.
 - 6. Special requirements for pumping.
 - 7. Any special characteristics of the mix which require precautions in the mixing, placing or finishing techniques to achieve the finished product specified.

- E. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by Architect.
- F. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:
 - 1. Subjected to freezing and thawing: W/C 0.45.
 - 2. Subjected to deicers/watertight: W/C 0.40.
 - 3. Subjected to brackish water, salt spray, or deicers: W/C 0.40.
- G. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
 - 1. Ramps and sloping surfaces: Not more than 3 inches.
 - 2. Reinforced foundation systems: Not less than 1 inch and not more than 3 inches.
 - 3. Concrete containing high-range water-reducing admixture (superplasticizer): Not more than 8 inches after adding admixture to site-verified 2-to-3-inch slump concrete.
 - 4. Other concrete: Not less than 3 inches and not more than 5 inches.

2.5 **ADMIXTURES:**

- A. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
- B. Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg.F (10 deg.C).
- C. Use high-range water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs, architectural concrete, parking structure slabs, concrete required to be watertight, and concrete with water-cement ratios below 0.50.
- D. Use air-entraining admixture in exterior exposed concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1-1/2 percent within the following limits:
 - 1. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or hydraulic pressure:
 - a. 4.5 percent (moderate exposure); 5.5 percent (severe exposure) for 1-1/2-inch maximum aggregate.
 - b. 4.5 percent (moderate exposure); 6.0 percent (severe exposure) for 1-inch maximum aggregate.
 - c. 5.0 percent (moderate exposure); 6.0 percent (severe exposure) for 3/4-inch maximum aggregate.

- d. 5.5 percent (moderate exposure); 7.0 percent (severe exposure) for 1/2-inch maximum aggregate.
 - 2. Other concrete not exposed to freezing, thawing, or hydraulic pressure, or to receive a surface hardener: 2 to 4 percent air.
- E. Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

2.6 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.
- 1. When air temperature is between 85 deg.F (30 deg.C) and 90 deg.F (32 deg.C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg.F (32 deg.C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 GENERAL:

- A. Coordinate the installation of joint materials, vapor retarder/barrier, and other related materials with placement of forms and reinforcing steel.

3.2 FORMS:

- A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits:
- 1. Provide Class A tolerances for concrete surfaces exposed to view.
 - 2. Provide Class C tolerances for other concrete surfaces.
- B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.
- C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.

- D. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- E. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- F. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.3 **PLACING REINFORCEMENT:**

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.
 - 1. Avoiding cutting or puncturing vapor retarder/barrier during reinforcement placement and concreting operations. Repair damages before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Architect.
- D. Place reinforcement to maintain minimum coverages as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.4 **JOINTS:**

- A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Architect.
- B. Provide keyways at least 1-1/2 inches deep in construction joints in walls and slabs and between walls and footings. Bulkheads designed and accepted for this purpose may be used for slabs.
- C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.
- D. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- E. Isolation Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Joint fillers and sealants are specified in Section 07 9200 - "Joint Sealants".
- F. Contraction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels of patterns as shown. Use saw cuts 1/8 inch wide by one-fourth of slab depth or inserts 1/4 inch wide by one-fourth of slab depth, unless otherwise indicated.
 - 1. Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.
 - 2. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
 - 3. If joint pattern is not shown, provide joints not exceeding 15 feet in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).
 - 4. Joint fillers and sealants are specified in Division 7 Section "Joint Sealants."

3.5 **PREPARING FORM SURFACES:**

- A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before placing reinforcement.
- B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.

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

3.6 **CONCRETE PLACEMENT:**

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.
- D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
 1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.
- E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.
 1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
 2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
 3. Maintain reinforcing in proper position on chairs during concrete placement.

- F. Cold-Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
- G. When air temperature has fallen to or is expected to fall below 40 deg.F (4 deg.C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg.F (10 deg.C) and not more than 80 deg.F (27 deg.C) at point of placement.
 - 1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- H. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.
 - 1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg.F (32 deg.C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
 - 3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
 - 4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Architect.

3.7 **FINISHING FORMED SURFACES:**

- A. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.
- B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or another similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.

- C. Smooth-Rubbed Finish: Provide smooth-rubbed finish on scheduled concrete surfaces that have received smooth-formed finish treatment not later than 1 day after form removal.
 - 1. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 **MONOLITHIC SLAB FINISHES:**

- A. Scratch Finish: Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and where indicated.
 - 1. After placing slabs, finish surface to tolerances specified in Section 3.11. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.
- B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and where indicated.
 - 1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Finish surfaces to tolerances specified in Section 3.11. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- C. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or another thin film-finish coating system.
 - 1. After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances specified in Section 3.11. Grind smooth any surface defects that would telegraph through applied floor covering system.

- D. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply a trowel finish as specified, then immediately follow by slightly scarifying the surface with a fine broom.
- E. Nonslip Broom Finish: Apply a nonslip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- F. Colored Wear-Resistant Finish: Apply a colored wear-resistant finish to monolithic slab surface indicated.
1. Apply dry shake materials for the colored wear-resistant finish at a rate of 100 lb per 100 sq. ft., unless a greater amount is recommended by material manufacturer.
 2. Cast a trial slab approximately 10 feet square to determine actual application rate, color, and finish, as acceptable to Architect.
 3. Immediately following the first floating operation, uniformly distribute with mechanical spreader approximately two-thirds of the required weight of the dry shake material over the concrete surface, and embed by power floating. Follow floating operation with second shake application, uniformly distributing remainder of dry shake material with overlapping applications to ensure uniform color, and embed by power floating.
 4. After broadcasting and floating, apply a trowel finish as specified. Cure slab surface with a curing compound recommended by the dry shake material manufacturer. Apply the curing compound immediately after the final finishing.

3.9 FLOOR FLATNESS/LEVELNESS REQUIREMENTS:

- A. After placing slabs, finish surface to the following tolerances of F(F) (floor flatness) and F(L) (floor levelness) measured according to ASTM E 1155:

FINISH	SLAB-ON-GRADE				FRAMED FLOOR	
	OVERALL		LOCAL		OVERALL	LOCAL
	FF	FL	FF	FL	FF	FL
Scratch Finish	18	15	15	13	25	22
Float Finish	20	17	18	15	25	22
Trowel Finish	25	22	20	17	25	22

Specified overall F-numbers apply to the whole floor, taken as one. Minimum local F-numbers apply to each slab, bounded by construction joints.

3.10 MISCELLANEOUS CONCRETE ITEMS:

- A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.11 CONCRETE CURING AND PROTECTION:

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.
- B. No curing agents or sealers are to be applied to the concrete slab where Resilient Athletic Flooring is scheduled.
- C. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
- D. Curing Methods: Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.
 - 1. Provide moisture curing by the following methods:
 - a. Keep concrete surface continuously wet by covering with water.
 - b. Use continuous water-fog spray.
 - c. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4-inch lap over adjacent absorptive covers.
 - 2. Provide moisture-retaining cover curing as follows:
 - a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Apply curing compound on exposed interior slabs and on exterior slabs, walks, and curbs as follows:
 - a. Apply curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - b. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.
- E. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- F. Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by applying the appropriate curing method.
 1. Final cure concrete surfaces to receive finish flooring with a moisture-retaining cover, unless otherwise directed.

3.12 **REMOVING FORMS:**

- A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg.F (10 deg.C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days or until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.
- C. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

3.13 **REUSING FORMS:**

- A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

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

3.14 CONCRETE SURFACE REPAIRS:

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Architect.
- B. Mix dry-pack mortar, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.
 - 1. Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.
 - 2. For surfaces exposed to view, blend white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
- C. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.
 - 1. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.
 - 1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.
 - 2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.

3. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Architect.
 4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- E. Perform structural repairs with prior approval of Architect for method and procedure, using specified epoxy adhesive and mortar.
- F. Repair methods not specified above may be used, subject to acceptance of Architect.

3.15 QUALITY CONTROL TESTING DURING CONSTRUCTION:

- A. General: The Owner will employ a testing agency to perform tests and to submit test reports.
- B. Sampling and testing for quality control during concrete placement may include the following, as directed by Architect.
1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
 - a. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 - b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
 - c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg.F (4 deg.C) and below, when 80 deg.F (27 deg.C) and above, and one test for each set of compressive-strength specimens.
 - d. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
- C. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. more than the first 25 cu. yd. of each concrete class placed in any one day, or for each 5000 sq ft of surface are placed; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

1. Any additional cylinder required by the Contractor for early strength gain tests for form stripping or post-tensioning are Contractor's responsibility and shall be paid for by Contractor.
2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
3. When total quantity of a given class of concrete is less than 50 cu. yd., Architect may waive strength testing if adequate evidence of satisfactory strength is provided.
4. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
5. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
6. Test results will be reported in writing to Architect, Structural Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.
7. 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.
8. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

END OF CAST-IN-PLACE CONCRETE

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SECTION 04 0120.62

MAINTENANCE OF UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. Related Sections:
 - .. Section 04200 - "Unit Masonry"

1.2 SUMMARY:

- A. Section includes maintenance of unit masonry consisting of brick clay masonry cleaning as follows:
 - 1. Preliminary cleaning, including removing plant growth.
 - 2. Cleaning exposed unit masonry surfaces.

1.3 DEFINITIONS:

- A. Very Low-Pressure Spray: Under 100 psi.
- B. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.
- C. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.
- D. High-Pressure Spray: 800 to 1200 psi; 4 to 6 gpm.
- E. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of masonry units to freezing and thawing.

1.4 SUBMITTALS:

- A. Product Data: For each type of chemical cleaner. Include recommendations for application and use. Include test data substantiating that products comply with requirements.
- B. Cleaning Program.

1.5 QUALITY ASSURANCE:

- A. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used, protection of surrounding materials, and control of runoff during operations.
 - 1. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.
- B. Cleaning Appearance Standard: Cleaned surfaces are to have a uniform appearance as viewed from 50 feet away by Architect. Perform additional paint and stain removal, general cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.
 - 1. Cleaning: Clean an area approximately 100 sq. ft. for each type of masonry surface condition.
 - a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not use cleaners and methods known to have deleterious effect.
 - b. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample areas for negative reactions.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- C. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to masonry cleaning including, but not limited to, the following:
 - a. Construction schedule. Verify availability of materials, Restoration Specialist's personnel, equipment, and facilities needed to make progress and avoid delays.

1.6 PROJECT CONDITIONS:

- A. Weather Limitations: Proceed with work only when existing and forecasted weather conditions permit masonry cleaning work to be performed according to cleaner and equipment manufacturers' written instructions and specified requirements.

- B. Clean masonry surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least 7 days after completion of cleaning.

1.7 COORDINATION:

- A. Coordinate masonry cleaning with public circulation patterns at Project site. Some work is near public circulation patterns. Public circulation patterns cannot be closed off entirely, and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

1.8 SEQUENCING AND SCHEDULING:

- A. Perform masonry cleaning work in the following sequence:
 - 1. Remove plant growth.
 - 2. Clean masonry surfaces.

PART 2 - PRODUCTS

2.1 PAINT REMOVERS:

- A. Alkaline Paste Paint Remover: Manufacturer's standard alkaline paste formulation for removing paint coatings from masonry.
 - 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. ABR Products, Inc.; 800 Brush Grade.
 - b. Diedrich Technologies Inc.; 606 Multi-Layer Paint Remover or 606X Extra Thick Multi-Layer Paint Remover.
 - c. Hydroclean, Hydrochemical Techniques, Inc.; Hydroclean HT-716 Heavy Duty Paint Remover.
 - d. Price Research, Ltd.; Price Heavy Duty Paint Stripper.
 - e. PROSOCO; Enviro Klean Safety Peel 2, Sure Klean Heavy-Duty Paint Stripper or Sure Klean Heavy-Duty Paint Stripper D.
- B. Solvent-Type Paint Remover: Manufacturer's standard water-rinse, solvent-type gel formulation for removing paint coatings from masonry.
 - 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. ABR Products, Inc.; Super Bio Strip Gel.
 - b. Diedrich Technologies Inc.; 505 Special Coatings Stripper.
 - c. Dumond Chemicals, Inc.; Peel Away 2.
 - d. Hydroclean, Hydrochemical Techniques, Inc.; Hydroclean HT-300 Solvent Paint Remover.

- e. Price Research, Ltd.; Price Strip-All.
 - f. PROSOCO; Sure Klean Fast Acting Stripper.
- C. Low-Odor, Solvent-Type Paint Remover: Manufacturer's standard low-odor, water-rinse solvent-type gel formulation, containing no methanol or methylene chloride, for removing paint coatings from masonry.
- 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. ABR Products, Inc.; Super Bio Strip Gel.
 - b. Cathedral Stone Products, Inc.; S-301, S-303, or S-305.
 - c. Dumond Chemicals, Inc.; Peel Away 6, Peel Away 7, or Peel Away 21.
 - d. PROSOCO; Enviro Klean Safety Peel 1 or Enviro Klean Safety Peel 3.

2.2 CLEANING MATERIALS:

- A. Water: Potable.
- B. Hot Water: Water heated to a temperature of 140 to 160 deg F.
- C. Job-Mixed Mold, Mildew, and Algae Remover: Solution prepared by mixing 2 cups of tetrasodium polyphosphate, 5 quarts of 5 percent sodium hypochlorite (bleach), and 15 quarts of hot water for every 5 gal. of solution required.

PART 3 - EXECUTION

3.1 PROTECTION:

- A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.
 - 1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.

3.2 CLEANING MASONRY, GENERAL:

- A. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water will not wash over cleaned, dry surfaces.
- B. Use only those cleaning methods indicated for each masonry material and location.

1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
 2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.
 - a. Equip units with pressure gages.
 3. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
 4. For high-pressure water-spray application, use fan-shaped spray tip that disperses water at an angle of at least 40 degrees.
 5. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.
- C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.
- D. Water Application Methods:
1. Water-Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches from surface of masonry and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.
- E. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.3 PRELIMINARY CLEANING:

- A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil and debris from open masonry joints to whatever depth they occur.
- B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, calking, asphalt, and tar.
1. Carefully remove heavy accumulations of material from surface of masonry with a sharp chisel. Do not scratch or chip masonry surface.
 2. Remove paint and calking with alkaline paint remover.
 - a. Comply with requirements in "Paint Removal" Article.
 - b. Repeat application up to two times if needed.
 3. Remove asphalt and tar with solvent-type paint remover.

- a. Comply with requirements in "Paint Removal" Article.
- b. Apply paint remover only to asphalt and tar by brush without pre-wetting.
- c. Allow paint remover to remain on surface for 10 to 30 minutes.
- d. Repeat application if needed.

3.4 PAINT REMOVAL:

A. Paint Removal with Covered or Skin-Forming Alkaline Paint Remover:

1. Remove loose and peeling paint using high-pressure spray, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
2. Apply paint remover to dry, painted masonry with trowel, spatula, or as recommended by manufacturer.
3. Apply cover, if required by manufacturer, per manufacturer's written instructions.
4. Allow paint remover to remain on surface for period recommended by manufacturer or as determined in test panels.
5. Scrape off paint and remover and collect for disposal.
6. Rinse with cold water applied by low-pressure spray to remove chemicals and paint residue.
7. Use alkaline paste paint remover, according to "Paint Removal with Alkaline Paste Paint Remover" Paragraph, if necessary to remove remaining paint.
8. Apply acidic cleaner or manufacturer's recommended afterwash to masonry, while surface is still wet, using low-pressure spray equipment or soft-fiber brush. Let cleaner or afterwash remain on surface as a neutralizing agent for period recommended by chemical-cleaner or afterwash manufacturer.
9. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.

B. Paint Removal with Solvent-Type Paint Remover:

1. Remove loose and peeling paint using high-pressure spray, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
2. Apply thick coating of paint remover to painted masonry with natural-fiber cleaning brush, deep-nap roller, or large paint brush.
3. Allow paint remover to remain on surface for period recommended by manufacturer. Agitate periodically with stiff-fiber brush.
4. Rinse with cold water applied by low-pressure spray to remove chemicals and paint residue.

3.5 CLEANING BRICKWORK:

A. Cold-Water Soak:

1. Apply cold water by intermittent spraying to keep surface moist.
2. Use perforated hoses or other means that will apply a fine water mist to entire surface being cleaned.

3. Apply water in cycles with at least 30 minutes between cycles.
 4. Continue spraying until surface encrustation has softened sufficiently to permit its removal by water wash, as indicated by cleaning tests.
 5. Continue spraying for 72 hours.
 6. Remove soil and softened surface encrustation from masonry with cold water applied by low-pressure spray.
- B. Cold-Water Wash: Use cold water applied by high-pressure spray.
- C. Hot-Water Wash: Use hot water applied by high-pressure spray.
- D. Mold, Mildew, and Algae Removal:
1. Wet masonry with hot water applied by low-pressure spray.
 2. Apply mold, mildew, and algae remover by brush or low-pressure spray.
 3. Scrub masonry with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used and that masonry surface remains wet.
 4. Rinse with cold water applied by low-pressure spray to remove mold, mildew, and algae remover and soil.
 5. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

3.6 FINAL CLEANING:

- A. Wash adjacent woodwork and other nonmasonry surfaces. Use detergent and soft brushes or cloths.
- B. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.

END OF MAINTENANCE OF UNIT MASONRY

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SECTION 04 01 20.63

BRICK MASONRY REPAIR

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. Repairing brick masonry.
- 2. Removing abandoned anchors.
- 3. Painting steel uncovered during the work.

B. Related Requirements:

- 1. Section 01 35 16 "Alteration Project Procedures" for general remodeling, renovation, repair, and maintenance requirements.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 01 22 00 "Unit Prices."
 - 1. Unit prices apply to additions to and deletions from Work as authorized by Change Orders.

1.4 DEFINITIONS

- A. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.
- B. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.
- C. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of bricks to freezing and thawing.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to brick masonry repair including, but not limited to, the following:
 - a. Verify brick masonry repair specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, sequencing, tolerances, and required clearances.
 - c. Quality-control program.
 - d. Coordination with building occupants.

1.6 SEQUENCING AND SCHEDULING

- A. Work Sequence: Perform brick masonry repair work in the following sequence, which includes work specified in this and other Sections:
 1. Remove plant growth.
 2. Inspect masonry for open mortar joints and point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 3. Remove paint.
 4. Clean masonry.
 5. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
 6. Repair masonry, including replacing existing masonry with new masonry materials.
 7. Rake out mortar from joints to be repointed.
 8. Point mortar and sealant joints.
 9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
 10. Where water repellents are to be used on or near masonry work, delay application of these chemicals until after pointing and cleaning.
- B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in bricks according to "Brick Masonry Patching" Article. Patch holes in mortar joints according to Section 04 01 20.64 "Brick Masonry Repointing."

1.7 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 2. Include recommendations for product application and use.
 3. Include test data substantiating that products comply with requirements.
- B. Shop Drawings:
 1. Include plans, elevations, sections, and locations of replacement bricks on the structure, showing relation of existing and new or relocated units.
 2. Show provisions for expansion joints or other sealant joints.

3. Show provisions for flashing, lighting fixtures, conduits, and weep holes as required.
4. Show locations of scaffolding and points of scaffolding in contact with masonry. Include details of each point of contact or anchorage.

C. Samples for Initial Selection: For the following:

1. Colored Mortar: Submit sets of mortar that will be left exposed in the form of sample mortar strips, 6 inches long by 1/2 inch wide, set in aluminum or plastic channels.
 - a. Have each set contain a close color range of at least six Samples of different mixes of colored sands and cements that produce a mortar matching existing, cleaned mortar when cured and dry.
 - b. Submit with precise measurements on ingredients, proportions, gradations, and source of colored sands from which each Sample was made.
2. Sand Types Used for Mortar: Minimum 8 oz. of each in plastic screw-top jars.
3. Patching Compound: Submit sets of patching compound Samples in the form of plugs (patches in drilled holes) in sample units of masonry representative of the range of masonry colors on the building.
 - a. Have each set contain a close color range of at least six Samples of different mixes of patching compound that matches the variations in existing masonry when cured and dry.
4. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For the following:

1. Each type of brick unit to be used for replacing existing units. Include sets of Samples to show the full range of shape, color, and texture to be expected. For each brick type, provide straps or panels containing at least four bricks. Include multiple straps for brick with a wide range.
2. Each type of patching compound in the form of briquettes, at least 3 inches long by 1-1/2 inches wide. Document each Sample with manufacturer and stock number or other information necessary to order additional material.
3. Accessories: Each type of accessory and miscellaneous support.

1.8 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For brick masonry repair specialist.
- B. Quality-control program.

1.9 QUALITY ASSURANCE

- A. Brick Masonry Repair Specialist Qualifications: Engage an experienced brick masonry repair firm to perform work of this Section. Firm shall have completed work similar in material, design, and

extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing masonry is insufficient experience for masonry repair work.

1. Field Supervision: Brick masonry repair specialist firm shall maintain experienced full-time supervisors on Project site during times that brick masonry repair work is in progress.
 2. Brick Masonry Repair Worker Qualifications: When bricks are being patched, assign at least one worker per crew who is trained and certified by manufacturer of patching compound to apply its products.
- B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising performance and preventing damage.
- C. Mockups: Prepare mockups of brick masonry repair to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation.
1. Masonry Repair: Prepare sample areas for each type of masonry repair work performed. If not otherwise indicated, size each mockup not smaller than two adjacent whole units or approximately 48 inches in least dimension. Construct sample areas in locations in existing walls where directed by Architect unless otherwise indicated. Demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:
 - a. Replacement: Four brick units replaced.
 - b. Patching: Three small holes at least 1 inch for each type of brick indicated to be patched.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver bricks to Project site strapped together in suitable packs or pallets or in heavy-duty cartons and protected against impact and chipping.
- B. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

- E. Store sand where grading and other required characteristics can be maintained and contamination avoided.
- F. Handle bricks to prevent overstressing, chipping, defacement, and other damage.

1.11 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit brick masonry repair work to be performed according to product manufacturers' written instructions and specified requirements.
- B. Temperature Limits: Repair brick masonry only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.
- C. Cold-Weather Requirements: Comply with the following procedures for masonry repair unless otherwise indicated:
 - 1. When air temperature is below 40 deg F, heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F.
 - 2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after repair.
- D. Hot-Weather Requirements: Protect masonry repairs when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.
- E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Source Limitations: Obtain each type of material for repairing brick masonry (brick, cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 MASONRY MATERIALS

- A. Face Brick: As required to complete brick masonry repair work.
 - 1. Brick Matching Existing: Units with colors, color variation within units, surface texture, size, and shape that match existing brickwork:

- a. For existing brickwork that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range and variation rather than brick that matches an individual color within that range.

2. Special Shapes:

- a. Provide molded, 100 percent solid shapes for applications where core holes or "frogs" could be exposed to view or weather when in final position and where shapes produced by sawing would result in sawed surfaces being exposed to view.
- b. Provide specially ground units, shaped to match patterns, for arches and where indicated.
- c. Mechanical chopping or breaking brick, or bonding pieces of brick together by adhesive, are unacceptable procedures for fabricating special shapes.

3. Tolerances as Fabricated: According to tolerance requirements in ASTM C216, Type FBX or Type FBS.

B. Building Brick: ASTM C62, of same vertical dimension as face brick, for masonry work concealed from view.

1. Grade SW where in contact with earth.
2. Grade SW, MW, or NW for concealed backup.

2.3 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type II, except Type III may be used for cold-weather construction; white or gray, or both where required for color matching of mortar.

1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Masonry Cement: ASTM C91/C91M.

D. Mortar Cement: ASTM C1329/C1329M.

E. Mortar Sand: ASTM C144.

1. Exposed Mortar: Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
2. Colored Mortar: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.

F. Mortar Pigments: ASTM C979/C979M, compounded for use in mortar mixes, and having a record of satisfactory performance in masonry mortars.

G. Water: Potable.

2.4 MANUFACTURED REPAIR MATERIALS

- A. Brick Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching brick masonry.
 - 1. Use formulation that is vapor and water permeable (equal to or more than the brick), exhibits low shrinkage, has lower modulus of elasticity than bricks being repaired, and develops high bond strength to all types of masonry.
 - 2. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.
 - 3. Formulate patching compound in colors and textures to match each brick being patched. Provide **[sufficient number of] [no fewer than three] <Insert number>** colors to enable matching of the color, texture, and variation of each unit.

2.5 ACCESSORY MATERIALS

- A. Setting Buttons and Shims: Resilient plastic, nonstaining to masonry, sized to suit joint thicknesses and bed depths of bricks, less the required depth of pointing materials unless removed before pointing.
- B. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.
- C. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer according to MPI #23 (surface-tolerant, anticorrosive metal primer) or SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating.
 - 1. Surface Preparation: Use coating requiring no better than SSPC-SP 3, "Power Tool Cleaning" or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning" surface preparation according to manufacturer's literature or certified statement.
 - 2. VOC Limit: Use coating with a VOC content of 400 g/L or less.
- D. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:
 - 1. Previous effectiveness in performing the work involved.
 - 2. Minimal possibility of damaging exposed surfaces.
 - 3. Consistency of each application.
 - 4. Uniformity of the resulting overall appearance.
 - 5. Do not use products or tools that could leave residue on surfaces.

2.6 MORTAR MIXES

- A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

- B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.
 - 1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black which is limited to 2 percent, unless otherwise demonstrated by a satisfactory history of performance.
- C. Do not use admixtures in mortar unless otherwise indicated.
- D. Mixes: Mix mortar materials in the following proportions:
 - 1. Rebuilding (Setting) Mortar by Volume: ASTM C270, Proportion Specification, 1 part portland cement, 1 part lime, and 6 parts sand.
 - 2. Rebuilding (Setting) Mortar by Type: ASTM C270, Proportion Specification, Type N unless otherwise indicated; with cementitious material limited to portland cement and lime.
 - 3. Rebuilding (Setting) Mortar by Property: ASTM C270, Property Specification, Type N unless otherwise indicated; with cementitious material limited to portland cement and lime.
 - 4. Pigmented, Colored Mortar: Add mortar pigments to produce exposed, setting (rebuilding) mortar of colors required.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Prevent mortar from staining face of surrounding masonry and other surfaces.
 - 1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
 - 2. Keep wall area wet below rebuilding and repair work to discourage mortar from adhering.
 - 3. Immediately remove mortar splatters in contact with exposed masonry and other surfaces.
- B. Remove gutters and downspouts and associated hardware adjacent to masonry and store during masonry repair. Reinstall when repairs are complete.
 - 1. Provide temporary rain drainage during work to direct water away from building.

3.2 MASONRY REPAIR, GENERAL

- A. Appearance Standard: Repaired surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.

3.3 BRICK REMOVAL AND REPLACEMENT

- A. Remove bricks that are damaged, spalled, or deteriorated. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.

1. When removing single bricks, remove material from center of brick and work toward outside edges.
- B. Support and protect remaining masonry that surrounds removal area.
- C. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
- D. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.
- E. Remove in an undamaged condition as many whole bricks as possible.
 1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
 2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
 3. Store brick for reuse. Store off ground, on skids, and protected from weather.
 4. Deliver cleaned brick not required for reuse to Owner unless otherwise indicated.
- F. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for brick replacement.
- G. Replace removed damaged brick with other removed brick in good condition, where possible, matching existing brick. Do not use broken units unless they can be cut to usable size.
- H. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
 1. Maintain joint width for replacement units to match existing joints.
 2. Use setting buttons or shims to set units accurately spaced with uniform joints.
- I. Lay replacement brick with rebuilding (setting) mortar and with completely filled bed, head, and collar joints. Butter ends with enough mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.
 1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
 2. Rake out mortar used for laying brick before mortar sets according to Section 040120.64 "Brick Masonry Repointing." Point at same time as repointing of surrounding area.
 3. When mortar is hard enough to support units, remove shims and other devices interfering with pointing of joints.
- J. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
 1. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

3.4 PAINTING STEEL UNCOVERED DURING THE WORK

- A. Notify Architect if steel is exposed during masonry removal. Where Architect determines that steel is structural, or for other reasons cannot be totally removed, prepare and paint it as follows:
 - 1. Surface Preparation: Remove paint, rust, and other contaminants according to SSPC-SP 3, "Power Tool Cleaning" or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning" as applicable to comply with paint manufacturer's recommended preparation.
 - 2. Antirust Coating: Immediately paint exposed steel with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application (dry film thickness per coat).
- B. If on inspection and rust removal, the thickness of a steel member is found to be reduced from rust by more than 1/16 inch, notify Architect before proceeding.

3.5 BRICK MASONRY PATCHING

- A. Patch the following bricks unless another type of repair or replacement is indicated:
 - 1. Bricks indicated to be patched.
 - 2. Bricks with holes.
 - 3. Bricks with chipped edges or corners.
 - 4. Bricks with small areas of deep deterioration.
- B. Remove and replace existing patches unless otherwise indicated or approved by Architect.
- C. Patching Bricks:
 - 1. Remove loose material from masonry surface. Carefully remove additional material so patch does not have feathered edges but has square or slightly undercut edges on area to be patched and is at least **1/4 inch** thick, but not less than recommended in writing by patching compound manufacturer.
 - 2. Mask adjacent mortar joint or rake out for repointing if patch extends to edge of brick.
 - 3. Mix patching compound in individual batches to match each unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.
 - 4. Rinse surface to be patched and leave damp, but without standing water.
 - 5. Brush-coat surfaces with slurry coat of patching compound according to manufacturer's written instructions.
 - 6. Place patching compound in layers as recommended in writing by patching compound manufacturer, but not less than 1/4 inch or more than 2 inches thick. Roughen surface of each layer to provide a key for next layer.
 - 7. Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of brick. Shape and finish surface before or after curing, as determined by testing, to best match existing brick.
 - 8. Keep each layer damp for 72 hours or until patching compound has set.
 - 9. Remove and replace patches with hairline cracks or that show separation from brick at edges, and those that do not match adjoining brick in color or texture.

3.6 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water applied by low-pressure spray.
 - 1. Do not use metal scrapers or brushes.
 - 2. Do not use acidic or alkaline cleaners.
- B. Clean adjacent nonmasonry surfaces. Use detergent and soft brushes or cloths.
- C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.
- D. Remove masking materials, leaving no residues that could trap dirt.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.
- B. Architect's Project Representatives: Architect will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Architect's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.

3.8 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property.
- B. Masonry Waste: Remove masonry waste and legally dispose of off Owner's property.

END OF SECTION 04 01 20.63

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SECTION 04 2000

UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units (CMUs).
 - 2. Mortar and grout.
 - 3. Ties and anchors.
 - 4. Embedded flashing.
 - 5. Miscellaneous masonry accessories.
- B. Products Installed but not Furnished under This Section:
 - 1. Wall insulation.
- C. Related Requirements:
 - 1. See Division 5 Section "Metal Fabrications".

1.3 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each type and color of the following:
 - 1. Accessories embedded in masonry.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of the following:

1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. Material Certificates: For each type of product indicated. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards
 2. Cementitious materials. Include name of manufacturer, brand name, and type.
 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 4. Grout mixes. Include description of type and proportions of ingredients.
 5. Reinforcing bars.
 6. Joint reinforcement.
 7. Anchors, ties, and metal accessories.
- B. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- C. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.
- D. Shop Drawings: For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. Mortar test for each mix required per ASTM C780
- C. Grout Test (compressive strength) for each mix required per ASTM C 1019.
- D. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects.
 1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 60 inches long by 48 inches high by full thickness.
 2. Build sample panels facing south.
 3. Clean one-half of exposed faces of panels with masonry cleaner indicated.
 4. Protect approved sample panels from the elements with weather-resistant membrane.

5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.

1.7 DELIVERY, STORAGE, AND HANDLING

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

1.8 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe, and hold cover in place.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.

3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

2.3 CONCRETE MASONRY UNITS (CMU's)

- A. Shapes: Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding and other special conditions as noted.
- B. Concrete Masonry Units: ASTM C90
 1. Unit Compressive Strength: Provide units with a minimum average net area compressive strength of 2000 psi.

2.4 Masonry Lintels

- A. Made from bond beam concrete masonry units or open bottom lintel blocks with reinforcing bars placed as indicated and filled with coarse grout.

2.5 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
 - 1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C 91/C 91M.
- E. Mortar Cement: ASTM C 1329/C 1329M.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Use only pigments with a record of satisfactory performance in masonry mortar.
- G. Colored Cement Products: Packaged blend made from portland cement and hydrated lime or masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 - 1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 - 2. Pigments shall not exceed 10 percent of portland cement by weight.
 - 3. Colored Mortar Allowance of \$12/Bag, with final selection as made by Architect. Allowance includes all delivery and handling charges; Allowance does not include taxes, labor or any related accessories. If a mortar of lesser value is selected, contractor shall issue to owner a deductive change order for the difference in the Allowance price and Actual price, and based on the actual quantity of brick used on project
- H. Aggregate for Mortar: ASTM C 144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

- I. Aggregate for Grout: ASTM C 404.
- J. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- K. Water: Potable.

2.6 REINFORCEMENT

- A. Uncoated steel reinforcing bars: ASTM A 615, Grade 60.
- B. Masonry Joint Reinforcement: ASTM A 951; hot dipped galvanized, carbon steel wire. 9 gage side and cross rods, ladder type.

2.7 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.

2.8 EMBEDDED FLASHING MATERIALS

- A. Flexible Flashing:
 - 1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Advanced Building Products Inc.; Peel-N-Seal.
 - 2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
 - 3) Dayton Superior Corporation, Dur-O-Wal Division; Dur-OBarrier Thru-Wall Flashing.
 - 4) Fiberweb, Clark Hammerbeam Corp.; Aquaflash 500.
 - 5) Grace Construction Products, W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
 - 6) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
 - 7) Hohmann & Barnard, Inc.; Textroflash.
 - 8) W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
 - 9) Polyguard Products, Inc.; Polyguard 300.
 - 10) Sandell Manufacturing Co., Inc.; Sando-Seal.

- 11) Williams Products, Inc.; Everlastic MF-40. Building Products Inc.; Cop-R-Cote.
 - b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
- B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

- A. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).
- B. Preformed Control-Joint Gaskets: Made from rubber compounds complying with ASTM D 2000 and designed to fit a standard sash block and to maintain lateral stability in masonry wall.
- C. Expansion joint material: As indicated on drawings to isolate structural masonry to create independent structures.
- D. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe, in color selected from manufacturer's standard.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 1. Configuration:
 - a. Strips, full depth of cavity and 10 inches high, with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.

2.10 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
 1. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Diedrich Technologies, Inc.
 - b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.

2.11 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime mortar.
 - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide Type S mortar.
- C. Pigmented Mortar: Use colored cement product.
- D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
- E. Grout for Unit Masonry: Comply with ASTM C 476.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels and sills, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

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- B. Bond Pattern for CMU Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames solidly with mortar unless otherwise indicated.
- F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.6 CONTROL JOINTS

- A. General: Install control-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in brick as follows:
 - 1. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 07 92 00 "Joint Sealants."

3.7 LINTELS

- A. Install steel lintels where indicated.

3.8 FLASHING, WEEP HOLES, AND CAVITY VENTS

- A. General: Install embedded flashing and weep holes in masonry at lintels and other obstructions to downward flow of water in wall, and where indicated.

- B. Install flashing as follows unless otherwise indicated:
 - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 - 2. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under air barrier, lapping at least 4 inches.
 - 3. At lintels, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
 - 4. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install weep holes in exterior veneers in head joints of first course of masonry immediately above embedded flashing.
 - 1. Use specified weep/cavity vent products to form weep holes.
 - 2. Space weep holes 24 inches o.c. unless otherwise indicated.
- E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

3.9 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level C in TMS 402/ACI 530/ASCE 5.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

- E. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for compressive strength.
- F. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- G. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- H. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- I. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- J. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.10 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 04 20 0

SECTION 051200

STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Structural steel.
- 2. Grout.

B. Related Sections:

- 1. Division 1 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
- 2. Division 5 Section "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications, and other metal items not defined as structural steel.

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.

- 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
- 2. Include embedment drawings.

3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 5. Reproduction & Reuse of contract documents for the purpose of preparing shop drawings is strictly prohibited. Electronic files of the structural framing plans may be provided for the purpose of preparing shop drawings for a nominal fee of \$100 per sheet.
- C. Qualification Data: For qualified Installer and fabricator.
- D. Welding certificates.
- E. Mill test reports for structural steel, including chemical and physical properties.
- F. Product Test Reports: For the following:
1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 2. Shop primers.
 3. Nonshrink grout.
- G. Manufacturer Certificates: Upon completion of fabrication, submit original form in triplicate – *Fabricator's Certificate of Compliance* executed and signed by authorized individual.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work
- B. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Comply with applicable provisions of the following specifications and documents:
1. AISC 303.
 2. AISC 360.
 3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.

1.7 COORDINATION

- A. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes and WT Shapes: ASTM A 992/A 992M (Grade 50).
- B. Channels, Angles, M, S-Shapes: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- E. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
 - 1. Weight Class: As Indicated.
 - 2. Finish: Black.
- F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.
- B. Unheaded Anchor Rods: ASTM F 1554, Grade 36.
 - 1. Configuration: Hooked.
 - 2. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
 - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
 - 5. Finish: Plain
- C. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
 - 1. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
 - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 3. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
 - 4. Finish: Plain
- D. Threaded Rods: ASTM A 36/A 36M.
 - 1. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
 - 2. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened ASTM A 36/A 36M carbon steel.
 - 3. Finish: Plain
- E. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.

2.3 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, non-asphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- B. Galvanizing Repair Paint: ASTM A 780.

2.4 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.
 - 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."
- F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.

- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 - 2. Surfaces to be field welded.
 - 3. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 4. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 3, "Power Tool Cleaning." All Steel except where noted otherwise.
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.8 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
 - 1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
 - 2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: Shop welds will be visually inspected according to AWS D1.1/D1.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Base Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 1. Set plates for structural members on wedges, shims, or setting nuts as required.

2. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure.
 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
 3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.
- D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

3.7 ATTACHMENTS

- A. FABRICATOR'S CERTIFICATE OF COMPLIANCE

END OF SECTION 051200

Fabricator's Certificate of Compliance

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2 of the International Building Code must submit *Fabricator's Certificate of Compliance* at the completion of fabrication.

Project: _____

Fabricator's Name: _____

Address: _____

Certification or Approval Agency: _____

Certification Number: _____

Date of Last Audit or Approval: _____

Description of structural members and assemblies that have been fabricated:

I hereby certify that items described above were fabricated in strict accordance with the approved construction documents.

Name and Title (type or print)

Signature

Date

SECTION 05 4000

COLD-FORMED METAL FRAMING

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. Exterior non-load-bearing wall framing.
 - 2. Ceiling joist framing.
- B. Related Requirements:
 - 1. Section 05 5000 "Metal Fabrications" for masonry shelf angles and connections.
 - 2. Section 09 2216 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.
- B. Shop Drawings:
 - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.
 - 1. Expansion anchors.
 - 2. Power-actuated anchors.

3. Mechanical fasteners.
4. Vertical deflection clips.
5. Horizontal drift deflection clips

C. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Cold-Formed Steel Framing Design Standards:

1. Wall Studs: AISI S211.
2. Headers: AISI S212.
3. Lateral Design: AISI S213.

B. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 COLD-FORMED STEEL FRAMING, GENERAL

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: 33 OR 50 KSI
 2. Coating: G60 (Z180) minimum.
- B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: As required by structural performance.
 2. Coating: G90 (Z275) minimum.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
 2. Minimum Flange Width: 1-5/8 inches (41 mm).
 3. Minimum Return: 0.43 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: Matching steel studs.
 2. Minimum Flange Width: 1-1/4 inches (32 mm).
- C. Vertical Deflection Clips: Manufacturer's standard bypass and head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
1. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm).
 2. Flange Width: 1 inch (25 mm) plus the design gap.
- E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.4 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Anchor clips.
 - 5. End clips.
 - 6. Foundation clips.
 - 7. Gusset plates.
 - 8. Stud kickers and knee braces.
 - 9. Hole reinforcing plates.
 - 10. Backer plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36 threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
 - 1. Corrosion Resistance: Tested in accordance with ASTM B 117 for 0% red rust after 500 hour exposure.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
 - 1. Corrosion Resistance: Tested in accordance with ASTM B 117 for 0% red rust after 500 hour exposure.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2. Length: For self-drilling and self-threading screws thread bearing length, as defined by the manufacturer, shall be not less than as required to extend a minimum of three full threads through the material(s) being anchored.
 3. Corrosion Resistance: Tested in accordance with ASTM B 117 for 0% red rust after 500 hour exposure.
- F. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or ASTM A 780.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, non-staining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multi-monomer plastic, and non-leaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.7 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 1. Fabricate framing assemblies using jigs or templates.
 2. Cut framing members by sawing or shearing; do not torch cut.
 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing and cold-formed steel framing to other materials by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- C. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing shall be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install field-fabricated, cold-formed framing and securely anchor to supporting structure.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members together by screw fastening. Wire tying of framing members is not permitted.
 - a. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads. Complying with requirements for spacing and edge distances.
 - 3. Fasten other materials to cold-formed steel framing and cold-formed steel framing to other materials by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL AND CEILING INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: 16 inches (406 mm) maximum unless indicated otherwise.
- C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single leg deflection tracks and anchor to building structure.
 - 2. Connect vertical deflection clips to bypassing and infill studs and anchor to building structure.
 - 3. Connect drift clips to cold-formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (305 mm) of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - a. Install solid blocking at centers indicated on Shop Drawings.
 - 2. Bridging: Cold-rolled steel channel mechanically fastened to webs of punched studs.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, which ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
 - 1. Division 3 - Concrete Sections
 - 2. Section 04200 - "Unit Masonry"
 - 3. Section 05120 - "Structural Steel"
 - 4. Section 05210 - "Steel Joists"
 - 5. Section 05310 - "Steel Deck"
 - 6. Section 05400 - "Cold-Formed Metal Framing"
 - 7. Section 05510 - "Metal Stairs"
 - 8. Section 05520 - "Handrails and Railings"

1.2 DESCRIPTION OF WORK:

- A. Work described in this section includes metal fabrications, which include items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere. Types of work in this section includes metal fabrications for:
 - 1. Rough hardware.
 - 2. Loose bearing and leveling plates.
 - 3. Loose steel lintels.
 - 4. Miscellaneous framing and supports.
 - 5. Concrete stair and concrete filled metal stair nosings (at any new stairs).
 - 6. Temporary elevator hoist / support beams.
 - 7. Elevator sill support angles.
 - 8. Galvanized pipe bollards (galvanized steel pipe with galvanized domed cap, concrete fill, paint, etc.; Minimum 36-inches height unless other height is specifically indicated on the Drawings).
 - 9. Ladders.
 - 10. Temporary elevator hoist / support beams; Elevator sill support angles.
 - 11. Metal downspout boots.

1.3 QUALITY ASSURANCE:

- A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Structural Design Responsibility: Framing and supports which are structural by nature, uses, applications, etc., shall be designed by the Fabricator's Structural Engineer, who is experienced in design of the items indicated and who is currently licensed to practice in the State of Alabama, and design documents, Drawings and calculations shall be submitted; To include the responsible Design Engineer's signed and dated seal on all such submittals.
- C. Manufactured Items: Submit manufacturer's complete product data, details and dimensioned drawings. Provide shop drawings when manufacturer's data does not indicate all required information. Manufactured items (i.e.: ladders, etc.) shall be designed by the manufacturer's Structural Engineer.

1.4 PERFORMANCE REQUIREMENTS:

- A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
- B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 SUBMITTALS:

- A. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.
- B. Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others. Where materials or fabrications are indicated to comply with certain requirements for design loadings include structural computations, material properties and other information needed for structural analysis.
 - 1. Show fabrication and installation details. In addition to applicable requirements above, include plans, elevations, sections, and details of connections. Show

anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.

- C. Samples: Submit representative samples of materials and finished products as may be requested by Architect.
- D. Seals: Framing and supports which are structural by nature, uses, applications, etc., shall be designed by the Fabricator's Structural Engineer, who is experienced in design of the items indicated and currently licensed to practice in the State of Alabama and City of Montgomery, and design documents, Drawings and calculations shall be submitted; To include the responsible Design Engineer's signed and dated seal on all such submittals.

1.6 PROJECT CONDITIONS:

- A. Field Measurements: Where fabrications are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabrication without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting acceptable to fabricator's professional engineer, and in a manner that will not affect structural performance, deflection, safety, etc.

1.7 COORDINATION:

- A. Coordinate installation of anchorages for metal fabrications and supports. 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, without delaying the work of this section or the Work of the project.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
- B. Ferrous Metals:
 - 1. Steel Plates, Shapes and Bars: ASTM A 36.

2. Steel Bar Grating: ASTM A 569 or ASTM A 36.
 3. Steel Tubing: Cold formed, ASTM A 500, Grade B.
 4. Structural Steel Sheet: Hot-rolled, ASTM A 570; or cold-rolled ASTM A 611, Class 1; of grade required for design loading.
 5. Galvanized Structural Sheet Steel: ASTM A 446, of grade required for design loading. Coating designation as indicated, or if not indicated, G90.
 6. Steel Pipe: ASTM A 53; Type and grade (If applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (schedule 40), unless otherwise indicated.
 7. Gray Iron Castings: ASTM A 48, Class 30.
 8. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.
 9. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
 10. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.
- C. Non-Ferrous Metals:
1. Aluminum Drawn Seamless Tube: ASTM B 483, 6063-T832.
 2. Aluminum Castings: ASTM B 26, 356.0-T6.
 3. Aluminum Plate and Sheet: ASTM B 209, 6061-T6.
- D. Grout - Non-Shrink Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE-CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.
- E. Fasteners:
1. Provide zinc-coated, galvanized fasteners for exterior use, and where built into interior and exterior walls. Select fasteners for the type, grade and class required.
 2. Provide stainless steel fasteners for any use where fasteners come in contact with and/or are anchored to preservative pressure treated (P.T.) wood, fire-retardant treated wood, and at roofs and roof related construction. Select

fasteners for the type, grade and class required.

F. Paint:

1. Metal Primer Paint: Southern Coating "Heavy Duty RIP Primer 1-0900", Tnemec A10- 99 Primer", or approved equivalent.
2. Primer selected must be compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Section 09900 - "Painting".
3. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, complying with Military Specifications MIL-P-21035 (Ships), or SSPC- Paint-20.
4. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL:

A. Workmanship:

1. Use materials of size and thickness shown or, if not shown, of required size and thickness to produce strength and durability in finished product. Work to dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use type of materials shown or specified for various components of work.
2. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32-inch unless otherwise shown. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
3. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.
4. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown, or if not shown, Phillips flat-head (countersunk) screws or bolts.
5. Provide for anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

6. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.
 7. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.
- B. Galvanizing: Provide a zinc coating for those items shown or specified to be galvanized, as follows:
1. ASTM A 153 for galvanizing iron and steel hardware.
 2. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars, and strip 1/8-inch thick and heavier.
 3. ASTM A 386 for galvanizing assembled steel products.
- C. Shop Painting:
1. Apply shop primer to surfaces of metal fabrications except those which are galvanized or as indicated to be embedded in concrete or masonry, unless otherwise indicated, and in compliance with requirements of SSPC-PA1 "Paint Application Specification No. 1" and the paint manufacturer's current written instructions and recommendations, for all shop painting.
 2. Stripe paint all edges, corners, crevices, bolts, welds and sharp edges.
- D. Surface Preparation:
1. Prepare ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specification and environmental exposure conditions of installed metal fabrications, except as otherwise required by paint manufacture's current written instructions and recommendations for the substrates to be coated:
 2. Exterior (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning."
 3. Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning."

2.3 ROUGH HARDWARE:

- A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 sections.
- B. Fabricate items of sizes, shapes and dimensions required. Furnish malleable iron washers

for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.4 LOOSE BEARING AND LEVELING PLATES:

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.5 LOOSE STEEL LINTELS:

- A. Provide loose structural steel lintels for openings and recesses in masonry walls and partitions as shown. Weld adjoining members together to form a single unit where indicated. Provide not less than 8-inches bearing at each side of openings, unless otherwise shown.

- 1. Galvanize all loose steel lintels in exterior walls.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS:

- A. Provide miscellaneous steel framing and supports which are not a part of structural steel framework, as required to complete work.
- B. Fabricate miscellaneous units to sizes, shapes and profiles shown or, if not shown, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.
- C. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Except as otherwise shown, space anchors 24-inches o.c. and provide minimum anchor units of 1-1/4-inches wide x 1/4- inch x 8-inch long steel straps.
- D. Galvanize exterior miscellaneous frames and supports.

2.7 CAST STAIR NOSINGS:

- A. Fabricate units of metal indicated below in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions. Provide units with an integral abrasive finish consisting of aluminum oxide, silicon carbide, or a combination of both.
 - 1. Metal: Cast aluminum, abrasive finish at tread.
 - 2. Configurations: At Interior Metal / Concrete Stairs, provide cast units at treads at

nosings adjacent to each landing (e.g.: at every top and bottom tread's stair nosing of each stair run landing), and at Exterior Stairs provide at every stair nosing, whether or not indicated on the Drawings, and in the following configurations, unless otherwise indicated, equivalent to standard products indicated, as manufactured by American Safety Tread, Inc. (Phone: 1-800-245-4881):

- a. Nosings for Cast-In-Place Concrete Stairs: Equivalent to Style No. 816, cross-hatched units, 4 inches (100 mm) wide x tread length less 4 inches at each end, for casting flush into cast-in-place concrete steps.
 - b. Nosings for Concrete Filled Metal Pan Stairs: Equivalent to Style No. 820, cross-hatched units, 4 inches (100 mm) wide by tread width less 3 inches at each end, for casting flush into concrete filled metal pan stairs.
3. Provide anchors for embedding units in concrete, as an integral part of nosing units, as standard with manufacturer.
 4. Apply bituminous paint to concealed bottoms, sides, and edges of units set into concrete.
 5. Provide a cast-in silicone carbide granules embedded into walking surface, at top of tread and where cross-hatched surfaces are indicated.
 6. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Safety Tread Co., Inc. (basis of design)
 - b. Amstep Products.
 - c. Armstrong Products, Inc.
 - d. Balco/Metalines, Inc.
 - e. Granite State Casting Co.
 - f. Safe-T-Metal Co.
 - g. Wooster Products Inc.

2.8 METAL LADDERS:

A. General:

1. Comply with ANSI A14.3, unless otherwise indicated.
2. For elevator pit ladders, comply with ASME A17.1.
3. Space siderails 18 inches (457 mm) apart, unless otherwise indicated.
4. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted brackets, made from same metal as ladder.

B. Steel Ladders: Unless specifically indicated otherwise on the Drawings, comply with the following:

1. Siderails: Continuous, 3/8-by-2-1/2-inch (9.5-by-64-mm) steel flat bars, with eased edges.
 2. Rungs: 3/4-inch- (19-mm-) diameter square steel bars.
 3. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
 4. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung by a proprietary process.
 5. Subject to compliance with requirements, provide equivalent to one of the following:
 - a. IKG Industries, a Harsco company; Mebac.
 - b. W. S. Molnar Company; SlipNOT.
 6. Prime ladders, including brackets and fasteners, with zinc-rich primer.
 - a. Finish painting is specified in Division 9 Section "Painting", not the work of this Section 05500.
- C. Alternating Tread Ships Ladders: Pre-Engineered steel units, including stair assembly, handrails, top landing with guardrails, slip-resistant treads, anchors, templates, installation instructions, and all related work.
1. Product/Manufacturer: Provide equivalent to standard products and specifications of Lapeyre Stair Inc.; Harahan, LA; Phone: 1-(800)-535-7631 or 1-(504)-570-6209.
 2. Slope: 56-degrees.
 3. Height: As indicated on Drawings.
 4. Finish: Powder coat baked enamel, safety yellow.

2.9 METAL DOWNSPOUT BOOTS:

- A. Source Limitations: Obtain downspout boots from single source from single manufacturer.
- B. Provide downspout boots made from cast aluminum in heights indicated with inlets of size and shape to suit downspouts. Provide units with flanges and holes for countersunk anchor bolts.
 1. Outlet: Horizontal, to discharge into pipe.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

- B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete insets, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.2 **INSTALLATION:**

A. General:

1. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction, including threaded fasteners for concrete and masonry inserts, toggle bolts, through- bolts, lag bolts, wood screws and other connectors as required.
2. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry or similar construction.
3. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip-galvanized after fabrication, and are intended for bolted or screwed field connections.

- B. Field Welding: Comply with AWS Code for procedures of manual shielded metal arc welding, appearance and quality of welds made, and methods used in correcting welding work.

C. Setting Loose Plates:

1. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
2. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout. Use non-metallic, non-shrink grout.
3. Pack grout solidly between bearing surfaces and plates to insure that no voids remain.

- D. Manufactured Items: Install in strict accordance with manufacturer's current written instructions, recommendations and reviewed submittals and shop drawings.

3.3 ADJUST AND CLEAN:

- A. Touch up Painting:
 - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same materials as used for shop painting.
 - 2. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. For Galvanized Surfaces: Clean field welds, bolted connections and abraded areas and apply galvanized repair paint to comply with ASTM A 780.

END OF METAL FABRICATIONS

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SECTION 06 1000

ROUGH CARPENTRY

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. Framing with dimension lumber.
 - 2. Rooftop equipment bases and support curbs.
 - 3. Wood blocking, cants, and nailers.
 - 4. Plywood backing panels.
- B. Related Requirements:
 - 1. Section 01 91 80 "Building Envelope Commissioning Requirements" apply to this Section
 - 2. Section 01 91 13 "General Commissioning Requirements" apply to this Section.
 - 3. Section 06 16 00 "Sheathing" for sheathing.

1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.
- D. Timber: Lumber of 5 inches nominal size or greater in least dimension.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
 4. For products receiving a waterborne treatment, include written statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
- B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES:
1. Wood-preservative-treated wood.
 2. Fire-retardant-treated wood.
 3. Power-driven fasteners.
 4. Post-installed anchors.
 5. Metal framing anchors.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent for 2-inch nominal thickness or less; no limit for more than 2-inch nominal thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - 2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Treatment shall not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898.
 - 3. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664 and design value adjustment factors shall be calculated according to ASTM D6841.
- C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.
- F. Application: Treat items indicated on Drawings, and the following:
 - 1. Concealed blocking.
 - 2. Roof construction.
 - 3. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Rooftop equipment bases and support curbs.
 - 4. Cants.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:
 - 1. Hem-fir (north); NLGA.
 - 2. Mixed southern pine or southern pine; SPIB.
 - 3. Spruce-pine-fir; NLGA.
 - 4. Hem-fir; WCLIB or WWPA.
 - 5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 - 6. Eastern softwoods; NeLMA.

- C. Concealed Boards: 19 percent maximum moisture content and the following species and grades:
1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
 2. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
 3. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
 4. Eastern softwoods; No. 2 Common grade; NeLMA.
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Unless otherwise noted on drawings, Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.6 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
1. Where rough carpentry is exposed to pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193, or ICC-ES AC308 as appropriate for the substrate.
1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.

2.7 METAL FRAMING ANCHORS

- A. Allowable design loads, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation.
 - 1. Use for interior locations unless otherwise indicated.
- C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
 - 1. Use for wood-preserved-treated lumber and where indicated.

2.8 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Install plywood backing panels by fastening to studs; coordinate locations with roofing wall base flashing needs and utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- F. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- G. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- H. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 - 2. ICC-ES evaluation report for fastener.
- J. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- C. Do not overload the roof sheathing with lumber or plywood stored on completed low-slope roofing area.

END OF ROUGH CARPENTRY

SECTION 06 16 00

SHEATHING

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. Wall sheathing.
 - 2. Roof sheathing.
 - 3. Parapet sheathing.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for plywood backing panels.
 - 2. Section 01 91 80 "Building Envelope Commissioning Requirements" apply to this Section.
 - 3. Section 01 91 13 "General Commissioning Requirements" apply to this Section.
 - 4. Section 07 27 22 "Fluid Applied Air Barrier" for fluid-applied air barrier installed over wall sheathing.
 - 5. Section 07 93 00 "Total Building Air Leakage Testing".

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
 - 3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5516.

4. For products receiving waterborne treatment, include statement that moisture content of

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer testing and inspecting agency.
- B. Evaluation Reports: For the following, from ICC-ES:
 1. Wood-preserved-treated plywood.
 2. Fire-retardant-treated plywood.
- C. Field quality-control reports.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS

- A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- B. Factory mark panels to indicate compliance with applicable standard.

2.3 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWPAC U1; Use Category UC2.
 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.4 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Use treatment that does not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
 - 3. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D5516 and design value adjustment factors shall be calculated according to ASTM D6305. Span ratings after treatment shall be not less than span ratings specified.
- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
- E. Application: Treat plywood indicated on Drawings, and the following:
 - 1. Wall sheathing within 48 inches of fire walls.

2.5 WALL SHEATHING

- A. Plywood Sheathing: DOC PS 1, Exterior sheathing.
 - 1. Span Rating: Not less than 24/0.
 - 2. Nominal Thickness: Not less than 5/8 inch unless noted otherwise on the drawings.

2.6 ROOF SHEATHING

- A. Coated Prime Fiberglass-Mat Faced Gypsum Roof Boards: ASTM C1177/C1177M.
 - 1. Basis-of-Design: DensDeck® Roof Board or equal
 - 2. Thickness: 1/4 inch thick.
 - 3. Size: 48 by 96 inches for installation on metal decking with flute spans less than or equal to 2-5/8".

2.7 PARAPET SHEATHING

- A. Plywood Sheathing: DOC PS 1, Exterior sheathing.
 - 1. Span Rating: Not less than 24/0.
 - 2. Nominal Thickness: Not less than 5/8 inch unless noted otherwise on the drawings.

2.8 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For roof, parapet and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.
- E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- F. Screws for Fastening Gypsum Sheathing to Steel Deck: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
 - 1. For steel deck less than 0.0329 inch thick, use screws that comply with ASTM C1002.
 - 2. For steel deck from 0.033 to 0.112 inch thick, use screws that comply with ASTM C954.

2.9 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with ASTM D3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
 - 3. ICC-ES evaluation report for fastener.
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall, parapet and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.
- H. Adhere to the manufacturer's printed temperature limitations regarding sheathing adhesive storage and applications.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated. Exercise precautions to avoid "ghost" holes in the sheathing. Where feasible, seal "Ghost" holes with high performance urethane sealant prior to air and water barrier applications and cladding installations. Address all other sheathing installation deficiencies prior to air and water barrier applications and cladding installations.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall and Roof Sheathing:
 - a. Screw to cold-formed metal framing / steel deck.
 - b. Space panels 1/8 inch apart at edges and ends.

END OF SHEATHING

SECTION 062000

FINISH CARPENTRY

PART 1- GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Related work specified elsewhere includes:
 - 1. Section 055000 - "Metal Fabrications"
 - 2. Section 061000 - "Rough Carpentry"
 - 3. Section 064000 - "Architectural Woodwork"
 - 4. Section 079000 - "Joint Sealers"
 - 5. Section 087100 - "Finish Hardware"
 - 6. Section 099113 - "Painting"

1.2 DESCRIPTION OF WORK:

- A. Definition: Finish carpentry includes carpentry work which is exposed to view, is non-structural, and which is not specified as part of other sections.
- B. Types of finish carpentry work in this section include:
 - 1. Interior and exterior running and standing trim, and sills.
 - 2. Plywood; APA certified/labeled.
- C. Refer to Section 061000 - "Rough Carpentry", Section 055000 - "Metal Fabrications" and Structural Drawings for framing anchors.
- D. Finish carpentry is intended to be finish painted on site, under section 099113.
 - 1. All standing and running trim and all exposed lumber and wood products shall be back-primed prior to installation.
 - 2. Framing and deck above any soffit vents and any perforated soffit materials shall be painted with minimum 1-coat non-specular flat black enamel prior to installation of soffit vents, under Section 09900.

1.3 QUALITY ASSURANCE:

- A. Factory-mark each piece of lumber and plywood with type, grade, mill and grading agency identification; except omit marking from surfaces to receive transparent finish, and submit mill certificate that material has been inspected and graded in accordance with requirements if it cannot be marked on a concealed surface.
- B. Wood products listed in this section shall be Fire Retardant Treated Wood. Hoover Treated Wood Products, Inc. are considered to be approved, or other equals.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's specifications and installation instructions for each item of factory-fabricated products, siding, paneling, trim, etc. Include color samples for items requiring color selection.
- B. Samples: Submit the following samples for each species and cut or pattern of finish carpentry.
 - 1. Interior Standing and Running Trim: 2'-0" long x full board or molding width, unfinished.
 - 2. Exterior Standing and Running Trim: 2'-0" long x full board or molding width, unfinished.
- C. Wood Treatment Data: Submit chemical treatment manufacturer's instructions for handling, storage, installation and finishing treated materials, if required.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Protect finish carpentry materials during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Do not deliver finish carpentry materials, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

1.6 JOB CONDITIONS:

- A. Conditioning: Installer shall advise Contractor of temperature and humidity requirements for finish carpentry installation areas. Do not install finish carpentry until required temperature and relative humidity conditions have been stabilized and will be maintained in installation areas.

- B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed finish carpentry within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period. The fabricator of woodwork shall determine optimum moisture content and required temperature and humidity conditions.

PART 2 - PRODUCTS

2.1 WOOD PRODUCT QUALITY STANDARDS:

- A. Softwood Lumber Standards: Comply with PS 20 and with applicable grading rules of the respective grading and inspecting agency for the species and product indicated.
- B. Western Red Cedar: Western Red Cedar Lumber Association (WRCLA) and National Lumber Grading Authority (NLGA) rules.
- C. Plywood Standard: Comply with PS 1/ANSI A199.1.
- D. Hardwood Lumber Standard: Comply with National Hardwood Lumber Association (NHLA) rules.
- E. Woodworking Standard: Where indicated for a specific product comply with specified provision of the following:
 - 1. Architectural Woodwork Institute (AWI) "Quality Standards".

2.2 MATERIALS:

- A. General:
 - 1. Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed or worked and dressed lumber, as applicable, manufactured to the actual sizes as required by PS 20 or to actual sizes and pattern as shown, unless otherwise indicated.
 - 2. Moisture Content of Softwood Lumber: Provide kiln-dried (KD) lumber having a moisture content from time of manufacture until time of installation not greater than values required by the applicable grading rules of the respective grading and inspecting agency for the species and product indicated.
 - 3. Moisture Content of Hardwood Lumber: Provide kiln-dried (KD) lumber having a moisture content from time of manufacture until time of installation within the ranges required in the referenced woodworking standard.

4. Lumber for Transparent Finish (Stained or Clear): Refer to Section 064000 - "Architectural Woodwork".
 5. Lumber for Painted Finish: At Contractor's option, use pieces which are either glued-up lumber or made of solid lumber stock.
- B. Interior and Exterior Finish Carpentry:
1. WM/Series Wood Molding Patterns: For stock molding patterns graded under Wood Molding and Millwork Producers Industry WM 4, provide the following grade based on finish indicated and fabricated from any Western hardwood species graded and inspected by WWPA or other referenced standard or agency.
 - a. Moldings for Transparent Finish: N-Grade (finger joints not permitted); Refer to Section 064000 - "Architectural Woodwork".
 - b. Moldings for Painted Finish: P-Grade.
 2. Standing and Running Trim for Painted (opaque) Finish: Any Western hardwood species (interior) graded and inspected by WWPA, and softwood (exterior) as indicated, complying with following requirements:
 - a. Grade for Standard Sizes and Patterns:
 - 1) "C Select" or "Choice" for White Pine or Spruce (exposed at exterior)
 - 2) "C Select" or "Choice" for White or Yellow Poplar (interior), except where trim is associated with woodwork specified in Section 064000, in which case such trim shall match the stained and sealed hardwood indicated therein.
 - b. Grade for Special (Custom) Sizes and Patterns: Custom for quality of materials and manufacture as required in referenced woodworking standard.
 3. Hardwood Plywood Stock Panels: Provide manufacturer's stock hardwood plywood panels complying with applicable requirements of PS 51 for species and grade of face veneers and backing, adhesive, construction, thickness, panel size, and finish.
 - a. Face Veneer Species for Painted Finish: Rotary cut Natural Birch.
 - b. Grade: Premium.
 - c. Backing Veneer Species: Any hardwood compatible with face species.

- d. Construction: Veneer core.
 - e. No. of Plies: 5.
 - f. Thickness: As indicated on the Drawings, or if not indicated, at least 3/4-inch.
 - g. Panel Size: As required.
 - h. Plywood Type (Water Resistance Capability): Type I at Exterior and Type II at Interior.
 - i. Face Pattern: Plain (no grooves) with veneer edge matched within each panel face to comply with type of match required by referenced product standard.
 - j. Face Veneer Matching (Panel-to-Panel): No match required.
 - k. Finish: Polish sanded.
4. Softwood Plywood: Comply with DOCPS1, "U.S. Product Standard for Construction and Industrial Plywood."
- a. Face Veneer Species for Painted Finish: SYP, or any similar species permitted by referenced standards.
 - b. Grade:
 - 1) Plywood Soffits, Medium Density Overlay (MDO): A-C, minimum
 - 2) Sub-flooring: Tongue-and-groove, and as follows:
 - a) Below Carpet and at Attics: B-C, minimum.
 - b) Below Vinyl Floor Coverings: A-C, minimum.
 - c. Backing Veneer Species: Same as face veneer.
 - d. Construction: Veneer core.
 - e. Thickness: As indicated on the Drawings, or if not indicated, at least as follows:
 - 1) Soffits: 1/2-inch.

- 2) Sub-flooring: 3/4-inch, tongue-and-groove.
- f. Panel Size: As required.
- g. Plywood Type (Water Resistance Capability): Type I (exterior).
- h. Finish: Exterior pieces primed at back and edges prior to installation (typical), with face finish as follows:
 - 1) Typical: Sanded.

2.3 MISCELLANEOUS MATERIALS:

- A. Fasteners and Anchorages: Provide nails, screws and other anchoring devised of the type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible, and complying with applicable Federal Specifications and the International Building Code.
 - 1. Where finish carpentry is exposed on exterior or in areas of high relative humidity, provide fasteners and anchorages with a hot-dipped zinc coating (ASTM A 153).

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Condition wood materials to average prevailing humidity conditions in installation areas prior to installing.
- B. Backprime Lumber and panel products for painted finish exposed on the exterior and where exposed to moisture and high relative humidity on the interior. Comply with requirements of Section 09900 - "Painting", for primers and their application.
- C. Pre-Installation Meeting: Meet at project site prior to delivery of finish carpentry materials and review coordination and environmental controls required for proper installation and ambient conditioning in areas to receive work. Include in meeting the Contractor, Architect and other Owner Representatives (if any), Installers of finish carpentry, wet work including plastering, other finishes, painting, mechanical work and electrical work, and firms and persons responsible for continued operation (whether temporary or permanent) of HVAC system as required to maintain temperature and humidity conditions. Proceed with finish carpentry on interior only when everyone concerned agrees that required ambient conditions can be properly maintained.

3.2 INSTALLATION:

- A. Discard units of material which are unsound, warped, bowed twisted, improperly treated, not

adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or which are of defective manufacture with respect to surfaces, sizes or patterns.

- B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level countertops; and with 1/16" maximum offset in flush adjoining 1/8" maximum offsets in revealed adjoining surfaces.
- C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- D. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum lengths of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners, to produce tight fitting joints with full surface contact throughout length of joint. Use scarf joints for end-to-end joints.
- E. Anchor finish carpentry work to anchorage devices or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fasteners heads are required, use fine finishing nail for exposed nailings, countersunk and filled flush with finished surface, and matching final finish where transparent is indicated.
- F. Hardwood Plywood Paneling: Where grain character or color variations are noticeable, select and arrange panels on each wall for best match of adjacent panels. Install with uniform, tight joints between panels.
 - 1. Attach panels to supports with panel adhesive and fasteners, plus nailing, in accordance with manufacturer's current written instructions for concealed-fastener installation.
 - 2. Apply panel adhesive on supports, immediately prior to panel placement and nailing.
 - 3. Apply battens and corner trim as indicated.
- G. Plywood Panels: Install panels with edges over continuous framing or blocking. Nail at 6-inch (150-mm) intervals at panel perimeter and 12-inch (300-mm) intervals at intermediate supports, unless manufacturer recommends other intervals. Leave 1/16-

inch (1.5-mm) gap between adjacent panels, unless otherwise recommended in writing by panel manufacturer. Leave 1/8-inch (3-mm) gap at perimeter and openings, unless otherwise recommended by panel manufacturer.

1. Seal unavoidable butt joints at inside and outside corners and at trim locations.
2. Apply as indicated.
3. Conceal fasteners to greatest practical extent by countersinking and filling.

3.3 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION:

- A. Repair damaged and defective finish carpentry work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean finish carpentry work on exposed and semi-exposed surfaces. Touch-up shop-applied finishes to restore damaged or soiled areas.
- C. Refer to Section 099113 - "Painting", for final finishing of installed finish carpentry work, not the work of this Section 062000.
- D. Protection: Installer of finish carpentry work shall advise Contractor of final protection and maintained conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

END OF FINISH CARPENTRY

SECTION 064000

ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Related work specified elsewhere includes:
 - 1. Section 061000 - "Rough Carpentry"
 - 2. Section 062000 - "Finish Carpentry"
 - 3. Section 079200 - "Joint Sealers"
 - 4. Section 081416 - "Flush Wood Doors"
 - 5. Section 099123 - "Painting"

1.2 DESCRIPTION OF WORK:

- A. Extent of each type of architectural woodwork is indicated on drawings and in schedules.
- B. Types of architectural woodwork include the following, and related work and trim:
 - 1. Laminate clad cabinets and countertops
 - 2. Wood cabinets and countertops.
 - 3. Closet and utility shelving (paint on site, under Section 099123).
 - 4. Wood frames, panels, base, and miscellaneous trim (paint on site, under Section 099123), painted (opaque finish) unless specifically indicated otherwise; or stained (transparent finish) only where specifically indicated.
 - 5. Wood panels, mouldings, trim and related work.
 - 6. Hardware for architectural woodwork.
 - 7. Solid surface countertops, inserts, integrated sinks, backsplash, and as otherwise indicated on the Drawings.
- C. Architectural woodwork and components for opaque finish are intended to be finish painted on-site, under Section 09900.
- D. Architectural woodwork and components for natural, stained and/or transparent finish (IF ANY) are intended to be painted in woodwork fabricator's shop under controlled conditions, under the work of this Section 064000.

1.3 QUALITY ASSURANCE:

- A. AWI Quality Standard: Comply with applicable requirements of “Architectural Woodwork Quality Standards” published by the Architectural Woodwork Institute (AWI), except as otherwise indicated.
- B. Fabricator Qualifications: Fabricators shall be experienced firms specializing in the types of architectural woodwork required for this project for at least 5-verifiable years and on at least 5-verifiable projects of similar size, scope, complexity, and quality as this project.
 - 1. Architectural Woodwork Fabricator: 5-years and 10-verifiable projects.
- C. Installer Qualifications: Arrange for installation of architectural woodwork by a firm which can demonstrate at least 5-verifiable years successful experience in installing architectural woodwork items on at least 5-verifiable projects, similar in type and quality to those required for this project.
- D. Refer to Section 01015 - “Special Conditions”, for additional information and minimum experience requirements.

1.4 SUBMITTALS:

- A. Shop Drawings: Submit shop drawings showing location of each item, dimensioned plans and elevations, large scale details, attachment devices and other components.
 - 1. Manufacturer’s current and complete product data, for manufactured units of work, including color selection data and samples; and design load capacities for any wood columns, and their plinths and anchorage systems.
- B. Samples: Submit the following samples:
 - 1. Lumber and panel products with or for transparent finish; 6-inches x 3/4-inch x 18- inches, for each species and cut, finished on 1-side and 1-edge.
 - 2. Lumber and panel products with factory-applied opaque finish, 8-inches x 10-inches, for each finish system and color.
 - 3. Stone: Manufacturer’s standard samples, approximately 12-inches x 12-inches with finish as required for this project, and representative color range anticipated.
 - 4. Exposed Cabinet Hardware Support Hardware: One unit of each type and finish, which will be returned for use on the project, upon request by the Contractor.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Protect woodwork during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Do not deliver woodwork, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, woodwork must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

1.6 PROJECT CONDITIONS:

- A. Conditioning: Woodwork Manufacturer and Installer shall advise Contractor of temperature and humidity requirements for woodwork installation and storage areas. Do not install woodwork until required temperature and relative humidity have been stabilized and will be maintained in installation areas.
- B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed woodwork within a 1.0-percent tolerance of optimum moisture content, from date of installation through remainder of construction period. Require Woodwork Manufacturer to establish optimum moisture content and required temperature and humidity conditions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Laminate Clad Cabinet Manufacturers: Subject to compliance with requirements, provide premium grade custom made cabinets and woodwork from a millwork shop complying with requirements of "Quality Assurance" article above.
- B. Plastic Laminate Manufacturer: Subject to compliance with requirements, provide solid, stippled, textured, and/or patterned high pressure decorative laminates of one of the following:
 - 1. Ralph Wilson Plastics Co. (Wilsonart) – Basis of Design
 - 2. Formica Corporation.
 - 3. Micarta Division, Westinghouse Electric Corporation.
 - 4. Nevamar Division, International Paper Co.

2.2 FABRICATION, GENERAL:

- A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber at time of fabrication and for relative humidity conditions in the installation areas.
- B. Fabricate woodwork to dimensions, profiles, and details indicated with dowel, dado, glue and screw construction, with openings and mortises precut, where possible, to receive hardware and other items and work.
 - 1. Ease edges to a 1/16-inch radius, for corners of cabinets and edges of solid wood (lumber) members less than 1-inch in nominal thickness, 1/8-inch radius for edges of rails and similar members over 1-inch in nominal thickness.
- C. Complete fabrication, assembly, hardware application, and other work before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- D. Pre-Cut Openings: Fabricate architectural woodwork with pre-cut openings, where possible, to receive hardware, appliances, plumbing fixtures, electrical work and similar items. Locate openings accurately and use templates or roughing-in diagrams for proper size and shape. Smooth edges of cutoffs and, where located in countertops and similar exposures seal edges of cutouts with a water-resistant coating.
- E. Measurements: Before proceeding with fabrication of woodwork required to be fitted to other construction, obtain field measurements and verify dimensions and shop drawing details as required for accurate fit. A tight fit of less than 1/8-inch is expected.

2.3 FIRE-RETARDANT MATERIALS:

- A. Where fire-retardant treated lumber is indicated, provide materials which are pressure impregnated with fire-retardant chemicals and comply with the following requirements:
 - 1. As required to comply with referenced standards and finish classifications necessary as per the International Building Code, NFPA 101 - Life Safety Code, authorities having jurisdiction, and acceptable in all respects for indoor use and finish requirements.
 - 2. Fire-Retardant Chemicals: Use chemicals of type and for applications indicated which do not bleed-through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated lumber from untreated lumber.
- B. Fire Performance Characteristics: Provide materials which are identical to those tested per

ASTM methods and time periods indicated, are marked and listed for fire performance characteristics by Underwriters Laboratories, Inc., or other testing and inspecting agency acceptable to authorities having jurisdiction, and comply with the following requirements:

1. Mill lumber after treatment, within limits set for wood removal which does not affect listed fire performance characteristics, using a woodworking plant certified by testing and inspecting agency.
- C. Marking: Identify treated lumber with separable paper classification marking of inspecting and testing agency, unless otherwise indicated.
- D. Surface Burning Characteristics: Not exceeding values required by latest edition of the "International Building Code" and "NFPA 101" (with amendments), tested per ASTM E 84 for standard time period.
 1. Flame Spread: Per Code.
 2. Smoke Developed: Per Code.
- E. Kiln-dry woodwork after treatment to levels required for non-fire-retardant treated woodwork materials. Maintain moisture content required by kiln drying, before and after treatment.
 1. Discard treated lumber which does not comply with requirements of referenced woodworking standard. Do not use twisted, warped, bowed, discolored, or otherwise damaged or defective lumber.

2.4 STANDING AND RUNNING TRIM, AND SILLS:

- A. Quality Standard: Comply with AWI Section 300.
- B. Rout or groove backs of flat trim members, kerf backs of other wide flat members, except for members with ends exposed in finished work.
- C. Assemble Casings in plant except where limitations of access to place of installation require field assembly.
- D. Interior Trim and Sills for Transparent Finish (only where specifically indicated, if any); Comply with the following requirements:
 1. Grade: Premium.
 2. Lumber Species: Select Poplar, unless otherwise indicated.
 3. Cut: Plain Sliced.
 4. Locations: Provide stained transparent finish within rooms which have new

woodwork with transparent finish, and all other exposed locations, unless indicated otherwise.

- E. Interior trim and Sills for Opaque Finish; (typical finish unless specifically indicated otherwise); Comply with the following requirements:
1. Grade: Premium.
 2. Lumber Species: Any closed-grain hardwood listed in referenced woodworking standard.
 3. Cut: Plain or Rotary cut.
 4. Locations: Provide opaque finish within rooms which have new woodwork with opaque finish, unless indicated otherwise.
 5. Solid Surface sills. See detail.

2.5 ARCHITECTURAL CABINET TOPS:

- A. Quality Standard: Comply with applicable 400 and its Divisions 400B and 400C.
- B. Type of Top - Insert: Solid Surface
1. Type: Solid Surface
 2. Colors, Patterns and Finishes: As indicated, or if not indicated, as selected from any of manufacturer's standard finishes and colors.
 - a. Color: **REFER TO FINISH SCHEDULE**; Corian by Dupont; or equivalent cost product as selected by Architect.
 - b. Finish: Polished.
 3. Edge Treatment: As required to mount flush into countertop(s) where occurs.
 4. Thickness - Tops and Substrates:
 - a. Tops: 1-inch, unless indicated otherwise on the Drawings.
 - b. Built-Up Edges: 1-1/2 inches, unless indicated otherwise on the Drawings.
 - c. Substrates: Refer to the Drawings for thickness of plywood below solid surface inserts, or if not indicated, at least 1-inch thick
 - d. Solid Surface integrated sink. See drawings.

C. Type of Top - Laminate Clad:

1. Grade: Premium; Grade I.
2. Edge Treatment: HPDL to match exposed face; Back- and end-splash pieces similar.
3. Core: Minimum 47-lb. density particle board, except at least 3/4-inch A-B plywood with exterior glue (approved for interior use), at tops with sinks and/or plumbing fixtures.
4. Minimum Thickness: 1-1/4-inches at exposed edges, 3/4-inch at tops and splashes, unless indicated otherwise on the Drawings.

D. Type of Top - Wood Panel Product for Opaque Finish:

1. Grade: Premium.
2. Wood Species: Any closed-grain hardwood listed in referenced woodworking standard;
3. Cut: Plain or Rotary cut.
4. Matching of Adjacent Veneer Leaves: Not required.
5. Edge Treatment: Solid wood matching face for species and cut.
6. Core Material: Medium-density moisture resistant particleboard or veneer core plywood with exterior glue (approved for interior use).
7. Thickness: As indicated, or if not indicated, at least 3/4-inch.

E. Type of Top - Wood Panel Product for Transparent Finish:

1. Grade: Premium.
2. Wood Species: AWI Veneer Grade A, Poplar, Plain Sliced, unless specifically indicated otherwise.
3. Matching of Adjacent Veneer Leaves: Slip match.
4. Veneer Matching Within Panel Face: Balanced center match, and end match.
5. Edge Treatment: Solid wood matching face for species and cut.

6. Core Material: Medium-density moisture resistant particleboard or veneer core plywood with exterior glue (approved for interior use).
7. Thickness: As indicated, or if not indicated, at least 3/4-inch.

2.6 CABINET HARDWARE AND ACCESSORY MATERIALS:

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items which are specified in Division 8 Section "Finish Hardware."
- B. Cabinet Hardware Schedule: Refer to schedule at end of this section for cabinet hardware required for architectural cabinets.
- C. Hardware Standard: Comply with ANSI/BHMA A156.9 "American National Standard for Cabinet Hardware" for items indicated by reference to BHMA numbers or referenced to this standard.
- D. Hardware Finishes: Comply with BHMA 1301 for finishes indicated by BHMA Code Numbers or if not otherwise indicated, provide finishes complying with requirements indicated.
 1. For exposed hardware comply with requirements indicated for finish and base indicated at the end of this Section 064000.
 2. For concealed hardware provide manufacturer's standard brushed chrome or brass finish with complies with product class requirements of ANSI/BHMA A156.9, and to match exposed hardware on same cabinet unit.

2.7 CLOSET AND UTILITY SHELVING:

- A. Quality Standard: Comply with AWI Section 600.
- B. Shelving for Opaque Finish: Comply with the following requirements:
 1. Grade: Premium.
 2. Shelving Material: Birch faced veneer core plywood.
 3. Exposed Edging: Solid hardwood.
 4. Thickness: 1-inch at wood shelves, unless indicated otherwise

- C. Shelving for *Transparent* Finish: Comply with the following requirements:
1. Location: Only in rooms where specifically indicated on Drawings.
 2. Grade: Premium.
 3. Species: AWI Veneer Grade A, Select Poplar, Rotary Cut, unless otherwise indicated on the Drawings.
 4. Thickness (plywood): 1-inch (minimum), with solid wood nosing.
 5. Lumber for shelving, *only* where indicated on the Drawings: 5/4-inch with nosings as indicated.

2.8 CLOSET AND UTILITY SHELVING HARDWARE:

- A. Adjustable Shelf Standards and Related Supports:
1. Provide standards and supports of type indicated, with matching finish on fasteners and accessories.
 2. Horizontal Slotted Type:
 - a. Mortise mounted, 5/8-inch wide x 3/16-inch high x length indicated, plated steel.
 - b. Equivalent to K & V No. 255, BRN.
 3. Support Type:
 - a. Closed shelf rest, bronze plated steel.
 - b. Equivalent to K & V No. 256, BRN.
 4. Closet Hanger Rod and Support:
 - a. Rod: Equivalent to K&V No. 770-1.
 - b. Supports: Equivalent to K&V No. 734 and No. 735, one (1) each per rod.

2.9 FASTENERS AND ANCHORS:

- A. Screws: Select material, type, size and finish required for each use. Comply with FS FF-S-111 for applicable requirements.
- B. Nails: Select material, type, size and finish required for each use. Comply with FS FF-N-105 for applicable requirements.
- C. Anchors: Select material, type, size and finish required by each substrate for secure anchorage. Provide non-ferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion-resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.

2.10 FINISHING OF INTERIOR ARCHITECTURAL WOODWORK:

- A. Quality Standard: Comply with AWI Section 1500, unless otherwise indicated.
- B. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing of concealed surfaces and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.

2.11 ARCHITECTURAL LAMINATE CLAD CABINETS:

- A. Quality Standard:
 - 1. Comply with AWI Section 400 and its Divisions 400B and 400C.
 - 2. Grade: Premium.
 - 3. Design: Flush overlay European style with concealed adjustable hinges, and as otherwise indicated on the Drawings.
- B. Laminate Cladding: High pressure decorative laminate complying with NEMA LD 3 and as follows:
 - 1. Colors, Patterns and Finishes: As indicated or, if not otherwise indicated, as selected by Architect from laminate manufacturers' standard products in the following categories: Solid, stippled, textured and/or patterned colors; Thru-color type.

2. Laminate Grade for Exposed Surfaces: Provide laminate cladding complying with the following requirements for type of surface and grade.
 - a. Horizontal Surfaces Other Than Tops: GP-50 (0.050" nominal thickness).
 - b. Post formed Surfaces: PF-42 (0.042" nominal thickness).
 - c. Vertical Surfaces: GP-50 (0.050" nominal thickness).
 - d. Balance Sheets and Liners: GP-28 (0.028" nominal thickness) -minimum.
- C. Hardboard: AHA A135.4 (tempered).

2.12 FLUSH WOOD PANELING AND WAINSCOTS FOR OPAQUE FINISH:

- A. Quality Standard: Comply with AWI Section 500 requirements for flush wood paneling.
 1. Grade: Premium.
 2. Wood Species: Any closed-grain hardwood listed in referenced woodworking standard.
 3. Cut: Plain or Rotary cut.
 4. Matching of Adjacent Veneer Leaves: Not required.
 5. Edge Treatment: Solid wood matching face for species and cut, at exposed edges.
 6. Core Material: Medium-density moisture resistant particleboard or veneer core plywood with exterior glue (approved for interior use).
 7. Back Veneer: Hardwood with similar density as face veneer.
 8. Thickness: As indicated, or if not indicated, at least 1/2-inch.

2.13 INTERIOR FRAMES AND JAMBS FOR OPAQUE FINISH:

- A. Quality Standard: Comply with AWI Section 900.
 1. Grade: Premium.
- B. Wood Species: Any closed-grain hardwood listed in referenced woodworking standard.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Condition woodwork to average prevailing humidity conditions in installation areas prior to installing.
- B. Pre-Installation Meeting: Meet at project site prior to delivery of architectural woodwork and review coordination and environmental controls required for proper installation and ambient conditioning in areas to receive work. Include in meeting the Contractor; Architect and other Owner Representatives (if any); Installers of architectural woodwork, wet work such as plastering, other finishes, painting, mechanical work and electrical work; and firms or persons responsible for continued operation (whether temporary or permanent) of HVAC system as required to maintain temperature and humidity conditions. Proceed with woodwork installation only when everyone concerned agrees that required ambient conditions can be maintained.
- C. Deliver concrete inserts and similar anchoring devices to be built into substrates, well in advance of time substrates are to be built.
 - 1. Coordinate location and placement of concealed treated blocking (by others) prior to finish materials installations.
- D. Prior to installation of architectural woodwork, examine shop fabricated work for completion, and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION:

- A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install woodwork plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8-inch in 8'-0" for plumb and level (including tops); and with no variations in flushness of adjoining surfaces.
- C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
 - 1. Seal all hardware cuts, routed slots, etc., before installation of hardware.

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- D. Anchor woodwork to anchors or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fasteners heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork, and matching final finish where transparent finish is indicated.
- E. Standing and Running Trim, and Sills: Install with maximum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners and comply with referenced Quality Standards for joinery.
- F. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated. Maintain veneer sequence matching (if any) of cabinets with transparent finish.
 - 1. Install cabinets with no more than 1/8-inch in 96-inches sag, bow, or other variation from a straight line.
- G. Wood Storage Shelving: Complete the assembly of units and install in the areas indicated, including hardware and accessories as indicated.
- H. Tops: Anchor securely to base units and other support systems indicated. Caulk space between backsplash and wall with specified sealant.
 - 1. Install countertops with no more than 1/8-inch in 96-inches (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
- I. Wood Panels: Anchor panels to supporting substrate with concealed panel-hanger clips and by blind nailing on backup strips, splined-connection strips, and similar associated trim and framing. Do not face nail unless otherwise indicated.
 - 1. Install flush panels with no more than 1/16-inch in 96-inches vertical cup or bow and 1/8- inch in 96-inches horizontal variation from a true plane.
- J. Refer to Section 099123 - "Painting", for final finishing of installed architectural woodwork.

3.3 ADJUSTMENT, CLEANING, FINISHING, AND PROTECTION:

- A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair replace woodwork. Adjust joinery for uniform appearance.

- B. Clean, lubricate and adjust hardware.
- C. Clean woodwork on exposed and semi-exposed surfaces. Touch-up shop-applied finishes to restore damaged or soiled areas.
- D. Complete the finishing work specified as work of this section, to whatever extent not completed at shop or prior to installation of woodwork.
- E. Provide final protection and maintain conditions, in a manner acceptable to Fabricator and Installer, which ensures architectural woodwork being without damage or deterioration at time of substantial completion.

3.4 CABINET HARDWARE SCHEDULE:

- A. General: Subject to requirements and finishes stated above, furnish the following items in quantities and at locations indicated, by named manufacturers or equivalent products acceptable to Architect.
 - 1. Cabinet Hinges: 170-degrees adjustable "CLIP System" concealed self-closing hinges as manufactured by Julius Blum, Inc., or equivalent by Grass or Stanley.
- B. Cabinet Door and Drawer Pulls:
 - 1. Wire pulls, equivalent to Stanley No. 4484, solid brass (ANSI B12012), 4-inches long, with 1-inch clearance; Finish to match Section 087100 – "Finish Hardware" finish in room(s) where occurs, or equivalent priced pulls selected by Architect after bidding.
- C. Cabinet Door Catches: Manufacturer's standard 2-screw sill mounted unit made of molded nylon, lipped over sill to form bumper and hold in place, with 2-screw mounted heavy door mounted unit with nylon roller; provide spring-mounted units where required.
 - 1. Acceptable Manufacturers: Any of manufacturer's listed for other cabinet hardware.
- D. Drawer Slides: Heavy Duty, non-corrosive (galvanized) full extension ball bearing slides rated at 100-pounds, with positive stop, and self-closing and lift-out disconnect features; Model No. 1429, as manufactured by Knappe & Vogt, or equivalent by Blum or Grant.
 - 1. At legal size drawers, use K&V No. 1483 or equivalent, rated at 150-pounds, with same features as noted above.

- E. Shelf Standards: Manufacturer's standard steel units with anchors and supports 5/8-inch wide x 3/16-inch high, adjustable on 1/2-inch centers; Series 255, as manufactured by K&V, or equivalent by Grant or Stanley.
1. Wood Cabinets: Model No. 255 BRN with No. 256 BRN supports and matching fasteners.
 2. Omit standards where fixed shelves are indicated.
 3. All standards to be recess mounted (flush in routed dados), unless specifically indicated otherwise.
- F. Locks: Where indicated on the Drawings, provide cabinet manufacturer's standard 5-disc tumbler, cam type, keyed differently at each room and at each teller station, and master keyed.
1. Furnish 2-keys for each lock.
 2. Furnish 5-master keys
 3. Finish to match Section 087100 - "Finish Hardware" finish in room(s) where occurs.

END OF ARCHITECTURAL WOODWORK

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SECTION 06 6400

PLASTIC PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic sheet paneling.
2. Factory-laminated plastic sheet paneling.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring for installing plastic paneling.
2. Section 064219 "Plastic-Laminate-Faced Wood Paneling."
3. Section 102600 "Wall and Door Protection" for corner guards installed over plastic paneling.

1.2 ACTION SUBMITTALS

- A. Product Data:** For each type of product.
- B. Samples:** For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.3 QUALITY ASSURANCE

1.4 PROJECT CONDITIONS

- A. Environmental Limitations:** Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain plastic paneling and trim accessories from single manufacturer.**

2.2 PLASTIC SHEET PANELING

- A. Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D5319. **Panels are to be USDA accepted for incidental food contact.**
 - 1. Surface-Burning Characteristics: As follows when tested by a qualified testing agency in accordance with ASTM E84. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: **25** or less.
 - b. Smoke-Developed Index: 450 or less.
 - 2. Nominal Thickness: Not less than 3/32".
 - 3. Surface Finish: **Molded pebble texture.**
 - 4. Color: **As selected by Architect from manufacturer's full range.**
 - 5. Water-Resistant Gypsum Board: ASTM C1396/C1396M or ASTM C1178/C1178M, 5/8 inch, Type X, with water-resistant core and surfaces.

2.3 ACCESSORIES

- A. Trim Accessories: Manufacturer's standard **one-piece** vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, **outside corners**, and caps as needed to conceal edges.
 - 1. Color: **As selected by Architect from manufacturer's full range.**
- B. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.
- C. Adhesive: As recommended by plastic paneling manufacturer.
- D. Sealant: **Mildew-resistant, single-component, neutral-curing silicone** sealant recommended by plastic paneling manufacturer and complying with requirements in Section 079200 "Joint Sealants."

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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.
- B. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.
- C. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.
- D. Lay out paneling before installing. Locate panel joints **[to provide equal panels at ends of walls not less than half the width of full panels]**.
 - 1. Mark plumb lines on substrate at locations for accurate installation.
 - 2. Locate **trim accessories** and **panel joints** to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

- A. Install plastic paneling according to manufacturer's written instructions.
- B. Install panels in a full spread of adhesive.
- C. Install factory-laminated panels using concealed mounting splines in panel joints.
- D. Install trim accessories with **adhesive as recommended by manufacturer**.
- E. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.
- F. Maintain uniform space between panels and wall fixtures. Fill space with sealant.
- G. Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures. Fill space with sealant.
- H. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION PLASTIC PANELING

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SECTION 07 2100

BUILDING INSULATION

PART 1- GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
 - 1. Section 04 22 00 - "Concrete Unit Masonry"
 - 2. Section 06 10 00 - "Rough Carpentry"
 - 3. Section 07 42 13.23 - "Metal Composite Material Wall Panels"
 - 4. Section 09 21 16 - "Gypsum Drywall"

1.2 SUMMARY:

- A. This Section includes the following:
 - 1. Building insulation, **formaldehyde-free**, in batt form, in any exterior stud walls, below roof deck, at bottom of wood and metal trusses, at miscellaneous locations, and as otherwise required to provide a continuous and complete insulation envelope between interior and exterior of building; And at any uninsulated walls, attics, etc., opened or otherwise encountered during the course of the work of this project.
 - 2. Extend insulation up to at least the bottom of primary attic or roof insulation, at all wood and metal stud exterior walls.
 - 3. Extend sound batts up to top of wall or up to bottom of attic insulation, at new wood and metal stud interior walls where so indicated, or if not indicated, at least at perimeter interior walls of all mechanical, electrical and equipment rooms, rooms which contain toilet and shower fixtures, conference rooms, offices, and within all stud walls fire-rated 2-hours or more.
 - 4. Supports and miscellaneous accessories.
 - a. **Note:** Insulation shall be supported above the surface of any horizontal fire- rated gypsum board, using manufacturer's standard wires, straps, or other effective method acceptable to product manufacturers and authorities having jurisdiction. The only acceptable alternative will be assembly test data which indicates no reduction in the fire-rating of fire protection materials due to insulation being in direct contact with fire-rated assembly materials.

1.3 DEFINITIONS:

- A. Thermal Resistivity: Where the thermal resistivity of insulation products are designated by “r-values,” they represent the reciprocal of thermal conductivity (k-values). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivities are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

1.4 SUBMITTALS:

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of insulation product and accessory specified.

1.5 QUALITY ASSURANCE:

- A. Fire Performance Characteristics: Provide insulation materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.
- B. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.6 DELIVERY, STORAGE, AND HANDLING:

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer’s recommendations for handling, storage, and protection during installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Manufacturers: Subject to compliance with requirements, provide formaldehyde-free insulation products of one of the following:
 - 1. Manufacturers of Glass Fiber Insulation: **(formaldehyde-free)**
 - a. CertainTeed Corp.
 - b. Georgia-Pacific

- c. Knauf Fiber Glass GmbH.
 - d. Manville Building Insulations Div., Manville Sales Corp.
 - e. Ottawa Fibre, Inc.
 - f. Owens/Corning Fiberglass Corp.
2. Manufacturers of Open-Cell Foam:
 - a. UPC (Basis of Design)
 - b. Carlisle
 - c. EnviroSeal

2.2 INSULATING MATERIALS:

- A. General:
 1. Provide insulating materials that comply with requirements and with referenced standards.
 2. Preformed Units: Sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.
- B. Unfaced Mineral Fiber Blanket/Batt Insulation (sound batts): Thermal insulation produced by combining mineral fibers of type described below with **formaldehyde-free** thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing); and as follows:
 1. Mineral Fiber Type: Fibers manufactured from glass or slag; **formaldehyde-free**.
 2. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.
 3. Thickness: Unfaced 3" or 3-1/2" for use in all areas shown on Drawings and where sound batts are indicated herein this Section 07210, and for in-fill of voids around windows, frames, etc., at metal and wood framing.
- C. Faced Mineral Fiber Blanket/Batt Insulation: Thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type III, Class A (blankets with reflective vapor-retarder membrane facing with flame spread of 25 or less); foil-scrim-kraft membrane on one face, and as follows:
 1. Mineral Fiber Type: Fibers manufactured from glass or slag; **formaldehyde-free**.
 2. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.
 3. Thickness: **Full stud depth**, generally 3-1/2 inches nominal, R-11; 5-1/2 inches nominal, R-19; and 8 inches nominal, R-23, etc., continuous at all exterior stud walls; and 10 inches nominal, R-30 where indicated.

4. NOTE: Where insulation is concealed by other construction (inside walls, on or above ceiling materials, etc.), the following insulation may be used, except NOT at Mechanical plenum spaces.
 - a. ASTM C 665, Type II, Class C; Kraft-faced membrane on one face; **Formaldehyde-free**, and otherwise same as above.
- D. Open-Cell Foam: (UPC 500 OCX Appendix-x- Basis of Design)
 1. Follow manufacturer's Instructions.
 2. Follow with an intumescent coating.
 - a. Manufacturer: International Fireproof Technology, Inc. – DC315 Polyurethane foam (SPF) -Basis of Design. Follow manufacturer's instructions.

2.3 MISCELLANEOUS MATERIALS:

- A. General: Provide support system acceptable to insulation manufacturer where insulation batts are not fully concealed in wall construction, occur between open horizontal framing (i.e.: nothing else at bottom of framing if in attic), where a reduction occurs in fire protection materials fire-rating due to insulation being in direct contact with fire-rated assembly materials, etc., in addition to mechanical anchorage.
 1. Products: Provide one of the following or other method acceptable to Architect:
 - a. Galvanized struts or straps, at 2'-0" o.c. maximum, anchored at each end.
 - b. Galvanized 2" mesh "chicken wire," continuous, and anchored to framing at 1'- 0" o.c. maximum.
- B. Baffles: Provide insulation manufacturer's standard recommended baffles at eaves, only where batt insulation is to be installed in ventilated attic, to close-off edges of insulation and to keep from extending batts into above soffit area. Provide at least 1-inch clear from roof decking to allow ventilation through attic and concealed areas from soffit vents.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine substrates and conditions with Installer present, for compliance with requirements of the Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION,GENERAL:

- A. Comply with insulation manufacturer's instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.
 - 1. Do not install insulation which is or has been wet, or otherwise damaged.
- B. Provide support system at locations where insulation is exposed in open or partially exposed framing, or is otherwise unsupported.
- C. Extend insulation full thickness as indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections that interfere with placement.
 - 1. Omit insulation over recessed lighting fixtures.
- D. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF GENERAL BUILDING INSULATION:

- A. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate using mechanical anchorage to provide permanent placement and support of units.
- B. Set vapor retarder faced units with vapor retarder to warm side of construction, except as otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
- C. Stuff glass fiber loose fill insulation into miscellaneous voids and cavity spaces. Compact to approximately 40 percent of normal maximum volume (to a density of approximately 2.5 pcf).

3.4 PROTECTION:

- A. General: Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF BUILDING INSULATION

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SECTION 07 2700

FIRESTOPPING

PART 1- GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2. DESCRIPTION OF WORK:

- A. Work described in this Section includes:
 - 1. Through penetration firestopping in fire rated construction.
 - 2. Construction-gap firestopping at connections of the same materials and different materials in fire rated construction.
 - 3. Construction-gap fire stopping occurring within fire rated wall, floor, floor-ceiling, and/or roof-ceiling assemblies.
 - 4. Construction-gap firestopping at the top of fire rated walls.
 - 5. Through-penetration smoke-stopping in smoke partitions.
 - 6. Construction-gap smoke-stopping in smoke partitions.
- B. Related work Specified elsewhere includes:
 - 1. For structural, finish, and fire protection materials: Refer to the appropriate Specifications Sections.
 - 2. Fire dampers and manufactured devices: Refer to Division 23.
 - 3. Raceway seals and manufactured electrical devices: Refer to Division 26.
- C. Unless specifically indicated otherwise, the party, trade, or subcontractor whose work penetrates fire-rated construction and/or fire-rated assemblies, shall be responsible for firestopping around their own penetrations.
- D. In the event the General Contractor employs a Specialty Subcontractor for the required firestopping work, they shall notify all prospective Bidders, so as to avoid duplication in pricing.
 - 1. The Specialty Subcontractor shall provide coordination of requirements and the related work of other trades in advance of and as the Work progresses.

1.3 REFERENCED STANDARDS:

- A. Underwriters Laboratories – U.L. Fire Resistant Directory:
 - 1. Through-penetration fire stop devices (XHCR).
 - 2. Fire resistant ratings (BXUV).
 - 3. Through-penetration firestop systems (XHEZ).
 - 4. Fill, void, or cavity material (XHHW).
- B. American Society for Testing and Materials Standards:
 - 1. ASTM E 814: Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
 - 2. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. Underwriters Laboratories, Inc.:
 - 1. UL 1479: Fire Tests of Through-Penetration Firestops.
 - 2. UL 723: Surface Burning Characteristics of Building Materials.

1.4 DEFINITIONS:

- A. Assembly: Particular arrangement of materials specific to given type of construction described or detailed in referenced documents.
- B. Barriers: Time rated fire walls, smoke barrier walls, time rated floor-ceiling and roof-ceiling assemblies, and structural floors and walls.
- C. Firestopping: Methods and materials applied in penetrations and unprotected openings to limit spread of heat, fire, gasses, and smoke.
- D. Penetration: Opening or foreign material passing through or into barrier or structural floor such that full thickness of rated materials is not obtained.
- E. Construction Gaps: Gaps between adjacent sections of walls, exterior walls, at wall tops between top of wall and ceiling, and structural floors or roof decks; and gaps between adjacent sections of structural floors.
- F. System: Specific products and applications, classified and numbered by Underwriters Laboratories, Inc., to close specific barrier penetrations.
- G. Sleeve: Metal fabrication or metal pipe section extending through thickness of barrier and used to permanently guard penetration. Sleeves are described as part of penetrating system in other sections and may or may not be required.

1.5 SYSTEM DESCRIPTION:

A. Design Requirements:

1. Fire Rated Construction: Maintain barrier and structural floor fire ratings including resistance to cold smoke at all penetrations, connections with other surfaces and/or types of construction, at separations required to permit building movement and sound and/or vibration absorption, and at other construction gaps.
2. Smoke Barrier Construction: Maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction and at all separations required to permit building movement and sound and/or vibration absorption, and at other construction gaps.

1.6 SUBMITTALS:

- A. Submit in accordance with General Conditions, Division 1, and Section 01015 - "Special Conditions," unless specifically indicated otherwise.
- B. Product Data: Manufacturer's written specifications and technical data including the following:
1. Detailed specifications of construction and fabrication.
 2. Manufacturer's current written installation instructions.
 3. Summary of test data for each product intended for use and limitations. Include name and address of the required independent testing laboratory and compliances obtained.
- C. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.
1. Details of each proposed assembly identifying intended products and applicable UL System number or UL Classified devices.
 2. Manufacturer or manufacturer's representative shall provide qualified engineering judgments and drawings relating to non-standard applications as needed.
- D. Quality Control Submittals: Statement of qualifications.
- E. Applicators' Qualifications Statement: List past projects indicating required experience.

1.7 QUALITY ASSURANCE:

- A. Specialty Contractor's Qualifications: Firm experience in installation or application of systems similar in complexity to those required for this project, plus the following:
 - 1. Acceptable to or licensed by manufacturer, and to State, Local, and/or other authority having jurisdiction, where applicable.
 - 2. At least 2-years experience with systems intended for use.
 - 3. Successfully completed at least five projects of similar size, scope, and complexity using the systems intended for use.
- B. Local and State Regulatory Requirements: Submit forms or acceptance for proposed assemblies not conforming to specific UL Firestop System Numbers or UL classified devices and/or systems.
- C. Materials shall have been tested to provide fire rating at least equal to that of the construction.

1.8 DELIVERY, STORAGE AND HANDLING:

- A. Comply with manufacturer's current written instructions and recommendations.
- B. Packing and Shipping:
 - 1. Deliver products in original unopened packaging with legible manufacturer's identification.
 - 2. Coordinate delivery with scheduled installation date, so as to allow minimum storage at site.
- C. Storage and Protection: Store materials in a clean, dry, ventilated interior location. Store materials off of floor, and protect from soiling, abuse, moisture, and freezing. Follow manufacturer's written instructions when more stringent.
- D. Remove damaged and/or contaminated materials immediately, legally dispose of off site, and Replace, at Contractor's expense.
- E. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

1.9 PROJECT CONDITIONS:

A. Existing Conditions:

1. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding with work.
2. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.

B. Environmental Requirements:

1. Furnish adequate ventilation if using solvents.
2. Furnish forced air ventilation during installation if required by manufacturer and/or authorities having jurisdiction.
3. Keep Flammable materials away from sparks or flame.
4. Provide masking or drop cloths to prevent contamination of adjacent surfaces by firestopping materials.
5. Comply with manufacturer's written recommendations for temperature and humidity conditions before, during, and after installation of firestopping.

1.10 GUARANTEE:

- A. Submit copies of written guarantee agreeing to repair or replace joint sealers which fail in joint adhesion, co-adhesion, abrasive resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, and/or general durability, and/or which appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality or characteristic of the material for the exposure indicated. The guarantee period shall be for 1-year from the date of "Substantial Completion."

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND PRODUCTS:

- A. Use only those listed in the UL Fire Resistance Directory for the UL System involved.
- B. Products shall be as manufactured by one of the following, or pre-approved equivalent:
1. Dow Corning.
 2. HILTI.
 3. 3M Fire Protection Products.
 4. Nelson Firestop Products.
 5. Rector Seal Corp.
 6. Specified Technologies, Inc.
 7. Tremco, Inc., Div. of RPM Corporation.

- C. All firestopping products must be from a single manufacturer.
- D. All trades shall use products from the same manufacturer.

2.2 THROUGH-PENETRATION FIRESTOPPING OF FIRE-RATED CONSTRUCTION:

- A. Systems or devices listed in the UL Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that they conform to the construction type, penetrant type, annular space requirements, and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems or devices must be asbestos-free.
 - 1. Additional requirements: Withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the UL system or device, and designated to perform this function.

2.3 CONSTRUCTION-GAP FIRESTOPPING OF FIRE-RATED CONSTRUCTION:

- A. Firestopping at construction gaps between edges of floor slabs and exterior wall construction.
- B. Firestopping at construction gaps between tops of partitions and underside of structural systems.
- C. Firestopping at construction gaps between tops of partitions and underside of fire-rated ceiling or ceiling assembly.
- D. Firestopping of control joints in fire rated masonry partitions.
- E. Firestopping expansion joints.
- F. Acceptable manufacturers and products: Use only those listed in the UL Fire Resistant Directory for the UL System involved.

2.4 SMOKE STOPPING AT SMOKE PARTITIONS:

- A. Through-penetration smoke-stopping: Any system complying with the requirements for through-penetration firestopping in fire-rated construction, as specified in the "Referenced Standards" is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded, as applicable.
- B. Construction-gap smoke-stopping: Any system complying with the requirement for

construction-gap firestopping in fire-rated construction, as specified in the "Referenced Standards" is acceptable, provided that the system includes the specified smoke seal or will provide the smoke seal. The length of time of the fire resistance may be disregarded, as applicable.

2.5 ACCESSORIES:

- A. Fill, void, and cavity materials: As classified under category XHHW in the UL Fire Resistance Directory.
- B. Forming materials: As classified under category XHKU in the UL Fire Resistance Directory.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion. Notify the General Contractor of such conditions.
 - 1. Verify barrier penetrations are properly sized and in suitable conditions for application of materials.
 - 2. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 PREPARATION AND CLEANING:

- A. Clean surfaces to be in contact with penetration seal materials, of dirt, grease, oil, loose materials, rust or other substances, that may effect proper fitting, adhesion, or the required fire resistance.

3.3 INSTALLATION:

- A. Install penetration seal materials in accordance with printed instructions of the UL Fire Resistance Directory and in accordance with manufacturer's written instructions and recommendations.
- B. Seal holes or voids made by penetrations to ensure an effective smoke barrier.
- C. Where floor openings without penetrating items are more than 4-inches in width and subject to traffic or loading, install firestopping materials capable of supporting same loading as required for floor system.

- D. Protect materials from damage on surfaces subject to traffic.
- E. Place firestopping in annular space around fire dampers before installation of damper's anchoring flanges, which are to be installed in accordance with fire damper manufacturer's written recommendations, unless specifically indicated otherwise.
- F. Where large openings are created in walls, or floors to permit installation of pipes, ducts, cable tray, bus duct, or other items, close unused portions of opening with firestopping material tested for the application.
- G. Install smoke firestopping as specified for firestopping.
- H. Where rated walls are constructed with horizontally continuous air space, double width masonry, or double stud frame construction, provide vertical, 12-inch wide fiber dams for full thickness and height of air cavity at maximum intervals of 15'-0" on center.

3.4 FIELD QUALITY CONTROL:

- A. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.
- B. Keep areas of work accessible until inspection by the Architect, building inspector, fire inspector, and/or other authority having jurisdiction.
- C. Perform under this Section 07270, patching and repairing of firestopping caused by cutting or penetration by other trades, and/or by any other cause.

3.5 ADJUSTING AND CLEANING:

- A. Immediately clean-up spills of liquid components.
- B. Neatly cut and trim materials as required.
- C. Remove equipment, materials and debris, leaving area in undamaged and clean condition.
- D. Legally dispose of excess materials, trash, debris, etc., off of site.

END OF FIRESTOPPING

SECTION 07 62 00

FLASHING AND SHEET METAL

PART 1- GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.
- B. Related work specified elsewhere includes:
 - 1. Section 04 20 00 - "Concrete Unit Masonry"
 - 2. Section 06 10 0 - "Rough Carpentry"
 - 3. Section 07 24 00 - "Exterior Insulation And Finish System (EIFS)"
 - 4. Section 07 41 13 - "Manufactured Roof Panels"
 - 5. Section 07 92 00 - "Joint Sealers"
 - 6. Section 08 11 0 - "Steel Doors and Frames"
 - 7. Section 08 41 13 - "Aluminum Entrances and Storefront"
 - 8. Section 08 92 0 - "Glazed Aluminum Curtain Walls"
 - 9. Section 08 91 19 - "Fixed Louvers"

1.2 SUMMARY:

- A. This Section includes the following, where indicated, and where required by project conditions, and which are not part of other Sections:
 - 1. Prefinished metal counter flashing and base flashing.
 - 2. Miscellaneous prefinished metal wall flashing, counterflashing, and reglets.
 - 3. Exposed prefinished metal trim/fascia units, parapet caps (copings), downspouts with connected to boots into storm drainage only where indicated on the Drawings (if any), and otherwise, onto precast concrete splashblocks at grade and onto corrugated splash pan at roofing, and other items as indicated on the Drawings.
 - 4. Elastic flashing at top of all curbs, top course of double wythe walls, at perimeters of all exterior wall openings (i.e.: doors, windows, louvers, etc.), through-wall flashing, and elsewhere as indicated.
 - 5. Miscellaneous sheet metal accessories as indicated and as required by project conditions.
 - 6. "Special Flashing" at locations indicated; Refer to Division 7 roofing and siding sections for additional information and requirements.
 - a. Where roofing planes intersect vertical walls and planes, turn edges up at least 8-inches.

7. Where different roofing systems meet, provide **water-tight** prefinished metal perimeter flashings/gravel guards at terminal edges and at juncture of roofing systems, and coordinated with other roofing systems.
- B. Exposed metal flashing is intended to be factory formed, prefinished baked enamel, as specified, in manufacturer's standard non-metallic color(s) selected by Architect after bidding.

1.3 **SUBMITTALS:**

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for Flashing, Sheet Metal and Accessories: Manufacturer's current technical product data, installation instructions and general recommendations for each specified sheet material, fabricated product, coating system, and color selection data.
- C. Samples of the following flashing, sheet metal, and accessory items:
 1. 12-inch-long samples of factory-fabricated products exposed as finished work. Provide complete with specified factory finish.
 2. Physical samples for color selections, where color selection is required.
- D. Shop drawings showing layout, profiles, methods of joining, and anchorages details, including major counterflashings, trim/fascia units, expansion joint systems, and other fabricated work. Provide layouts at 1/4-inch scale and details at 3-inch scale.
- E. Provide written assurance that each sheet metal product to be incorporated into a Roofing warranty is approved by the roof system manufacturer, and also code compliant per ANSI-SPRI ES-1.

1.4 **PROJECT CONDITIONS:**

- A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 SHEET METAL, TRIM UNITS, FLASHING, COPING, GUTTERS AND DOWNSPOUTS, AND TRIM MATERIALS:

- A. Fabricate of **minimum 24-gage** metal, with minimum 50,000 p.s.i. yield, with 2-coat full strength (70-percent) Kynar 500 resin (20-year) finish. Provide one of the following base metals, to be the same base metal used for other sheet metal applications and systems:
 - 1. ASTM A 792 aluminum-zinc alloy coated steel sheet ("Galvalume"), or
 - 2. ASTM A 653, G-90 (galvanized) zinc-coated steel sheet.
 - 3. Typical metal flashing, except where specifically indicated otherwise.
- B. Prefinished Metal Drip Edge: Brake-formed sheet metal with at least a 2-inch roof deck flange at shingles and at least 4-inch roof deck flange at any "flat" roofs; 1-inch flange extension to support any shingle roofing and 1/2" raised edge at single-ply roofing; with a 1-1/2-inch fascia flange with a 3/8-inch hemmed edge drip at lower edge at any shingle or metal roofing, which is not already included with metal roofing system. Furnish in lengths of at least 10 feet.
 - 1. Furnish for metal roofing systems and metal flashing systems over 6" wide, if indicated in addition to metal roofing trim.
- C. Prefinished Metal Flashing and 2-Inch High Diverter Strips:
 - 1. Install diverter strips 1'-0" above low roof edge(s) of sloped roofs, at all locations over exterior doors, and over exterior mechanical units where roof edge gutters or parapet walls do not occur.
- D. Prefinished Coping System: Provide prefinished Kynar coated steel coping system, including cleats and all necessary accessories for a complete and properly installed water-tight system.
 - 1. Product/Manufacturer: Same as membrane roof system.
 - 2. ANSI-SPRI ES-1 compliant metal coping system, with continuous clip across top of and length of parapets (full secondary concealed wall cap), with drive cleat seam joints - filled with sealant, double-folded, and corners turned down.

E. Finishes:

1. Finish for any exposed metal flashings, gutters, downspouts, coping systems, etc., shall be 2-coat 70% resin "Kynar 500" coating (i.e.: primer and color coats); and note that the finish system may be a traditional liquid or powder coat, complying with AAMA 2605, with a total dry film thickness of not less than 1.6-mils, and manufacturer's standard 20-year minimum finish warranty; Manufacturer's standard primer or washcoat on back side, and inside gutters.
2. Colors: As selected by Architect after Bid Date, from manufacturer's standard non-metallic colors; Minimum 15 colors to select from, including color(s) to match similar metal panel applications on the new buildings, or window framing.

2.2 LEAD FLASHING (AT VENT STACKS):

- A. 4-pound lead sheet, fabricated to extend 4 inches minimum onto roof and turn down 1 inch minimum down inside vent stacks.
1. For metal roofing, provide counterflashing over vent stacks, curbs, and other penetrations' flashings in same material and color as metal roofing.
 2. Note that flashing at metal roofing shall also be as recommended by metal roof panel manufacturer and shall fully comply with applicable warranties.

2.3 SPECIAL FLASHING:

- A. Self-Adhering, Polyethylene-Faced Sheet: ASTM D 1970, 40 mils (1.0 mm) thick minimum, consisting of slip-resisting polyethylene-film reinforcing and top surface laminated to SBS-modified asphalt adhesive, with release-paper backing; cold applied.
- B. Products - Metal Siding Over Solid Substrates: Provide equivalent to "Ice and Water Shield" waterproofing underlayment, with self adhesive and self-sealing property, which will not crack, dry out, or rot and is resistant to fungus and bacteria, as manufactured by W.R. Grace & Company - Conn; Atlanta, Georgia, by one of the following:
1. Atlas Roofing Corporation; StormMaster DG.
 2. Garland Co;
 3. Grace, W. R. & Co.; Grace Ice and Water Shield (*basis of design*).
 4. Henry Company; Perma-Seal PE.
 5. Johns Manville International, Inc.; Roof Defender.
 6. NEI Advanced Composite Technology; AC Poly Ice and StormSeal.
 7. Owens Corning; WeatherLock.
 8. Polyguard Products, Inc.; Polyguard Deck Guard.
 9. Protecto Wrap Company; Rainproof TM.

10. TAMKO; TW Metal and Tile.
 11. CertainTeed WinterGuard Granular
- C. Products - Metal Roofs, and Horizontal or Sloped Metal Flashings Over 6" Wide, Occurring Over Solid Substrates: Provide continuous, equivalent to "Ultra" high temperature resistant waterproofing roofing underlayment, as manufactured by W.R. Grace & Company - Conn; Atlanta, Georgia.
1. Self-Adhering, High-Temperature Sheet: 30 to 40 mils (0.76 to 1.0 mm) thick minimum, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 2. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
 3. Low Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
 4. Products:
 - a. Carlisle Coatings & Waterproofing, Div. of Carlisle Companies Inc.; Dri-Start "HR" High Performance Roofing Underlayment.
 - b. Grace, W. R. & Co.; Ultra (*basis of design*).
 - c. Henry Company; Perma-Seal PE.
 - d. Metal-Fab Manufacturing, LLC; MetShield.
 - e. TC MiraDRI; WIP 300HT.
- D. Install 1-layer over entire substrates indicated above. Where roofing planes intersect vertical walls and planes, turn edges up at least 8-inches.
- E. Coordinate with, and refer to Division 7 Roofing and Siding Sections for additional information and requirements.

2.4 **MISCELLANEOUS MATERIALS AND ACCESSORIES:**

- A. Solder:
1. For use with steel or copper: Provide 50 - 50 tin/lead solder (ASTM B 32), with rosin flux.
 2. For use with stainless steel: Provide 60 - 40 tin/lead solder (ASTM B 32), with acid-chloride type flux, except use rosin flux over tinned surfaces.
- B. Fasteners: Same metal as flashing/sheet metal or other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
- C. Bituminous Coating: SSPC - Paint 12, solvent-type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
- D. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, non-drying, nonmigrating

sealant.

- E. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed and complying with requirements for joint sealants as specified in Section 07900 - "Joint Sealers."
- F. Paper Slip Sheet: 5-lb. rosin-sized building paper.
- G. Counterflashing and Reglets: Metal units of type and profile indicated, or if not indicated, as required for the intended use, compatible with flashing indicated, noncorrosive.
 - 1. At surface-mounted parapet and wall flashing conditions, equivalent to 2-piece "Springlok" Flashing Systems, as manufactured by Fry Reglet; Norcross, Georgia; Phone: 1-770-441-2337, except where brake-formed metal is specifically indicated.
- H. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required for performance.
- I. Fibered Aluminum Roof Coating: ASTM D 2824, Type II; FS TT-C-1079. Equivalent to Perma-Seal coating No. 3910; Brush applied only.
- J. Provide precast concrete splashblock sloped away from building, approximately 12-inches wide x 24-inches long x 2-inches thick x 3-inches high, with 3-raised edges and one "open" end turned toward building – at locations where downspouts would otherwise drain on grade.
 - 1. Provide 1-precast concrete splashblock at each downspout which drains onto grade or paving;
 - 2. Provide 1-preformed metal pan with corrugated bottom and properly hemmed edges (minimum 12" x 24") at each downspout which drains onto a roof below.

2.5 **FABRICATED UNITS:**

- A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line

and levels indicated, with exposed edges folded back to form hems.

1. At metal roofing and horizontal or sloped metal flashings over 6-inches wide, provide custom configurations and continuous brake-metal roofing system, with continuous concealed clip anchors rated for I-90 uplift conditions, with 1-inch high standing seam Pittsburgh lock-seam joints - filled with sealant, double-folded, and corners turned down at 45-degrees.
 2. Provide matching materials and finish for fascia metal covering, flashing, counterflashing and trim.
- B. Seams: Fabricate nonmoving seams in sheet metal with standing seam at exposed tops and lapped side or edge seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer. Pop-rivet joints for additional strength where required and at vertical faces.
- C. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
- D. Gutters: Form in "continuous" sections with the least number of joints, unless otherwise indicated, complete with end pieces, outlet tubes and other special pieces as required. Size as indicated on the Drawings, or if not indicated, size in accordance with SMACNA and submit for approval prior to fabrication. Join sections with riveted and soldered or sealed joints, concealed wherever possible. Provide expansion-type slip joint at locations indicated, or if not indicated, as recommended by SMACNA for the metal being used.
1. Furnish gutter supports spaced 36-inches on center, or 32-inches on center at 16" metal roofing panels, or 48-inches on center at 24" metal roofing panels, constructed of same metal as gutters.
 2. Provide bronze, copper, or aluminum wire ball strainers at outlets, which are slightly below front edge of gutters and not visible from normal view.
 3. Finish shall be as indicated, or if not indicated, to match roofing, roof edge fascia and rake, or as selected by Architect.
- E. Downspouts: Form in 10-foot-long sections, complete with elbows, offsets and other special pieces as required. Join sections with 1-1/2-inch telescoping joints. Provide off-set anchor straps / supports designed to hold downspouts securely 1-inch away from walls; locate anchor straps / supports at top and bottom and equally spaced at approximately 5-feet on center in between. Finish shall be as indicated, or if not indicated, to match gutters, roof edge fascia and rake, or as selected by Architect.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS:

- A. General: Except as otherwise indicated, comply with manufacturer's current written installation instructions and recommendations, with SMACNA "Architectural Sheet Metal Manual," and reviewed submittals and shop drawings.
 - 1. Install manufactured, bought-out items in accordance with manufacturer's current written instructions and recommendations.
 - 2. Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.
- B. Underlayment: Where stainless steel or aluminum is to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper and a course of polyethylene underlayment.
- C. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.
- D. Install reglets to receive counterflashing in manner and by methods indicated, in a straight line and single elevation.
- E. Install counterflashing in reglets, by snap-in seal arrangement for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure, or if not indicated, as recommended by referenced standards, flashing and roofing manufacturers, and otherwise as required for the intended application.
- F. Nail or anchor flanges of expansion joint units to curb nailers, at maximum spacing of 6 inches o.c. Fabricate seams at joints between units with minimum 3-inch overlap, to form a continuous, waterproof system.
- G. Flashing:
 - 1. Comply with manufacturer's current written instructions and recommendations for installation of all systems components in all applications indicated on the Drawings, and as otherwise required by project conditions.
 - 2. At any parapet wall and roof curbs applications, extend flashing continuous,

over top of wall or curb, and turn down one inch (1") minimum on exterior side of wall and mechanically anchor in place at side of top of wall, below and concealed by continuous metal clip anchor (acting as termination bar) and metal cap flashing or coping, and down over top edge of roofing flashing material at roof side.

- H. Provide 1- precast concrete splashblock at each downspout which drains onto grade, and 1- preformed metal pan at each downspout which drains onto roof below.

3.2 **CLEANING AND PROTECTION:**

- A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
 - 1. After cleaning, repair and restore damaged metal and metal finishes with prefinished paint manufacturer's special air-drying touch-up paint, in manner such that touch-up is not apparent.
 - 2. Replace damaged flashing and sheet metal work which cannot be repaired and when finish repair and restoration is not acceptable to Architect.
- B. Protection: Advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Substantial Completion.

END OF FLASHING AND SHEET METAL

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SECTION 07 9200

JOINT SEALERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
 - 1. Section 32 10 00 – “Portland Cement Concrete Paving”
 - 2. Section 32 13 13 – “Curbs and Gutters”
 - 3. Section 03 30 00 – “Concrete Work”
 - 4. Section 04 22 00 – “Unit Masonry”
 - 5. Division 6 – “Wood And Plastics”
 - 6. Division 7 – “Siding, Soffit and Roofing Systems”
 - 7. Division 8 – “Doors and Windows”
 - 8. Division 9 – “Finishes”
 - 9. Division 10 – “Specialties”
 - 10. Divisions 23 – (Joint sealers for mechanical work)
 - 11. Divisions 26 – (Joint sealers for electrical work)

1.2 DESCRIPTION OF WORK:

- A. Work described in this section includes joint sealer systems.

1.3 SYSTEM PERFORMANCES:

- A. Provide joint sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.

1.4 QUALITY ASSURANCE:

- A. Installer Qualifications: Engage an Installer who has successfully completed within the last three years at least 3 joint sealer applications similar in type and size to that of this project and who will assign mechanics from these

earlier applications to this project, of which one will serve as lead mechanic.

- B. Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from a single manufacturer for each different product required.
- C. Refer to Division 1 Section "Special Conditions", for additional information and minimum experience requirements.

1.5 SUBMITTALS:

- A. Product Data: Submit manufacturer's complete product specifications, handling/installation/curing instructions, color charts and performance tested data sheets for each product required.

1.6 DELIVER, STORAGE AND HANDLING:

- A. Deliver materials to project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multi-component materials.
- B. Store and handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.
- C. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

1.7 PROJECT CONDITIONS:

- A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturer or below 40° F.
 - 2. When joint substrates are wet due to rain, frost, condensation or other causes.
- B. Joint Width Conditions: Do not proceed with installation of joint sealers when joint widths are less than allowed by joint sealer manufacturer for application indicated.
- C. Asbestos Prohibited: Refer to Section 01015 - "Special Conditions".

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL:

- A. Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by testing and field experience.
- B. Colors: Provide color of exposed joint sealers indicated, or if not indicated, as selected by Architect from manufacturer's standard colors.

2.2 ELASTOMERIC JOINT SEALANTS:

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those for Type, Grade, Class and Uses.
- B. Multi-Part Nonsag Urethane Sealant: Type M, Grade NS, Class 25, Uses NR, M, A and, as applicable to joint substrates indicated, O.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Building Systems, "MasterSeal NP 2"
 - b. Pecora Corp., "Dynatrol II"
 - c. Sika Corporation, "Sikaflex 2CNS"
 - d. Tremco, Inc., "Dymeric 240FC"
 - 2. Locations for Use: Exterior joints and penetrations in vertical surfaces of concrete, and between metal and concrete, mortar of stone; overhead or ceiling joints; perimeters of metal frames in exterior walls; vertical expansion and control joints in masonry and concrete; and at all miscellaneous locations requiring a joint sealant.
 - 3. Equivalent 1-part sealants will be acceptable for interior surfaces only, by one of the above named manufacturers.
 - 4. Where used in conjunction with stucco or EIFS, provide 1-part non-yellowing aliphatic polyurethane, equivalent to one of the following:
 - a. BASF Building Systems, "MasterSeal CR 195"
 - b. Pecora Corp., "Dynatrol I-XL Tru-White"
- C. Two-Part Pourable Urethane Sealant: Type M, Grade P, Class 25; Uses T, M, A and, as applicable to joint substrates indicated, O.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Building Systems, "MasterSeal SL 2
 - b. Bostik Findley, "Chem-Calk 550".
 - c. Pecora Corporation, "NR-200 Urexpan".
 - d. Sika Corporation, "Sikaflex 2CSL"
 - e. Tremco, Inc., "THC-900/901".
 - f. Tremco, Inc., "Vulkem 45SSL".
 - g. W. R. Meadows, Inc., "Pourthane".
 2. Locations for Use: Exterior and interior expansion, control and construction joints in horizontal surfaces; and joints subject to pedestrian and light vehicular traffic.
- D. One-Part Mildew-Resistant Silicone Sealant: Type S, Grade NS; Class 25, Uses NT, G, A and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide for sealing interior joints with nonporous substrates around ceramic tile, showers, sinks and plumbing fixtures.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corp., "Dow-Corning 786"
 - b. General Electric, "SCS 1702".
 - c. Pecora Corp., "863 #345 White"
 - d. Sika Corporation, Sikasil GP
 - e. Tremco, Inc., "Tremsil 200"; White, Clear.
 2. Locations for Use: Interior joints in vertical surfaces and terminal edges of tile; and joints at damp areas, such as around sinks and plumbing fixtures and pipe penetrations; and exposed terminal edges of vinyl flooring, such as around door frames and terminations at concrete.

2.3 LATEX JOINT SEALERS:

- A. Acrylic-Emulsion Sealant: Manufacturer's standard, one part nonsag, acrylic, mildew resistant, acrylic emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior and on protected exterior exposures involving joint movement of not more than $\pm 7.5\%$.
1. Products: Subject to compliance with requirements, provide with one of the following:
 - a. Bostik Construction Products Div.; "Chem-Calk 600";
 - b. Pecora Corp.; "AC-20";
 - c. Tremco Inc.; "Tremflex 834";

2. Locations for Use: Interior joints in field-painted vertical and overhead surfaces at perimeter of metal door frames, gypsum drywall, plaster and concrete or concrete masonry; and all other interior locations not indicated otherwise.

2.4 FIRE-RESISTANT JOINT SEALERS:

- A. Refer to Section 07270 - "Firestopping," for additional information and detailed requirements.

2.5 JOINT SEALANT BACKING:

- A. General: Provide sealant backings of material and type which are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint-Fillers:
 1. Preformed, compressible, resilient, non-waxing, non-extruding strips of plastic foam of material indicated below, and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
 2. Backer Rod: Premium grade, closed cell polyethylene foam rod; Sealtight Backer Rod, as manufactured by W.R. Meadows, Inc., or approved equivalent.
 3. Joint Filler: "Ceramar" flexible foam expansion joint filler, as manufactured by W.R. Meadows, Inc., or approved equivalent.
- C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing bond between sealant and joint filler or other materials at back (3rd) surface of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS:

- A. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated.
- B. Cleaners for Nonporous Surfaces: Provide non-staining, chemical cleaner of type acceptable to manufacturer of sealant and sealant backing materials which are not harmful to substrates and adjacent nonporous materials.

- C. Masking Tape: Provide non-staining, non-absorbent type compatible with joint sealants and to surface adjacent to joints.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Require Installer to inspect joints indicated to receive joint sealers for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Obtain Installer's written report listing any conditions detrimental to performance of joint sealer work. Do not allow joint sealer work to proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:
1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; oil; grease; waterproofing; water repellents; water; surface dirt and frost.
 2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, acid washing or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 3. Remove latence and form release agents from concrete.
 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile and other non- porous surfaces by chemical cleaners or other means which re not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's

recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.

- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALERS:

- A. General: Comply with joint sealer manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions indicated.
- C. Latex Sealant Installation Standard: Comply with requirements of ASTM C 790 for use of latex sealants.
- D. Installation of Sealant Backings:
 - 1. Install sealant backings to comply with the following requirements:
 - 2. Install joint-fillers of type indicated or recommended by sealant manufacturer to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint-fillers.
 - b. Do not stretch, twist, puncture or tear joint-fillers.
 - c. Remove absorbent joint-fillers which have become wet prior to sealant application and replace with dry material.
 - 3. Install bond breaker tape between sealants and joint-fillers, compression seals or back of joints where required to prevent third-side adhesion of sealant to back of joint.
- E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes

and depths relative to joint widths which allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants:

1. Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
2. Concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 PROTECTION AND CLEANING:

- A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they 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 sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.
- B. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

3.5 SCHEDULE OF ACOUSTICAL JOINT SEALANTS:

- A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- B. Manufacturers/Products: Subject to compliance with requirements, provide preapproved equivalent to one of the following:
 1. Pecora Corporation; AC-20 FTR or AIS-919.
 2. USG Corporation; SHEETROCK Acoustical Sealant.
- C. Locations for Use: At locations indicated for various materials and systems, including in part, both sides of stud tracks for interior stud wall assemblies, top flange of lay-in ceiling grids and gypsum ceiling supporting grid systems and other locations so indicated.

3.6 JOINT SEALANT ADHESION TESTING:

- A. Provide Air Barrier to transition membrane to fenestration adhesion testing in accordance with ASTM C1521, Method A and Section 01 91 80 "Building Envelope Commissioning Requirements".
- B. Adhesion Testing per ASTM C1521-19

During three (3) phases of the project and after curing time has passed, three (3) adhesion test should be conducted at 25%, 50% and 75% of the project. Adhesion testing should be conducted by an approved representative of the sealant company. These tests should be submitted in writing on the Sealant Company's Letterhead. Failure could result in the removal of all sealant install and a full replacement at no cost to the Owner.

END OF JOINT SEALERS

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SECTION 081100

STEEL DOORS AND FRAMES

PART - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
 - 1. Section 04200 - "Unit Masonry"
 - 2. Section 05400 - "Cold-Formed Metal Framing"
 - 3. Section 06100 - "Rough Carpentry"
 - 4. Section 07900 - "Joint Sealers"
 - 5. Section 09900 - "Painting"

1.2 DESCRIPTION OF WORK:

- A. Work described in this section includes steel doors and frames, and any indicated glazing, fire-rated where indicated.
 - 1. All frames shall be equally and double rabbetted, unless otherwise indicated.
 - 2. All frames shall be fully welded with joints ground smooth.
- B. **All exterior hollow metal doors and hollow metal frames (exposed to outside air) shall be Large Missile Impact Rated.**
 - 1. Glazing in hollow metal frames shall be same as required in Division 8 Section "Glass and Glazing", fire rated where indicated.

1.3 QUALITY ASSURANCE:

- A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (SDI-100) and as herein specified.
- B. Fire-Rated Door and Frame Assemblies:
 - 1. Where fire-rated door assemblies are indicated or required, provide fire-rated door and frame assemblies that comply with NFPA 80 "Standard for Fire Doors and Windows," and have been tested, listed and labeled in accordance with ASTM E 152 "Standard Methods of Fire Tests of Door Assemblies" by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.

2. Labels mounted on doors and door frames must indicate the time rating of the door/frame assembly.
- C. Large Missile Impact and Hurricane Resistant Rated Assemblies, and Fire Rated Where Indicated:
1. Provide insulated exterior door and frame assemblies which have been tested and certified as "Large Missile Impact" and "Hurricane Resistant" rated, including compliance with State of Florida Building Code and Dade County, Florida protocol, and third-party tested/certified by equivalent to UL and ITS/WH certified to one or all of the following test standards, as applicable:
 - a. ANSI A250.13
 - b. ASTM E330/E1886/E1996
 - c. PA201, PA202, PA203
 - d. TAS201, TAS202, TAS203
 2. Certification shall also include fire door certification, where door and frame assemblies are also to be fire-rated.
 3. All frames shall be fully-welded with joints ground smooth. No knock-down frames.

1.4 SUBMITTALS:

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product Data: Submit manufacturer's technical product data substantiating that products comply with requirements.
- C. Shop Drawings:
 1. Submit for fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
 2. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.
 3. Coordinate glazing frames and stops with glass and glazing requirements.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Comply with manufacturer's current written instructions and recommendations.
- B. Deliver hollow metal work cartoned or crated to provide protection during transit and job storage. Provide additional sealed plastic wrapping for factory finished doors.

- C. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided finish items are equivalent in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.
- D. Store doors and frames at building site under cover. Place units on minimum 4-inch-high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4-inch spaces between stacked doors to promote air circulation.
- E. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Manufacturer: Subject to compliance with requirements, provide steel doors and frames by one of the following, fire-rated where indicated:
 - 1. Steel Doors and Frames, (General):
 - a. Amweld Div, American Welding & Mfg. Co.,
 - b. Builder's Manufacturing Company
 - c. Ceco Corp.
 - d. Curries Manufacturing, Inc.
 - e. Dittco Products Inc.
 - f. Fenestra Corp.
 - g. Habersham Metal Products Company
 - h. Mesker Industries, Inc.
 - i. Overly Manufacturing Company
 - j. Pioneer Bldrs. Products Corp./Div. CORE Industries, Inc.
 - k. Republic Builders Products Corp./Subs. Republic Steel.
 - l. SteelCraft/Div. American Standard Co.
 - 2. Thermal Rated Steel Door and Frame Assemblies:
 - a. Subject to compliance with requirements, any above named manufacturer.
 - b. Ceco Corp.
 - c. Copco Door Co.
 - d. Curries Mfg., Inc.
 - e. Fenestra Corp.
 - f. Mesker Industries, Inc.
 - g. Pioneer Bldrs, Products Corp./Div. CORE Industries, Inc.
 - h. Republic Builders Products Corp./Subs. Republic Steel.
 - i. SteelCraft/Div. American Standard Co.

2.2 MATERIALS:

- A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.
- B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM SA 568.
- C. Galvanized or Galvanealed Steel Sheets; Smooth and Paintable Finish: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526, with ASTM A 525, G60 zinc coating, mill phosphatized; or ASTM A60 Galvannealed.
- D. Supports and Anchors: Fabricate of not less than 18-gage galvanized sheet steel.
- E. Inserts, Bolts and Fasteners: Manufacturer's standard units, except hot-dip galvanize items to be built into exterior walls, complying with ASTM A 153, Class C or D as applicable.
- F. Galvanizing Repair Paint: High zinc dust content paint for repair of galvanized surfaces damaged by fabrication or welding, complying with M.I. Specification MIL-P-21035.
- G. Shop Applied Primer: Rust-inhibitive enamel or paint, either air drying or baking, suitable as a base for specified finish paints.

2.3 FABRICATION:

- A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at project site.
- B. Fabricate exposed faces of doors and panels, including stiles and rails of non-flush units, from only cold-rolled steel.
- C. Fabricate frames, concealed stiffeners, reinforcement, edge channels and moldings from either cold-rolled or hot-rolled steel (at fabricator's option).
- D. Fabricate exterior doors, panels and frames from galvanized sheet steel. Close top and bottom edges of exterior doors as integral part of door construction or by addition of minimum 16-gauge inverted steel channels.
 - 1. Use galvanizing repair paint for surfaces damaged by fabrication or welding.
- E. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.

F. Thermal-Rated (Insulating) Assemblies:

1. At exterior locations and elsewhere as shown or scheduled, provide doors which have been fabricated as thermal insulating door and frame assemblies and tested in accordance with ASTM C 236.
2. Unless otherwise indicated, provide urethane insulated thermal-rated assemblies with U factor of 0.12 Btu, (hr./ft²./F Degrees) or better.

G. Finish Hardware Preparation:

1. Prepare doors and frames to receive mortise and concealed finish hardware in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A 115 series specifications for door and frame preparation for hardware.
2. Reinforce doors and frames to receive surface applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site.
3. Locate finish hardware as indicated on final shop drawings, or if not indicated, in accordance with "Recommended Locations for Builders' Hardware," published by Door and Hardware Institute.

H. Shop Painting:

1. Clean, treat and paint exposed surfaces of steel door and frame units, including galvanized surfaces.
2. Clean steel surfaces of mill scale, rust, oil, grease, dirt and other foreign materials before application of paint.
3. Use galvanizing repair paint for surfaces damaged by fabrication or welding, prior to prime coat.
4. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.
5. Do not paint fire labels on doors or frames.

2.4 STANDARD STEEL DOORS:

- A. Provide metal doors of types and styles as indicated on drawings or schedules, of seamless, hollow steel construction with 16-gauge face sheets. Form exterior doors of hot dip galvanized steel.

2.5 STANDARD STEEL FRAMES:

- A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricated frames of minimum 16-gauge cold-rolled furniture steel.

1. Frames for doors 7'-10" or more in height and/or over 3'-5" in width: 14 gauge cold-rolled furniture steel, and one additional hinge, whether or not indicated in hardware schedule.
- B. Frames shall be formed by press brake with corners sharp and true. Corners shall be mitered and accurately fitted, and shall be fully electrically welded and then ground smooth. Removable spreaders shall be welded to the bottom of the frame. Frames shall be accurately mortised for hardware.
- C. A minimum of three wall anchors shall be provided at each jamb, except four at doors 7'-10" high or more, and six at doors 10-foot high or more. Anchors shall be attached to door frames, adjustable, suitable for wall conditions and job requirements, and shall be 16 gauge minimum. Floor anchors shall be provided and welded to foot of each jamb with two 5/16" holes for securing to the floor.
- D. Reinforcements of adequate gauge shall be provided for strikes, closers and brackets and other surface applied hardware for field drilling and tapping.
- E. Form exterior frames of hot dip galvanized steel.
- F. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-swing frames and 2 silencers on heads of double-swing frames. Provide silencers equivalent to "GJ64" silencers as manufactured by Glenn-Johnson Corp., for metal frames, when not provided under the work of Section 08710 - "Finish Hardware."
 1. Provide additional door silencers at doors over 3'-0" wide or 7'-0" in height.
- G. Plaster Guards: Provide 26-gauge steel plaster guards or mortar boxes, welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware operation.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. General: Install standard steel doors, frames and accessories in accordance with final shop drawings and manufacturer's data, and as herein specified.
- B. Placing Frames:
 1. Comply with provisions of SDI-1-06 "Recommended Erection Instructions for Steel Frames," unless otherwise indicated.

2. Except for frames located at in-place concrete or masonry, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
3. In masonry construction, locate a minimum of 3 wall anchors per jamb at hinge and strike levels. Add 1 wall anchor per jamb at hinge and strike levels for each whole 1'-10" height increment over 6'-0"; Similar at glazed and cased openings. Fill solid with grout as adjacent construction progresses.
4. At in-place concrete or masonry construction, set frames and secure to adjacent construction with machine screws and masonry anchorage devices.
5. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. Attach wall anchors to studs with tapping screws. Add additional anchors as indicated in Paragraph 3.1-B3 above.
6. Install fire-rated frames in accordance with NFPA Std. No. 80.
7. Install hurricane-resistant, large-missile impact rated doors and frames in accordance with tested and certified criteria.

C. Door Installation:

1. Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.
2. Place fire-rated doors with clearances as specified in NFPA Std. No. 80.
3. Place hurricane-resistant, large-missile impact rated doors and frames in accordance with tested and certified criteria.
4. Install silencers after all painting of doors and frames has been completed.

3.2 ADJUST AND CLEAN:

A. Prime Coat Touch-up:

1. Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.
2. Use galvanizing repair paint for galvanized surfaces, prior to prime coat.

B. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF STEEL DOORS AND FRAMES

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SECTION 08 1213

HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes hollow-metal frames.
- B. Related Requirements:
 - 1. Section 081416 "Flush Wood Doors" for wood doors installed in hollow metal frames.
 - 2. Section 087100 "Door Hardware" for door hardware for wood doors in hollow metal frames.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, fire-resistance ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each frame type.
2. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
3. Locations of reinforcement and preparations for hardware.
4. Details of each different wall opening condition.
5. Details of anchorages, joints, field splices, and connections.
6. Details of moldings, removable stops, and glazing.
7. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.7 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of frame assembly, for tests performed by a qualified testing agency.
- B. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each unit to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Amweld International, LLC.
 2. Ceco Door Products; an Assa Abloy Group company.
 3. Concept Frames, Inc.
 4. Curries Company; an Assa Abloy Group company.

5. Deansteel.
6. Karpen Steel Custom Doors & Frames.
7. Mesker Door Inc.
8. Republic Doors and Frames.
9. Steelcraft; an Ingersoll-Rand company.

- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
- B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR FRAMES

- A. Construct interior frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Comply with NAAMM-HMMA 861 "Guide Specifications for Commercial Hollow Metal Doors and Frames".

2.4 WELDED FRAMES

- A. Standard-Duty Frames: SDI A250.8, Level 1. Not Applicable.
- B. Heavy-Duty Frames: SDI A250.8, Level 2. Typical unless noted otherwise.
1. Physical Performance: Level B according to SDI A250.4.
 2. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch
 3. Construction: Face welded.
 4. Exposed Finish: Prime.

2.5 DRYWALL FRAMES

- A. Not Applicable.

2.6 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.7 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Zcoating designation; mill phosphatized.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

- I. Glazing: Comply with requirements in Section 088000 "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.8 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 - 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 - 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - c. Compression Type: Not less than two anchors in each frame.

- d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
- 6. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
- 7. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- C. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce frames to receive non-templated, mortised, and surface-mounted hardware.
 - 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- D. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.
 - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior frames.
 - 4. Provide loose stops and moldings on inside of hollow-metal work.
 - 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.9 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.10 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, 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 embedded and built-in anchors to verify actual locations before frame 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 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap frames to receive non-templated, mortised, and surface-mounted hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

- g. Field apply bituminous coating to backs of frames that will be filled with grout containing anti-freezing agents.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 - 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 - 5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
 - 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 - 7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
 - 8. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch measured at jambs at floor.
- C. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 1213

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SECTION 081416

FLUSH WOOD DOORS

PART 1- GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
 - .. Section 06200 - "Finish Carpentry"
 - .. Section 08110 - "Steel Doors and Frames"
 - .. Section 08710 - "Finish Hardware"
 - .. Section 09900 - "Painting"
 - .. Division 15 - "Mechanical" (Door Louvers and Frames)

1.2 DESCRIPTION OF WORK:

- A. Work described in this section includes solid core flush wood doors with veneer faces and metal frames for any light openings.
- B. Unless otherwise indicated, all wood doors will receive "transparent factory finish" specified below.

1.3 SUBMITTALS:

- A. Product Data: Submit door manufacturer's technical data for each type of door, including details of core and edge construction, and trim for openings and louvers. Include factory- finishing specifications.
- B. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, details of metal frames for light openings, location and extent of hardware blocking, fire ratings, and other pertinent data.

C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

1.4 QUALITY ASSURANCE:

A. Quality Standards: Comply with the following standards:

1. NWWDA Quality Standard: I.S.1 "Industry Standard for Wood Flush Doors", of National Wood Window and Door Association (NWWDA).
2. AWI Quality Standard: "Architectural Woodwork Quality Standards", including Section 1300 "Architectural Flush Doors", of Architectural Woodwork Institute (AWI) for grade of door, core construction, finish and other requirements exceeding those of NWWDA quality standard.

B. NWWDA Quality Marking:

1. Mark each wood door with NWWDA Wood Flush Door Certification Hallmark certifying compliance with applicable requirements of NWWDA I.S.1 Series.
2. For manufacturers not participating in NWWDA Hallmark Program, a certification of compliance may be substituted for marking of individual doors.

C. Fire-Rated Wood Doors: Provide wood doors which are identical in materials and construction to units tested in door and frame assemblies per ASTM E 152 and which are labeled and listed for ratings indicated by UL, Warnock Hersey or other testing and inspection agency acceptable to authorities having jurisdiction.

D. Manufacturer:

1. Obtain doors from a single manufacturer, selecting from manufacturers listed herein.
2. Other manufacturers may be considered, however, approval must be requested from the Architect in writing at least ten (10) days prior to original bid date. Architect will issue only written approval, via letter and/or Addendum, and conditionally subject to compliance with

specified requirements.

1.5 PRODUCT DELIVER, STORAGE AND HANDLING:

- A. Protect wood doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of NWWDA pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors" as well as with manufacturer's instructions.
- B. Identify each door with individual opening numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable or concealed markings.

1.6 PROJECT CONDITIONS:

- A. Conditioning:
 - 1. Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period to comply with the following requirements applicable to project's geographical location:
 - 2. Referenced AWI quality standard including Section 100-S-3 "Moisture Content".

1.7 WARRANTY:

- A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents or otherwise.
- B. Door Manufacturer's Warranty:
 - 1. Submit written agreement on door manufacturer's standard form signed by Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup or twist), or that show telegraphing of core construction in face veneers, or do not conform to tolerance limitations of referenced quality standards.
 - 2. Warranty shall also include refinishing and reinstallation which may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.

3. Warranty shall be in effect during following period to time after date of Substantial Completion.
 - a. Solid Core Interior Doors: Life of installation.
- C. Contractor's Responsibilities: Replace or refinish doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Available Manufacturers: Subject to compliance with requirements, provide doors on one of the following:
 1. Solid Core Doors with Wood Veneer Faces:
 - a. Graham (Basis of design)
 - b. Algoma Hardwoods, Inc.
 - c. Buell Door Company
 - d. Eggers Industries, Architectural Door Division.
 - e. Ipik Door Co., Inc.
 - f. Marshfield Door Systems, Inc.
 - g. Oshkosh Architectural Door Co.
 2. Metal Frames for Light Openings in Fire Rated and Other Doors: Manufacturer's standard beveled or square frame of 18-gage cold-rolled steel, factory-primed, and approved for use in door of fire-rating indicated or required, and in other doors where indicated.

2.2 INTERIOR FLUSH WOOD DOORS:

- A. Solid Core Doors: Comply with the following requirements.
 1. Faces for Transparent Finish: Natural Birch; Rotary cut.
 - a. Similar color and appearance at both sides of doors.
 2. AWI Grade:
 - a. Transparent Finish: Premium.

- b. Opaque Finish: Custom.
 - 3. Solid Core Construction: PC-5 (Particle board core, 5-ply, hot-pressed method), except at wood doors where 30 percent or more of their area is glass use SLC-5 (Staved lumber core, 5-ply, hot-pressed method). Provide 5-inch wood blocking at top, bottom and middle when closers, kickplates, and panic hardware (respectively) are indicated.
 - 4. Match between Veneer Leaves: Book match.
 - 5. Assembly of Veneer Leaves on Door Faces: Center balance match.
 - 6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 - 7. Stiles: Same species as faces.
 - 8. Applied Tier 3 Molding is acceptable.
- B. Fire-Rated Solid Core Doors:
- 1. Comply with the following requirements: Faces and AWI Grade: Provide faces and grade to match non-rated doors in same area of building, unless otherwise indicated.
 - 2. Construction: Manufacturer's standard core construction as required to provide fire- resistance rating indicated.
 - 3. Edge Construction: Provide manufacturer's standard laminated edge construction for improved screw-holding capability and split resistance as compared to edges composed of a single layer of treated lumber.
 - 4. Pairs: Provide fire-rated pairs with fire-retardant stiles which are labeled and listed for kinds of applications indicated without formed steel edges and astragals.

2.3 FACTORY FINISHING:

- A. Finish doors at factory.
- B. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: NWWDA I.S.1-A System TR-6 catalyzed polyurethane.

3. Staining: Stain color as selected by Architect from manufacturers full line of colors
4. Effect: Filled finish.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine installed door frames prior to hanging door:
 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
 2. Reject doors with defects.

3.2 INSTALLATION:

- A. Hardware: For installation see Section 08710 - "Finish Hardware", of these specifications.
- B. Manufacturer's Instructions:
 1. Install wood doors to comply with manufacturer's current written instructions and recommendations, and to comply with referenced AWI standard, and as indicated.
 2. Install fire-rated doors in corresponding fire-rated frames in accordance with requirements of NFPA No. 80.
 3. Trim light openings with moldings of material and profile indicated.
- C. Job-Fit Doors:
 1. Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors of hardware. Seal cut surfaces after fitting and machining.
 2. Fitting Clearances for Non-Rated Doors: Provide 1/8" at jambs and heads; 1/16" per leaf at meeting stiles for pairs of doors; and 1/8" from bottom of door to top of decorative floor finish or covering. Where threshold is

shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold.

3. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80.
 4. Bevel non-rated doors 1/8" in 2" at lock and hinge edges.
 5. Bevel fire-rated doors 1/8" in 2" in lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Prefit Doors: Fit to frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore exposed finish before installation if fitting or machining is required at Project site. Seal all concealed wood resulting from fitting and machining.

3.3 ADJUSTING AND PROTECTION:

- A. Operation: Rehang or replace doors which do not swing or operate freely.
- B. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at time of Substantial Completion.

END OF FLUSH WOOD DOORS

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SECTION 083113

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
 - 1. Section 03310 - "Concrete"
 - 2. Section 04200 - "Unit Masonry"
 - 3. Section 06100 - "Rough Carpentry" (P.T. 2x wood blocking, grounds, rough opening subframes, etc.)
 - 4. Section 07900 - "Joint Sealers"
 - 5. Section 09250 - "Gypsum Drywall"
 - 6. Section 09900 - "Painting"
 - 7. Section 10200 - "Louvers and Vents" (any hinged louvers used as access doors)
 - 8. Divisions 15 and 16 (additional access doors provided and installed by Contractors for Plumbing, Mechanical, Electrical, and related work).

1.2 SUMMARY:

- A. This Section includes access doors for installation in the following types of new construction:
 - 1. Gypsum drywall.
 - 2. Unit masonry.
 - 3. As otherwise indicated.
- B. Provide fire-rated access doors where indicated or scheduled, and at access openings in all walls of stairs, elevator shafts and equipment rooms, other shafts and plumbing chase walls which are partially or fully open through floors, and at walls and ceilings indicated or required by Code to be fire-rated.

1.3 SUBMITTALS:

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. Product data in form of manufacturer's technical data and installation instructions for each type of access door assembly, including setting drawings, templates, instructions, and directions for installation of anchorage, devices.

- a. Include complete schedule, including types, general locations, sizes, wall and ceiling construction details, finishes, latching or locking provisions, and other data pertinent to installation.
2. Shop drawings showing fabrication and installation of customized access doors and frames, including details of each frame type, elevations of door design types, anchorage and accessory items.

1.4 QUALITY ASSURANCE:

- A. Single-Source Responsibility: Obtain access doors for entire project from one source from a single manufacturer.
- B. Fire-Resistance Ratings: Wherever a fire-resistance classification is indicated, provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in Underwriters Laboratories, Inc.'s "Building Materials Directory" for rating shown.
 1. Provide UL label on each fire-rated access door.
- C. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.
- D. Coordination: Furnish inserts and anchoring devices that must be built into other work for installation of access doors. Coordinate delivery with other work to avoid delay.

1.5 PROJECT CONDITIONS:

- A. Verification: Obtain specific locations and sizes for required access doors from trades requiring access to concealed equipment, and indicate on submittal schedule.
- B. Special-Size Access Doors: Use where required or requested; indicate on schedule.

PART 2 - PRODUCTS

2.1 MANUFACTURERS/PRODUCTS:

- A. Manufacturers: Subject to compliance with requirements, provide access doors by one of the following:
 1. Bar-Co., Inc.
 2. Cesco Products
 3. J.L. Industries
 4. Karp Associates, Inc.
 5. Larsens Manufacturing Co.
 6. Milcor, Inc.
 7. The Williams Brothers Corp.

2.2 MATERIALS AND FABRICATION:

- A. General: Furnish each access door assembly manufactured as an integral unit, complete with all parts, and ready for installation.
- B. Steel Access Doors and Frames: Fabricate units of continuous welded steel construction, unless otherwise indicated. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown.
- C. Frames: Fabricate from 16-gage galvanized steel, or 18-gage stainless steel with No. 4 satin finish, to match doors required at various locations.
 - 1. Fabricate frame with exposed flange, nominal 1-inch wide around perimeter of frame for units installed in the following construction:
 - a. Exposed masonry.
 - b. Exposed concrete.
 - c. Exposed siding.
 - 2. For gypsum drywall or gypsum veneer plaster, furnish perforated flange frames with drywall bead.
 - 3. For full-bed plaster/stucco and any E.I.F.S. applications, furnish frames with galvanized expanded metal lath and exposed casing bead, welded to perimeter of frame.
- D. Painted Flush Panel Doors (non-fire-rated and fire-rated): Fabricate from not less than 16-gage galvanized sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees. Finish with manufacturer's factory-applied prime paint.
 - 1. Restore any damage to galvanized finish with cold-process galvanizing repair paint, prior to applying factory prime coating, or other finishes.
 - 2. Attic Access Doors (if any): Equivalent to Model FD Ceiling Access Door, as manufactured by J.L. Industries, Inc., by one of the above named manufacturers.
 - a. Size: As indicated on the Drawings; However, minimum opening size shall be 36-inches (hinged side) x 22-inches.
 - b. Provide up-opening equivalent model at any ships ladders.
 - c. Provide equivalent non-fire-rated ceiling access door, where fire rating is not indicated.
- E. Stainless Steel Flush Panel Doors: Fabricate from not less than 18-gage stainless steel sheet, with concealed spring hinges or concealed piano hinge set to open 175 degrees. Buff exposed surfaces to #4 satin finish, except where other finishes are indicated.
- F. For fire-rated units, provide manufacturer's standard insulated flush panel/doors, with continuous piano hinge and self-closing mechanism.

- G. Locking Devices: Furnish flush, screwdriver-operated cam locks of number required to hold door in flush, smooth plane when closed.
- H. Finishes:
 - 1. Exterior: **3-coat** 70% resin “Kynar 500” finish (i.e.: 0.08-mil prime coat, 0.08-mil color, 0.08-mil clear topcoat) with minimum 2.4-mil total dry film thickness, in color selected by Architect from manufacturer’s standard non-metallic colors - 15 non-metallic colors minimum to select from, to include medium bronze; and color(s) to match window/storefront framing.
 - 2. Interior, Exposed to Normal View: To match finish on interior door finish hardware, or if not indicated, to match existing hardware in room where occurs.
 - 3. Interior, in Service Areas, Above Ceilings, etc: Factory primed baked enamel.
 - 4. Toilet Rooms, Janitors Rooms, Kitchens, Kitchen Areas, Rooms Where Food is Stored, Prepared, Cooked and/or Served, and Break Rooms: Stainless steel, No. 4, satin finish.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Comply with manufacturer’s current written instructions and recommendations for installation of access doors.
- B. Coordinate installation with work of other trades.
- C. Prepare perimeter of rough openings in concrete, CMU, and clay masonry with mortar/grout full-depth of wall and to size required; use pressure-treated wood as necessary for other concealed blocking, grounds, and supports at any stud wall construction.
- D. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

3.2 ADJUST AND CLEAN:

- A. Adjust hardware and panels after installation for proper operation.
- B. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

END OF ACCESS DOORS

SECTION 08 3600

ALUMINUM SECTIONAL OVERHEAD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Glazed Aluminum Sectional Overhead Doors
- B. Electric Operators and Controls.
- C. Operating Hardware, tracks, and support.

1.2 RELATED SECTIONS

- A. Section 03300 - Cast-In-Place Concrete: Prepared opening in concrete. Execution requirements for placement of anchors in concrete wall construction.
- B. Section 04810 - Unit Masonry Assemblies: Prepared opening in masonry. Execution requirements for placement of anchors in masonry wall construction.
- C. Section 055000 - Metal Fabrications: Steel frame and supports.
- D. Section 06114 - Wood Blocking and Curbing: Rough wood framing and blocking for door opening.
- E. Section 079200 - Joint Sealants: Perimeter sealant and backup materials.
- F. Section 087100 - Door Hardware: Cylinder locks.
- G. Section 09900 - Paints and Coatings: Field painting.
- H. Section 11150 - Parking Control Equipment: Remote door control.
- I. Section 16130 - Raceway and Boxes: Empty conduit from control station to door operator.
- J. Section 16150 - Wiring Connections: Electrical service to door operator.

1.3 REFERENCES

- A. ANSI/DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

- A. Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with applicable code.
 - 1. Design wind load at the project site is 160 mph (minimum), unless greater loads are indicated on Structural Drawings or otherwise required by applicable building codes or authorities having jurisdiction.
- B. Wiring Connections; See electrical drawings; Coordinate for power requirements.
- C. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.
- 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. Shop Drawings: Indicate plans and elevations including opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
- D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- E. Operation and Maintenance Data.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience.

- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened labeled packaging until ready for installation.
- B. Protect materials from exposure to moisture until ready for installation.
- C. Store materials in a dry, ventilated weathertight location.

1.8 PROJECT CONDITIONS

- A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

1.9 WARRANTY

- A. Finish Warranty:
 - 1. 20-year warranty finish for clear anodized

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: ARMLITE DOOR MANUFACTURING CO., 40 Colonial Drive, Piscataway, NJ 08854. Tel. Toll Free: (800) 554-35816. www.armrlite.com
- B. Substitutions: Or Approved Equal
- C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 GLAZED ALUMINUM SECTIONAL OVERHEAD DOORS

- A. Glazed Sectional Overhead Doors: TITAN MODEL by ArmRLite Door Manufacturing Co.
 - 1. Door Assembly: Stile and rail assembly secured with concealed heli-arch welds; through rods, bolts, and self-tapping screw construction methods will not be accepted.
 - a. Panel Thickness: 1-3/4 inches.
 - b. Center Stile Width: 3-3/8 inches
 - c. End Stile Width: 3-3/8 inches.
 - d. Intermediate Rail Pair Width: 3-11/16 inches.
 - e. Top Rail Width:

- 1) As required to meet performance requirements.
- f. Bottom Rail Width:
 - 1) As required to meet performance requirements.
- g. Aluminum Panels: 0.50 inch thick, insulated aluminum.
- h. Stiles and Rails: 6063 - T6 aluminum.
- i. Springs:
 - 1) 100,000 cycles.
- j. Glazing:
 - 1) 1" impact resistant 7-wall polycarbonate (clear)
- 2. Finish and Color:
 - a. Clear Anodized
- 3. Windload Design: Provide to meet the Design/Performance requirements specified.
- 4. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
- 5. Lock: Interior galvanized single unit.
- 6. Weatherstripping:
 - a. Manufacturers standard that meets performance requirements.
- 7. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
- 8. Electric Motor Operation: Provide Electric operator, size and type as recommended by manufacturer and compatible with existing power availability.
- 9. Push-button operated control system with open, close, and stop buttons.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until openings have been properly prepared.
- B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.
- C. Verify electric power is available and of correct characteristics.
- D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install overhead doors and track in accordance with approved shop drawings and the manufacturer's printed instructions.
- B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.
- C. Anchor assembly to wall construction and building framing without distortion or stress.
- D. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
- E. Fit and align door assembly including hardware.
- F. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.4 CLEANING AND ADJUSTING

- A. Adjust door assembly to smooth operation and in full contact with weatherstripping.
- B. Clean doors, frames and glass.
- C. Remove temporary labels and visible markings.

3.5 PROTECTION

- A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.
- B. Protect installed products until completion of project.
- C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

END ALUMINUM SECTIONAL OVERHEAD DOORS

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SECTION 08 41 13

ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
 - 1. Section 042000 - "Unit Masonry"
 - 3. Section 061000 - "Rough Carpentry"
 - 4. Section 079200 - "Joint Sealers"
 - 5. Section 08710 - "Finish Hardware"
 - 6. Section 088100 - "Glass and Glazing"

1.2 SUMMARY:

- A. This Section includes design and installation of the following types of prefinished, non- thermally broken aluminum entrance and storefront systems, which are of hurricane, wind, and wind-blown "large missile" resistant design and installation and outside glazed at exterior; and prefinished aluminum entrance and storefront systems inside glazed at interior:
 - 1. Flush center-glazed aluminum entrances and storefront, with special beveled stops at doors only; Muntins (if any) only as indicated on the Drawings:
 - a. Hurricane, wind, and wind-blown "large missile" resistant, medium stile exterior entrance doors with continuous-type hinge design, and door frames (not thermally broken);
 - 1) 9/16-inch laminated clear transparent Low-E glass, heat strengthened or fully tempered glass (as required by glass size and code) for exterior doors is specified in Division 8 Section "Glass and Glazing".
 - b. Hurricane, wind, and wind-blown "large missile" resistant, outside glazed transoms, sidelights and frames for entrances and storefront framing systems, at exterior; not thermally broken.

2. If indicated, prefinished aluminum faced insulated panels in storefront framing system.
 3. Sub-Sill: At all sill locations (whether or not indicated on the Drawings) provide matching 0.040-inch (minimum) brake-metal, with hemmed edges, turned up at rear and ends, and angled down at extended front/exterior edge. Set in solid bed of silicone sealant.
- B. The extent of aluminum entrances and storefront is indicated on the Drawings.
- C. Glazing shall be as specified elsewhere, but no less than 1-5/16 inches over-all insulated units at exterior, 9/16-inch minimum thickness at exterior doors, and 1/4-inch minimum at interior frames and doors.

1.3 **SYSTEM PERFORMANCE REQUIREMENTS:**

- A. Delegated Design: Engage a qualified Alabama professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design exterior aluminum entrances in glazed curtain walls as provided and installed under this Section.
- B. General: Design and provide aluminum entrance and storefront assemblies that comply with performance characteristics specified, as demonstrated by testing the manufacturer's corresponding stock or custom assemblies according to test methods indicated; Hurricane, wind, and wind-blown "large missile" resistant at exterior locations.
- C. Thermal Movement: Design the aluminum entrance and storefront framing systems to provide for expansion and contraction of the component materials. Entrance doors shall function normally over the specified temperature range.
1. The system shall be capable of withstanding a metal surface temperature range of 180 deg F (100 deg C) without buckling, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, stress on glass, or other detrimental effects.
- D. Design Requirements: Provide aluminum entrance and storefront systems that comply with structural performance (with reinforcing as necessary), air infiltration, and water penetration requirements indicated.
1. Wind Loads: Provide aluminum entrance and storefront assemblies capable of withstanding wind pressures for components and cladding as indicated on the Structural Drawings.
 2. **Design wind load at the project site is 160 mph** (minimum), unless greater loads are indicated on Structural Drawings or otherwise required by applicable building codes or authorities having jurisdiction.

- E. Structural Performance: Conduct tests for structural performance in accordance with ASTM E 330. At the conclusion of the tests there shall be no glass breakage or permanent damage to fasteners, anchors, hardware or actuating mechanism. Framing members shall have no permanent deformation in excess of 0.2 percent of their clear span.
 - 1. Deflection Normal to the Plane of the Wall: Test pressure required to measure deflection of framing members normal to the plane of the wall shall be equivalent to the wind load specified above. Deflection shall not exceed 1/360 of the clear span, when subjected to uniform load deflection test.
 - 2. Deflection Parallel to the Plane of the Wall: Test pressures required to measure deflection parallel to the plane of the wall shall be equal to 1.5 times the wind pressures specified above. Deflection of any member carrying its full dead load shall not exceed an amount that will reduce glass bite below 75 percent of the design dimension and shall not reduce the edge clearance between the member and the fixed panel, glass or other fixed member above to less than 1/8-inch. The clearance between the member and an operable door or window shall be at least 1/16-inch.
- F. Air Infiltration: Provide aluminum entrance and storefront framing system with an air infiltration rate of not more than 0.06 CFM per sq. ft. of fixed area (excluding operable door edges) when tested in accordance with ASTM E 283 at a static air pressure differential of 6.24 psf.
- G. Water Penetration: Provide framing systems with no uncontrolled water penetration (excluding operable door edges) as defined in the test method when tested in accordance with ASTM E 331 at a minimum static air pressure differential of 12 psf, as defined by AAMA 501.
- H. Condensation Resistance: Where framing systems are of "thermal-break" construction, provide units tested for thermal performance in accordance with AAMA 1503 showing condensation resistance factor (CRF) of not less than 45.

1.4 **SUBMITTALS:**

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
 - 1. Product data for each aluminum entrance and storefront system required, including:
 - a. Manufacturer's standard details and fabrication methods.
 - b. Data on finishing, hardware and accessories.
 - c. Recommendations for maintenance and cleaning of exterior surfaces.

2. Shop drawings for each aluminum entrance and storefront system required, including:
 - a. For exterior aluminum entrances in glazed curtain walls as provided and installed under this Section:
 - 1) Prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of exterior aluminum entrances for glazed curtain walls.
 - 2) Show connection to and continuity with adjacent glazed curtain walls components.
 - b. Delegated-Design Submittal: For aluminum entrances in glazed curtain walls provided and installed under this Section, including analysis data signed, dated and sealed by the qualified Alabama professional engineer responsible for their preparation.
 - c. Layout and installation details, including relationship to adjacent work.
 - d. Elevations at 1/4-inch scale.
 - e. Detail sections of typical composite members.
 - f. Anchors and reinforcement.
 - g. Hardware mounting heights.
 - h. Provisions for expansion and contraction.
 - i. Glazing details, including in part, special beveled stops for doors, and any muntins.
3. Hardware Schedule: Submit complete hardware schedule organized into sets based on hardware specified. Coordinate hardware with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish. Include item name, name of the manufacturer and complete designations of every item required for each door opening.
4. Samples for Color Selection: Submit pairs of samples of each specified color and finish on 12-inch-long sections of extrusions or formed shapes. Where normal color variations are anticipated, include 2 or more units in each set of samples indicating extreme limits of color variations.
5. Samples for Verification Purposes: The Architect reserves the right to require samples, that show fabrication techniques and workmanship, and design of hardware and accessories.
6. Test Reports: Provide certified test reports from a qualified independent testing laboratory showing that aluminum entrance and storefront systems have been tested in accordance with specified test procedures and comply with performance characteristics indicated.

1.5 QUALITY ASSURANCE:

- A. Installer Qualifications: Engage an Installer with at least five (5) years experience in and who has completed installations of aluminum storefront and entrances similar in design and extent to those required for the project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer's Qualifications: Provide aluminum entrances and storefront systems produced by a firm with at least five (5) years experience in manufacturing systems that are similar to those indicated for this project and that have a record of successful in-service performance.
- C. Single Source Responsibility: Obtain aluminum entrance and storefront systems, and structural sealants, from one source and from a single manufacturer.
- D. Design Criteria: The drawings indicate the size, profile, and dimensional requirements of aluminum entrance and storefront work required and are based on the specific types and models indicated. Aluminum entrance and storefront by other manufacturers may be considered, provided deviations in dimensions and profiles are minor and do not change the design concept, as judged solely by the Architect. The burden of proof of equality is on the proposer.
- E. Refer to Division 1 Section "Special Conditions", for additional information and minimum experience requirements.

1.6 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver aluminum entrance and storefront components in the manufacturer's original protective packaging.
- B. Store aluminum components in a clean dry location away from uncured masonry or concrete. Cover components with waterproof paper, tarpaulin or polyethylene sheeting in a manner to permit circulation of air.
 - 1. Stack framing components in a manner that will prevent bending and avoid significant or permanent damage.

1.7 PROJECT CONDITIONS:

- A. Field Measurements: Check openings by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of the work.
 - 1. Coordinate fabrication tolerances to ensure proper fit.

1.8 WARRANTY:

- A. Warranty: Submit a written warranty, executed by the manufacturer, agreeing to repair or replace units that fail in materials or workmanship within the specified warranty period. Failures include, but are not necessarily limited to:
 - 1. Structural failures including excessive deflection, excessive leakage or air infiltration.
 - 2. Faulty operation.
 - 3. Deterioration of metals, metal finishes and other materials beyond normal weathering.
- B. Warranty Period: 3 years after the date of project Substantial Completion.
 - 1. Finish Warranty: 10 years after date of project Substantial Completion.
- C. The above warranty shall be in addition to, shall be in effect simultaneously with, and shall not alter other project or product warranties or guarantees, nor shall it serve as a limitation to other remedies available to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Manufacturer: Subject to compliance with requirements, provide entrance and storefront systems manufactured by one of the following:
 - 1. Oldcastle Building Envelope
 - 2. Coral Architectural Products.
 - 3. EFCO Corporation.
 - 4. Kawneer Company, Inc., an Alcoa company.
 - 5. CRL/United States Aluminum Corp.
 - 6. YKK Architectural Products
- B. Product/Manufacturer: Provide one (1) of the following systems, or pre-approved equivalent by one (1) of the above-named manufacturers.
 - 1. Exterior Entrances and Storefront: 2-1/2-inches x 5-inches nominal mullion profile which accommodates 1-5/16" laminated glass; flush center-glazed, and as indicated, with stiffeners and/or structural reinforcement as required to comply with project loads, and windload and large missile impact requirements:
 - a. Oldcastle Series 5100.

- b. Kawneer IR501.
- c. U.S. Aluminum IG600.

2.2 **MATERIALS:**

A. Aluminum:

- 1. ASTM B221, alloy 6063-T6 for extrusions; ASTM B209, alloy 5005-H16 for sheets; or other alloys and temper recommended by manufacturer appropriate for specified finish.
- 2. Minimum thickness of [0.080] inch for main framing members.

B. Internal Reinforcing:

- 1. ASTM A36 for carbon steel; or ASTM B308 for structural aluminum.
- 2. (1 ¼" x 4 9/16" x ¼") steel channel (vertical mullions) and (1 ¼" x 4 11/16" x 12 ga) steel channel (vertical jams).
- 3. Steel components factory coated with alkyd type zinc chromate primer complying with FS TT-P-645.

C. Anchorage Devices:

- 1. Manufacturer's standard formed or fabricated steel or aluminum assemblies of shapes, plates, bars or tubes.
- 2. Hot-dip galvanize steel assemblies after fabrication; comply with ASTM A123, 2.0 ounce minimum coating.

D. Fasteners:

- 1. Aluminum, non-magnetic stainless steel or other non-corrosive materials compatible with items being fastened.
- 2. Provide concealed fasteners wherever possible.
- 3. For exposed locations, provide Phillips flathead screws with finish matching item fastened.
- 4. For concealed locations, provide manufacturer's standard fasteners.

E. Expansion Anchor Devices: Lead-shield or toothed-steel, drilled-in, expansion bolt anchors.

F. Protective Coatings: Cold-applied asphalt mastic complying with SSPC-Paint 12, compounded for 30 mil thickness for each coat; or alkyd type zinc chromate primer complying with FS TT-P-645.

G. Touch-Up Primer for Galvanized Components: Zinc oxide conforming with FS TT-P-641.

H. Glazing Gaskets:

1. Compression type design, replaceable extruded, of neoprene, polyvinyl chloride (PVC), or ethylene propylene diene monomer (EPDM) at exterior gasket. Profile and hardness as required to maintain uniform pressure for watertight seal.
 2. Dow – Corning #795 structural silicone sealant at interior gasket with Norton “V-2110” SSA spacer tape.
- I. Glass and Glazing:
1. Refer to Section 08800
- I. Weatherstripping:
1. Provide D-1913 EPDM fin seal in AS-6 adjustable astragal.
 2. Provide D-174 silicone weatherstripping in bottom door rail.
- J. Internal Sealants and Sealant Tapes.

2.3 **HARDWARE:**

- A. Finish Hardware Schedule (per door): Equivalent to the following, **EXCEPT as modified and upgraded by the storefront supplier to comply with the required large missile impact rated exterior door assemblies and systems.**
1. Butt hinges: BH-1M (4-1/2" x 4")-Regent
 2. Continuous gear hinge: 224 HD-Roton
 3. Concealed overhead closers: LCN 2030
 4. Surface closers: LCN 4040
 5. Push bar: Manufacturer's standard.
 6. Pulls: Manufacturer's standard.
 7. Panic devices: First Choice CVR CR-100 or Jackson 2086 or First Choice RP-100,
 8. Deadlocks: 1850-505 Adams-Rite
 9. Cylinders: CY-1 (active)-, CY-5 Oldcastle Building Envelope®
 10. Thresholds: Provide with integral raised stop and bulb-type weather stripping for outward opening storefront doors. Manuf. of storefront system must provide a “tested” threshold as described herein, that will provide a fully warrantable system or provide documentation that their product will be fully warrantable with a raised stop and bulb type threshold. **No exceptions will be allowed.**
 11. Flush bolts: FB-1201-VRM-International
 12. Weatherstripping: D-118/D-120- Oldcastle Building Envelope®
- B. Accessories: As required by project conditions.

2.4 COMPONENTS:

- A. Storefront Framing System: Provide storefront and entrance framing systems fabricated from extruded aluminum members of size and profile indicated. Include subframes and other reinforcing members of the type indicated. Provide for flush glazing storefront from the interior on all sides without projecting stops. Shop-fabricate and preassemble frame components where possible. Provide storefront frame sections without exposed seams.
 - 1. Mullion Configurations (if any mullions are indicated on the Drawings): Provide pockets at the inside glazing face to receive resilient elastomeric glazing. Mullions and horizontals shall be one piece. Make provisions to drain moisture accumulation to the exterior.
- B. Entrance Door Frames: Provide tubular and channel frame entrance door frame assemblies, as indicated, with welded or mechanical joints in accordance with manufacturer's standards. Reinforce as necessary to support required loads, and reinforce at all door jambs.
- C. Hurricane Resistant Stile-and-Rail Type Entrance Doors: Provide tubular frame members, fabricated with mechanical joints using heavy inserted reinforcing plates and concealed tie- rods or j-bolts. Provide special beveled stops for doors; and muntins at locations where any muntins are indicated on the Drawings.
 - 1. Glazing: Fabricate doors to facilitate replacement of glass or panels, without disassembly of stiles and rails. Provide beveled, snap-on, extruded aluminum glazing stops, with exterior stops anchored for non removal.
 - 2. Design: Oldcastle Building Envelope Model MSD-375 StormMax; or pre-approved equivalent by one of the manufacturers listed in Part 2.1 of this specification section.
 - a. 1 ¾-inch deep; 0.125 wall thickness
 - b. Medium stile; 4 3/4-inch, unless indicated otherwise.
 - c. Bottom Rail: 9-inches total height, MINIMUM, unless greater height is otherwise indicated on the Drawings.

2.5 FABRICATION:

- A. Coordination of Fabrication:
 - 1. Check actual frame or door openings required in construction work by accurate field measurements before fabrication.
 - 2. Fabricate units to withstand loads, which will be applied when system is in place.

B. General:

1. Thermal Break Construction: Fabricate storefront framing system with an integrally concealed, low conductance thermal barrier, located between exterior materials and exposed interior members to eliminate direct metal to metal contact. Use manufacturer's standard construction that has been in use for similar projects for period of not less than 3 years.
2. Conceal fasteners wherever possible.
3. Reinforce work as necessary for performance requirements, and for support to structure.
4. Separate dissimilar metals and aluminum in contact with concrete utilizing protective coating or preformed separators, which will prevent contact and corrosion.
5. Comply with Section 08810 for glazing requirements.

C. Prefabrication: Complete fabrication, assembly, finishing, hardware application, and other work to the greatest extent possible before shipment to the Project site. Disassemble components only as necessary for shipment and installation.

1. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces. Complete these operations for hardware prior to application of finishes.
2. Do not drill and tap for surface mounted hardware items until time of installation at project site.

D. Aluminum Framing:

1. Provide members of size, shape and profile indicated, designed to provide for glazing from interior.
2. Fabricate frame assemblies with joints straight and tight fitting.
3. Reinforce internally with structural members as necessary to support design loads.
4. Maintain accurate relation of planes and angles, with hairline fit of contacting members.
5. Seal horizontals and direct moisture accumulation to exterior.
6. Provide flashings and other materials used internally or externally that are corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials.
7. Provide manufacturer's extrusions and accessories to accommodate expansion and contraction due to temperature changes without detrimental to appearance or performance.
8. Make provisions in framing for minimum edge clearance, nominal edge cover and nominal pocket width for thickness and type of glazing or infill used in accordance with recommendations of manufacturer and FGMA Glazing Manual.

- E. Welding:
 - 1. Comply with recommendations of the American Welding Society.
 - 2. Use recommended electrodes and methods to avoid distortion and discoloration.
 - 3. Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.
- F. Flashings: Form from sheet aluminum with same finish as extruded sections. Material thickness as required to suit condition without deflection or "oil canning".

2.7 FINISHES:

- A. Organic Coating [high performance fluorocarbon]:
 - 1. Comply with requirements of AAMA 2605.
 - 2. Surfaces cleaned and given conversion coating pre-treatment prior to application of 0.3 mil dry film thickness of epoxy or acrylic primer following recommendations of finish coat manufacturer.
 - 3. Finish coat of 70% minimum fluorocarbon resin fused to primed surfaces at temperature recommended by manufacturer, 1.0 mil minimum dry film thickness.
 - 4. Acceptable coatings are Trinar by Akzo Coatings, Inc.; Nubelar by Glidden Company; Fluoroceram by Morton International, Inc.; Duranar by PPG Industries Inc.; and Fluoropon by Valspar Corporation.
 - 5. Provide in either a 2, 3, or 4 coat system as required for color selected.
 - 6. Manufacturer's standard colors as selected by Architect.
- B. Provide samples of final selected finishes for architect's verification; Refer to "Submittals" paragraph above.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine substrates and supports, with the Installer present, for compliance with requirements indicated, installation tolerances, and other conditions that affect installation of aluminum entrances and storefronts. Correct unsatisfactory conditions before proceeding with the installation.
 - 1. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 **INSTALLATION:**

- A. Comply with manufacturer's current written instructions and recommendations for installation, for each product and system.
- B. Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels. Install components in proper alignment and relation to established lines and grades indicated. Provide proper support and anchor securely in place.
- C. Construction Tolerances: Install aluminum entrance and storefront to comply with the following tolerances:
 - 1. Variation from Plane: Do not exceed 1/8-inch in 12 feet of length or 1/4-inch in any total length.
 - 2. Offset from Alignment: The maximum offset from true alignment between two identical members abutting end to end in line shall not exceed 1/16-inch.
 - 3. Diagonal Measurements: The maximum difference in diagonal measurements shall not exceed 1/8-inch.
 - 4. Offset at Corners: The maximum out-of-plane offset of framing at corners shall not exceed 1/32-inch.
- D. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
 - 1. Zinc or cadmium plate steel anchors and other unexposed fasteners after fabrication.
 - 2. Paint dissimilar metals where drainage from them passes over aluminum.
 - 3. Paint aluminum surfaces in contact with mortar, concrete or other masonry with alkali resistant coating.
 - 4. Paint wood and similar absorptive material in contact with aluminum and exposed to the elements or otherwise subject to wetting, with two coats of aluminum house paint. Seal joints between the materials with approved sealant.
- E. Drill and tap frames and doors and apply surface-mounted hardware items. Comply with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.
- F. Set sill members and other members in bed of sealant as indicated, or with joint fillers or gaskets as indicated to provide weathertight construction. Comply with requirements of Division 7 for sealants, fillers, and gaskets.
- G. Refer to "Glass and Glazing" Section of Division 8 for installation of glass and other panels indicated to be glazed into doors and framing, and not preglazed by manufacturer.

1. Refer to Drawings for locations of insulated panels which may occur in place of glazing and/or at interior side behind glazing in applied stops.

3.3 ADJUSTING:

- A. Adjust operating hardware to function properly, for smooth operation without binding, and for weathertight closure.

3.4 CLEANING:

- A. Clean the completed system, inside and out, promptly after installation, exercising care to avoid damage to coatings.
- B. Clean glass surfaces after installation, complying with requirements contained in the "Glass and Glazing" Section for cleaning and maintenance. Remove excess glazing and sealant compounds, dirt and other substances from aluminum surfaces.

3.5 PROTECTION:

- A. Institute protective measures required throughout the remainder of the construction period to ensure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

3.6 FIELD QUALITY CONTROL:

- A. Water Spray Test – After the installation cure time of the sealant, hose nozzle water test 50 LF of storefront perimeter in keeping with AAMA 501.2 standards. No water penetration is accepted.
- B. If failure occurs, re-test failed unit(s). After repairs have been made, test a minimum of an additional 50 LF at no expense to the Owner.

END OF ALUMINUM ENTRANCES AND STOREFRONTS

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SECTION 087100
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
1. Commercial door hardware for the following:
 - a. Swinging doors.
 - b. Other doors to the extent indicated.
- B. Related Sections:
1. Division 8: Steel Doors and Frames.
 2. Division 8: Flush Wood Doors.
 3. Division 8: Aluminum Entrances and Storefronts.
- C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain the requirements of this Section.
1. Permanent cores and keys to be installed by the Owner.

1.3 SUBMITTALS

- A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.

- a. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
- 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
- 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve all lock functions and submitted keying schedule prior to the ordering of permanent cylinders.
- D. Submittal shall be embossed or have the imprint of a Certified, up to date, Seal stamp.
- E. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.
- F. Fire-Rated Door Assembly Testing: Per NFPA80, submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced Installer who has completed standard Builders hardware installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant (AHC), active in the DHI Continuing Education Program with an up to date Seal, and who is

experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project. Go to <http://www.dhi.org/> to search list for local Architectural Hardware Consultants.

- D Source Limitations: Obtain each type and variety of aluminum, steel and wood door hardware from the same single manufacturer, unless otherwise indicated.
- E. Regulatory Requirements: Comply with provisions of the following:
1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:
 - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
 - 1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
 - 2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.
 2. NFPA 101: Comply with the following for means of egress doors:
 - a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - b. Thresholds: Not more than 1/2 inch high.
 3. International Building Code IBC2015.
 4. International Building Code Section 1609 for Hurricane Protection.
- F. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing per NFPA 252 (neutral pressure at 40" above sill) or UL-10C.
- G. Keying Conference: Conduct conference to comply with requirements in Division 1 Section "Project Meetings." Supplier to meet with Owner to finalize keying requirements and to obtain final instructions in writing. Keying conference to incorporate the following criteria into the final keying schedule document:
1. Function of building, purpose of each area and degree of security required.
 2. Review and verify lock function for every opening.
 3. Plans for existing and future key system expansion.
 4. Requirements for key control system.
 5. Installation of permanent keys and cylinder cores as required.
 6. Provide Key Biting List.

7. Provide extra Key Blank and Cylinders.
8. Address for delivery of keys.

H. Pre-Installation Conference: Conduct conference at Project site attended by representatives of Supplier, Installer, and Contractor to review proper hardware installation methods and the procedures for receiving and handling hardware. At completion of installation, provide written certification that hardware items were applied per conference recommendations and to finish hardware specifications.

1. Inspect and discuss all roughing-in and other preparatory work performed by other trades.
2. Review sequence of operation for each type of door hardware.
3. Review and finalize construction schedule and verify availability of materials.
4. Review required testing, inspecting, and certifying procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule and include basic installation instructions with each item or package.
- C. Deliver permanent keys, cylinders, cores, and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

1.7 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of Builders Hardware that fails in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
 2. Faulty operation of the hardware.
 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- C. Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods: Five years for bored latches and locksets, five years for exit devices, and ten years for manual door closers.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section and the Door Hardware Schedule at the end of Part 3.
1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated for named products listed in Hardware Sets.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:
1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

2.2 HINGES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Butt Hinges:
 - a. *Stanley a Dormakaba Company (STA).
 - b. McKinney Company (McK)
 - c. Ives (IVE)

2. Continuous Hinges:
 - a. *Stanley a Dormakaba Company (STA).
 - b. McKinney Company (McK)
 - c. Ives (IVE)
- B. Standards: BHMA Certified products complying with the following:
 1. Butts and Hinges: BHMA A156.1.
 2. Template Hinge Dimensions: BHMA A156.7.
 3. Spring Hinges: BHMA A156.17.
- C. Quantity: Provide the following, unless otherwise indicated:
 1. Two Hinges: For doors with heights up to 60 inches.
 2. Three Hinges: For doors with heights 61 to 90 inches.
 3. Four Hinges: For doors with heights 91 to 120 inches.
 4. For doors with heights of more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches (of door height greater than 120 inches).
- D. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

Up to 48 by 86 by 1-3/4	4-1/2	0.134	0.180
48 by 120 by 1-3/4	5	0.146	0.190
- E. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 1. Exterior Doors: Heavy weight, non-ferrous, ball bearing hinges.
 2. Interior Doors: Heavy weight, steel, ball bearing hinges unless Hardware Sets indicate standard weight.
- F. Hinge Options: Comply with the following where indicated in the Door Hardware Schedule or on Drawings:
 1. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
 - a. Out-swinging exterior doors.
 - b. Out-swinging controlled doors.

2.3 DOOR BOLTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Surface Bolts:
 - a. Trimco Manufacturing (TRI).

- b. *Rockwood (ROC).
 - c. Ives (IVE).
- 2. Flush Bolts:
 - a. Trimco Manufacturing (TRI).
 - b. *Rockwood (ROC)
 - c. Ives (IVE).
- B. Standards: Comply with the following:
 - 1. Surface Bolts: BHMA A156.16.
 - 2. Manual Flush Bolts: BHMA A156.16.
- C. Surface Bolts and Flush Bolts: BHMA Certified Grade 1.
- D. Provide manual flush bolts with top rod of sufficient length to allow bolt location approximately six feet from the floor. Furnish dust proof strikes for bottom bolts. Surface bolts to be 8" in length and U.L. listed for labeled fire doors.
- E. Bolt Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
 - 1. Mortise Flush Bolts: Minimum 3/4-inch throw.

2.4 LOCKS AND LATCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Mechanical Bored Locks and Latches:
 - a. 8Best Access Systems a Dormakaba Company (BES) – 9K3 Series.
 - b. Sargent- 10X Series
 - c. Schlage- an Allegion Company- ND Series
- B. Standards: Comply with the following:
 - 2. Bored Locks and Latches: BHMA A156.2.
- D. Bored Locks: BHMA Certified Grade 1, Series 4000.
- F. Lock Trim: Match the following design style:
 - 1. Lever: Best- 15D
- G. Lock Functions: Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:
 - 2. Bored Locks: BHMA A156.2.

H. Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:

1. Bored Locks: Minimum 1/2-inch latchbolt throw.
- I. Backset: 2-3/4 inches unless otherwise indicated.
- J. Knurl all knobs or levers to mechanical rooms, electrical rooms or closets, and all other hazardous or dangerous areas as required by Code. Fire Exit Stair Door Hardware shall not be knurled.

2.5 CYLINDERS AND KEYING

- A. Provide Standard Cylinders for SFIC 7-pin Cores.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Cylinders:
 - a. Best Access Systems a Dormakaba Company (BES) - Cormax
- C. Standards: Comply with the following:
 1. Cylinders: BHMA A156.5.
 2. Key Control System: BHMA A156.5.
- D. Cylinder Grade: BHMA Certified Grade 1.
- E. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
 1. Removable Cores: Core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- F. Construction Keying: Comply with the following:
 1. Construction Master keying: Provide temporary construction keyed cores that are replaceable by permanent cores. Provide construction master keys in quantity as required by project Contractor.
- G. Keying System: Unless otherwise indicated, provide for a keying system complying with the following requirements:
 1. New Master Key System: Cylinders are factory keyed operated by a change key, master key, and a grand master key. Conduct keying meeting with End User to define and document keying system instructions and requirements.
- H. Keys: Provide nickel-silver keys complying with the following:
 1. Stamping: Permanently inscribe each key with a visual key control number and as directed by Owner.

2. Quantity: Provide the following:
 - a. Cylinder Change Keys (Per Lock or Cylinder): Two.
 - b. Master Keys: Six.
 - c. Construction Control Keys: Two.
 - d. Permanent Control Keys: Two.
- I. Key Registration List: Provide keying transcript list to Owner's representative for lock cylinders.

2.6 STRIKES

- A. Standards: Comply with the following:
- B.
 1. Strikes for Bored Locks and Latches: BHMA A156.2.
 2. Dustproof Strikes: BHMA A156.16.
- C. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 1. Flat-Lip Strikes: For locks with three-piece anti-friction latchbolts, as recommended by manufacturer.

2.7 EXIT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one the following:
 - a. Precision Exit Devices a Dormakaba Company(PRE)- 2000 Series
 - b. Sargent, An ASSA ABLOY Company- PE8800
 - c. Von Duprin- an Allegion Company- 99 Series.
- C. Standards: Comply with the following:
 1. BHMA A156.3.
- C. Exit Devices: BHMA Certified Grade 1.
- D. Panic Exit Devices: Listed and labeled by a testing and inspection agency acceptable to authorities having jurisdiction, for panic protection, based on testing per UL 305.
- E. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled by a testing and inspection agency acceptable to authorities having jurisdiction, for panic protection, based on testing per UL 305 and NFPA 252.

F. Outside trim: Match design for locksets and latchset, unless otherwise indicated.

G. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

2.8 CLOSERS

A. Manufacturers: Subject to compliance with requirements, provide products by one the following:

1. Surface-Mounted Closers (Heavy Duty):
 - a. Stanley Dorma-Kaba – HD8000 Series
 - b. LCN – 4000 Series.
 - c. Sargent, An ASSA ABLOY Company- 350 Series

B. Standards: Comply with the following:

1. Closers: BHMA A156.4.

C. Surface Closers: BHMA Certified Grade 1.

D. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide non-handed, factory-sized closers adjustable to meet field conditions and requirements for opening force. Unless otherwise indicated, all door closers are to be mounted inside rooms not visible from a corridor or lobby.

E. Closer Options: As indicated in hardware sets, or required for proper installation, provide Manufacturers reinforcements for all door closer options including delayed action, hold open arms, extra duty parallel arms, positive stop/hold open arms, compression stop/hold

open arms, special mounting brackets, spacers and drop plates. Through bolt type mounting is required as indicated in the door hardware sets.

2.9 OPERATING and PROTECTIVE TRIM UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Metal Protective Trim Units:
 - a. Trimco Manufacturing (TRI).
 - b. *Rockwood (ROC)
 - c. Ives (IVE).

- B. Standard: Comply with BHMA A156.6.
- C. Materials: Fabricate protection plates from the following:
 - 1. Stainless Steel: .050 inches thick, beveled four sides (B4E) with countersunk screw holes.
- D. Push-Pull Design: Minimum 1" Round with 8" Centers. Provide 90-degree offset pulls at exterior openings.
- E. Fasteners: Provide manufacturer's designated fastener type as indicated in door hardware sets.
- F. Furnish protection plates sized two inches less than door width (LDW) on push side and by height specified in door hardware sets.

2.10 STOPS AND BUMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Stops and Bumpers:
 - a. Trimco Manufacturing (TRI).
 - b. *Rockwood (ROC)
 - c. Ives (IVE)
- D. Standards: Comply with the following:
- E.
 - 1. Stops and Bumpers: BHMA A156.16.
 - 2. Door Silencers: BHMA A156.16.
- C. Stops and Bumpers: BHMA Certified Grade 1.
- D. Floor Stops: For doors, unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic.
 - 1. Where floor or wall stops are not appropriate, provide overhead stops.
- E. Silencers for Metal Door Frames: BHMA Grade 1; neoprene or rubber, minimum diameter 1/2 inch fabricated for drilled-in application to frame. Provide (3) per single door and (2) per paired door frame. Code requires holes in frames be filled with product or fasteners.

2.11 DOOR THRESHOLDS, WEATHERSTRIPPING AND GASKETING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Door Thresholds, Weatherstripping and Gasket Seals:
 - a. National Guard Products (NGP).
 - b. *Pemko (PEM)
 - c. Zero International (ZER).
- B. Standard: Comply with BHMA A156.22.
- C. General: Provide continuous weatherstrip seal on exterior doors and smoke, light, or sound gasketing on interior doors where specified. Provide non-corrosive fasteners for exterior applications.
1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame. Install header seal before mounting door closer arms.
 2. Meeting Stile Astragals: Fasten to meeting stiles, forming seal when doors are closed.
 3. Door Sweep: Apply to bottom of door, forming seal with threshold when door is closed.
- D. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing per UL 1784.
1. Provide smoke labeled perimeter gasketing at all smoke-labelled openings.
- E. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing per UL-10C.
1. Intumescent Seals and Gasketing: Provide concealed, Category A type gasketing systems on assemblies only where an intumescent seal is required by Door Manufacturer to meet IBC and UL-10C positive pressure labeling.

2.12 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws per manufacturers recognized installation standards for application intended.

2.13 FINISHES

- A. Standard: Comply with BHMA A156.18.

- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case, less than specified by referenced standards for the applicable units of hardware.
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- E. BHMA Designations: Comply with base material and finish requirements indicated by the following:
 - 1. BHMA 600: Primed for painting, over steel base metal.
 - 2. BHMA 626: Satin chromium plated over nickel, over brass or bronze base metal.
 - 3. BHMA 628: Satin aluminum, clear anodized, over aluminum base metal.
 - 4. BHMA 630: Satin stainless steel, over stainless-steel base metal.
 - 5. BHMA 689: Aluminum painted, over any base metal.
 - 6. BHMA 690: Dark bronze painted, over any base metal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for all door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Steel Doors and Frames: Comply with ANSI/BHMA A115 series.
- B. Wood Doors: Comply with ANSI/BHMA A115-W series.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and re-installation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

C. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Secure the services of an Architectural Hardware Consultant (AHC) to perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

1. The Hardware Supplier will inspect all swinging doors and hardware immediately following completion of installation and state in report whether installed work complies with or deviates from specifications or construction document requirements.

a. Inspection Scope:

1) Inspect all swinging doors and door hardware.

2) Inspector to furnish a Field Quality Report, itemized per each individual opening, to the Architect within 7 days of the inspection, including:

a) Deficiencies in workmanship and standard industry practices.

b) Use of allowable products.

c) Use of manufacturer recommended fasteners.

d) Compliance with the ADA.

e) Proper door/frame/hardware clearances.

f) Problems related to function, security, aesthetics, or maintenance.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Secure the services of a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

3.8 DOOR HARDWARE SETS

- A. The hardware sets listed below represent the design intent and direction of the Owner and Architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the Architect with corrections made prior to the bidding process.

SECTION 087100
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
1. Commercial door hardware for the following:
 - a. Swinging doors.
 - b. Other doors to the extent indicated.
- B. Related Sections:
1. Division 8: Steel Doors and Frames.
 2. Division 8: Flush Wood Doors.
 3. Division 8: Aluminum Entrances and Storefronts.
- C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain the requirements of this Section.
1. Permanent cores and keys to be installed by the Owner.

1.3 SUBMITTALS

- A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.

- a. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
- 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
- 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve all lock functions and submitted keying schedule prior to the ordering of permanent cylinders.
- D. Submittal shall be embossed or have the imprint of a Certified, up to date, Seal stamp.
- E. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.
- F. Fire-Rated Door Assembly Testing: Per NFPA80, submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced Installer who has completed standard Builders hardware installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant (AHC), active in the DHI Continuing Education Program with an up to date Seal, and who is

experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project. Go to <http://www.dhi.org/> to search list for local Architectural Hardware Consultants.

- D Source Limitations: Obtain each type and variety of aluminum, steel and wood door hardware from the same single manufacturer, unless otherwise indicated.
- E. Regulatory Requirements: Comply with provisions of the following:
 - 1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:
 - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
 - 1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
 - 2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.
 - 2. NFPA 101: Comply with the following for means of egress doors:
 - a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - b. Thresholds: Not more than 1/2 inch high.
 - 3. International Building Code IBC2015.
 - 4. International Building Code Section 1609 for Hurricane Protection.
- F. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing per NFPA 252 (neutral pressure at 40" above sill) or UL-10C.
- G. Keying Conference: Conduct conference to comply with requirements in Division 1 Section "Project Meetings." Supplier to meet with Owner to finalize keying requirements and to obtain final instructions in writing. Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Review and verify lock function for every opening.
 - 3. Plans for existing and future key system expansion.
 - 4. Requirements for key control system.
 - 5. Installation of permanent keys and cylinder cores as required.
 - 6. Provide Key Biting List.

7. Provide extra Key Blank and Cylinders.
8. Address for delivery of keys.

H. Pre-Installation Conference: Conduct conference at Project site attended by representatives of Supplier, Installer, and Contractor to review proper hardware installation methods and the procedures for receiving and handling hardware. At completion of installation, provide written certification that hardware items were applied per conference recommendations and to finish hardware specifications.

1. Inspect and discuss all roughing-in and other preparatory work performed by other trades.
2. Review sequence of operation for each type of door hardware.
3. Review and finalize construction schedule and verify availability of materials.
4. Review required testing, inspecting, and certifying procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule and include basic installation instructions with each item or package.
- C. Deliver permanent keys, cylinders, cores, and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

1.7 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of Builders Hardware that fails in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
 2. Faulty operation of the hardware.
 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- C. Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods: Five years for bored latches and locksets, five years for exit devices, and ten years for manual door closers.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section and the Door Hardware Schedule at the end of Part 3.
1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated for named products listed in Hardware Sets.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:
1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

2.2 HINGES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Butt Hinges:
 - a. *Stanley a Dormakaba Company (STA).
 - b. McKinney Company (McK)
 - c. Ives (IVE)

2. Continuous Hinges:
 - a. *Stanley a Dormakaba Company (STA).
 - b. McKinney Company (McK)
 - c. Ives (IVE)
- B. Standards: BHMA Certified products complying with the following:
 1. Butts and Hinges: BHMA A156.1.
 2. Template Hinge Dimensions: BHMA A156.7.
 3. Spring Hinges: BHMA A156.17.
- C. Quantity: Provide the following, unless otherwise indicated:
 1. Two Hinges: For doors with heights up to 60 inches.
 2. Three Hinges: For doors with heights 61 to 90 inches.
 3. Four Hinges: For doors with heights 91 to 120 inches.
 4. For doors with heights of more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches (of door height greater than 120 inches).
- D. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

Up to 48 by 86 by 1-3/4	4-1/2	0.134	0.180
48 by 120 by 1-3/4	5	0.146	0.190
- E. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 1. Exterior Doors: Heavy weight, non-ferrous, ball bearing hinges.
 2. Interior Doors: Heavy weight, steel, ball bearing hinges unless Hardware Sets indicate standard weight.
- F. Hinge Options: Comply with the following where indicated in the Door Hardware Schedule or on Drawings:
 1. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
 - a. Out-swinging exterior doors.
 - b. Out-swinging controlled doors.

2.3 DOOR BOLTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Surface Bolts:
 - a. Trimco Manufacturing (TRI).

- b. *Rockwood (ROC).
 - c. Ives (IVE).
- 2. Flush Bolts:
 - a. Trimco Manufacturing (TRI).
 - b. *Rockwood (ROC)
 - c. Ives (IVE).
- B. Standards: Comply with the following:
 - 1. Surface Bolts: BHMA A156.16.
 - 2. Manual Flush Bolts: BHMA A156.16.
- C. Surface Bolts and Flush Bolts: BHMA Certified Grade 1.
- D. Provide manual flush bolts with top rod of sufficient length to allow bolt location approximately six feet from the floor. Furnish dust proof strikes for bottom bolts. Surface bolts to be 8" in length and U.L. listed for labeled fire doors.
- E. Bolt Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
 - 1. Mortise Flush Bolts: Minimum 3/4-inch throw.

2.4 LOCKS AND LATCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Mechanical Bored Locks and Latches:
 - a. 8Best Access Systems a Dormakaba Company (BES) – 9K3 Series.
 - b. Sargent- 10X Series
 - c. Schlage- an Allegion Company- ND Series
- B. Standards: Comply with the following:
 - 2. Bored Locks and Latches: BHMA A156.2.
- D. Bored Locks: BHMA Certified Grade 1, Series 4000.
- F. Lock Trim: Match the following design style:
 - 1. Lever: Best- 15D
- G. Lock Functions: Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:
 - 2. Bored Locks: BHMA A156.2.

H. Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:

1. Bored Locks: Minimum 1/2-inch latchbolt throw.
- I. Backset: 2-3/4 inches unless otherwise indicated.
- J. Knurl all knobs or levers to mechanical rooms, electrical rooms or closets, and all other hazardous or dangerous areas as required by Code. Fire Exit Stair Door Hardware shall not be knurled.

2.5 CYLINDERS AND KEYING

- A. Provide Standard Cylinders for SFIC 7-pin Cores.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Cylinders:
 - a. Best Access Systems a Dormakaba Company (BES) - Cormax
- C. Standards: Comply with the following:
 1. Cylinders: BHMA A156.5.
 2. Key Control System: BHMA A156.5.
- D. Cylinder Grade: BHMA Certified Grade 1.
- E. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
 1. Removable Cores: Core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- F. Construction Keying: Comply with the following:
 1. Construction Master keying: Provide temporary construction keyed cores that are replaceable by permanent cores. Provide construction master keys in quantity as required by project Contractor.
- G. Keying System: Unless otherwise indicated, provide for a keying system complying with the following requirements:
 1. New Master Key System: Cylinders are factory keyed operated by a change key, master key, and a grand master key. Conduct keying meeting with End User to define and document keying system instructions and requirements.
- H. Keys: Provide nickel-silver keys complying with the following:
 1. Stamping: Permanently inscribe each key with a visual key control number and as directed by Owner.

2. Quantity: Provide the following:
 - a. Cylinder Change Keys (Per Lock or Cylinder): Two.
 - b. Master Keys: Six.
 - c. Construction Control Keys: Two.
 - d. Permanent Control Keys: Two.
- I. Key Registration List: Provide keying transcript list to Owner's representative for lock cylinders.

2.6 STRIKES

- A. Standards: Comply with the following:
- B.
 1. Strikes for Bored Locks and Latches: BHMA A156.2.
 2. Dustproof Strikes: BHMA A156.16.
- C. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 1. Flat-Lip Strikes: For locks with three-piece anti-friction latchbolts, as recommended by manufacturer.

2.7 EXIT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one the following:
 - a. Precision Exit Devices a Dormakaba Company(PRE)- 2000 Series
 - b. Sargent, An ASSA ABLOY Company- PE8800
 - c. Von Duprin- an Allegion Company- 99 Series.
- C. Standards: Comply with the following:
 1. BHMA A156.3.
- C. Exit Devices: BHMA Certified Grade 1.
- D. Panic Exit Devices: Listed and labeled by a testing and inspection agency acceptable to authorities having jurisdiction, for panic protection, based on testing per UL 305.
- E. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled by a testing and inspection agency acceptable to authorities having jurisdiction, for panic protection, based on testing per UL 305 and NFPA 252.

F. Outside trim: Match design for locksets and latchset, unless otherwise indicated.

G. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

2.8 CLOSERS

A. Manufacturers: Subject to compliance with requirements, provide products by one the following:

1. Surface-Mounted Closers (Heavy Duty):
 - a. Stanley Dorma-Kaba – HD8000 Series
 - b. LCN – 4000 Series.
 - c. Sargent, An ASSA ABLOY Company- 350 Series

B. Standards: Comply with the following:

1. Closers: BHMA A156.4.

C. Surface Closers: BHMA Certified Grade 1.

D. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide non-handed, factory-sized closers adjustable to meet field conditions and requirements for opening force. Unless otherwise indicated, all door closers are to be mounted inside rooms not visible from a corridor or lobby.

E. Closer Options: As indicated in hardware sets, or required for proper installation, provide Manufacturers reinforcements for all door closer options including delayed action, hold open arms, extra duty parallel arms, positive stop/hold open arms, compression stop/hold

open arms, special mounting brackets, spacers and drop plates. Through bolt type mounting is required as indicated in the door hardware sets.

2.9 OPERATING and PROTECTIVE TRIM UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Metal Protective Trim Units:
 - a. Trimco Manufacturing (TRI).
 - b. *Rockwood (ROC)
 - c. Ives (IVE).

- B. Standard: Comply with BHMA A156.6.
- C. Materials: Fabricate protection plates from the following:
 - 1. Stainless Steel: .050 inches thick, beveled four sides (B4E) with countersunk screw holes.
- D. Push-Pull Design: Minimum 1" Round with 8" Centers. Provide 90-degree offset pulls at exterior openings.
- E. Fasteners: Provide manufacturer's designated fastener type as indicated in door hardware sets.
- F. Furnish protection plates sized two inches less than door width (LDW) on push side and by height specified in door hardware sets.

2.10 STOPS AND BUMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Stops and Bumpers:
 - a. Trimco Manufacturing (TRI).
 - b. *Rockwood (ROC)
 - c. Ives (IVE)
- D. Standards: Comply with the following:
- E.
 - 1. Stops and Bumpers: BHMA A156.16.
 - 2. Door Silencers: BHMA A156.16.
- C. Stops and Bumpers: BHMA Certified Grade 1.
- D. Floor Stops: For doors, unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic.
 - 1. Where floor or wall stops are not appropriate, provide overhead stops.
- E. Silencers for Metal Door Frames: BHMA Grade 1; neoprene or rubber, minimum diameter 1/2 inch fabricated for drilled-in application to frame. Provide (3) per single door and (2) per paired door frame. Code requires holes in frames be filled with product or fasteners.

2.11 DOOR THRESHOLDS, WEATHERSTRIPPING AND GASKETING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Door Thresholds, Weatherstripping and Gasket Seals:
 - a. National Guard Products (NGP).
 - b. *Pemko (PEM)
 - c. Zero International (ZER).

B. Standard: Comply with BHMA A156.22.

C. General: Provide continuous weatherstrip seal on exterior doors and smoke, light, or sound gasketing on interior doors where specified. Provide non-corrosive fasteners for exterior applications.

1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame. Install header seal before mounting door closer arms.
2. Meeting Stile Astragals: Fasten to meeting stiles, forming seal when doors are closed.
3. Door Sweep: Apply to bottom of door, forming seal with threshold when door is closed.

D. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing per UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke-labelled openings.

E. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing per UL-10C.

1. Intumescent Seals and Gasketing: Provide concealed, Category A type gasketing systems on assemblies only where an intumescent seal is required by Door Manufacturer to meet IBC and UL-10C positive pressure labeling.

2.12 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws per manufacturers recognized installation standards for application intended.

2.13 FINISHES

A. Standard: Comply with BHMA A156.18.

- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case, less than specified by referenced standards for the applicable units of hardware.
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- E. BHMA Designations: Comply with base material and finish requirements indicated by the following:
 - 1. BHMA 600: Primed for painting, over steel base metal.
 - 2. BHMA 626: Satin chromium plated over nickel, over brass or bronze base metal.
 - 3. BHMA 628: Satin aluminum, clear anodized, over aluminum base metal.
 - 4. BHMA 630: Satin stainless steel, over stainless-steel base metal.
 - 5. BHMA 689: Aluminum painted, over any base metal.
 - 6. BHMA 690: Dark bronze painted, over any base metal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for all door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Steel Doors and Frames: Comply with ANSI/BHMA A115 series.
- B. Wood Doors: Comply with ANSI/BHMA A115-W series.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and re-installation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

C. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Secure the services of an Architectural Hardware Consultant (AHC) to perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

1. The Hardware Supplier will inspect all swinging doors and hardware immediately following completion of installation and state in report whether installed work complies with or deviates from specifications or construction document requirements.

a. Inspection Scope:

1) Inspect all swinging doors and door hardware.

2) Inspector to furnish a Field Quality Report, itemized per each individual opening, to the Architect within 7 days of the inspection, including:

a) Deficiencies in workmanship and standard industry practices.

b) Use of allowable products.

c) Use of manufacturer recommended fasteners.

d) Compliance with the ADA.

e) Proper door/frame/hardware clearances.

f) Problems related to function, security, aesthetics, or maintenance.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Secure the services of a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

3.8 DOOR HARDWARE SETS

- A. The hardware sets listed below represent the design intent and direction of the Owner and Architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the Architect with corrections made prior to the bidding process.

SECTION 087100 – DOOR HARDWARE (HARDWARE SCHEDULE)**Hardware Set #01**

Doors: 210A, 211A, 212A, 213A, 226A, 201A, 202A, 203A, 204A, 206A, 208A

Each to receive:

3	EA	Butt Hinge	FBB179 4.5" x 4.5" 26D	Stanley
1	EA	Lockset	9K3-7AB14D STD S3 626	Best
1	EA	Construction Core	7190224	Best
1	EA	Closer	HD8016 AF80P 689	Best
1	EA	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK 630	Trimco
1	EA	Wall Bumper	1270CV 626	Trimco
3	EA	Silencer	1229A GREY	Trimco

Hardware Set #02

Doors: 214A, 214B, 215A, 226B

Each to receive:

3	EA	Butt Hinge	FBB179 4.5" x 4.5" 26D	Stanley
1	EA	Lockset	9K3-7D14D STD S3 626	Best
1	EA	Construction Core	7190224	Best
1	EA	Closer	HD8016 AF80P 689	Best
1	EA	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK 630 (KICK PLATE NOT FOR 226B)	Trimco
1	EA	Wall Bumper	1270CV 626	Trimco
3	EA	Silencer	1229A GREY	Trimco

Hardware Set #02.1 - ALUMINUM DOORS

Doors: 218A

Each to receive:

1	EA	Rim Cylinder	12E-72 STD 626	Best
1	EA	Construction Core	7190224	Best
BALANCE OF HARDWARE BY ALUMINUM DOOR SUPPLIER				

Hardware Set #02.2 - PAIR DOORS

Doors: 205A

Each to receive:

6	EA	Butt Hinge	FBB179 4.5" x 4.5" 26D	Stanley
2	EA	Manual Flushbolt	3917-12 626	Trimco
1	EA	Lockset	9K3-7D14D STD S3 626	Best
1	EA	Construction Core	7190224	Best
1	EA	Closer	HD8016 AF80P 689	Best
2	EA	Kick Plate	K0050 10" x 27" B4E-HEAVY-KP CSK 630	Trimco
2	EA	Wall Bumper	1270CV 626	Trimco
1	EA	Dust Proof Strike	3910 626	Trimco
2	EA	Silencer	1229A GREY	Trimco

Hardware Set #02.3 - PAIR DOORS

Doors: 219A

Each to receive:

6	EA	Butt Hinge	FBB179 4.5" x 4.5" 26D	Stanley
2	EA	Manual Flushbolt	3917-12 626	Trimco
1	EA	Lockset	9K3-7D14D STD S3 626	Best
1	EA	Construction Core	7190224	Best
1	EA	Closer	HD8016 AF80P 689	Best
2	EA	Kick Plate	K0050 10" x 35" B4E-HEAVY-KP 630	Trimco
2	EA	Wall Bumper	1270CV 626	Trimco
1	EA	Dust Proof Strike	3910 626	Trimco
2	EA	Silencer	1229A GREY	Trimco

Hardware Set #03

Doors: 207A

Each to receive:

3	EA	Butt Hinge	FBB179 4.5" x 4.5" 26D	Stanley
1	EA	Privacy Set	9K3-0L14D S3 626	Best
1	EA	Closer	HD8016 AF80P 689	Best
1	EA	Mop Plate	K0050 6" x 35" B4E-HEAVY-KP CSK 630	Trimco
1	EA	Wall Bumper	1270CV 626	Trimco
3	EA	Silencer	1229A GREY	Trimco

Hardware Set #04 - ALUMINUM DOORS

Doors: 209A

Each to receive:

1	EA	Rim Cylinder	12E-72 STD 626	Best
1	EA	Construction Core	7190224	Best
BALANCE OF HARDWARE BY ALUMINUM DOOR SUPPLIER				

Hardware Set #05

Doors: E200F, E200G, E200I

Note: EXISTING DOOR & EXISTING FRAME

Each to receive:

1	EA	Exit Device	2103 X 4903D 630	Precision
1	EA	Rim Cylinder	12E-72 STD 626	Best
1	EA	Construction Core	7190224	Best
1	EA	Electric Strike	0162 32D	RCI
BY OTHERS (SECURITY)				

Hardware Set #05.1 - ALUMINUM DOORS

Doors: E200A, E200B

Each to receive:

1	EA	Rim Cylinder	12E-72 STD 626	Best
1	EA	Construction Core	7190224	Best
BALANCE OF HARDWARE BY ALUMINUM DOOR SUPPLIER				

Hardware Set #05.2

Doors: 227C

Each to receive:

3	EA	Butt Hinge	FBB191 4.5" x 4.5" NRP 32D	Stanley
1	EA	Exit Device	2103 X 4903D 630	Precision
1	EA	Rim Cylinder	12E-72 STD 626	Best
1	EA	Construction Core	7190224	Best
1	EA	Closer	HD8016 ISH 689	Best
1	EA	Gasketing	303AS 1 SET (HEAD & JAMBS)	Pemko
1	EA	Door Sweep	315CN 36"	Pemko
1	EA	Threshold	2005AT 36"	Pemko
1	EA	Rain Drip	346C 40"	Pemko

Hardware Set #06.1 - ALUMINUM DOORS

Doors: E200C, E200D, E200E

Note: EXISTING DOOR & EXISTING FRAME

Each to receive:

1	EA	Rim Cylinder	12E-72 STD 626	Best
1	EA	Construction Core	7190224	Best
BALANCE OF HARDWARE BY ALUMINUM DOOR SUPPLIER				

Hardware Set #07

Doors: 216A

Each to receive:

3	EA	Butt Hinge	FBB179 4.5" x 4.5" 26D	Stanley
1	EA	Lockset	9K3-7D14D STD S3 626	Best
1	EA	Construction Core	7190224	Best
1	EA	Closer	HD8016 AF80P 689	Best
1	EA	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK 630	Trimco
1	EA	Wall Bumper	1270CV 626	Trimco

Hardware Set #08

Doors: 200C, 200E, 224, 227B

Each to receive:

1	EA	Rim Cylinder	12E-72 STD 626	Best
1	EA	Construction Core	7190224	Best
BALANCE OF HARDWARE BY OVERHEAD DOOR SUPPLIER				

Hardware Set #09

Doors: E217A

Note: EXISTING DOOR & EXISTING FRAME

Each to receive:

3	EA	Butt Hinge	FBB179 4.5" x 4.5" 26D	Stanley
1	EA	Exit Device	2103 X 4903D 630	Precision
1	EA	Rim Cylinder	12E-72 STD 626	Best
1	EA	Construction Core	7190224	Best
1	EA	Closer	HD8016 AF80P 689	Best
1	EA	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK 630	Trimco
3	EA	Silencer	1229A GREY	Trimco

Hardware Set #010

Doors: 200B

Each to receive:

3	EA	Butt Hinge	FBB168 4.5" x 4.5" 26D	Stanley
1	EA	Exit Device	2115 x 1715A 48" 630	Precision
1	EA	Closer	HD8016 AF80P 689	Best
1	EA	Kick Plate	K0050 10" x 46" B4E-HEAVY-KP CSK 630	Trimco
1	EA	Wall Bumper	1270CV 626	Trimco
3	EA	Silencer	1229A GREY	Trimco

Hardware Set #010.1 - PAIR DOORS

Doors: 200D, 227A

Each to receive:

6	EA	Butt Hinge	FBB179 4.5" x 4.5" 26D	Stanley
2	EA	Exit Device	2215 X 1715A LBR 630	Precision
2	EA	Closer	HD8016 AF80P 689	Best
2	EA	Kick Plate	K0050 10" x 35" B4E-HEAVY-KP 630	Trimco
2	EA	Wall Bumper	1270CV 626	Trimco
2	EA	Silencer	1229A GREY	Trimco

Hardware Set #011 - ALUMINUM PAIR DOORS

Doors: 200A

Each to receive:

2	EA	Rim Cylinder	12E-72 STD 626	Best
2	EA	Construction Core	7190224	Best
BALANCE OF HARDWARE BY ALUMINUM DOOR SUPPLIER				

Hardware Set #012 - PAIR DOORS

Doors: 225A

Each to receive:

8	EA	Butt Hinge	FBB179 4.5" x 4.5" 26D	Stanley
2	EA	Exit Device	2215 X 1715A 10'0" LBR 630	Precision
2	EA	Closer	HD8016 ISH 689	Best
2	EA	Kick Plate	K0050 10" x 35" B4E-HEAVY-KP 630	Trimco
2	EA	Silencer	1229A GREY	Trimco

SECTION 08 81 00

REVISED GLASS AND GLAZING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Glass.
- B. Decorative privacy glazing film.
- C. Glazing compounds and accessories.

1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 081416 - Flush Wood Doors: Glazed doors. Glazing furnished by door manufacturer.
- C. Section 084113 - Aluminum-Framed Storefronts: Glazing furnished by storefront manufacturer.
- D. Section 08920 - Glazed Aluminum Curtain Walls: Glazing furnished by wall manufacturer.
- E. Section 102813 - Toilet, Bath, and Laundry Accessories: Framed Mirrors.

1.3 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2015).
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014a.
- D. ASTM C1036 - Standard Specification for Flat Glass; 2016.
- E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.
- G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.
- H. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
- I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.
- J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.
- K. GANA (GM) - GANA Glazing Manual; 2009.

- L. GANA (SM) - GANA Sealant Manual; 2008.
- M. ICC (IBC) - International Building Code; 2015.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
- D. Provide compatibility testing of IGU edge seal with glazing compounds and setting blocks, and submit results of testing.
- E. Product Data on Decorative Privacy Glazing Film for specified product.
- F. Samples:
 - 1. Submit two samples 12x12 inch in size of glass units, showing coloration and design, for selection purposes.
 - 2. Submit 2 samples, minimum of 5" Wide x 60" Long of Decorative Privacy Glass Film, showing entire width of pattern, texture, and opacity level.
- G. Shop Drawing showing plan & elevation of doors to receive film with installation orientation and dimensions.
- H. Manufacturer's requirements for product delivery, handling, site conditions, and installation recommendations for Decorative Privacy Glazing Film.
- I. Manufacturer's operation and maintenance data for installed products, including precautions against harmful cleaning materials and methods for Decorative Privacy Glazing Film.
- J. Certificates: Certify that products meet or exceed specified requirements.
- K. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. ~~Extra Insulating Glass Units: One of each glass size and each glass type.~~
 - 3. Extra Glazing Film Materials: Furnish 2 percent extra material at the time of installation for future maintenance repairs. Deliver in protective packaging for storage, and label contents appropriately. Contractor shall store as recommended by manufacturer and deliver to Owner's Representative at Substantial Completion.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual and GANA Sealant Manual for glazing installation methods.

- B. Labeling: Furnish each pane of fire resistance-rated glazing and each pane of safety glazing with a permanent identification which meets the requirements of the latest approved edition of the International Building Code.
- C. Glazing Standards: Comply with recommendations of Glass Association of North America (GANA) "Glazing Manual" and "Sealant Manual", and SIGMA TM-3000, "Vertical Glazing Guidelines", except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.
- D. Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
- E. Fire Resistance Rated Glass: Provide glass products that meet CPSC 16 CFR 1201, Category II requirements for fire-rated glass and are labeled and listed by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
- F. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component pane of units with appropriate certification label of the inspecting and testing organization indicated below.
 - 1. Insulating Glass Certification Council (IGCC).
 - a. ASTM E 2190.
- G. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.
- H. Installer of Decorative Privacy Glazing Film shall be performed by a trained and qualified installer, specialized and experienced with installation of window film. Provide documentation that installer has installed window film on at least 3 previous projects.

1.7 MOCK-UP

- A. Include Glazing in Mock-Up as described in Section 014000 - Quality Requirements.

1.8 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.9 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Sealed Insulating Glass Units: Provide a ten (10) year warranty to include coverage for seal

failure, interpane dusting or misting, including replacement of failed units.

- C. Replacements Under Warranties: Provide same warranty as original glass and glazing, beginning from date of replacement completion for glass units replaced under Warranty provisions.

PART 2 - PRODUCTS

2.1 INSULATING GLASS UNITS

- A. Type IG-1 - Sealed Insulating Glass Units: Vision glazing, low-E.
1. Application: All exterior glazing unless otherwise indicated.
 2. Basis of Design: PPG R100.
 3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Low-E (solar control type), on #2 surface.
 4. Inboard Lite: 9/16" Clear laminated for large missile requirements
 - a. Tint: Clear.
 5. Edge Spacer: See "Sealed Insulating Glass Units" Article below.
 6. Edge Spacer Color: See "Sealed Insulating Glass Units" Article below.
 7. Total Thickness: 1-5/16" inch.
 8. Total Visible Light Transmittance: 42 percent, nominal.
 9. Total Solar Heat Gain Coefficient: 23 percent, nominal.
 10. Light to Solar Gain ratio (LSG): 1.79.
 11. Glazing Method: Gasket glazing.
- B. Type IG-2 - Sealed Insulating Glass Units: Safety glazing:
1. Applications: Provide this type of glazing in the following locations:
 - a. Glazed lites in exterior doors.
 - b. Glazed sidelights and panels next to doors.
 - c. Other locations required by applicable federal, state, and local codes and regulations.
 - d. Other locations indicated on the drawings.
 2. Type: Same as other vision glazing except use fully tempered float glass for both outboard and inboard lites.
 3. Edge Spacer: See "Sealed Insulating Glass Units" Article below.
 4. Edge Spacer Color: See "Sealed Insulating Glass Units" Article below.
- C. Type IG-3 - Sealed Insulating Glass Units: Opaque glazing.
1. Application: Exterior glazing where indicated.
 2. Basis of Design: PPG R100.
 3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Low-E (solar control type), on #2 surface.
 4. Inboard Lite: 9/16" Clear laminated for large missile requirements with .090 artic snow interlayer
 - a. Tint: Clear.

5. Edge Spacer: See "Sealed Insulating Glass Units" Article below.
 6. Edge Spacer Color: See "Sealed Insulating Glass Units" Article below.
 7. Total Thickness: 1-5/16" inch.
- D. Type IG-4 - Sealed Insulating Glass Units: Spandrel Safety glazing:
1. Applications: Provide this type of glazing in the following locations, if spandrel glazing is indicated for these locations:
 - a. Glazed lites in exterior doors.
 - b. Glazed sidelights and panels next to doors.
 - c. Other locations required by applicable federal, state, and local codes and regulations.
 - d. Other locations indicated on the drawings.
 2. Type: Same as other spandrel glazing except use fully tempered float glass for both outboard and inboard lites.
 3. Tint and opacifier: As scheduled for other spandrel glazing.
- E. Type E-1 - Single Exterior Vision Glazing:
1. Application: Exterior glazing not indicated to be Insulating Glass Units.
 2. Type: Annealed float glass.
 3. Tint: No Tint.
 4. Coating: R100 on #2 surface.
 5. Thickness: 1/4 inch.
 6. Visual Light Transmittance: 42 percent, nominal.
 7. Solar Heat Gain Coefficient: 23 percent, nominal.
 8. Glazing Method: Gasket glazing.
- F. Type E-2 - Single Exterior Vision Glazing: Safety glazing.
1. Applications: Exterior glazing not indicated to be Insulating Glass Units, but required to be safety glazed.
 - a. Locations required by applicable federal, state, and local codes and regulations.
 2. Type: Fully tempered float glass.
 3. Tint: No Tint
 4. Coating: R100 on #2 surface.
 5. Thickness: 1/4 inch.
 6. Light Transmittance: 42 percent, nominal.
 7. Solar Heat Gain Coefficient: 23 percent, nominal.
 8. Glazing Method: Gasket glazing.
- G. Type S-1 - Single Vision Glazing:
1. Application: All interior glazing unless otherwise indicated.
 2. Type: Annealed float glass.
 3. Tint: Clear.
 4. Thickness: 1/4 inch.
 5. Glazing Method: Gasket glazing.
- H. Type S-2 - Fire-Protection-Rated Glazing:

1. IBC Fire Protection Rating: D-H-T-90 or W-90, minimum.
2. Safety Certification: 16 CFR 1201 Category II.
3. Application: Provide this type of glazing in the following locations:
 - a. Glazed lites in fire doors.
 - b. Fire windows.
 - c. Sidelights, borrow lites, and other glazed openings in partitions indicated as having an hourly fire rating.
 - d. Other locations indicated on the drawings.
4. Fire Rating: As indicated on the drawings.
5. Type: Glass-ceramic safety glazing.
6. Thickness: 1/4 inch.
7. Glazing Method: As required for fire rating.
- I. Type S-3 - Single Safety Glazing: Non-fire-rated **-FOR THIS PROJECT**
 1. Application: Provide this type of glazing in the following locations:
 - a. Glazed lites in doors, except double glazed lites in doors, and fire doors.
 - b. Glazed sidelights to doors, except in double glazed sidelites, fire-rated walls and partitions.
 - c. Other locations required by applicable federal, state, and local codes and regulations.
 - d. Other locations indicated on the drawings.
 2. Type: Fully tempered float glass as specified.
 3. Tint: Clear.
 4. Thickness: 1/4 inch.
 5. Glazing Method: Gasket glazing.
- J. Mirror Glass: Where indicated.

2.2 EXTERIOR GLAZING ASSEMBLIES

- A. Structural Design Criteria: Select type and thickness to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with ASCE 7.
 1. Use the procedure specified in ASTM E1300 to determine glass type and thickness.
 2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
 3. Glass thicknesses listed are minimum.

2.3 GLASS MATERIALS

- A. Float Glass Manufacturers:
 1. AGC Glass Company North America, Inc: www.us.agc.com.
 2. Guardian Industries Corp: www.sunguardglass.com.
 3. Pilkington North America Inc: www.pilkington.com/na.
 4. PPG Industries, Inc; [Basis of Design]: www.ppgideascales.com.
 5. Substitutions: Refer to Section 01 6000 - Product Requirements.
- B. Float Glass: Provide float glass based glazing unless noted otherwise.

1. Annealed Type: ASTM C1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
 2. Heat-Strengthened and Fully Tempered Types: ASTM C1048.
 3. Thicknesses: As indicated; for exterior glazing comply with specified requirements indicated for wind load design regardless of specified thickness.
- C. Fire-Protection-Rated Glazing: Type, thickness, and configuration as required to achieve indicated ratings.
1. IBC Fire Protection Rating: As indicated on drawings.
 2. Provide products listed by Underwriters Laboratories or Intertek Warnock Hersey.
 3. Labeling: Provide permanent label on each piece giving the IBC rating and other information required by the applicable code.
- D. Fire-Protection-Rated Glazing:
1. IBC Fire Protection Rating: D-H-T-90 or W-90, minimum.
- E. High Impact-Resistant Tempered Safety Glazing: Complying with 16 CFR 1201 test requirements for Category II.
- F. Glass-Ceramic Safety Glazing: UL- or WH-listed as fire-protection-rated glazing and complying with 16 CFR 1201 test requirements for Category II without the use of a surface-applied film.
- G. Ceramic-Coated Spandrel Glass: ASTM C 1048, Condition B, Type I, Quality-Q3, and complying with other requirements specified.
- H. Mirror Glass: ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality Q1 (mirror select); silvering, protective coating and physical characteristics complying with ASTM C1503; 6 mm minimum thick.
1. Sizes noted on Drawings.

2.4 SEALED INSULATING GLASS UNITS

- A. Manufacturers:
1. Any of the manufacturers specified for float glass.
 2. Any fabricator certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
 3. Substitutions: Refer to Section 01600 - Product Requirements.
- B. Sealed Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 2. Edge Spacers: Aluminum, bent or soldered corners.
 3. Edge Spacer Color: As selected by Architect.
 4. Edge Seal: Glass to elastomer with supplementary silicone sealant.
 5. Purge interpane space with dry argon air.

2.5 GLAZING COMPOUNDS

- A. Manufacturers:

1. Bostik Inc: www.bostik-us.com.
 2. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com.
 3. Pecora Corporation: www.pecora.com.
 4. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
 5. Substitutions: Refer to Section 01600 - Product Requirements.
- B. Glazing Putty: Polymer modified latex recommended by manufacturer for outdoor use, knife grade consistency; grey color.
- C. Butyl Sealant: Single component; ASTM C920, Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.
- D. Acrylic Sealant: Single component, solvent curing, non-bleeding; ASTM C920, Type S, Grade NS, Class 12-1/2, Uses M and A; with cured Shore A hardness range of 15 to 25; color as selected.
- E. Polysulfide Sealant: Two component; chemical curing, non-sagging type; ASTM C920, Type M, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.
- F. Polyurethane Sealant: Single component, chemical curing, non-staining, non-bleeding; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 20 to 35; color as selected.
- G. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

2.6 GLAZING ACCESSORIES

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
- C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.
- D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option I; color as selected.
- E. Glazing Clips: Manufacturer's standard type.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that openings for glazing are correctly sized and within tolerance.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that

may impede moisture movement, weeps are clear, and ready to receive glazing.

3.2 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant.
- D. Install sealants in accordance with ASTM C1193 and GANA Sealant Manual.
- E. Install sealants in accordance with manufacturer's instructions.

3.3 INSTALLATION - EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)

- A. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- B. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- C. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.4 INSTALLATION - EXTERIOR DRY METHOD (TAPE AND GASKET SPLINE GLAZING)

- A. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- D. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
- E. Trim protruding tape edge.

3.5 INSTALLATION - EXTERIOR WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

- A. Cut glazing tape to length and set against permanent stops, 3/16 inch below sight line. Seal corners by butting tape and dabbing with butyl sealant.
- B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.
- E. Install removable stops, with spacer strips inserted between glazing and applied stops 1/4 inch below sight lines.

1. Place glazing tape on glazing pane of unit with tape flush with sight line.
- F. Install removable stops, with spacer strips inserted between glazing and applied stops, 1/4 inch below sight line. Place glazing tape on glazing pane or unit with tape flush with sight line.
- G. Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.
- H. Apply cap bead of sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.6 INSTALLATION - EXTERIOR BUTT GLAZED METHOD (SEALANT ONLY)

- A. Temporarily brace glass in position for duration of glazing process. Mask edges of glass at adjoining glass edges and between glass edges and framing members.
- B. Temporarily secure a small diameter non-adhering foamed rod on back side of joint.
- C. Apply sealant to open side of joint in continuous operation; thoroughly fill the joint without displacing the foam rod. Tool the sealant surface smooth to concave profile.
- D. Permit sealant to cure then remove foam backer rod. Apply sealant to opposite side, tool smooth to concave profile.
- E. Remove masking tape.

3.7 INSTALLATION - INTERIOR DRY METHOD (TAPE AND TAPE)

- A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
- D. Place glazing tape on free perimeter of glazing in same manner described above.
- E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- F. Knife trim protruding tape.

3.8 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT)

- A. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch above sight line.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
- D. Install removable stops, spacer shims inserted between glazing and applied stops at 24 inch intervals, 1/4 inch below sight line.

- E. Fill gaps between pane and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.
- F. Trim protruding tape edge.

3.9 INSTALLATION - INTERIOR WET METHOD (COMPOUND AND COMPOUND)

- A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 24 inch centers, kept 1/4 inch below sight line.
- B. Locate and secure glazing pane using glazers' clips.
- C. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.10 INSTALLATION - DECORATIVE PLASTIC GLAZING FILM

- A. Install plastic film with adhesive, applied in accordance with film manufacturer's instructions.
- B. Place without air bubbles, creases or visible distortion.
- C. Fit tight to glass perimeter with razor cut edge.

3.11 INSTALLATION - MIRRORS

- A. Install mirrors in accordance with GANA recommendations.
- B. Install mirrors in correctly sized openings, using setting blocks (neoprene 80 to 90 Shore A durometer hardness), spacer shims, stainless steel clips, and adhesive compatible with mirror coating and wall substrate.
- C. Set mirrors plumb and level, free of optical distortion.
- D. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

3.12 FIELD QUALITY CONTROL

- A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- B. Monitor and report installation procedures and unacceptable conditions.

3.13 CLEANING

- A. Remove glazing materials from finish surfaces.
- B. Remove labels after Work is complete.
- C. Clean glass and adjacent surfaces.

3.14 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not

mark heat absorbing or reflective glass units.

END OF REVISED GLASS AND GLAZING

SECTION 08 8700

ARCHITECTURAL WINDOW FILMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Interior Window Film
- B. Related work specified elsewhere includes:
 - 1. Section 084113 - "Aluminum Entrances and Storefronts"
 - 2. Section 088100 - "Glass and Glazing"

1.2 SUMMARY:

- A. Extent of glass and glazing work is indicated on drawings and schedules.
- B. Types of work in this section include glass and glazing, (1-5/16" Insulating Laminated hurricane impact resistant and Low E at exterior) for:
 - 1. Steel and aluminum doors, frames, entrances, sidelites and view windows.
 - 2. Wood doors, frames, sidelites and view windows.
 - 3. Fiberglass doors and frames.
 - 4. Glazing accessories.

1.3 REFERENCES:

- A. ASTM International (ASTM)
 - 1. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
 - 2. ASTM E 308 - Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931 System.

1.4 SUBMITTALS:

- A. Manufacturer's Product Data for specified products.
- B. Submit shop drawings showing layout, profiles, and product components, including dimensions, anchorage, and accessories.

- C. Samples: 4 inch by 4 inch Samples of specified color and pattern for verification.
- D. Submit operation and maintenance data for installed products, including precautions against harmful cleaning materials and methods.
- E. Mock ups: as required

1.5 QUALITY ASSURANCE:

- A. Obtain all products in this section from a single Manufacturer with a minimum of 10 years' experience.
- B. Installer: Installation shall be performed by a trained and qualified installer, specialized and experienced in work required for this project. A list of experienced installation integrators is available at 3M.com/AMD or 3M Commercial Solutions Division at 1-888-650-3497.

1.6 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.
- C. Product must remain in original plastic bag and boxes and have storage conditions as follows:
 - 1. 40 °F – 90 °F (4 °C – 32 °C)
 - 2. Out of direct sunlight
 - 3. Clean dry area
 - 4. Original container
 - 5. Do not stack boxes over six (6) units high. Excessive weight can damage the film
 - 6. Products are not recommended for interior applications where condensation consistently occurs.
 - 7. Handle products in accordance with manufacturer's instructions.
 - 8. Shelf life: 2 years

1.7 PROJECT CONDITIONS:

- A. Confirm appropriate substrate is suitable for mounting of glass finish components prior to start of installation.
- B. Apply materials when environmental conditions are within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits. Application temperature range is 60 °F – 100 °F (16 °C – 38 °C).
- C. Environmental Limitations: Do not install until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 WARRANTY:

- A. Manufacturer's Warranty: Submit manufacturer's standard warranty document by authorized manufacturer.
- B. Standard Product Warranty: Refer to the applicable manufacturer's technical data sheet for product warranty.

1.9 EXTRA MATERIALS:

- A. Furnish 2 percent extra material at time of installation. Deliver in protective packaging for storage and label contents appropriately.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
 - 1. Manufacturers of Architectural Window Film:
 - a. 3M (Basis of Design)
 - b. LLumar
 - c. SunTek

2.2 MATERIAL STANDARD:

- A. Design based upon 3M™ CRYSTAL Glass Finishes- See Finish Schedule for more info.

2.3 MATERIAL PROPERTIES:

- A. General: Glass finishes field-applied application to glass or plastic material as visual opaque or decorative film.
- B. Film: Vinyl
- C. Option to Electrocut (by other than Manufacturer)
- D. Adhesive: Acrylic, Pressure Sensitive, Permanent
- E. Liner: Silicone-coated Polyester
- F. Thickness (Film and Adhesive without Liner):
 - 1. Dusted - 3.2 mils (81 microns)
 - 2. Frosted - 4.7 mils (120 microns)
- G. Fire Performance: Surface burning characteristics when tested in accordance with ASTM E84, Class A:
 - 1. Flame Spread: 25 maximum.
 - 2. Smoke Developed: 450 maximum.

2.4 OPTICAL PERFORMANCE:

- A. CRYSTAL Dusted Decorative / Privacy Glazing Film:
 - 1. Ultraviolet Transmittance (ASTM E 903): 27 percent.
 - 2. Visible Light Transmittance (ASTM E 903, ASTM E308): 85 percent.
 - 3. Visible Light Reflectance (ASTM E 903): 79 percent.
 - 4. Solar Heat Transmittance: 76 percent.
 - 5. Solar Heat Reflectance: 7 percent.
 - 6. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): 0.93.
- B. CRYSTAL Frosted Decorative / Privacy Glazing Film:
 - 1. Ultraviolet Transmittance (ASTM E 903): 20 percent.
 - 2. Visible Light Transmittance (ASTM E 903, ASTM E308): 72 percent.
 - 3. Visible Light Reflectance (ASTM E 903): 12 percent.
 - 4. Solar Heat Transmittance: 64 percent.
 - 5. Solar Heat Reflectance: 10 percent.
 - 6. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): 0.82.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine substrate(s) for compliance. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Refer to the applicable manufacturer's technical data sheet to determine compatibility of finish to substrate.
- C. Do not proceed with installation until unsatisfactory conditions have been corrected.
- D. Responsibility for state of surfaces prior to installation to be pre-determined by installation specialist.
- E. Scheduling of installation by Owner or its representative implies that substrate and conditions are prepared and ready for product installation per the recommendations of the installation specialist.
- F. Proceeding with installation implies installer's acceptance of substrate and conditions.

3.2 SURFACE PREPARATION:

- A. Comply with all manufacturer's instructions for surface preparation.
- B. Thoroughly clean substrate of substances that could impair the overlay's bond, including mold, mildew, oil, grease.
- C. Re-clean surfaces with appropriate surface prep solvent and remove any haze or surface contamination.

3.3 APPLICATION:

- A. Application must be performed by qualified installer.

- B. Do not proceed with installation until all finishing work has been completed in and around the work area.
- C. Verify pattern prior to material acquisition.
- D. Comply with manufacturer's installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- E. Install substrates with no gaps or overlaps. Form smooth, wrinkle-free, bubble-free surface for finished installation.
- F. Remove air bubbles, wrinkles, blisters and other defects. Use approved procedures to prevent the formation of air bubbles, wrinkles, blisters and other defects.
- G. Refer to the applicable manufacturers installation guide for additional details.

3.4 CLEANING AND PROTECTION:

- A. Use cleaning methods recommended by architectural surfacing manufacturer for applicable environment.
- B. Protect completed glass finish during remainder of construction period.
- C. Consult with authorized installation specialist for project specifics.

END OF ARCHITECTURAL WINDOW FILMS

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SECTION 08 9119

FIXED LOUVERS

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. Fixed extruded-aluminum louvers.

1.3 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades (i.e., the axis of the blades are horizontal).
- C. Vertical Louver: Louver with vertical blades (i.e., the axis of the blades are vertical).
- D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.
- E. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven-rain performance, as determined by testing according to AMCA 500-L.
- F. Windborne-Debris-Impact-Resistant Louver: Louver that provides specified windborne-debris-impact resistance, as determined by testing according to AMCA 540.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
 - 1. Show weep paths, gaskets, flashings, sealants, and other means of preventing water intrusion.
 - 2. Show mullion profiles and locations.
- C. Samples: For each type of metal finish required.
- D. Delegated-Design Submittal: For louvers indicated to comply with structural performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.
- B. Windborne-debris-impact-resistance test reports.
- C. Sample Warranties: For manufacturer's special warranties.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
 - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 WARRANTY

- A. Special Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail in materials or workmanship within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:

- a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain fixed louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural performance requirements and design criteria indicated.
- B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
 1. Wind Loads: Determine loads based on pressures as indicated on Drawings.
- C. Windborne-Debris-Impact Resistance: Louvers located within 30 feet of grade shall pass basic protection, when tested according to AMCA 540.
- D. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- F. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal, Drainable-Blade, Windborne-Debris-Impact-Resistant Louver:
1. Louver Depth: 6 inches.
 2. Frame and Blade Nominal Thickness: Not less than 0.080 inch.
 3. Mullion Type: Exposed.
 4. Louver Performance Ratings:
 - a. Free Area: Not less than 8.25 sq. ft. for 48-inch- wide by 48-inch- high louver.
 - b. Point of Beginning Water Penetration: Not less than 1077 fpm.
 - c. Air Performance: Not more than 0.15-inch wg static pressure drop at 1077-fpm free-area exhaust velocity.
 5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.
 6. AMCA Rating: AMCA 540.

2.4 MATERIALS

- A. Aluminum Extrusions: ASTM B221, Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: ASTM B209, Alloy 3003 or 5005, with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Fasteners: Use types and sizes to suit unit installation conditions.
1. Use Phillips flat-head screws for exposed fasteners unless otherwise indicated.
 2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
 3. For fastening galvanized steel, use hot-dip-galvanized-steel or 300 series stainless-steel fasteners.
 4. For fastening stainless steel, use 300 series stainless-steel fasteners.
 5. For color-finished louvers, use fasteners with heads that match color of louvers.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.5 FABRICATION

- A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

- C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
 - 1. Frame Type: As required for a weathertight fit at adjoining materials.
- D. Include supports, anchorages, and accessories required for complete assembly.
- E. Provide subsills made of same material as louvers for recessed louvers.
- F. Join frame members to each other and to fixed louver blades with fillet welds unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.6 ALUMINUM FINISHES

- A. Finish louvers after assembly.
- B. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 92 00 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
 - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF FIXED LOUVERS

SECTION 092116

GYPSUM DRYWALL

PART 1- GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary conditions and Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
 - 1. Section 06100 - "Rough Carpentry" (grounds and concealed P.T. blocking)
 - 2. Section 07210 - "Building Insulation" (thermal insulation and sound batts)
 - 3. Section 07270 - "Firestopping"
 - 4. Section 07600 - "Flashing and Sheet Metal"
 - 5. Section 07900 - "Joint Sealers" (acoustical and joint sealant)
 - 6. Section 09900 - "Painting"

1.2 DESCRIPTION OF WORK:

- A. Work described in this section includes the following types of gypsum board construction:
 - 1. Steel framing members to receive gypsum board.
 - 2. Gypsum board screw-attached to steel framing and furring members, and to wood framing, where indicated.
 - 3. Grid type suspension systems for sloped and horizontal ceiling applications of interior gypsum board products which are not attached directly to primary framing system (if any).
 - 4. Gypsum sheathing, with air infiltration barrier (felt), building wrap and/or waterproofing underlayment, as indicated.
 - 5. Prefinished extruded aluminum interior trim.
 - 6. Notes:
 - a. Extend framing and gypsum board up at fire-rated walls to bottom of fire-rated enclosures above (where occurs) or to roof or floor deck, and mud top edges.
 - b. Extend non-rated walls up to bottom of structure.
 - c. Extend only that partition framing specifically indicated as not full-height up to finished ceilings and tie-off every 4th stud to structure above.
 - d. Completed work in repair and renovation work shall be flush with and to match finish texture to immediately adjacent materials and work.
 - 7. Refer to Section 07210 - "Building Insulation," for thermal insulation and any "sound batts".

1.3 DEFINITIONS:

- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this section or other referenced standards.

1.4 SUBMITTALS:

- A. Submit the following according to Conditions of the Contract and Division 1 Specifications Sections.
 - 1. Current product data and installation instructions from manufacturers for each type of product specified; Six (6) Sets - minimum.

1.5 QUALITY ASSURANCE:

- A. Fire-Resistance Ratings:
 - 1. Where indicated, provide materials and construction which are identical with those of assemblies whose fire resistance rating has been determined per ASTM E 119 by a testing and inspecting organization acceptable to authorities having jurisdiction.
 - 2. Provide fire-resistance rated assemblies identical to those indicated by reference to GA File numbers in GA-600 "Fire Resistance Design Manual" or to design designations in U.L. "Fire Resistance Directory" or in listing of other testing agencies acceptable to authorities having jurisdiction.
- B. Single Source Responsibility: Obtain all steel framing and all metal trim, and each type of gypsum board and related joint treatment materials from a single manufacturer.
- C. Pre-Construction Conference: Prior to beginning work associated with roof system, the Contractor and appropriate subcontractors shall meet to discuss coordination of the work of the trades associated with the installation of the roof system, suspended acoustical and gypsum board ceiling, suspended mechanical ductwork, suspended light fixtures, etc. This work shall be planned and coordinated to provide hanger attachments needed by the various trades in a manner that will minimize conflict with installation of the roof system.

1.6 DELIVERY, STORAGE AND HANDLING:

- A. Comply with manufacturer's current written instructions and recommendations.
- B. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

- C. Store materials inside, under cover, and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.
- D. When materials are moved into the building, distribute pallets and loads evenly around work areas so as to avoid overloading structure, causing damage to any materials, interfering with work of other trades, etc.
- E. Handle gypsum boards to prevent damage to edges, ends and surfaces. Do not bend or otherwise damage metal corner beads, trim, etc.
- F. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

1.7 PROJECT CONDITIONS:

- A. Environmental Requirements, General: Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C 840, with gypsum board manufacturer's recommendations, and with adhesive manufacturer's recommendations, for before, during, and after installation.
- B. Minimum Room Temperatures: For non-adhesive attachment of gypsum board to framing, maintain not less than 40 deg. F.
- C. Ventilate building spaces to remove water not required for drying joint treatment materials. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

1.8 SEQUENCING AND SCHEDULING:

- A. Sequence installation of gypsum board and sheathing with installation of exterior cladding and roofing to comply with requirements indicated below:
 - 1. Do not leave gypsum sheathing board exposed to weather after its application for more than one month or, if protected as indicated below, for more than 6 months:
 - a. Cover exterior surface of sheathing with a temporary air infiltration barrier equivalent to 6-mil polyethylene film. Apply covering immediately after sheathing is installed.
 - b. Remove covering just prior to installation of asphalt felt, face brick, and similarly applied exterior materials.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
1. Steel Framing and Furring:
 - a. Aegis Metal Framing, LLC
 - b. ClarkDietrich Building Systems
 - c. Marino/WARE Industries, Corp.
 - d. SEMCO, Southeastern Metals, Div. of Gibraltar Industries
 - e. Southeastern Stud & Components, Inc.
 - f. Steel-Con; Div. of Steel Construction Systems
 - g. Super Stud Building Products, Inc.
 - h. Telling Industries, LLC
 2. Grid or Direct Suspension Systems:
 - a. Armstrong World Industries, Inc.
 - b. CertainTeed
 - c. Chicago Metallic Corp.
 - d. USG Interiors, Inc.; United States Gypsum Company
 - e. Worthington Industries, Inc.
 3. Gypsum Board and Related Products:
 - a. CertainTeed
 - b. Georgia-Pacific Corp.
 - c. Gold Bond Building Products Div., National Gypsum Company
 - d. Continental Building Products (formerly Lafarge Gypsum)
 - e. United States Gypsum Company
 4. Extruded Moldings and Reveal Moldings:
 - a. AMICO
 - b. Fry Reglet Corporation
 - c. Gordan, Inc.
 - d. M&M Systems Corporation

2.2 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS:

- A. General: Provide components which comply with ASTM C 754 for materials and sizes, unless otherwise indicated.
- B. Wires for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper.
- C. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

- D. Steel Studs for Furring Channels: ASTM C 645, with flange edges bent back 90 deg. and doubled over to form 3/16-inch minimum lip (return), minimum thickness of base (uncoated) metal and minimum depth as follows:
1. Thickness: 20 gauge, unless otherwise indicated.
 2. Depth: As indicated.
 3. Spacing: As indicated in referenced standard and on drawings, but no less than at all edges and 24-inches o.c.
- E. Steel Rigid Furring Channels: ASTM C645, hat-shaped, depth of 7/8-inch, and minimum thickness of base (uncoated) metal as follows:
1. Thickness: 20 gauge at interior and 18-gauge at exterior, unless otherwise indicated.
 2. Spacing: As indicated in referenced standard and on drawings, but not less than at all edges and 24-inches o.c.
 - a. At ceilings and soffits indicated to receive more than a single layer of gypsum board, spacing shall be not less than at all edges and 16-inches o.c.
- F. Grid Suspension System: ASTM C 645, manufacturer's standard grid suspension system composed of main beams and cross furring members which interlock to form a modular supporting network.
1. Locations for Use: Provide grid type suspension systems for sloped and horizontal ceiling applications of interior gypsum board products which are not attached directly to primary framing system; Minimum 4-feet x 4-feet grid and cross tees at 2-feet o. c., with minimum installation requirements as required by manufacturer's current written instructions, referenced standards, and as indicated in this Section 09250 and Section 09511 - "Acoustical Panel Ceilings". Provide and comply with manufacturer's published requirements for accessories, trim, and hanger wire, and as otherwise required to provide flat ceilings without deflection or sag.
 2. Product/Manufacturer: Provide suspended modular grid furring system equivalent to standard drywall suspension system for flat ceilings, with 1-1/2-inch grid faces, and as follows:
 - a. Equivalent to "Drywall Suspension System", as manufactured by USG Interiors, or one of the other above named manufacturers.

2.3 STEEL FRAMING FOR WALLS AND PARTITIONS:

- A. Steel Studs and Runners:
1. ASTM C 645, with flange edges bent back 90 deg. and doubled over to form

3/16-inch minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and minimum depth as follows:

2. Metal studs at interior partitions shall be 3-5/8-inches x 20 gauge (362S162-33), 6-inches x 20 gauge (600S162-33), or 8-inches x 18 gauge (800S162-43), at locations indicated on the Drawings, spaced at 16-inches o.c., unless otherwise indicated below, or otherwise shown on drawings or required by project conditions. Stud width shall be 1-5/8-inches unless otherwise indicated.
3. Use double studs or 6-inch studs, as indicated or as otherwise required, for chase walls, piping, conduits, or etc.
4. Metal studs at shaft wall or similar construction shall be type, thickness, depth and configuration indicated, or if not indicated, not less than the studs used in the tested assembly. Minimum thickness of 3-5/8-inch studs shall be 22 gauge, and of 6-inch studs shall be 20 gauge.
5. Special stud tracks for all curved walls shall be equivalent to "Flex-C Trac" galvanized flexible segmented track with slidable side straps, as manufactured by Flex-Ability Concepts, Inc.; Edmond, OK; Phone: (405) 302-0611.
6. Any interior load-bearing studs, if any, shall be at least 6-inches depth x 18 gauge (600S162-43), or 8-inches x 18 gauge (800S162-43), unless otherwise indicated on Drawings - galvanized C-studs spaced at 16-inches o.c.

B. Track:

1. Bottom Track: Unless otherwise indicated or required by project conditions, fire-ratings, etc., provide manufacturer's standard Deep Leg Tracks, unpunched unless otherwise indicated, of size, shape and gauge indicated, with 1-5/16-inch flange.
2. Deflection Track - Typical at Stud Walls Up To Slab or Similar Fixed Structure at Top of Walls: Provide for no less than 1" of vertical movement, Equivalent to one of the following:
 - a. Dietrich Double Track System
 - b. Dietrich Track-Over-Track System
 - c. Dietrich SLP-TRK slotted track system
 - d. Dietrich TR-Series with Spazzer 9200 Bar (SPZD)
3. Special stud tracks for all curved walls shall be equivalent to "Flex-C Trac" galvanized flexible segmented track with slidable side straps, as manufactured by Flex-Ability Concepts, Inc.; Oklahoma City, OK; Phone: (405) 996-5343.
4. Special stud tracks for all arched walls shall be equivalent to "Flex-C Arch" galvanized flexible segmented track with slidable straps, as manufactured by Flex-Ability Concepts, Inc.; Oklahoma City, OK; Phone: (405) 996-5343.

- C. Fasteners: Provide fasteners of type, material, size, corrosion resistance, holding power and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum drywall manufacturers for applications indicated.

- D. Continuous Horizontal Bridging / Bracing:
1. 1-1/2-inch cold-rolled channels (galvanized).
 2. Spacing: 4'-0" or 4'-6" o.c. vertically, through pre-punched slots in studs.
 3. Splice Plates: 16 gauge at all splices.
 4. Anchors (bridging channels to studs): 1-1/2-inches x 2-inches x 16 gauge clip angle, 1/4- inch less than stud width, secured with four (4) 5/8-inch S-14 screws. (Anchors required at ends of runs, where snap-in fit to stud slots is not snug or allows stud to move/slide on channels, and at studs on each side of splices in bridging channels).
- E. Strap Bracing: 1-1/2-inch x 20-gauge galvanized steel, anchored at ends, splices, and each stud with typical framing screws. Placement at curved walls shall align with radius or curve indicated at each such location.
- F. Extruded Moldings and Reveal Moldings: Provide manufacturer's standard alloy 6063-T5 extruded units with clear anodized finish, standard, architectural 200R1 medium etch (AA-M32C10A21), and as follows:
1. Design: Provide shapes and configurations as indicated on the Drawings.
 - a. Form reveal moldings to cover at least two sides and rear of reveal.
 - b. At drywall (or plaster) edge, provide continuous expanded metal edge, designed for mudding-in.
 - c. At ceiling grid edge, provide continuous edge designed for compatibility with lay-in ceiling grid and matching grid finish.
 2. Color: Clear Anodized

2.4 **GYPSUM BOARD:**

- A. General: Provide gypsum board of types indicated in maximum lengths available to minimize end- to-end joints.
- B. Gypsum Wallboard: ASTM C 36, ASTM C 1396 and as follows:
1. Type: Type X at all locations.
 2. Edges: Tapered and featured (rounded or beveled) for prefilling.
 3. Thickness: 5/8-inch for general use, except where 1/4-inch layers (at least two layers) may be indicated or required for curved wall or ceiling assemblies.
- C. Gypsum Backing Board for Multi-Layer Applications: ASTM C 442 or, where backing board is not available from manufacturer, gypsum wallboard, ASTM C 36, ASTM C 1396 and as follows:

1. Type: Type X at all locations.
 2. Edges: Manufacturer's standard.
 3. Thickness: 5/8-inch.
- D. Moisture-, Mold- and Mildew- Resistant Gypsum Board: ASTM C 36, ASTM C 1396, and as follows:
1. Type: Type X at all locations; Moisture-, mold- and mildew- resistant core and facings/surfaces.
 2. Edges: Manufacturer's standard.
 3. Thickness: 5/8-inch.
 4. Locations: At rooms with toilet fixtures and/or service sinks, entire wall behind sinks and walls beside service sinks, and elsewhere indicated.
 5. Use 5/8-inch thick equivalent to Georgia-Pacific "Dens-Shield" tile backer board with sealed and facing-taped joints, at ceramic and hard tile; ASTM C 1177 or ASTM C 1178.
 6. Use "exterior gypsum board" where exposed at any exterior locations; ASTM C 931 or ASTM C 1396.
 7. Old style "Green Board" WILL NOT BE ACCEPTABLE FOR ANY USE.
- E. Gypsum Sheathing Board with Water-Resistant Core: Gypsum sheathing board consisting of noncombustible gypsum core incorporating a water-resistant material, water-repellent surfaced on face, back and long edges; complying with ASTM C 79 and requirements indicated below:
1. Type: Type X at all locations.
 2. Edge and End Configuration: Square.
 3. Thickness: 5/8-inch, unless indicated otherwise on the Drawings.
 4. Size: 4'-0" x 8'-0" or 9'-0" as required for coordination with framing.
 5. **Note:** Use one of the following, with sealed and facing-taped joints at any exterior stud walls and exterior stud framing, **only** where plywood or other wood sheathing is not indicated.
 - a. CertainTeed "GlasRoc Sheathing"
 - b. Georgia-Pacific "Dens-Glass Gold"
 - c. Gold Bond "e²XP"
 - d. Lafarge Weather Defense Platinum
 - e. USG "Securock"
 6. Cover ALL SHEATHING with air infiltration barrier (felt) and waterproofing underlayment where specified in Division 7 Section "Flashing and Sheet Metal"
- F. Acoustical Plaster Systems : Contractor to provide acoustical gypsum board wall systems as identified on the drawings and details with the following design criteria:
1. Type: Acoustical Plaster System shall be provided in areas indicated on the drawings. System shall be designed to provide a reverberation time of 1 second. With % ALCONS of 5.85.

2. Products: Manufacturers for acoustical plaster shall include products by BASWA, (basis of design), Fellert, StarSilent, USG and Asona. Other manufacturers will be considered following the guidelines for substitutions. Refer to drawings for additional information.

2.1 TRIM ACCESSORIES:

- A. Cornerbead and Edge Trim for Interior Installation: Provide corner beads, edge trim and control joints which comply with ASTM C 1047 and requirements indicated below:
 1. Material: Formed metal, plastic, or metal combined with paper, with metal complying with the following requirement.
 - a. Sheet steel coated with zinc by hot-dip or electrolytic processes, or with aluminum.
 2. Edge trim shapes indicated below by reference to designations of Fig. 1 in ASTM C 1047:
 - a. "LC" Bead, unless otherwise indicated.
 - b. "L" Bead where indicated or required.
 - c. "U" Bead where indicated.
 3. One-Piece Control Joint: Formed with vee-shaped slot per Fig. 1 in ASTM C 1047, with slot opening covered with removable strip.

2.2 GYPSUM BOARD JOINT TREATMENT MATERIALS:

- A. General: Provide materials complying with ASTM C 475, ASTM C 840, and recommendations of manufacturer of both gypsum board and joint treatment materials for the application indicated.
- B. Joint Tape: Paper reinforcing tape.
- C. Drying-Type Joint Compounds:
 1. Factory-prepackaged vinyl-based products complying with the following requirements for formulation and intended use.
 2. Ready-Mix Formulation: Factory-premixed product.
 3. Taping compound formulated for embedding tape and for first coat over fasteners and flanges of corner beads and edge trim.
 4. Topping compound formulated for fill (second) and finish (third) coats.
 5. All-purpose compound for use as both taping and topping compound.
- D. Setting-Type Joint Compound:

1. Factory-prepackaged, job-mixed, chemical-hardening powder products formulated for uses indicated.
2. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer for this purpose.

2.8 MISCELLANEOUS MATERIALS:

- A. General: Provide auxiliary materials for gypsum drywall construction which comply with referenced standards and the recommendations of the manufacturer of the gypsum board.
- B. Spot Grout: ASTM C 475, setting-type joint compound of type recommended for spot grouting hollow metal door frames.
- C. Fasteners: Type S steel drill screws, 1-inch long unless otherwise required for shaft wall or multi-layer application, with corrosion-resistant finish in form of cadmium plating or proprietary coating, and as follows:
 1. For attachment of gypsum board panels to light gauge steel framing of less than 0.033 of an inch in thickness (20 gauge), provide steel drill screws complying with ASTM C 1002.
 2. For attachment of gypsum board panels, including sheathing, to steel framing from 0.033 (20 gauge) to 0.112 of an inch in thickness, provide steel drill screws complying with ASTM C 954.
- D. Air Infiltration Barrier: Asphalt-saturated organic felt complying with ASTM D 226, Type 1 (No. 15 asphalt felt), unperforated; unless indicated otherwise.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine substrates to which drywall construction attaches or abuts, preset hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of drywall. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION FOR METAL SUPPORT SYSTEMS:

- A. Ceiling Anchorages:
 1. Coordinate installation of ceiling suspension system with installation of overhead structural systems to ensure that inserts and other structural anchorage

provisions have been installed to receive ceiling anchors in a manner that will develop their full strength and at spacing required to support ceiling.

3.3 INSTALLATION OF STEEL FRAMING, GENERAL:

- A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking and bracing at terminations in the work and for support of fixtures, equipment services, heavy trim, cabinets, countertops, shelving, grab bars, toilet accessories, furnishings, and similar construction to comply with details indicated and with recommendations of gypsum board manufacturer, or if none available, with "Gypsum Construction Handbook" published by United States Gypsum Co.
 - 1. Refer to Section 06100 - "Rough Carpentry" for additional information and requirements.
 - 2. Provide additional horizontal framing (flat studs or tracks) at 24-inches o.c. minimum in walls at cabinets and at ends of countertops, and as otherwise required, to assure square corners and flat walls without bowing, warping, etc.
- C. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement, at locations indicated below to comply with details shown on Drawings:
 - 1. Where edges of suspended ceilings abut building structure horizontally at ceiling perimeters or penetration of structural elements.
 - 2. Where partition and wall framing abuts overhead structure:
 - a. Provide slip or cushioned type joints as detailed to attain lateral support and avoid axial loading.
 - b. Unless framing is specifically indicated to terminate below ceilings, all framing and gypsum board shall extend up to bottom of structure above.
- D. Do not bridge building expansion and control joints with steel framing or furring members; independently frame both sides of joints with framing or furring members or as indicated.

3.4 INSTALLATION OF STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS:

- A. Suspend ceiling hangers from building structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
4. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
5. Secure hangers to structural support by connecting directly to structure where possible; otherwise, connect to anchorage devices or fasteners as indicated or required.
6. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to steel deck tabs.
8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
9. Do not connect or suspend steel framing from ducts, pipes or conduit.
10. Keep hangers and braces 2-inches clear of ducts, pipes and conduits.
11. Sway-brace suspended steel framing with hangers used for support.
12. Install suspended steel framing components in sizes and at spacing indicated but not less than that required by referenced steel framing installation standard.
13. Installation Tolerances: Install steel framing components for suspended ceilings so that cross furring members or grid suspension members are level to within 1/8-inch in 12 ft. as measured both lengthwise on each member and transversely between parallel members.
14. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross furring members to each other and butt-cut to fit into wall track.
15. Suspension Systems:
 - a. Suspend ceiling hangers from building structural members and as follows below, with system leveling tolerance of 1/8 inch in 12'-0".
 - b. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.
 - c. Wire Hangers: 0.1620-inch diameter (8 gauge), 4-feet on center. Install supplementary hangers as necessary at ceiling fixtures to provide a hanger at each corner of each fixture, diffuser, grille, and other ceiling-mounted

- equipment.
- d. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits indicated and as established by referenced standards.
 - e. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - f. Secure, angle, and rod hangers, (if any) to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for structure to which hangers are attached as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 - g. Space hangers not more than 4'-0" o.c. along each member supported directly from hangers, unless otherwise shown, and provide hangers not more than 8 inches from ends of each member.
 - h. Provide additional hangers as necessary, so that one hanger occurs on each side of lay-in and surface-mounted light fixtures, and at other grid supported equipment, devices, etc.

3.5 INSTALLATION OF STEEL FRAMING FOR WALLS AND PARTITIONS:

- A. Install runners (tracks) at floors, ceilings and structural walls and columns, where gypsum drywall stud system abuts other construction.
- B. Installation Tolerances: Install each steel framing and furring member so that fastening surface does not vary more than 1/8-inch from plane of faces of adjacent framing.
- C. Extend wall and partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
 - 1. Provide studs up to tie to structure at 4'-0" o.c. minimum, from partitions terminating below ceilings.
- D. Install steel studs and furring in sizes and at spacings, indicated but not less than that required by referenced steel framing installation standard.
- E. Install steel studs so that flanges point in the same direction and gypsum boards can be installed in the direction opposite to that of the flange.

- F. Install horizontal steel bridging/bracing in all walls, and the additional strap bracing at curved walls as steel framing progresses (refer to Paragraph 2.3 C and D above). Install in compliance with stud manufacturer's recommendations, at spacing indicated.
 - 1. Galvanized steel strap bracing shall be provided continuous at top and bottom runner tracks and at bridging locations at all curved stud walls.
- G. Frame door openings to comply with details indicated, with GA-219 and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - 1. Extend vertical jamb studs (double studs-typical) through suspended ceilings and attach to underside of floor or roof structure above, unless otherwise indicated.
- H. Frame openings other than door openings to comply with details indicated, or if none indicated, in same manner as required for door openings; and install framing below sills of openings to match framing required for door heads.

3.6 APPLICATION AND FINISHING OF GYPSUM BOARD, GENERAL:

- A. Gypsum Board Application and Finishing Standard: Install and finish gypsum board to comply with ASTM C 840 and GA-216.
- B. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24-inches in alternate courses of board.
- C. Install ceiling boards across framing in the manner which minimizes the number of end-butt joints, and which avoids end joints in the central area of each ceiling. Stagger end joints at least 24- inches.
- D. Install wall/partitions boards in manner which minimizes the number of end-butt joints or avoids them entirely where possible. At high walls, install boards horizontally with end joints staggered over studs.
- E. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16-inch open space between boards. Do not force into place.
- F. Locate either edge or end joints over supports, except in horizontal applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.

- G. Attach gypsum board to steel studs so that leading edge or end of each board is attached to open (unsupported) edge of stud flange first.
- H. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.
- I. Spot grout hollow metal door frames for solid core wood doors, hollow metal doors and doors over 32-inches wide. Apply spot grout at each jamb anchor clip just before inserting board into frame.
- J. Form control joints and expansion joints at locations indicated, with space between edges of boards, prepared to receive trim accessories.
 - 1. Provide control joints in long partitions and walls at a maximum spacing of 30 feet on center, unless a closer spacing is indicated. Provide control joints in large ceiling areas at a maximum spacing of 50 feet on center in each direction, unless a closer spacing is indicated. Consult with Architect on locations of all control joints prior to beginning work.
- K. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except inside double or chase walls which are required to be braced internally.
 - 1. Except where concealed application is required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area, and may be limited to not less than 75% of full coverage.
 - 2. Fit gypsum board around ducts, pipes, and conduits.
 - 3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4-to-1/2-inch-wide joints to install sealant.
 - 4. Fire-stop around penetrations as required by Codes and authorities having jurisdiction. Refer to Section 07270 for additional information and requirements.
- L. Where interior partitions are indicated to extend to the structure above, the drywall shall also extend to the structure with the same number of layers as required below the ceiling.
- M. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4-inch to 1/2-inch space and trim edge with "U" bead edge trim. Seal joints with acoustical sealant.
- N. At all interior walls, seal construction at perimeters, control and expansion joints, openings and penetrations with a continuous bead of acoustical sealant including a bead at both faces of partitions. Comply with ASTM C 919 and manufacturer's

recommendations for location of edge trim, and close off sound-flanking paths around or through construction, including sealing of partitions above acoustical ceilings.

- O. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations.
- P. Install "sound batts" and insulation as the work progresses. Refer to Section 07210 for additional information and requirements.

3.7 METHODS OF GYPSUM BOARD APPLICATION:

- A. Single-layer Application: Install gypsum wallboard as follows:
 - 1. On ceilings apply gypsum board prior to wall/partition board application to the greatest extent possible.
 - 2. On partitions/walls apply gypsum board vertically (parallel to framing), unless otherwise indicated or required for fire or smoke resistive rated assemblies. Provide maximum length panels, to minimize end joints.
 - 3. On partitions/walls 8'-1" or less in height apply gypsum board horizontally (perpendicular to framing); use maximum length sheets possible to minimize end joints.
- B. Multi-Layer Application:
 - 1. Install gypsum backing board for base layer and gypsum wallboard for face layer.
 - 2. On ceilings apply base layer(s) prior to base layer application on walls/partitions; apply face layers in same sequence. Offset joints between layers at least 10-inches. Apply base layers at right angles to supports unless otherwise indicated.
 - 3. On partitions/walls apply base layer(s) and face layers vertically (parallel to framing) with joints of base layers over supports and face layer joints offset at least one stud or furring member space from base layer joints.
- C. Single-Layer Fastening Methods: Apply gypsum boards to supports as follows:
 - 1. Fasten with screws.
- D. Multi-Layer Fastening Methods:
 - 1. Apply base layer(s) of gypsum board and face layer to base layer(s) as follows:
 - 2. Fasten both base layer(s) and face layer separately to supports with screws.

3.8 INSTALLATION OF DRYWALL TRIM ACCESSORIES:

- A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.

- B. Install corner beads at external corners.
- C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi- exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where "U" bead (semi-finishing type) is indicated.
 - 1. Install "LC" bead where drywall construction is tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
 - 2. Install "L" bead where edge trim can only be installed after gypsum board is installed.
 - 3. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).
- D. Install edge trim where indicated on wall panels at juncture with ceilings.
- E. Install control joints at locations indicated, or if not indicated, at spacings and locations required by referenced gypsum board application and finish standard, and approved by the Architect for visual effect.

3.9 **FINISHING OF DRYWALL:**

- A. General: Apply treatment at gypsum board joints (both directions); flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects and elsewhere as required to prepare work for decoration.
- B. Prefill open joints and rounded or beveled edges, if any, using setting-type joint compound.
- C. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.
- D. Finish interior gypsum wallboard by applying the following joint compounds in 5 coats (not including prefill of openings in base), and sand between coats and after last coat:
 - 1. Embedding and First Coat: Ready-mix drying-type all-purpose or taping compound.
 - 2. Fill (Second) Coat: Ready-mix drying-type all-purpose or topping compound.
 - 3. Finish (Third) Coat: Ready-mix drying-type all-purpose or topping compound.
 - 4. Finish (Fourth) Coat: Ready-mix drying-type all-purpose or topping compound.
 - 5. Finish (Fifth) Coat: Application of a thin skim coat of joint compound applied to entire surface.
- E. Partial Finishing: Omit third coat and sanding on concealed drywall construction which is indicated for drywall finishing, except where finishing is required to achieve fire-resistance rating, sound rating or to act as air or smoke barrier.

3.10 CLEANING AND PROTECTION OF WORK:

- A. Promptly remove any joint compound and adhesives and similar residue from adjacent surfaces, as it may occur.
- B. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall construction remain without damage or deterioration at time of Substantial Completion.

END OF GYPSUM DRYWALL

SECTION 09 2216

NON-STRUCTURAL METAL FRAMING

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. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.
3. Grid suspension systems for gypsum board ceilings.

B. Related Requirements:

1. Section 054000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; and roof rafters and ceiling joists.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E119 by an independent testing agency.

- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.
- C. Horizontal Deflection: For composite and non-composite wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.
 - 2. Protective Coating: ASTM A653/A653M, G40, hot-dip galvanized unless otherwise indicated.
- B. Studs and Tracks: ASTM C645.
 - 1. Steel Studs and Tracks:
 - a. Minimum Base-Steel Thickness: As required by performance requirements for horizontal deflection, but not less than 0.0359 inch for 3 5/8" and 6" steel studs and track - and - not less than 0.0478 inch for 8" steel studs and tracks.
 - b. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Where indicated, provide the following:
 - 1. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Pitched Track: Provide pitched track where required by roof slope.
- D. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-steel thickness, with minimum 1/2-inch- wide flanges.
 - 1. Depth: 1-1/2 inches.
 - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.

- F. Hat-Shaped, Rigid Furring Channels: ASTM C645.
 - 1. Minimum Base-Steel Thickness: 0.0179 inch.
 - 2. Depth: As indicated on Drawings.
- G. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.
 - 1. Configuration: Asymmetrical or hat shaped.
- H. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges.
 - 1. Depth: 3/4 inch.
 - 2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
 - 3. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.
- I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-steel thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.
- B. Hanger Attachments to Concrete:
 - 1. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, AC193, AC58, or AC308 as appropriate for the substrate.
 - a. Uses: Securing hangers to structure.
 - b. Type: Torque-controlled, expansion anchor or torque-controlled, adhesive anchor or adhesive anchor.
 - c. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
 - d. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.
 - 2. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

- D. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.
 - 1. Depth: 2 inches.
- E. Furring Channels (Furring Members):
 - 1. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch deep.
 - a. Minimum Base-Steel Thickness: 0.0179 inch.
 - 2. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical or hat shaped.
- F. Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.
 - 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. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - b. USG Corporation; Drywall Suspension System.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No.15 asphalt felt), nonperforated.
 - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
 - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
 2. Multilayer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
 3. Tile Backing Panels: As required by horizontal deflection performance requirements unless otherwise indicated by tile manufacturer.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- E. Direct Furring:
1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- F. Z-Shaped Furring Members:

1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches o.c.
 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
 3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.
- G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING CEILING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches o.c.
 2. Carrying Channels (Main Runners): 48 inches o.c.
 3. Furring Channels (Furring Members): 16 inches o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Do not attach hangers to steel roof deck.

- 5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
- 6. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF NON STRUCTURAL METAL FRAMING

SECTION 09 3000

TILING

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. Ceramic tile.
- 2. Crack isolation membrane.
- 3. Metal edge strips.

B. Related Sections:

- 1. Section 07 9200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.4 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per DCOF AcuTest:
1. Level Surfaces: greater than or equal to 0.042
 2. Step Treads: greater than or equal to 0.042
 3. Ramp Surfaces: greater than or equal to 0.042

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- D. Samples for Verification:
1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
 2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than 4 tiles. Use grout of type and in color or colors approved for completed Work.
 3. Full-size units of each type of trim and accessory for each color and finish required.
 4. Stone thresholds in 6-inch lengths.
 5. Metal edge strips in 6-inch lengths.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product, signed by product manufacturer.
- D. Material Test Reports: For each tile-setting and -grouting product.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
 - 1. Crack isolation membrane.
 - 2. Joint sealants.
 - 3. Metal edge strips.
- D. 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 mockup of each type of floor tile installation.
 - 2. Build mockup of each type of wall tile installation.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
- E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

A. Tile Type **HWT**: Wall Tile.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Daltile (Basis of Design)
 - b. South Cypress
 - c. Crossville, Inc.
 - d. American Olean
2. Composition: Ceramic.
3. Face Size:
 - a. **HWT-1**: 4x16 inches.
4. Thickness: 10 mm (3/8-inch nominal).
5. Finish: As scheduled.
6. Tile Color and Pattern: As scheduled.
7. Grout Color: As scheduled.
8. Trim Units: As scheduled. Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile.

2.3 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, modified-bituminous sheet with fabric reinforcement facing; 0.040-inch nominal thickness.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. MAPEI Corporation; Mapelastic SM.
 - b. National Applied Construction Products, Inc.; Strataflex.

- C. Latex-Portland Cement: Flexible mortar consisting of cement-based mix and latex additive.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. C-Cure; UltraCure 971.
 - b. MAPEI Corporation; Mapelastic (PRP 315).
 - c. TEC; a subsidiary of H. B. Fuller Company; Triple Flex Waterproofing, Crack Isolation Membrane & Mortar.

2.4 SETTING MATERIALS

- A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Boiardi Products; a QEP company.
 - b. Bonsal American; an Oldcastle company.
 - c. Bostik, Inc.
 - d. C-Cure.
 - e. Custom Building Products.
 - f. Jamo Inc.
 - g. Laticrete International, Inc.
 - h. MAPEI Corporation.
 - i. Mer-Kote Products, Inc.
 - j. Southern Grouts & Mortars, Inc.
 - k. Summitville Tiles, Inc.
 - l. TEC; a subsidiary of H. B. Fuller Company.
 - 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 - 3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.5 GROUT MATERIALS

- A. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Atlas Minerals & Chemicals, Inc.
 - b. Boiardi Products; a QEP company.
 - c. Bonsal American; an Oldcastle company.
 - d. Bostik, Inc.
 - e. C-Cure.
 - f. Custom Building Products.
 - g. Jamo Inc.
 - h. Laticrete International, Inc. (BASIS OF DESIGN)
 - i. MAPEI Corporation.
 - j. Mer-Kote Products, Inc.
 - k. Southern Grouts & Mortars, Inc.
 - l. Summitville Tiles, Inc.
 - m. TEC; a subsidiary of H. B. Fuller Company.
 - 2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F and 212 deg F, respectively, and certified by manufacturer for intended use.
- B. Grout for PregROUTed Tile Sheets: Same product used in factory to pregROUT tile sheets.

2.6 ELASTOMERIC SEALANTS

- A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 079200 "Joint Sealants."
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

- C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; Dow Corning 786.
 - b. GE Silicones; a division of GE Specialty Materials; Sanitary 1700.
 - c. Laticrete International, Inc.; Latasil Tile & Stone Sealant.
 - d. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
 - e. Tremco Incorporated; Tremsil 600 White.

2.7 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips:
1. Wall: Schluter Systems, Schiene
- C. Temporary Protective Coating: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
1. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- E. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bonsal American; an Oldcastle company; Grout Sealer.
 - b. Bostik, Inc.; CeramaSeal.
 - c. C-Cure; Penetrating Sealer 978.

- d. Custom Building Products; Surfaceguard Sealer.
- e. Jamo Inc.; Matte Finish Sealer.
- f. MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout.
- g. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
- h. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
- i. TEC; a subsidiary of H. B. Fuller Company; TA-257 Silicone Grout Sealer.

2.8 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that cmu for tile walls installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in cmu walls installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- C. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Ceramic Mosaic Tile: 1/16 inch.
 - 2. Paver Tile: 1/4 inch.
 - 3. Glazed Wall Tile: 1/16 inch.
 - 4. Decorative Thin Wall Tile: 1/16 inch.
- G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- H. Metal Edge Strips: Install at locations indicated.

3.4 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.5 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove epoxy and latex-portland cement grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 - 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.6 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Wall Installations, Wood or Metal Studs or Furring:

1. Ceramic Tile Installation: TCNA W245 or TCNA W248; thinset mortar on glass-mat, water-resistant gypsum backer board.
 - a. Tile Type: HWT-1
 - b. Thinset Mortar: Latex- portland cement mortar.
 - c. Grout: High-performance unsanded grout.

END OF SECTION 09 3000

SECTION 09 5153

ACOUSTICAL PANEL CEILINGS:

PART 1- GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
 - 1. Section 06100 - "Rough Carpentry" (concealed P.T. wood blocking and grounds)
 - 2. Section 06200 - "Finish Carpentry"
 - 3. Section 07210 - "Building Insulation"
 - 4. Section 07900 - "Joint Sealers"
 - 5. Section 09250 - "Gypsum Drywall"
 - 6. Division 15 - (Mechanical items, etc., mounted in ceilings).
 - 7. Division 16 - (Electrical items, light fixtures, etc., mounted in ceilings).
- C. Thermal insulation and sound batts for installation on acoustical panel ceilings, if required, is specified in Section 07210 - "Building Insulation."

1.2 SUMMARY:

- A. This Section includes acoustical and non-acoustical panel ceilings installed with grid suspension systems.

1.3 SUBMITTALS:

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. Product data for each type of product specified.
 - 2. Samples for verification purposes of each type of exposed finish required, prepared on samples of size indicated below and of same thickness and material indicated for final unit of Work. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected.
 - a. 6-inch-square samples of each acoustical panel type, pattern, and color.

- b. Set of 12-inch-long samples of exposed suspension system members, including moldings, for each color and system type required.

1.4 QUALITY ASSURANCE:

- A. **Installer Qualifications:** Engage an experienced Installer who has successfully completed acoustical ceilings similar in material, design, and extent to those indicated for Project, and which is acceptable to manufacturer of acoustical products herein, as indicated by written statement by their manufacturer(s).
 - 1. Refer to Section 01015- "Special Conditions", for additional experience requirements and information.
- B. **Fire-Performance Characteristics:** Provide acoustical ceilings that are identical to those tested for the following fire-performance characteristics, per ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
 - 1. **Surface Burning Characteristics:** As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
 - a. Flame Spread: 25 or less.
 - b. Smoke Developed: 50 or less.
- C. **Acoustical Performance Characteristics:** Provide acoustical ceiling systems which have been tested by UL or other acceptable independent testing organization, to certify compliance with STC and CAC minimum requirements indicated herein.
- D. **Single-Source Responsibility for Ceiling Units:** Obtain each type of acoustical ceiling unit from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- E. **Coordination of Work:** Coordinate layout and installation of acoustical ceiling units and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, and wall and partition systems.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

- B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS:

- A. Space Enclosure: Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

1.7 EXTRA MATERIAL:

- A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with appropriate labels.
 - 1. Acoustical and Non-Acoustical Ceiling Units: Furnish quantity of full-size units equal to 2.0 percent of amount installed, in whole unused cartons.

PART 2 - PRODUCTS

2.1 ACOUSTICAL CEILING UNITS, GENERAL:

- A. Standard for Acoustical Ceiling Units: Provide manufacturer's standard units of configuration indicated that comply with ASTM E 1264 classifications as designated by reference to types, patterns, acoustical ratings, and light reflectance, unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400 (plenum mounting in which face of test specimen is 15-3/4 inches [400 mm] away from the test surface) per ASTM E 795.
- B. Colors and Patterns: Provide products to match appearance characteristics indicated under each product type, or if not indicated, as selected by Architect from manufacturer's standard colors, surface textures, and patterns available for ceiling panels and exposed metal suspension systems of quality indicated herein.

2.2 ACOUSTICAL UNITS:

- A. Basis of Design, ACT-1 Armstrong Ultima 1951, White, 24"x24"x15/16" thick, Beveled Tegular – Or Approved Equal

2.3 NON-ACOUSTICAL UNITS:

- A. Not Applicable.

2.4 METAL SUSPENSION SYSTEMS, GENERAL:

- A. Refer to Drawings.
- B. Finishes and Colors: Provide manufacturer's standard factory-applied finish for type of system indicated, unless otherwise required.
 - 1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
 - a. Product/Manufacturer: "Environmental" grid system.
 - 1) "Environmental ZXA Grid System," as manufactured by USG Interiors or Donn.
 - 2) "Exposed Environmental (HD) Series," as manufactured by National Rolling Mills.
 - 3) "Prelude XL" Environmental Tee System, as manufactured by Armstrong World Industries, Inc.
 - 4) Equivalent products manufactured by lay-in panel manufacturer.
- C. Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- D. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched.
 - 1. Gauge: Provide wire sized to that stress at 3 times hanger design load (ASTM C 635, Table 1, Direct-Hung), will be less than yield stress of wire, but provide not less than 0.106-inch diameter (12 gauge).
- E. Hanger Rods - (as required): Mild steel, zinc coated, or protected with rust-inhibitive paint.
- F. Angle Hangers - (as required): Angles with legs not less than 7/8 inch wide, formed with 0.0365-inch-thick galvanized steel sheet complying with ASTM A 446, Coating

Designation G90, with bolted connections and 5/16-inch-diameter bolts.

- G. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit type of edge detail and suspension system indicated.
- H. Subject to compliance with requirements, provide suspension systems of one of the following:
 - 1. Manufacturers of Steel Exposed Suspension Systems:
 - a. Same as ceiling panel unit manufacturer.
 - b. Armstrong World Industries, Inc.
 - c. Chicago Metallic Corporation.
 - d. Donn Corporation.
 - 2. Manufacturers of Moldings and Trim:
 - a. Construction Specialties.
 - b. Fry Reglet Corporation.
 - c. Gordon, Inc.
 - d. MM Systems.
 - e. Technical Ceiling Systems, Inc.
 - f. Same as Suspension system manufacturer.

2.4 NON-FIRE-RESISTANCE-RATED DIRECT-HUNG SUSPENSION SYSTEMS:

- A. Wide-Face Capped Double-Web Steel Suspension System: Main and cross-runners roll-formed from galvanized cold-rolled steel sheet, with prefinished 15/16-inch-wide metal caps on flanges; other characteristics as follows:
 - 1. Structural Classification: Intermediate-Duty System.
 - 2. End Condition of Cross-Runners: Override (stepped) or butt-edge type, as standard with manufacturer.
 - 3. Cap Material and Finish:
 - a. Steel sheet, painted (typical).
 - b. Aluminum sheet with painted finish, (at "Environmental" grid systems).

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine substrates and structural framing to which ceiling system attaches or abuts, with Installer present, for compliance with requirements specified in this and other sections that affect installation and anchorage of ceiling system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

- A. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors, or supports, whose installation is specified in other sections.
 - 1. Furnish galvanized inserts and similar devices as required for wood structure (if required), to other trades for installation well in advance of time needed for coordination of other work.
- B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half-width units at borders, and comply with reflected ceiling plans.

3.3 INSTALLATION:

- A. General: Install acoustical ceiling systems to comply with installation standard referenced below, per manufacturer's current written instructions and CISCA "Ceiling Systems Handbook."
 - 1. Standard for Installation of Ceiling Suspension Systems: Comply with ASTM C 636.
- B. Arrange acoustical units and orient directionally patterned units, (if any) in a manner shown by reflected ceiling plans.
 - 1. Install panels with pattern running in one direction, as indicated, or if not indicated, as requested from and directed by Architect.
- C. Suspend ceiling hangers from building structural members and as follows, with system leveling tolerance of 1/8 inch in 12'-0":
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces

hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 4. Secure, angle, and rod hangers, (if any) to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices that are secure and appropriate for structure to which hangers are attached as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 5. Space hangers not more than 4'-0" o.c. along each member supported directly from hangers, unless otherwise shown, and provide hangers not more than 8 inches from ends of each member.
 - a. Provide additional hangers as necessary, so that one hanger occurs on each side of lay-in and surface-mounted light fixtures, and at other grid supported equipment, devices, etc.
 6. Install "high humidity finish" systems at all areas indicated to receive lay-in vinyl-faced gypsum "non-acoustical" ceiling panels.
- D. Install edge moldings of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical units.
1. Screw-attach moldings to substrate at intervals not over 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to tolerance of 1/8 inch in 12'-0". Miter corners accurately and connect securely.

3.4 CLEANING:

- A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.5 EXTRA MATERIALS:

- A. Deliver extra materials stock as indicated above, to Owner.

3.6 SCHEDULE:

- A. Refer to ceiling system schedule as provided in the construction documents.

END OF ACOUSTICAL PANEL CEILINGS

SECTION 096513

RESILIENT BASE AND 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:
Resilient base.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.
- C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 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. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed but, in no case less than 1 full box, or roll.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. Coordinate mockups in this Section with mockups specified in other Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg For more than 90 deg F

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg For more than 95 deg F in spaces to receive resilient products during the following time periods:
 - 48 hours before installation.
 - During installation.
 - 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg For more than 95 deg F
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. FloorScore Compliance: Resilient base and stair accessories shall comply with requirements of FloorScore certification.

2.2 RUBBER BASE **RB-1**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

Mannington Commercial
Johnsonite; a Tarkett company. (Basis of Design)
Roppe Corporation, USA.

Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).

- 1. Group: I (solid, homogeneous).
- 2. Style and Location: As Scheduled
Height:
- 3. RB-1- 4 inches,
Lengths: Coils in manufacturer's standard length.
Outside Corners:
- 4. Job formed @ straight base

- 5. Mitered @ cove base
Inside Corners: Job formed or pre-formed
Colors: As Scheduled.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
- C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.
- D. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are the same temperature as the space where they are to be installed. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. Pre-formed Corners: Install preformed corners before installing straight pieces.
- G. Job-Formed Corners:
 - 1. Outside Corners:

Use straight pieces of maximum lengths possible and form with returns not less than 12 inches in length.

- 1) Form without producing discoloration (whitening) at bends.
- 2. Miter corners as recommended by manufacturer. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 12 inches in length.
- 3. Miter or cope corners to minimize open joints.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation: Remove adhesive and other blemishes from exposed surfaces. Sweep and vacuum horizontal surfaces thoroughly. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519

RESILIENT TILE FLOORING

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. Solid Vinyl Floor Tile (Luxury Vinyl Tile)

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.
- C. Samples: Full-size units of each color and pattern of floor tile required.
- D. Samples for Initial Selection: For each type of floor tile indicated.
- E. Samples for Verification: Full-size units of each color and pattern of floor tile required.
- F. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in 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. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.
- B. 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 for floor tile including resilient base and accessories.
 - a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.

- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class II, not less than 0.22 W/sq. cm.

2.2 SOLID VINYL FLOOR TILE – (Luxury Vinyl Tile) **LVT-1**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product named on Drawings or comparable product by one of the following:
 - 1. J&J Industries (Basis of Design)
 - 2. Interface, Inc.
 - 3. Tarkett
- B. Size: As Scheduled.
- C. Colors and Patterns: As Scheduled.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
 - 1. Adhesives shall comply with the following limits for VOC content:
 - a. Luxury Vinyl Tile Adhesives: 50 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 1. Lay tiles square with room axis in pattern indicated.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 1. Lay tiles with grain running in one direction.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. After laying each section, roll solid vinyl floor tiles with 100 lb. roller. Re-roll entire floor after 1 to 2 hours.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Clean: Remove soil, adhesive, and blemishes from floor tile surfaces. DO NOT WAX, POLISH, OR BURNISH FLOOR!
- E. Joint Sealant: Apply sealant to resilient floor tile perimeter and around columns, at door frames, floor drains, and at other joints and penetrations.
- F. PROTECT FLOORING THROUGHOUT CONSTRUCTION. Cover floor tile until Substantial Completion.

END OF RESILIENT TILE FLOORING

SECTION 096723

RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes one resinous flooring system, one with epoxy body.

1. Application Method: Squeegee, screed, and broadcast.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

B. Samples for Verification: For each resinous flooring system required, 5 inches (150 mm) square, applied to a rigid backing.

C. Product Schedule: Use resinous flooring designations indicated in Part 2 and room designations indicated on Drawings in product schedule.

D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

E. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. No request for substitution shall be considered that would change the generic type of floor system specified (i.e. epoxy based flake broadcast with mortar coat). Equivalent materials of other manufactures may be substituted only on approval of Architect or Engineer. Request for substitution will only be considered only if submitted 10 days prior to bid date. Request will be subject to specification requirements described in this section.

B. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.

1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
2. Contractor shall have completed at least 10 projects of similar size and complexity.

C. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer, with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

D. Manufacturer Field Technical Service Representatives: Resinous flooring manufacture shall retain the services of Field Technical Service Representatives who are trained specifically on installing the system to be used on the project.

1. Field Technical Services Representatives shall be employed by the system manufacture to assist in the quality assurance and quality control process of the installation and shall be available to perform field problem solving issues with the installer.

E. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Apply full-thickness mockups on 48-inch- (1200-mm-) square floor area selected by Architect.
 - a. Include 48-inch (1200-mm) length of integral cove base.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Pre-installation Conference:

1. General contractor shall arrange a meeting not less than thirty days prior to starting work.
2. Attendance:
 - a. General Contractor
 - b. Architect/Owner's Representative.
 - c. Manufacturer/Installer's Representative.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects. Store material per product data sheet.

C. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on site weighing or volumetric measurements allowed.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

1. Maintain material and substrate temperature between 65 and 85 deg F (18 and 30 deg C) during resinous flooring application and for not less than 24 hours after application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

D. Concrete substrate shall be properly cured. A vapor barrier must be present for concrete sub-floors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring.

1.7 WARRANTY

A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of (1) full years from date of installation, or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of (1) full year from date of installation. A sample warranty letter must be included with bid package or bid may be disqualified.

PART 2 - PRODUCTS

2.1 RESINOUS FLOORING

A. Available Products: Subject to compliance with requirements.

1. Confirm inclusion of top sealer coat, and broadcast flakes into primer increasing bond strength. Products that may be incorporated into the work include,

a. Products: Subject to compliance with requirements:

1. Stonhard, Inc.; Stontek TRF -EF-1 and EB-1 Basis of Design.

2. Sherwin Williams- equal flooring system

b. System Characteristics:

1. Color and Pattern: Platinum large
2. Wearing Surface: Standard
3. Integral Cove Base: 6"
4. Overall System Thickness: 3/16"

c. System Components: Manufacturer's standard components that are compatible with each other and as follows:

1. Primer:

- a. Material Basis: Stonhard Urethane Primer
- b. Resin: Urethane
- c. Formulation Description: (2) two components, low viscosity, urethane.
- d. Application Method: Squeegee and nap roller.
- e. Number of Coats: (1) one.

2. Body Coat(s):

- a. Material Basis: Stonclad UR.
- b. Resin: Urethane 100% solids.
- c. Formulation Description: (4) four components.
- d. Application Method: Screed and metal trowel.
 - 1) Thickness of Coats: 1/8"/3mm, with primer coat
 - 2) Number of Coats: (1) One.

3. Undercoat: Bonding coat for vinyl flake broad cast.

- a. Material Basis: Stontec epoxy undercoat.
- b. Resin: Epoxy.
- c. Formulation Description: 100% solids.
- d. Type: Pigmented.
- e. Number of Coats: one.

4. Broadcast: Vinyl Flake:

- a. Material Basis: Stontec Flake

- b. Formulation Description: Decorative flake for broadcasting.
 - c. Type: Tweed (chips to be mixed in Mfg. facility)
 - d. Finish: Stonehard.
 - e. Number of Coats: one.
5. Topcoat:
- a. Material Basis: Stonseal CA7.
 - b. Resin: Aliphatic polyaspartic.
 - c. Formulation Description: (2) component, UV resistant.
 - d. Type: Clear.
 - e. Finish: Gloss.
 - f. Number of Coats: One or Two. Dependent on finish expectation.

Note: Components listed above are the basis of design intent; all bids will be compared to this standard including resin chemistry, color, wearing surface, thickness, and installation procedures, including number of coats. Contractor shall be required to comply with all the requirements of the Specifications and all of the components required by the Specifications, whether or not such products are specifically listed above.

d. SYSTEM PHYSICAL PROPERTIES

Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

- 1. Tensile Strength: 1,000 psi per ASTM D-638
- 2. Flexural Strength: 2,000 psi per ASTM D-580
- 3. Flexural Modulus of Elasticity: 1.1×10^6 psi per ASTM D-790
- 4. Hardness: .80 per ASTM D-2240, Shore D
- 5. Linear Coefficient of Thermal Expansion: 12×10^{-6} in./in. °F per ASTM C-531
- 6. Impact Resistance: Exceeds 160 in.-lbs. per ASTM D-426
- 7. Abrasion Resistance: 0.03 gm max. weight loss per ASTM D-4060, CS-17
- 8. Flammability: Class I per ASTM E-648

B. Available Products: Subject to compliance with requirements.

- 1. Confirm inclusion of top sealer coat, and broadcast flakes into primer increasing bond strength. Products that may be incorporated into the work include,

a. Products: Subject to compliance with requirements:

1. Stonhard, Inc.; Stonclad UR -EF-3 and EB-3 Basis of Design.
2. Sherwin Williams- equal flooring system

b. System Characteristics:

1. Color and Pattern: Charcoal
2. Wearing Surface: Standard smooth metal troweled, unsealed.
3. Integral Cove Base: 6"
4. Overall System Thickness: 1/8"

c. System Components: Manufacturer's standard components that are compatible with each other and as follows:

1. Primer:

- a. Material Basis: Stonhard Urethane Primer
- b. Resin: Urethane
- c. Formulation Description: 100 percent solids
- d. Application Method: Squeegee and back roll method.
- e. Number of Coats: (1) one.

2. Body Coat(s):

- a. Material Basis: Stonclad UR.
- b. Resin: Polyurethane.
- c. Formulation Description: (4) four components, 100 percent solids. Low VOC.
- d. Application Method: Metal trowel.
 - 1) Thickness of Coats: 1/4"(6.4mm).
 - 2) Number of Coats: (1) One.
- e. Aggregates: Quartz pigmented blended aggregate.

Note: Components listed above are the basis of design intent; all bids will be compared to this standard including resin chemistry, color, wearing surface, thickness, and installation procedures, including number of coats. Contractor shall be required to comply with all the requirements of the Specifications and all of the components required by the Specifications, whether or not such products are specifically listed above.

d. SYSTEM PHYSICAL PROPERTIES

Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Tensile Strength: 1,000 psi per ASTM D-307
2. Flexural Strength: 2,000 psi per ASTM D-580
3. Hardness: 80 to 84, per ASTM D-2240, Shore D
4. Impact Resistance: Exceeds 160 in.-lbs. per ASTM D-2794.
5. Flammability: Class I per ASTM E-648
6. Compressive Strength: 5,000 psi after 7 days per ASTM C 579
7. Water Absorption: <1% per ASTM C 413.

2.2 ACCESSORY MATERIALS

A. Patching, Leveling and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated. No Single component or cementitious materials.

B. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean and dry substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Mechanically prepare substrates as follows:

- a. Mechanically prepare with the use of Diamond grinding equipment to provide surface sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring. Or,

- b. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup or Diamond Grind with a dust free system.
 - c. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.
- 2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
- 3. Verify that concrete substrates meet the following requirements.
 - a. Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 80 percent.
 - b. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. of slab in 24 hours.
 - C. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
 - D. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations. Allowances should be included for Stonflex MP7 joint fill material.

3.2 APPLICATION

- A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
 - 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 - 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 - 3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
 - a. Apply joint sealant to comply with manufacturer's written recommendations.
- B. Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates
- C. Broadcast: Immediately broadcast quartz silica aggregate into the primer using manufacturer's specially designed spray caster. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.
- D. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing,

priming, troweling, sanding, and top coating of cove base. Round internal and external corners. Refer to detail drawings.

E. Body coat: Mix base material according to manufacturer's recommended procedures. Uniformly spread mixed material over previously primed substrate using manufacturer's installation tool. Roll material with strict adherence to manufacturer's installation procedures and coverage rates.

F. Broadcast: Immediately broadcast decorative flakes into the body coat. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.

G. First Sealer: Remove excess un-bonded flakes by lightly brushing and vacuuming the floor surface. Mix and apply sealer with strict adherence to manufacturer's installation procedures.

H. Second sealer: Lightly sand first sealer coat. Mix and apply second sealer coat with strict adherence to manufacturer's installation procedures.

3.3 TERMINATIONS

A. Chase edges to "lock" the coating system into the concrete substrate along lines of termination.

B. Penetration Treatment: Lap and seal coating onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.

C. Trenches: Continue coating system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.

D. Treat floor drains by chasing the coating to lock in place at point of termination.

3.4 JOINTS AND CRACKS

A. Treat control joints to bridge potential cracks and to maintain monolithic protection.

B. Treat cold joints and construction joints to and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.

C. Vertical and horizontal contraction and expansion joints are treated by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.5 FIELD QUALITY CONTROL

A. Material Sampling: Owner may at any time and any numbers of times during resinous flooring application require material samples for testing for compliance with requirements.

1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.

2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.6 CLEANING, PROTECTING, AND CURING

- A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 24 hours.
- B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection.
- C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer. General Contractor is responsible for cleaning prior to inspection.

END OF SECTION 096723

SECTION 099000

PAINTING

PART 1- GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to this section.

1.2 SUMMARY:

- A. This Section includes surface preparation, painting, and finishing of exposed interior and exterior items and surfaces, except where noted otherwise.
 - 1. Surface preparation, priming, and finish coats specified in this section are in addition to shop priming and surface treatment specified under other sections.
- B. Paint exposed surfaces whether or not colors are designated in "schedules," except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.
 - 1. Painting includes field painting exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
 - 2. Pipe identification tags end markers or bands, direction of flow arrows, voltage identification, etc., if any, are provided under Division 15 - "Mechanical", and Division 16 - "Electrical."
- C. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels.
 - 1. Examples of prefinished items not to be painted include, in part, the following factory-finished components:
 - a. Metal and plastic laminate toilet enclosures and partitions.
 - b. Acoustic materials.
 - c. Plastic laminate casework.
 - d. Finished mechanical and electrical equipment.
 - e. Light fixtures.
 - f. Switchgear.
 - g. Distribution cabinets.

- h. Signage, Plaques, Directories, and Bulletin Boards.
 - i. Storefront.
 - j. Finish Hardware.
 - 2. Examples of concealed surfaces not to be painted include, in part, wall or ceiling surfaces in the following generally inaccessible areas:
 - a. Foundation spaces.
 - b. Furred areas.
 - c. Utility tunnels.
 - d. Pipe spaces or chases.
 - e. Duct shafts.
 - 3. Examples of Finished metal surfaces not to be painted include, in part, the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper.
 - e. Bronze.
 - f. Brass.
 - g. Prefinished aluminum windows and trim.
 - 4. Examples of operating parts not to be painted include, in part, moving parts of operating equipment such as the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 - 5. Labels: Do not paint over Underwriter's Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- D. Related Sections: The following sections contain requirements that relate to this section:
- 1. Divisions 5 Sections, for shop priming metal work.
 - 2. Division 6 Sections, for shop priming woodwork.
- E. Where walls are indicated or otherwise required to be fire-rated and/or smokestop

partitions, and at all corridor partitions, exit enclosures, and fire walls, they shall be effectively and permanently identified with signs or stenciling in a manner acceptable to the authority having jurisdiction. Such identification shall be above any decorative ceiling and in concealed spaces. Suggested wording, "Fire and Smoke Barrier - Protect All Openings":

1. Minimum size of lettering to be 1-1/2" high.
2. Minimum of one sign or stencil at each side of each such wall.
3. Maximum spacing of signs or stenciling at each side of continuous walls to be 20'-0" on center.

1.3 SUBMITTALS:

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product Data: Manufacturer's most current technical information, label analysis, and application instructions for each material proposed for use.
 1. List each material and cross-reference to scheduled paint types, and including each specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification.
- C. Samples for initial color selection in the form of manufacturer's color charts from paint manufacturer intended for use.
- D. Samples for verification purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate. Define each separate coat, including fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.
 1. Submit samples on the following substrates for the Architect's review of color and texture only: Stained or Natural Wood: Provide two 4- by 8-inch samples of natural and stained wood finish on actual wood surfaces.

1.4 QUALITY ASSURANCE:

- A. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by paint manufacturer, and use only within the recommended limits.
- B. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 1. Notify the Architect of any problems anticipated using the materials specified,

prior to proceeding with work.

- C. Material Quality: Provide the manufacturer's best quality grade paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary names used to designate colors or materials are not intended to imply that products named are required or to exclude approved equivalent products of other manufacturers.
- D. Color Pigments: Pure, non-fading, applicable types to suite substrates and service indicated.
- E. Lead content in pigments or other painting materials and components is not allowed.
- F. Solvents and V.O.C. Compliance: At the time of this writing, sufficient product data and information is not available from paint manufacturers to specify new products to replace solvent based products specified. If new regulations are in effect restricting use of solvents and/or they are not available at the time painting is required for this project, submit and provide the equivalent water-borne products to those specified, at no additional cost to the Owner.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Comply with manufacturer's current written instructions and recommendations.
- B. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Manufacturer's name, stock number, and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
- C. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers, others present or passing through or inspecting work areas (painting or any other work), and the work areas themselves are protected from fire and health hazards resulting from handling, mixing, and application of materials.

- D. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

1.6 JOB CONDITIONS:

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F and 90 deg F, unless otherwise permitted by paint manufacturer's printed instructions.
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F and 95 deg F, unless otherwise permitted by paint manufacturer's printed instructions.
- C. Do not apply paint in snow, rain, fog, or mist, or when the relative humidity exceeds 85 percent, or at temperatures less than 5 deg F above the dew point, or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.
 - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer, during application, drying and curing periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
 - 1. Benjamin Moore and Co. (Moore).
 - 2. PPG Industries, Pittsburgh Paints (Pittsburgh).
 - 3. The Sherwin-Williams Company (SW).
 - 4. TNEMEC Company, Inc.
 - 5. International Fireproof Technology Inc.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Do not begin paint application until unsatisfactory conditions have been corrected.
 - 1. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

3.2 PREPARATION:

- A. General Procedures: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items in place that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items if necessary for complete painting of the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.
 - 1. Clean surfaces before applying paint or surface treatments. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- B. Surface Preparation: Clean and prepare surfaces to be painted in accordance with the manufacturer's instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing of problems anticipated with using the specified finish-coat material with substrates primed by others.
 - 2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by the paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
 - 3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer before application of primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Fill cracks in wood or plywood floors with a latex filler and prime filled areas after sanding, except where otherwise recommended by paint manufacturer. Sand smooth when

- dried.
 - b. Prime, stain, or seal unfinished wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
 - c. When transparent finish is required, backprime with spar varnish.
 - d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
 - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately upon delivery.
4. Ferrous Metals: Clean nongalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council.
- a. Treat bare, sandblasted, or pickled clean metal with a metal treatment wash coat before priming.
 - b. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.
5. Galvanized Surfaces: Clean galvanized surfaces with non- petroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- C. Materials Preparation: Carefully mix and prepare paint materials in accordance with manufacturer's directions.
- 1. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
 - 2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
 - 3. Use only thinners approved by the paint manufacturer, and only within recommended limits.
- D. Tinting: Tint each primer and undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat(s), but provide sufficient differences in shade of undercoats to distinguish each separate coat.
- 1. Finish coats as scheduled, shall be same color for each coat required.

3.3 APPLICATION:

- A. Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied. Use of spray equipment at the site is not allowed, except where specifically indicated.
1. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 2. Paint surface treatments and finishes are indicated on the Drawings and in Specifications.
 3. Finish colors will be selected after Bidding, unless indicated otherwise.
 4. Provide finish coats that are compatible with primers used.
 5. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce an even smooth surface in accordance with the manufacturer's directions.
 6. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
 7. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, connector covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas as required to maintain the system integrity and provide desired protection.
 8. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.
 9. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
 10. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
- B. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
- C. Finish doors on tops, bottoms, and side edges same as faces.
1. Sand lightly between each succeeding enamel or varnish coat.
- D. Primers:
1. Omit primer on metal surfaces that have been shop-primed and touch-up painted, only after verifying full compatibility of shop primers with materials specified for the next coat and finish coats.
 2. Primer may be omitted at previously painted existing surfaces in good

condition, except at interior concrete, plaster and drywall surfaces, after repairs to any existing damaged substrates and after spot priming of existing damaged paint finish, followed by cleaning and preparation recommended in writing by paint manufacturer.

- E. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - 1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure and where application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
- F. Minimum Coating Thickness: Apply materials at not less than the manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire system as recommended by the manufacturer.
- G. Mechanical and Electrical Work: Painting mechanical and electrical work is limited to items exposed in mechanical equipment rooms and in occupied spaces.
 - 1. Mechanical items to be painted include but are not limited to:
 - a. Piping, pipe hangers, and supports.
 - b. Tanks.
 - c. Ductwork.
 - d. Insulation.
 - e. Supports.
 - f. Accessory items.
 - 2. Electrical items to be painted include but are not limited to:
 - a. Conduit and fittings.
 - b. Switchgear.
- H. Block Fillers: Apply block fillers to new or previously unpainted concrete masonry block at a rate to ensure complete coverage with pores filled.
- I. Prime Coats: Before application of finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to assure a finish coat with no burn through or other defects due to insufficient sealing.

- J. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.
 - 1. Provide satin finish for final coats.
- L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.

3.4 **CLEANING:**

- A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
- B. Upon completion of painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping, using care not to scratch or damage adjacent finished surfaces.

3.5 **PROTECTION:**

- A. Protect work of other trades, whether to be painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
- B. Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.
- C. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 **EXTERIOR PAINT SCHEDULE:**

- A. General: Provide the following paint systems for the various substrates indicated. (Abbreviations Note: ct = coat; cts = coats)

- A: **IRON AND STEEL SURFACES:**

- 1. Sherwin-Williams:
 - a. Primer (1ct): Pro Industrial Pro-Cryl Universal Primer, B66-310
 - b. Finish (2cts): Sher-Cryl HPA High Performance Acrylic (Gloss, B66-300 or Semi-Gloss, B66-350)

- B: **GALVANIZED STEEL AND ALUMINUM SURFACES:**

1. Sherwin-Williams:
 - a. Primer (1ct): Pro Industrial Pro-Cryl Universal Primer, B66-310
 - b. Finish (2cts): Sher-Cryl HPA High Performance Acrylic, (Gloss, B66-300 or Semi-Gloss, B66-350)

C: PAINTED STUCCO, AND CONCRETE SURFACES:

1. Sherwin-Williams:
 - a. Primer (1ct): Loxon XP Concrete & Masonry Primer, LX11W0051;
Brush and Roller application only.
 - b. Finish (2cts): A-100 Exterior Latex Flat House Paint, A6 Series;
Brush and Roller application only.

D: CMU, BRICK, AND MASONRY SURFACES:

1. Sherwin-Williams:
 - a. Primer (1ct): Loxon Concrete & Masonry Primer, LX02 Series; Brush and Roller application only.
 - b. Finish (2cts): Loxon XP, LX11 Series Brush and Roller application only.
 - c. All block pores shall be completely filled.

E: PAINTED WOOD SURFACES - (Opaque Finish):

1. Sherwin-Williams:
 - a. Primer (1ct): Exterior Latex Wood Primer, A24W8041;
Option: Exterior Alkyd Wood Primer, Y24W8020
 - b. Finish (2cts): A-100 Exterior Latex Gloss House Paint, A8 Series

F: PAINTED PLYWOOD SURFACES:

1. Sherwin-Williams:
 - a. Primer (1ct): Exterior Latex Wood Primer, A24W8041
 - b. Finish (2cts): A-100 Exterior Latex Gloss House Paint, A8 Series

3.7 INTERIOR PAINT SCHEDULE:

- A. General: Provide the following paint systems for the various substrates, as indicated.

A: IRON AND STEEL SURFACES:

1. Sherwin-Williams:
 - a. Primer (1ct): Pro Industrial Pro-Cryl Universal Primer, B66-310
 - b. Finish (2cts): Pro Industrial 0 VOC Acrylic, B66-600 Series (Gloss, B66-600 Series / Semi-Gloss, B66-650 Series)
2. NOTE: Provide equivalent “dry-fall” product **spray-applied finish coats** over primer for any steel structure and exposed steel decking which will remain exposed after other work and improvements; 2 Coats.

Sherwin-Williams:

- a. Primer (1ct): Pro Industrial Pro-Cryl Universal Primer, B66-310
- b. Finish (2cts): Low VOC Waterbased Dry Fall, (Flat, B42W81 – EggShell, B42W82 – S/G, B42W83)

COMPLETELY COVER AND PROTECT ENTIRE FLOOR IN ROOMS WHERE OCCURS, PRIOR TO APPLICATIONS.

B: GALVANIZED STEEL AND ALUMINUM SURFACES:

1. Sherwin-Williams:
 - a. Primer (1ct): Pro Industrial Pro-Cryl Universal Primer, B66-310
 - b. Finish (2cts): Pro Industrial 0 VOC Acrylic, B66-600 Series (Gloss, B66-600 Series / Semi-Gloss, B66-650 Series)

C: PLASTER AND CONCRETE SURFACES:

1. Sherwin-Williams:
 - c. Primer (1ct): Loxon Concrete & Masonry Primer, A24W8300
 - d. Finish (2cts): ProMar 200 Zero VOC Interior Latex Egg-Shell, B20-2600

D: WOOD SURFACES TO BE PAINTED (OPAQUE FINISH):

1. Sherwin-Williams:
 - a. Primer (1ct): Premium Wall & Wood Primer, B28W8111
 - b. Finish (2cts): ProMar 200 Zero VOC Interior Latex S/G, B31-2600; Option: ProMar 200 WB Acrylic-Alkyd S/G, B34-8251

E: WOOD SURFACES TO RECEIVE NATURAL FINISH (STAINED):

1. Sherwin-Williams:
 - a. First Coat: Alkyd Interior Paste Wood Filler, fully compatible with other finish system products below.
 - b. Second Coat: Wood Classics "250" Interior Oil Stain, A49-800
 - c. Third Coat: Wood Classics WB Polyurethane, A68 Series
 - d. Fourth Coat: Wood Classics WB Polyurethane, A68 Series (Satin, A68F90 – Gloss, A68V91)
 - d. Fifth Coat: Wood Classics WB Polyurethane, A68 Series (Satin, A68F90 – Gloss, A68V91)
2. Natural finish (stained) shall be typical finish, unless indicated otherwise, for:
 - a. New wood doors, unless specifically indicated otherwise.
 - b. Elsewhere as indicated on the Drawings.

F: DRYWALL SURFACES - (Dry Areas):

1. Sherwin-Williams:
 - a. Primer (1ct): HB Interior Latex Primer/Surfacer, B28W08601; Approximately **20-mil dry thickness**; **⟨This primer only, spray- applied⟩**.

Number of coats as required to conceal minor wall irregularities, imperfections, differing textures, joint taping and mudding, etc., prior to finish coats.
 - b. Finish (2cts): ProMar 200 Zero VOC Interior Latex Egg-Shell, B20-2600

G: DRYWALL SURFACES - (Wet Areas: Toilet, Locker, Shower & Janitors Rooms, Kitchen Areas, Laboratories, Barber Shops, Healthcare Areas, any room with a plumbing fixture, and areas where food is stored, prepared, cooked and/or served):

1. Sherwin-Williams:
 - a. Primer (1ct): HB Interior Latex Primer/Surfacer, B28W08601; Approximately **20-mil dry thickness**; **⟨This primer only, spray- applied⟩**
Number of coats as required to conceal minor wall irregularities, imperfections, differing textures, joint taping and mudding, etc., prior to Second Primer and finish coats.
 - b. Finish (3cts): Waterbased Catalyzed Epoxy, B70W211 (Semi-Gloss, B60V25 – Gloss, B60V15)

H: CMU AND BRICK SURFACES - (Dry Areas):

1. Sherwin-Williams:
 - a. Primer (1ct): PrepRite Interior / Exterior Block Filler, B25W25;
Brush and Roller application only.
 - b. Finish (2cts): ProMar 200 Zero VOC Interior Latex S/G, B31-2600;
Brush and Roller application only.
 - c. All block pores shall be completely filled.

- I: CMU AND BRICK SURFACES - (Wet Areas: Toilet, Locker, Shower & Janitors Rooms, Kitchen Areas, Laboratories, Barber Shops, Healthcare Areas, any room with a plumbing fixture, and areas where food is stored, prepared, cooked and/or served):
 1. Sherwin-Williams
 - a. Primer (1ct): Heavy Duty Block Filler, B42W46; **Brush and Roller application only.**
Option: Cement-Plex 875 Epoxy Block Filler, B42W200; **Brush and Roller application only.**
 - b. Finish (2cts): Pro Industrial Zero VOC WB Catalyzed Epoxy, B73-300 Series; **Brush and Roller application only.**
 - c. All block pores shall be completely filled.

- I: OPEN CELL SPRAY FOAM INSULATION and EXISTING TECTUM PANELS LOCATED IN THE WELDING LAB
 2. International Fireproof Technology, Inc. or equal
 - a. Installation in strict accordance with manufacture current written instructions.
 - b. Color: Charcoal Black

END OF PAINTING

SECTION 10 2800

TOILET ACCESSORIES

PART 1 - GENERAL

1.0 RELATED DOCUMENTS

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

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior substrates.
 - 1. Public-use washroom accessories

1.2 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Include electrical characteristics.
- B. Samples: Full size, for each exposed product and for each finish specified.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify products using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from a single source from a single manufacturer.
- 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.

1.8 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, visible silver spoilage defects.
 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.0 PUBLIC-USE WASHROOM ACCESSORIES

- A. Paper Towel Dispenser, Automatic (Roll): **TA04**

Responsibility: **OFCI**

Basis-of-Design Product: **Owner to Furnish (Kimberly Clark- Icon- U58720-00)**

Description: Automatic Hard Roll Towel Dispenser, Black Mosaic

Size: 16.53"x12.41"x10.19"

Mounting: Surface mounted.

- B. Soap Dispenser, Liquid Soap, Auto: **TA19**

Responsibility: **OFCI**

Basis-of-Design Product: **Owner to Furnish (Kimberly Clark- Icon-U58724-00)**

Description: Automatic Soap Dispenser, Black Mosaic

Size: 11.5"x7.5"x3.98"

Mounting: Wall mount, surface.

- C. Mirror, Framed, without Shelf: **TA31**

Responsibility: **CFCI**

Basis-of-Design Product: **Bobrick B-165-2436**

Frame: Stainless steel channel.

Corners: Mitered, welded, and ground smooth.

Hangers: Produce rigid, tamper and theft-resistant installation, using one-piece, galvanized steel, wall hanger device with spring action locking mechanism to hold mirror unit in position with no exposed screws or bolts.

Size: 24 inches wide x 36 inches high.

D. Hook: **TA33**

Responsibility: **CFCI**

Basis-of-Design Product: **Bobrick B-6717**

Mounting: Surface mounted.

Material and Finish: Stainless steel, No. 4 satin finish.

E. Toilet Tissue Dispenser- Double Standard Roll: **TA01**

Responsibility: **OFCI**

Basis-of-Design Product: **Tork 59TR**

Mounting: Surface mounted.

Size: 8.25"Hx12.75"Wx5.57"D

Material and Finish: Plastic in Color Smoke

F. Grab Bars: **TA23, TA24, TA25**

Responsibility: **CFCI**

Basis-of-Design: **Bobrick B-6806x18, B-6806x36", B-6806x42**

Mounting: Surface Mounted

Material Finish: Stainless Steel

G. Sanitary Napkin Disposal: **TA36**

Responsibility: **CFCI**

Basis-of-Design: **Evogen EVNT-CWR**

Description: No Touch

Size: 11.99"Hx9"Wx4.5"D

Mounting: Surface Mounted.

Material Finish: White Copper

H. Seat Cover Dispenser: **TA37**

Responsibility: **CFCI**

Basis-of-Design: **Bobrick B-4221**

Size: 15-3/4"Wx11"Hx2"D

Mounting: Surface Mounted

Material: Stainless Steel

2.7 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.8 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of [six] keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

3.2 ADJUSTING AND CLEANING

- B. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- C. Remove temporary labels and protective coatings.

Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 10 2800

SECTION 10 4250

SIGNS

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.
- B. Related work specified elsewhere includes:
 - 1. Section 06100 - "Rough Carpentry" (concealed P.T. 2 x 10 wood blocking at anchorage)
 - 2. Section 042000 - Unit Masonry.
 - 3. Section 092116 - Gypsum Drywall.
 - 4. Section 099000 - Painting.
 - 5. Division 22 - Plumbing Identification.
 - 6. Division 23 - Mechanical Identification.
 - 7. Division 26 - Electrical Identification.
 - 8. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY:

- A. This Section includes the following types of signs:
 - 1. Prefinished Cast Aluminum Plaque: **To be furnished under Base Bid.** Refer to Detail, at "General Conditions" and "Exhibit E" Section of the Project Manual.
 - 2. Dimensional Letters, Numbers, Symbols - Exterior:
 - a. Copy: As indicated on the Drawings.
 - b. Architect and Owner will make final letter style selections, and have final approval prior to any fabrication.
 - c. **To be furnished under Base Bid.**
 - 3. Framed and Unframed Panel Signs: Room and Door signs. As designed by manufacturer to comply with U.S. Department of Justice Regulations for the "Americans With Disabilities Act of 1990," (ADA; ADA-AG); ANSI A117.1; the "Uniform Federal Accessibility Standards," (UFAS); applicable codes and standards; And revisions and amendments thereto.

- a. Design: Integral tactile raised letters, numbers, Braille, and/or graphics, as indicated on the Drawings, or if not indicated, as furnished by Architect after Bid Date.
 - b. Fabricated of acrylic plate with graphics chemically welded to sign face, resulting in a homogeneous end product; Except surface-mounted glued-on graphics, etc., are not acceptable.
 - c. **To be furnished under Base Bid.**
4. Framed and Unframed Panel Signs: Emergency Evacuation Plans. As designed by manufacturer to comply with U.S. Department of Justice Regulations for the "Americans With Disabilities Act of 1990," (ADA; ADA-AG); ANSI A117.1; the "Uniform Federal Accessibility Standards," (UFAS); applicable codes and standards; And revisions and amendments thereto.
 - a. Design: Integral tactile raised letters, numbers, Braille, and/or graphics, as indicated on the Drawings, or if not indicated, as furnished by Architect after Bid Date.
 - b. Fabricated of acrylic plate with graphics chemically welded to sign face, resulting in a homogeneous end product; Except surface-mounted glued-on graphics, etc., are not acceptable.
 - c. **To be furnished under Base Bid.**

1.3 **SUBMITTALS:**

- A. General: Submit the following in accordance with conditions of the contract and Division 1 Specification Sections.
 1. Product Data: Include manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.
 2. Shop Drawings: Provide shop drawings for fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
 - a. Provide message list for each sign required, including large-scale details of wording and layout of lettering, graphics, etc.
 - b. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.
 3. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.

- a. Aluminum: Samples of each finish type and color, on approximately 4-inch squares of sheet or plate, showing the full range of colors available.
 - b. Cast Acrylic Sheet and Plastic Laminate: Manufacturer's color charts consisting of actual sections of material including the full range of colors available for each material required.
4. Samples for verification of color, pattern, and texture selected, and compliance with requirements indicated:
- a. Aluminum: Samples of each finish type and color, on 6-inch long sections of extrusions or approximately 4-inch squares of casting, sheet or plate. Where finishes involve normal color and texture variations include sample sets showing the full range of variations expected.
 - b. Cast Acrylic Sheet and Plastic Laminate: Provide a sample panel of a sign intended for use on this project, or of not less than 6-inches by 8-inches for each material indicated. Include a panel for each color, texture, and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic devices.
5. Furnish full-size rubbings for metal plaques for final approval prior to fabrication.

1.4 QUALITY ASSURANCE:

- A. Single-Source Responsibility: For each separate type of sign required, obtain signs from 1-source from a single manufacturer.
- B. Design Criteria: The Drawings, and this Section 10425, indicate sizes, profiles, and dimensional requirements of signs. Other signs with deviations from indicated dimensions and profiles may be considered, provided deviations do not change the design concept. The burden of proof of equality is on the proposer.
- C. Signage Products: Products and installation, etc., under the work of this Section shall be in compliance with the more stringent of applicable provisions of the following; And 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.

1.5 PROJECT CONDITIONS:

- A. Verify project conditions and substrates, coordinate placement of blocking and anchorages, etc., as required for proper execution of the work of this Section 104250.

1.6 REFERENCE STANDARDS:

- A. 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 - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.
- D. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines; 2002.

1.7 DELIVERY, STORAGE, AND HANDLING:

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
 - 1. Manufacturers of Cast Aluminum Plaques:
 - a. Advance Corporation; Braille-Tac Div
 - b. A. R. K. Ramos.
 - c. Gemini Incorporated.
 - d. Leeds Architectural Letters
 - e. Matthews International Corporation; Bronze Division.
 - f. Metal Arts; Div. of L&H Mfg. Co.
 - g. Mills Manufacturing Company.
 - h. Nelson-Harkins Industries.
 - i. Southwell Company (The).
 - 2. Manufacturers of Cast Aluminum Dimensional Letters and Numbers:
 - a. ACE Sign Systems, Inc.
 - b. Advance Corporation; Braille-Tac Division.
 - c. A. R. K. Ramos.
 - d. ASI-Modulex, Inc.

- e. Bunting Graphics, Inc.
- f. Charleston Industries, Inc.
- g. Gemini Incorporated.
- h. Grimco, Inc.
- i. Innerface Sign Systems, Inc.
- j. Leeds Architectural Letters
- k. Metal Arts; Div. of L&H Mfg. Co.
- l. Mills Manufacturing Company.
- m. Mohawk Sign Systems.
- n. Nelson-Harkins Industries.
- o. Signature Signs, Incorporated.
- p. Southwell Company (The).

3. Manufacturers of Panel Signs and Wall Mounted Signs:

- a. ACE Sign Systems, Inc.
- b. Advance Corporation; Braille-Tac Division.
- c. Allen Industries Architectural Signage
- d. Allenite Signs; Allen Marking Products, Inc.
- e. APCO Graphics, Inc.
- f. ASI-Modulex, Inc.
- g. Best Sign Systems Inc.
- h. Bunting Graphics, Inc.
- i. Fossil Industries, Inc.
- j. Gemini Incorporated.
- k. Grimco, Inc.
- l. Innerface Sign Systems, Inc.
- m. InPro Corporation
- n. Leeds Architectural Letters
- o. Matthews International Corporation; Bronze Division.
- p. Mills Manufacturing Company.
- q. Mohawk Sign Systems.
- r. Nelson-Harkins Industries.
- s. Seton Identification Products.
- t. Signature Signs, Incorporated.
- u. Supersine Company (The)

2.2 MATERIALS:

- A. Aluminum Sheet: Provide aluminum sheet of alloy and temper recommended by the aluminum producer or finisher for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15.

- B. Aluminum Extrusions: Provide aluminum extrusions of alloy and temper recommended by the aluminum producer or finisher for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.
- C. Aluminum Castings: Provide aluminum castings of alloy and temper recommended by the aluminum producer and finisher for the casting process used and for the use and finish indicated.
- D. Cast Acrylic Sheet: Provide manufacturer's standard methyl methacrylate monomer plastic sheet, in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 psi when tested in accordance with ASTM D 790, a minimum allowable continuous service temperature of 176 deg. F (80 deg. C), and of the following general types or equivalent to products used for standard LA100 Acrylic Process by Leeds Architectural Letters, Inc.:
 - 1. White Translucent Sheet: Where sheet material is indicated as "white," provide white translucent sheet of density required to produce uniform brightness and minimum halation effects.
 - 2. Opaque Sheet: Where sheet material is indicated as "opaque," provide colored opaque acrylic sheet in colors and finishes as selected from the manufacturer's standards.
- E. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.
- F. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.3 CAST METAL PLAQUES:

- A. Plaques: Castings shall be free from pits, scale, sand holes, or other defects. Comply with requirements specified for metal, border style, background texture, and finish and with requirements shown for thickness, size, shape, and copy. Hand-tool and buff borders and raised copy to produce the manufacturer's standard satin polished finish. Refer to "Finish" article for other finish requirements.
 - 1. Metal: Aluminum.
 - 2. Border Style: Double raised line border with plain bevel edge, or equivalent priced border, as selected.
 - 3. Background Texture: Manufacturer's standard pebble texture, or as selected.
 - 4. Background Finish: Provide dark statuary finish (anodized aluminum or baked enamel as selected), to comply with the requirement specified for bronze finishes, except provide background texture specified above in lieu of mechanical finish.

5. Back of Plaques: Seal with manufacturer's standard clear, transparent, and non-yellowing lacquer, or similar finish with same characteristics and acceptable to Architect; Two coats minimum.

2.4 PANEL SIGNS:

- A. Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
 1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16-inch measured diagonally.
 2. As indicated on the Drawings, or if not indicated, allow for non-changeable signs, with room names, Braille, and graphics at Restroom doors and toilet stalls for the disabled and handicapped and similar locations, and square signs with room number and slots for 2 lines of changeable copy at classroom signs, all to be provided within Allowance amount.
 - a. Refer to Division 1 Section "Allowances", for additional information and requirements.
- B. Framed and Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to conform with the following requirements, unless otherwise selected:
 1. Edge Condition: Beveled or rounded.
 2. Edge Color for Acrylic Sheet: Edge color same as background.
 3. Corner Condition: Radius corners.
 4. Size: 6-inches x 6-inches (nominal; minimum); and 6-inches wide x 8-inches high at accessible signs with room names and graphics (toilet rooms, etc.), unless indicated otherwise.
 5. Signs With Inserts: Size: 8-inches wide x 6-inches (nominal; minimum), unless indicated otherwise.
- C. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.
- D. Raised Copy: Copy characters and Braille from matte-finish opaque acrylic sheet and chemically weld onto the acrylic sheet forming an integral and permanent sign panel face. Produce precisely formed characters with square cut edges free from burrs and cut marks.
 1. Panel Material: Matte-finished opaque acrylic sheet.
 2. Raised Copy Thickness: Not less than 1/32-inch.

2.5 PRE-FINISHED CAST ALUMINUM DIMENSIONAL LETTERS AND NUMBERS:

- A. Cast Letters and Numbers - Exterior and Interior: Form individual letters and numbers by casting. Produce characters with smooth, flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, or other defects. Cast lugs into the back of characters and tap to receive threaded mounting studs. Comply with requirements indicated for finish, style, and size.
1. Metal: Aluminum.
 2. Letter Height: As indicated on the Drawings.
 3. Letter Style: As indicated on the Drawings, or if not indicated, equivalent to three-dimensional "Architectural Prismatic", as manufactured by ARK Ramos Manufacturing Co., Inc., by one of the above manufacturers, or equivalent priced style selected by Architect and Owner after bidding; Upper case, unless otherwise indicated.
 4. Finish: Clear anodized or baked enamel, as selected by Architect and Owner after bidding.
 5. Copy: As indicated on the Drawings, or if not indicated, as directed by Architect and Owner after bidding.

2.6 FINISHES:

- A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Architect from the manufacturer's standards.
- B. Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and applications recommendations.
- C. Aluminum Finishes: Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.
1. Class II Clear Anodized Fine Satin Finish: AA-M31C21A31 (Mechanical Finish: Fine satin directional textured; Chemical Finish: Fine matte etched finish; Anodic Coating: Class II Architectural, clear film thicker than 0.4-mil).
 2. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.
 - a. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm), medium gloss.

2.7 ACCESSORIES:

- A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
- B. Tape Adhesive: Double sided tape, permanent adhesive.
- C. Use clear silicone sealant.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Verify that substrate surfaces are ready to receive work.

3.2 INSTALLATION:

- A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's written instructions.
 - 1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
 - 2. Coordinate proper placement of treated grounds and blocking by the Contractor.
- B. Cast Metal Plaques: Mount plaques using the standard method recommended by the manufacturer for the type of wall surface indicated.
 - 1. Concealed Mounting: Mount the plaques by inserting threaded studs into tapped lugs on the back of the plaque. Set in pre-drilled holes filled with quick-setting cement.
- C. Wall Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:
 - 1. Adhesive Mounting: Use double-sided vinyl tape where recommended by the sign manufacturer to hold the sign securely in place. Where also recommended or as required by project conditions, use liquid silicone adhesive recommended by the sign manufacturer to attach sign units to irregular, porous, or vinyl-covered surfaces.
 - 2. Mounting height: 60-inches above finished floor (A.F.F.) to top of sign.
 - a. Multiple signs shall align side-by-side or stacked vertically, as indicated, or if not indicated, as directed by the Architect.

- D. Dimensional Characters: Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
 - 1. Projected Mounting: Mount characters at projection distance from wall surface indicated, or if not indicated, 1/2-inch clear of wall.
- E. Following installation, clean all signs as recommended in writing by manufacturer.
 - 1. Include cleaning and maintenance instructions in Close-Out Documents turned over to Contractor.

3.2 PROTECTION:

- A. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SIGNS

SECTION 10 4416

FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
 - 1. Section 01500 - "Temporary Facilities"
 - 2. Section 06100 - "Rough Carpentry"
 - 3. Section 09250 - "Gypsum Drywall"
 - 4. Section 09900 - "Painting"

1.2 SUMMARY:

- A. This Section includes the following:
 - 1. Fire extinguishers.
 - 2. Fire extinguisher cabinets, factory finished.
 - 3. Mounting brackets.

1.3 SUBMITTALS:

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. Product data for each type of product specified. For fire extinguisher cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.
 - 2. Where color selections by Architect are required, include color charts showing full range of manufacturer's standard colors and designs available.

1.4 QUALITY ASSURANCE:

- A. Single-Source Responsibility: Obtain fire extinguishers, cabinets, and brackets from one source from a single manufacturer.

- B. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Amerex Corp.
 2. J.L. Industries.
 3. Larsen's Manufacturing Co.
 4. Modern Metal Products by Muckle.
 5. Potter-Roemer, Inc.

2.2 FIRE EXTINGUISHERS:

- A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard, which comply with requirements of governing authorities.
1. Abbreviations indicated below identify extinguisher types related to UL classification and rating system and not necessarily to type and amount of extinguishing material contained in extinguisher.
- B. Extinguishers:
1. Public and Service Areas:
 - a. Multi-purpose Dry Chemical Type: UL-rated 4-A:80-B:C, 10-pound nominal capacity, in enameled steel container.
 - b. Mounted in cabinet in public areas and on wall bracket in non-tenant, non-public and service areas, unless otherwise indicated on the Drawings.
 2. Kitchen / Food Service Areas (if any):
 - a. Regular Wet Chemical Type (Type "K"): UL-rated 2A:K, 2-1/2 gallon nominal capacity, in enameled steel container.
 - b. Mounted on wall bracket in Kitchen areas, unless otherwise indicated on the Drawings.

- C. Provide tag for each fire extinguisher, which identifies the unit, indicates date charged, and other pertinent data required by authorities having jurisdiction.

2.3 MOUNTING BRACKETS:

- A. Provide brackets designed to prevent accidental dislodgement of extinguisher, of sizes required for type and capacity of extinguisher indicated, in manufacturer's standard plated finish: Provide brackets for extinguishers not located in cabinets.

2.4 FIRE EXTINGUISHER CABINETS:

- A. General: Provide fire extinguisher cabinets where indicated, of suitable size for housing fire extinguishers of types and capacities indicated.
- B. Product/Manufacturer: Architectural Series, as manufactured by Larsen's Manufacturing Company; Ft. Lauderdale, FL; Phone: (305) 486-3325; or approved equivalent by another manufacturer named above.
 - 1. Solid #8 stainless steel door and trim with vertical engraved letters and heavy gauge white baked enamel box.
 - 2. Building Interiors - Public Areas:
 - a. Where Indicated and Where Possible: Fully Recessed, Model No. SS-2409-R2.
 - b. Where Indicated: Rolled Edge Semi Recessed, Model No. SS-2409-6R.
 - c. Provide equivalent "Flame-Shield" fire-rated cabinets at fire-rated walls (add "FS" before model numbers above), listed by UL, Warnock-Hersey or other acceptable independent testing/certifying agency. Provide with recessed handle to comply with ADA wall projection guidelines.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.
- B. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

- C. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions, and mounting heights as follows:
 - 1. Fire Extinguisher Cabinets: 4'-0" A.F.F. to horizontal centerline of door handle.
 - 2. Fire Extinguisher Mounting Brackets: 4'-0" A.F.F. to horizontal centerline of bracket release mechanism.
- D. Where exact location of cabinets and bracket-mounted fire extinguishers is not indicated, locate as directed by Architect.
- E. Install one fire extinguisher in each fire extinguisher cabinet and bracket.

END OF FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

SECTION 11 4500

RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
 - 1. Section 07900 - "Joint Sealers"
 - 2. Division 15 - "Mechanical"
 - 3. Division 16 - "Electrical"
 - 4. Exhibits- see equipment spec sheets

1.2 SUMMARY:

- A. This section includes residential appliances, and all accessories indicated, and as otherwise required for project conditions and complete and proper operation:
- B. The extent of residential appliances is indicated at the end of this Section.
- C. Contractor shall be responsible for providing all utilities for owner provided appliances and furnishings, and equipment. End user furnished equipment includes: refrigerators, microwaves, coffee makers, and dishwashers.
- D. Contractor shall provide and install ice machines listed below.

1.3 SUBMITTALS:

- A. Product data for each appliance specified, with installation instructions for each unit, whether built-in, set-in-place, or connected to other construction. Include methods of installation for each type of substrate, where applicable.
 - 1. If manufacturer's model numbers have changed since selection of appliances, submit and provide manufacturer's equivalent or replacement model, contingent on verification with manufacturer.
- B. Shop drawings showing installation details of appliances permanently affixed to construction, including full scale installation details of special conditions.

- C. If not preselected and specified, samples for initial selection purposes consisting of manufacturer's standard size samples showing full range of colors, textures, and patterns available for each type of appliance required.

1.4 QUALITY ASSURANCE:

- A. Single Source Responsibility: Provide products of a single manufacturer for each type of appliance required.
- B. Energy Ratings: Provide residential appliances that carry labels indicating energy cost analysis (estimated annual operating costs) and efficiency information as required by Federal Trade Commission.
- C. UL and NEMA Compliance: Provide electrical components required as part of residential appliances that are listed and labeled by UL and comply with applicable NEMA standards.

1.5 QUALITY ASSURANCE:

- A. Single Source Responsibility: Provide products of a single manufacturer for each type of appliance required.
- B. Energy Ratings: Provide residential appliances that carry labels indicating energy cost analysis (estimated annual operating costs) and efficiency information as required by Federal Trade Commission.
- C. UL and NEMA Compliance: Provide electrical components required as part of residential appliances that are listed and labeled by UL and comply with applicable NEMA standards.
- D. AGA and ANSI Standards: Provide any gas-burning appliances with the design certification seal of the American Gas Association (AGA) and comply with ANSI Z21-Series standards.
- E. Provide anti-tip anchor brackets for each range and any other floor mounted cooking equipment.

1.6 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver materials to project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, and lot number. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and

humidity; laid flat, blocked-off ground to prevent sagging and warping.

- B. Comply with instructions and recommendations of manufacturer for special delivery, storage, and handling requirements.

1.7 SEQUENCE AND SCHEDULING:

- A. Sequence appliance installation with other work to minimize possibility of damage and soiling during remainder of construction period.

1.8 MAINTENANCE:

- A. Maintenance Instructions: Submit manufacturer's printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use conditions. Include precautions against materials and method which may be detrimental to finishes and performance.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Stainless Steel: AISI Type 302/304, minimum 22-gauge, unless otherwise indicated.
- B. Brass: Solid, polished, flat products, FS QQ-B613; rods, shapes, and forgings, FS QQ-B-626.
- C. Aluminum: Alloy and temper as recommended by aluminum fabricator, ASTM B 209 for plate and sheet, ASTM B 26 for castings.
- D. Galvanized Sheet Steel: ASTM A 527 G60.
- E. Chrome Plating: Nickel & chromium electro-deposited on base metal, ASTM B456, Type SC2.
- F. Painted Finish: Manufacturer's standard porcelain enamel finish, unless otherwise indicated.
- G. Fasteners: Screws, bolts, or other exposed devices of same material as accessory unit, or of galvanized steel where concealed. Equip items with theft-proof fasteners where accessible to tampering.

2.2 FABRICATION - GENERAL:

- A. Provide appliances listed in this section and accessory items, both free standing and permanently installed, equipped with functions as specified. Fabricate units with tight seams and joints, exposed metal edges rolled. Manufacturer or product identification on exposed surfaces is unacceptable. Provide products with smooth welds, consistent finish with no evidence of wrinkling, chipping, uneven coloration, dents, or other imperfections.

2.3 FINISHES:

- A. Provide materials in colors and finishes as selected by Architect from manufacturer's standard colors and finishes, unless noted otherwise.

2.4 RESIDENTIAL APPLIANCES:

A. Acceptable Products/Manufacturers

- 1. Provide pigtails matching electrical outlets for all appliances requiring plug-in connection; Coordinate with Electrical, so as to avoid replacements or duplication.
- 2. Provide and install all plumbing requirements for water, and drainage.
- 3. Provide and install all exhaust ductwork and louvers required.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Inspect locations and utilities where residential appliances are to be installed prior to installation. Notify General Contractor in writing of any discrepancies which could be potentially detrimental to residential appliances.
 - 1. Do not install residential appliances until unacceptable conditions have been corrected.
 - 2. Verify that materials are those specified before installing.
 - 3. Install appliances only after finishing operations, including painting, have been completed.

- B. Install residential appliances in accordance with current written directions and recommendations of manufacturer, and reviewed Shop Drawings/Submittal data.
 - 1. Install at locations indicated, level, plumb, and ready for complete and proper operation by the Owner.
 - 2. Wall-Mounted Appliances: Install appliances in accordance with manufacturer's current written instructions and recommendations, using fasteners as recommended by manufacturer as appropriate to substrate.
- C. Free Standing Appliances: Install free standing units in locations indicated on the Drawings.
- D. Adjust accessory items for proper operation. Clean and polish exposed surfaces, using materials and methods recommended in writing by the manufacturer.

3.2 PROTECTION:

- A. Protect appliances against damage during remainder of construction period, in compliance with manufacturer's written directions and recommendations.

3.3 SCHEDULE OF RESIDENTIAL APPLIANCES:

- A. Plan for the following selected from Whirlpool, Kitchenaid, Bunn, or equal, See Drawings for number and location of each appliance.

RA1: Single Door Refrigerator: OFCI; Whirlpool Model No. ?

30" wide top freezer refrigerator with icemaker, 19.3 cu ft, fingerprint resistant stainless steel. Size: 30"W x 66.125"H x 32.25"D (close to these dimensions)

RA2: Double Door Refrigerator: OFCI; Frigidaire Model No. ?

36" wide refrigerator side-by-side refrigerator with ice maker, 25.6 cu ft, fingerprint resistant stainless steel. Energy Star Certified. Size: 36.25"W x 70"H x 35.75"D (close to these dimensions)

RA3: Microwave Oven: OFCI, GE Model No. GCST20S1WSS

2 cu. Ft. countertop microwave with 1,200-Watt cooking power, fingerprint resistant stainless steel. Size: 24.10"W x 13.60"H x 19.25"D

RA4: Ice Maker: OFCI, Manitowoc Model No. IDP0420A

Indigo NXT Series Ice maker, cube-style, air-cooled, 115v/60/1-ph, 11.3 amps

Size: 22"W x 21.5"H x 24.5"D,
Vending Ice Dispenser: OFCI, Manitowoc Model No.
SPA162, floor model, touchless lever, stainless steel,
ADA compliant, 115v/60/1-ph, 1.6 amps, NEMA 5-15P
Size: 22"Wx31-3/16"Dx54"H

RA5: Coffee Maker: CFCL, Bunn Model No. 33200.0002
VPR-2EP, Pourover commercial coffee brewer plus 2
easy pour commercial decanters, plumbing line
Required, stainless steel, makes 12 cups
Size: 20-3/4"H x 16-1/4"W x 8"D

List above does not include trim kits and additional accessories necessary for integration to
millwork, and for bid.

END OF RESIDENTIAL APPLIANCES

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SECTION 12 4920

ROLLER SHADES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Manual roller shades.

- B. Related Requirements:

- 1. Division 9 Section “Gypsum Board” for blocking, closures and related accessories.

1.3 SUBMITTALS

- A. Product Data: Manufacturer’s data sheets on each product to be used, including:

- 1. Preparation instructions and recommendations.
 - 2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
 - 3. Storage and handling requirements and recommendations.
 - 4. Mounting details and installation methods.

- B. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, power and control wiring diagrams, and relationship to adjacent work.

- C. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.

- D. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shade cloth samples and aluminum finish sample as selected. Mark face of material to indicate interior faces.

- E. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.
- F. Warranty: Provide manufacturer's warranty documents as specified in this Section.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain roller shades system through one source from a single manufacturer with a minimum of ten years experience and minimum of five projects of similar scope and size in manufacturing products comparable to those specified in this section. This includes but is not limited to all required extrusions, accessories, controls and fabricated roller shades or else all stated and published warranties may be void.
- B. Installer Qualifications: Engage an installer, which shall assume responsibility for installation of all system components, with the following qualifications.
 - 1. Installer for roller shade system shall be trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section.
- C. Fire-Test-Response Characteristics: Passes NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
- D. Electrical Components: NFPA Article 100 listed and labeled by either UL or ETL or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing. Where applicable, system components shall be FCC compliant.
- E. Shadecloth Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, and ATCC9645.
- F. PVC-Free Shadecloth: Comply with the following.
 - 1. Environmental Certification: Submit written certification from the manufacturer, including third party evaluation, recycling characteristics, and perpetual use certification as specified below. Initial submittals, which do not include the Environmental Certification, below will be rejected. Materials that are simply 'PVC free' without identifying their inputs shall not qualify as meeting the intent of this specification and shall be rejected.
 - 2. Third Party Evaluation: Provide documentation stating the shade cloth has undergone third party evaluation for all chemical inputs, down to a scale of 100 parts per million, that have been evaluated for human and environmental safety. Identify any and all inputs, which are known to be carcinogenic, mutagenic, teratogenic, reproductively toxic, or endocrine disrupting. Also identify items that are toxic to aquatic systems, contain heavy metals, or organohalogens. The material shall contain no inputs that are known

problems to human or environmental health per the above major criteria, except for an input that is required to meet local fire codes.

3. Recycling Characteristics: Provide documentation that the shade cloth can, and is part of a closed loop of perpetual use and not be required to be down cycled, incinerated or otherwise thrown away. Scrap material can be sent back to the mill for reprocessing and recycling into the same quality yarn and woven into new material, without down cycling. Certify that this process is currently underway and will be utilized for this project.
4. Perpetual Use Certification: Certify that at the end of the useful life of the shade cloth, that the material can be sent back to the manufacturer for recapture as part of a closed loop of perpetual use and that the material can and will be reconstituted into new yarn, for weaving into new shade cloth. Provide information on each shade band indicating that the shade band can be sent back to the manufacturer for this purpose.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 WARRANTY

- A. Warranty: Provide manufacturer's standard warranties, including the following:
 1. Roller Shade Hardware, and Shadecloth: Manufacturer's standard non-depreciating twenty-five year limited warranty.
 - a. Non-depreciating 10-year limited warranty.
 2. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to access to the work above 12' Feet AFF, which are the responsibility of others.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design Manufacturer for Window Shade System: Products by MechoSystems; 42-03 35th Street, Long Island City, NY 11101. Tel: (718) 729-2020 ext 1901; or equal.

2.2 SHADE BANDS

- A. Shade Bands: Construction of shade band includes the fabric, the enclosed hem weight, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
1. Concealed Hembar: Shall be continuous extruded aluminum for entire width of shade band and with the following characteristics:
 - a. Hembar shall be heat sealed on all sides.
 - b. Open ends shall not be accepted.
 2. Shade Band and Shade Roller Attachment:
 - a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection.
 - b. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
 - c. Mounting Spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
 - d. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets, does not meet the performance requirements of this specification and shall not be accepted.

2.3 ROLLER SHADE FABRICATION

- A. Fabricate shade cloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 1/8 inch in either direction per 8 feet of shade height due to warp distortion or weave design.
- B. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shade bands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be

responsible for establishing appropriate standards to assure proper tracking and rolling of the shade cloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.

- C. For railroaded shade bands, provide seams in railroaded multi-width shade bands as required to meet size requirements and in accordance with seam alignment as acceptable to Architect. Seams shall be properly located. Furnish battens in place of plain seams when the width, height, or weight of the shade exceeds manufacturer's standards. In absence of such standards, assure proper use of seams or battens as required to, and assure the proper tracking of the railroaded multi-width shade bands
- D. Provide battens for railroaded shades when width-to-height (W:H) ratios meet or exceed manufacturer's standards. In absence of manufacturer's standards, be responsible for proper use and placement of battens to assure proper tracking and roll of shade bands.
- E. Blackout shade bands, when used in side channels, shall have horizontally mounted, roll-formed stainless steel or tempered-steel battens not more than 3 feet on center extending fully into the side channels. Battens shall be concealed in an integrally colored fabric to match the inside and outside colors of the shade band, in accordance with manufacturer's published standards for spacing and requirements.
 - 1. Battens shall be roll formed of stainless steel or tempered steel and concave to match the contour of the roller tube.

2.4 ROLLER SHADE COMPONENTS

A. Access and Material Requirements:

- 1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
- 2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
- 3. Use only Delran engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester shall not be accepted.

B. Manual Operated Chain Drive Hardware and Brackets:

- 1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.

2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
3. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
4. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.
5. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
6. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable.
7. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
8. Drive Bracket / Brake Assembly:
 - a. Provide drive bracket fully integrated with all accessories, including, but not limited to: fascia, room darkening side / sill channels, center supports and connectors for multi-banded shades.
 - b. Drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 inch steel pin.
 - c. The brake shall be an over running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. in the stopped position.
 - d. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
 - e. The entire assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.

9. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. minimum breaking strength. Nickel plate chain shall not be accepted.

2.5 ROLLER SHADE SCHEDULE

- A. Roller Shade Schedule: Refer to the Drawings for locations.

1. Manual operating, chain drive, sunscreen roller shades in all exterior windows of rooms and spaces shown on the Drawings.
 - a. Fascias.

2.6 SHADECLOTH

- A. Visually Transparent Single-Fabric Shadecloth: Single thickness, opaque non-raveling 0.030-inch thick vinyl fabric, woven from 0.018-inch diameter extruded vinyl yarn comprising of 21 percent polyester and 79 percent reinforced vinyl, in colors selected from manufacturer's available range.
 1. Weave Pattern: Selected from manufacturer's full range of weave patterns.
 2. Color: Selected from manufacturer's standard colors.

2.7 ROLLER SHADE ACCESSORIES

- A. Fascia:

1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
2. Fascia shall be able to be installed across two or more shade bands in one piece.
3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.

- B. Room Darkening Side and Sill Channels:

1. Extruded aluminum with polybond edge seals and SnapLoc-mounting brackets and with concealed fastening. Exposed fastening is not acceptable. Channels shall accept one-piece exposed blackout hembar with vinyl seal to assure side light control and sill light control.
 - a. Side channels, 1-15/16 inches wide by 1-3/16 inches deep, two-band center channels, 2-5/8 inches wide by 1-3/16 inches deep.

- b. Color: Selected from manufacturer's standard colors or custom color as selected by Architect.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION OF ROLLER SHADES

- A. General:
 - 1. Verify Conditions: examine the areas to receive the work and the conditions under which the work would be performed and notify General Contractor of conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected. Commencement of installation shall constitute acceptance of substrate conditions by the installer.
 - 2. Field verify all opening measurements prior to fabrication of roller shades.
 - 3. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and as specified here in. Blocking for roller shades shall be installed plumb, level, in accordance with industry standard tolerances. The horizontal surface of the shade pocket shall not be out-of-level more than 0.625 inch over 20 linear feet
 - 4. Shades shall be located so the shade band is not closer than 2 inches to the interior face of the glass. Allow proper clearances for window operation hardware.
 - 5. Adjust, align and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
 - 6. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

7. Train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.
8. Protect installed products until completion of project.
9. Touch-up, repair or replace damaged products before Substantial Completion.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 12 4920

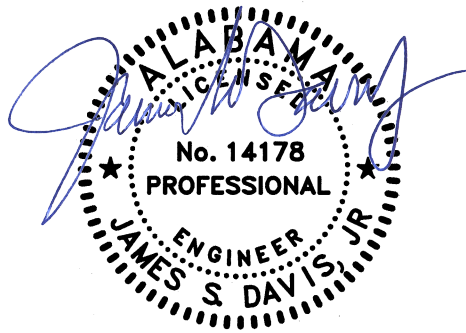
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DIVISION 21

FIRE SUPPRESSION

21 0500 GENERAL PROVISIONS – FIRE SUPPRESSION
21 4000 FIRE SUPPRESSION

END OF SECTIONS



10-26-2026

SECTION 21 0500

GENERAL PROVISIONS – FIRE SUPPRESSION

PART 1 – GENERAL

1.1 SCOPE:

- A. Provisions of this Section apply to all Fire Protection work.
- B. Include the provisions of General Conditions as part of this Section.
- C. Provide all labor, materials, equipment, and services necessary for the completion of all Fire Protection work shown or specified, complete and ready for operation, consisting in general of the following:
 - 1. Provide wet automatic sprinkler system coverage to the building.
 - 2. Modify existing wet automatic sprinkler system to match new architectural layout. provide complete NFPA 13 complaint system.
- D. Give required notices, file drawings, obtain and pay for permits, deposits and fees necessary for the installation of the Fire Protection work. Obtain and pay for inspections required by laws, ordinances, rules, regulations or public authority having jurisdiction. Obtain and pay for certificates of such inspections, and file such certificates with Owner.
- E. Permitting is required for sprinkler system flush-out water discharged to surface waters.

The State Contact:
Alabama Department of Environmental Management
Attn: Water Division
Post Office Box 301463
Montgomery, Alabama 36130-1463
Telephone Number: (334) 271-7823
Fax Number: (334) 279-3051
E-Mail: H2omail@adem.state.al.us

- F. "Provide" means to furnish and install, complete and ready for operation.

1.2 DRAWINGS:

- A. The Fire Protection design is a delegated design. The routing and sizing of mains, branches, runouts and all sprinkler locations is the responsibility of the contractor and is based on the criteria established by the locally adopted codes, NFPA and the Engineer of Record.

- B. Fire Protection Drawings are diagrammatic and subject to requirements of Architectural Drawings and conditions existing in the field. Fire Protection Drawings indicate generally the location of components and are not intended to show all fittings or all details of the work.
- C. Follow the drawings closely, coordinate dimensions with Architectural Drawings and field conditions. DO NOT scale Fire Protection drawings for location of system components.
- D. Make no changes without Architect's written permission. In case of doubt, obtain Architect's decision before proceeding with work. Failure to follow this instruction shall make the Contractor liable for damage to other work and responsible for removing and repairing defective or miss-located work in proper manner.
- E. DO NOT scale drawings to locate sprinkler heads. COORDINATE with lighting and ceiling grids. Contractor for Fire Protection work is responsible for coordinating with all trades.

1.3 APPLICABLE CODES AND STANDARDS:

- A. Comply with the current editions of the following Codes and Standards:
 - 1. 2021 International Building Code
 - 2. 2021 International Fire Code
 - 3. 2021 International Mechanical Code
 - 4. NFPA 13 – Standard for the Installation of Sprinkler Systems
 - 5. NFPA 24 – Standard for the Installation of Private Fire Service Mains and Their Appurtenances
 - 6. NFPA 25 – Standard for Inspection, Testing, and Maintenance of Water-based Fire Protection Systems.
 - 7. NFPA 101 - Safety to Life from Fire in Buildings and Structures
 - 8. NFPA 2001 – Standard on Clean Agent Fire Extinguishing Systems
 - 9. ANSI/B31.9 - Code for Building Services Piping
 - 10. Other standards as referenced in other sections of Division 210000

1.4 QUALIFICATIONS OF SUBCONTRACTOR:

- A. The Fire Protection sub-contractor shall meet the following minimum qualifications:
 - 1. He shall have been in business as a Contractor for Fire Protection work continuously, for at least 5 years prior to the date of opening bids for this project.

2. He shall have a satisfactory experience record with Fire Protection installations of character and scope comparable with this project and shall have completed five such installations in the past 5 years.
3. He shall be qualified, certified and licensed by the State of Alabama Fire Marshal. He shall meet all laws pertaining to fire protection in the Code of Alabama 1975 and any amendments of same.

1.5 CONFLICTS AND INTERFERENCES:

- A. If systems interfere or conflict, the Architect shall decide which equipment to relocate regardless of which was first installed.
- B. Coordinate with all other trades in regard to location and arrangement of all sprinkler system components.
- C. The routing of mechanical systems (ductwork) due to its size along with drain, waste and vent piping (e.g. sanitary and storm) due to its reliance on gravity, takes precedence over the routing of fire protection piping. Fire protection mains, branches, run-outs, drops etc. shall be coordinated, routed and installed with deference to the mechanical and gravity drainage systems.

1.6 WORKMANSHIP:

- A. Do all work in a neat and first-class manner. Remove and replace work not done in such manner as directed by the Architect.

1.7 COOPERATION:

- A. Cooperate with all other crafts. Perform work in a timely manner. Do not delay the execution of other work.

1.8 VISITING SITE:

- A. It is recommended that the contractor visit the site and become familiar with location and various conditions affecting work. No additional allowance will be granted because of lack of knowledge of such conditions.

1.9 MATERIALS:

- A. **Unless otherwise noted, provide new, standard, first-grade materials throughout. Unless otherwise noted, all products and materials shall be manufactured in the U.S.A. This shall include but not limited to: Pipe, fittings, hangers, valves, switches, gauges, sprinklers, pumps and all other associated equipment.**
- B. Where materials or products are specified by manufacturer's name, brand, trade name, or catalog reference, such named materials or products shall be the basis of the estimate, without substitution, and shall be furnished under the contract unless requests for equivalents are approved as noted below. Where two or more brands are named the choice of these shall be optional with the Contractor.

- C. Equivalents will be considered only if written request for approval has been received by the Architect (from a general contract bidder) 10 days prior to the date established for receipt of Proposals. Each request shall include the name of the material or equipment for which an equivalent is proposed and a complete description of the proposed equivalent including drawings, cuts, performance and test data, and deviation from the specification and any other information necessary for evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the equivalent may require shall be included. The burden of proof of the merit of the proposed equivalent is upon the proposer. The Architect's decision of approval or disapproval of a proposed equivalent is final.
- D. If the Architect approves any proposed equivalent prior to receipt of Proposals, approval will be set forth in an Addendum. **DO NOT RELY UPON APPROVALS MADE IN ANY OTHER MANNER.**
- E. No proposed equivalent will be considered after the Contract has been executed, except as described in paragraph C above.
- F. Within 45 days of execution of contract and before ordering materials or equipment, submit to Architect and obtain his approval of a detailed list showing each item which is to be furnished by make, trade name, catalog number, or the like; together with manufacturer's specifications, certified prints, and other data sufficient for making comparisons with items specified. When approved, such schedule shall be of equal force with these specifications in that no variation there from shall be allowed except with Architect's written approval. Submit PDF format files for approval. Provide PDF files of approved data for project close-out.
- G. All pressure vessels shall be constructed and tested in accordance with applicable ASME codes and shall bear ASME stamps. Certificates of inspection and approval shall be submitted to Architect.
- H. Similar items of equipment shall be the product of the same manufacturer.

1.10 SHOP DRAWINGS:

- A. Fire protection design and associated hydraulic calculations are a delegated design. The contractor shall generate all shop drawings and hydraulic calculations under the direct supervision of an engineer licensed in the state of Alabama.
- B. Before starting work, submit and obtain approval of detailed drawings of the following, fully dimensioned (including elevations of piping) and drawn to 1/4" to 1'-0" scale.
- C. Submit pdf of working shop drawings, material data, and hydraulic calculations. Shop drawings and hydraulic calculations are required to be sealed and signed by an engineer licensed in the state of Alabama. Shop drawings shall include low point drain locations, piping elevations, piping connection details, sprinkler locations, and a list of piping materials. All shop drawings shall be produced using AutoCad and a copy of the shop drawing files shall be provided in pdf format for shop drawing review. A thumb-drive with a copy of all approved shop drawings shall be provided for project closeout.
 - 1. Complete Fire Protection equipment plans showing location of equipment, conduit stubs for motors, floor drains, and equipment pads and foundations.
 - 2. Equipment piping.

- D. Thirty days before starting work, submit Fire Protection shop drawings bearing seals of approval of Owner's Underwriters and all Governmental Agencies having jurisdiction. Complete shop drawings are required to be submitted at one time. (See Section 214000.)
- E. Engineers' CAD/electronic drawings files will be available upon request for the convenience of the contractor and for use in preparation of shop drawings. A service fee of \$100.00 per drawing sheet file shall be remitted to the Engineer prior to delivery of CAD/electronic drawing files along with a signed agreement between the Engineer and Contractor.

1.11 RECORD DRAWINGS:

- A. When work starts the Architect will furnish two complete sets of white prints of the Fire Protection Drawings. All corrections, variations, and deviations, including those required by change orders, if any, must be recorded in colored ink or colored pencil at the end of each working day on these drawings. The marked prints shall be available at all times for the Architect's inspection.
- B. Prior to examining the request for final payment or making any response thereto, the Architect shall receive from the Contractor one complete set of the white prints, marked as stated above, indicating the actual completed installation of the work included under this contract.
 - 1. Accurately show location, size and elevation of new exterior utility work and its relationship to any existing utilities, obstructions, etc., contiguous to the area of work.
 - 2. Block out areas modified by change-order & identify them by change-order number.
 - 3. The Architect will forward the marked white prints to the Consulting Engineers for review. They will then be returned by the Architect to the Contractor for use in preparing record drawings.
- C. When work is completed, the Engineers' CAD/electronic drawing files will be made available upon request for the convenience to the contractor for a service fee of \$100.00 per CAD/electronic drawing sheet file and for use in preparing record drawings. Contractor shall transfer the information from the marked white prints to the CAD files, removing all superseded data in order to show the actual completed conditions. Include the contract drawings equipment schedules, details, and sections, edited to show actual completed conditions. When record drawings are complete, provide 2 sets of bond prints, and one complete set of AutoCAD drawing files (AutoCAD 2016 format) and one set of PDF drawing files on CD-ROM disks.
- D. Fire Protection Drawings shall be a set of CAD shop drawings, up-dated to show actual conditions at completion of work. Include the contract drawings equipment schedules and details edited to show actual completed conditions.

1.12 PROTECTION OF EQUIPMENT:

- A. During construction, protect Fire Protection piping and equipment damage or deterioration and prevent water, dust, etc. from entering the equipment.
- B. During construction, keep all openings of piping and equipment securely covered to prevent entry of water or dust.

- C. When installation is complete, clean piping and equipment and make ready for painting.
- D. Sprinklers shall have their factory applied protective covers installed for the duration of construction and only be removed at substantial completion. Any sprinklers that are painted, damaged or otherwise fouled with construction debris shall be replaced at no additional cost to the owner.

1.13 INSTALLATION OF EQUIPMENT:

- A. Install equipment to provide normal service access to all components.
- B. Where drawings show sufficient space for removing components, install equipment to provide such clearance. ***Provide space at all equipment power and control panels as required by local codes.***
- C. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with contract documents, obtain Architect's decision before proceeding.
- D. All equipment shall be firmly fastened in place:
 - 1. Pad mounted equipment shall be secured to pads using poured in place anchor bolts or cinch anchors.
 - 2. Vibration isolators shall be secured to floors or pads and equipment shall be bolted to the isolators.

1.14 EQUIPMENT SUPPORTS:

- A. Provide supports for piping and equipment. Hot dip galvanize after fabrication all supports, etc., located outdoors. Where noted provide 304 stainless steel supports. At the Contractor's option, all supports, etc. located outdoors may be 304 stainless steel instead of hot dip galvanized.
- B. Set floor-mounted equipment on concrete pads or platforms of height shown, but not less than 3-1/2" high. Chamfer pads 1".

1.15 CUTTING AND PATCHING AND INCIDENTAL WORK:

- A. Set sleeves and inserts and lay out and form openings in walls, beams, girders and structural floors in this Section.
- B. Cut, patch and repair as required to accomplish Fire Protection Work and finish to match adjacent work. Architect's approval required before cutting any part where strength or appearance of finished work is involved.

1.16 FLASHING:

- A. General: Furnish all pitch cups, metal base flashing and counter flashing required for Fire Protection Work. Installation of above items is specified in Roofing Section.

- B. Pitch Cups: 20 gauge galvanized steel, at least 8" deep, bases mitered and soldered and extending at least 4" horizontally.
- C. Metal Base Flashing: Galvanized steel for ferrous items, and stainless steel for stainless steel items. Minimum thickness 22 gauge (0.034") galvanized steel, 20 gauge (0.038") stainless steel, 0.032" aluminum. Bases mitered and soldered extending out at least 4" horizontally and 8" vertically.
- D. Metal Counter Flashing: Of material and gauges specified for base flashing, lapping base flashing at least 3".

1.17 EXCAVATION & BACKFILLING:

- A. Include all excavation and backfilling required to bring the work to line and grade shown, including excavation of rock and all other materials which may be encountered.
- B. Excavate trenches wide enough for proper installation of work. Grade trench bottoms evenly. Provide bell holes as necessary to ensure uniform bearing for pipes. Excavate minimum 6" below pipe. Refill cuts below required pipe grade with sand or compacted gravel. Support pipe continuously along its entire length. (Do not use piers to support piping.)
- C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas (engineered fill) with sand or fine gravel (89/10) in accordance with requirements of "Sitework" no less than 95% compactancy. Backfill paved areas with sand or fine gravel (89/10) compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe. Restore or repair pavements and the like after backfilling, matching adjacent work.
- D. Resod grassed areas and replace bushes, etc.

1.18 ELECTRICAL EQUIPMENT:

- A. Provide electrical equipment compatible with the current shown on electrical drawings. Verify current characteristics before ordering equipment.
- B. Should the Contractor with the Architect's approval make changes in electrical equipment from that shown on the Electrical Drawings, the Contractor shall be responsible for the cost of required changes.
- C. All control panels, electrical assemblies, etc. must bear a label from a recognized testing laboratory as an assembly, not as individual components and be UL/FM listed.

1.19 SLEEVES:

- A. For pipe through floors inside fire rated chases or through non-fire-rated walls: 20 gauge galvanized steel, 1" larger than pipe or pipe covering.
- B. For pipe through concrete beams: schedule 40 black steel pipe, 1" larger than pipe or pipe covering.

- C. For pipe passing through floors outside fire rated chases and fire rated wall and partitions, provide 20 gauge steel sleeve leaving the annular space between pipe or pipe covering as required by UL systems. Where pipe is insulated, insulation shall be continuous thru sleeve. Refer to Section Through-Penetration Firestop Systems where included in the contract documents. Otherwise, seal between sleeve and pipe or pipe covering with 3M Brand Fire Barrier CP 25WB caulk, Flamestop V, Specified Technologies, Inc. "Spec Seal Sealant", Rectorseal Corp. Metacaulk 950 or Hilti FSTONE bearing UL listing for actual conditions of installation, thickness and application in strict accord with UL reference for each type installation. Any equivalents must meet the 10 day prior approval provision and must show UL approval for all conditions, bare pipe, insulated pipe, etc. For plastic piping material submittal must show UL approval for each application and if caulk comes in direct contact with pipe, it must be compatible and not injurious to the pipe.
- D. Set sleeves before concrete is poured or masonry is erected. In existing construction, grout sleeves firmly in place.
- E. Extend floor sleeves 1-1/2" above finish floor in areas where floor is subject to being wet during normal usage (mechanical rooms, etc.).
- F. Where exposed pipes pass through walls and partitions in finished spaces, provide chrome plated F & C plates or escutcheons.

1.20 PAINTING:

- A. Refinish equipment damaged during construction to new condition.
- B. Prime and paint all bare, exposed piping using type specified in Painting Section. All exposed exterior piping shall be galvanized.
- C. Prime and paint all supports, etc. located indoors.
- D. Other painting is specified in Painting Section, Finishes Division.

1.21 PIPE IDENTIFICATION:

- A. Identify all piping exposed to view or accessible through removable ceilings or access panels with plastic snap-on pipe line markers. Color code markers in accordance with ANSI A13.1. Show pipe contents and direction of flow. Markers on lines 8" OD and smaller shall be taped in place; on lines over 8" OD secure with spring clips. Markers shall be equal to Craftmark, Brady, Seton or Brimar.
- B. Protect all factory identification tags, nameplates, model and serial numbers, stenciling, etc., during construction and replace if damaged.
- C. Label Spacing and Extent:
 - 1. On straight run of pipes: Above suspended ceilings space labels approximately 10 feet on center; elsewhere, 20 feet on center.
 - 2. Wherever a pipe enters or leaves a room or building.

3. At change of direction.
4. At main valves and control valves (not equipment valves).
5. At manifolds.
6. On risers, just above and below floors.

1.22 VALVE TAGS:

- A. 2" X 3" laminated plastic with 1/2" numbers engraved at top, leaving space for further engraving by others. Secure tags with chains to valve yoke or stem, not handles.
- B. Valve tag colors:
 1. Fire Protection: White tags with red numbers.
- C. Valve tag locations: At all valves on mains, risers and branches (not equipment service valves).
- D. Valve tag numbers: Starting with Number 1, number tags in sequence from the lowest point to the highest point in the building. In existing buildings extend existing sequences.

1.23 VALVE CHARTS:

- A. In all mechanical rooms, provide charts showing number and locations of all labeled valves, type of service, etc. Laminate in heavy plastic and provide brass grommets for attaching to wall. Attach to wall with anchors and brass screws.
- B. In existing buildings include existing valves in the charts of new valves.

1.24 EQUIPMENT IDENTIFICATION:

- A. Provide 2" x 3" or larger laminated plastic nameplates with 1/2" numbers and letters in colors specified below. Screw tags to equipment in obvious locations. Engrave equipment designation and numbers as shown on plans and drawings on upper half of tag, leaving lower half of tag for future engraving by Owner.
- B. Provide similar nameplates for motor starters furnished under this division.
- C. Secure nameplates with acorn head screws.
- D. Colors:
 1. Equipment connected to utility power only - black letters on white nameplates.
 2. Equipment connected to emergency power - red letters on white nameplates.

1.25 ACCESS DOORS:

- A. Furnish and install access doors for valves, low point drain valves, zone controls, inspectors test connections, air vents, and other items located above non-liftout ceilings or behind partitions or walls. Doors in non-fire rated walls and ceilings: 16-gauge steel with hinges and screwdriver latches. Doors in fire rated walls and ceilings: UL labeled with fire rating equal to fire rating of wall or ceiling. Doors in security ceilings to be 10 ga. steel panels, white powder coat, 2" x 2" x 3/16" steel angle frame heavy duty butt hinges with security screws. Provide door styles compatible with adjoining surfaces as selected by Architect. Size doors to permit removal of equipment and/or maintenance. Doors: Bar-Co, Nystrom, Williams Bros., or equal.
- B. Mark lay-in ceilings with colored vinyl self adhering disc stuck on grid adjacent to maintenance access points.

1.26 TESTING, & ADJUSTMENTS:

- A. All tests shall be witnessed by the Architect in addition to authorities having jurisdiction. A minimum of 72 hour notice is required prior to performance of test.
- B. After systems have been installed complete, adjust and test systems for proper operation. **All instruments used for testing work shall have been calibrated within 6 months and checked for accuracy prior to start of work.**
- C. Perform all tests as required by local codes. Contractor shall furnish testing equipment. **All piping pressure tests shall be hydrostatic tests.**
- D. If local codes are more stringent than the following, local codes shall govern.

1.27 WARRANTY & INSTRUCTIONS:

- A. See General Conditions - One-Year Warranty.
- B. Contractor shall and hereby does warrant all materials, workmanship and equipment furnished and installed by him to be free from defects for a period of one year after date of substantial completion of the Contract. Should any defects in material, workmanship, or equipment be made known to Contractor within the one-year warranty period, Contractor shall replace such materials, workmanship, or equipment without charge.
- C. After completion of the work, Contractor shall operate the equipment which he installs for a period of (10) working days, as a test of satisfactory operating conditions. During this time, Contractor shall instruct the Owner's operating personnel in the correct operation of the equipment.
- D. Provide PDF of manufacturer's operating and maintenance manuals and parts lists for all equipment and materials furnished. Provide a maintenance schedule listing routine maintenance operations and suggested frequency thereof. Include all warranty dates on equipment and guarantees.

1.28 PROJECT CLOSE-OUT:

- A. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following:
 - 1. Record drawings - Fire protection systems: PDF files and CAD files.
 - 2. Equipment Submittal Data PDF files.
 - 3. Equipment operating and maintenance manuals PDF files.
 - 4. Maintenance schedule.
 - 5. Equipment warranty dates and guarantees.
 - 6. List of Owner's Personnel who have received maintenance instructions.
 - 7. Test results of fire protection systems and names of those witnessing test. (See Section 214000 and NFPA 25 for testing requirements.)
 - 8. Install valve charts in Mechanical Rooms.
 - 9. Provide metal storage cabinet(s) and additional sprinklers, for each type of sprinkler installed, in quantities per NFPA 13.

1.29 TRAINING OF OWNER PERSONNEL:

- A. The General Contractor shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.
- B. The Engineer shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.
 - 1. The Fire Protection Engineer shall determine the special needs and areas where training will be most valuable. The Owner and Engineer shall decide how rigorous the training should be for each piece of commissioned equipment. The Fire Protection Engineer shall communicate the results to the Subs and vendors who have training responsibilities.
 - 2. Each Sub and vendor responsible for training shall submit a written training plan to the Fire Protection Engineer for review and approval prior to training. The plan will cover the following elements:
 - a. Equipment (included in training)
 - b. Intended audience
 - c. Location of training

- d. Objectives
 - e. Subjects covered (description, duration of discussion, special methods, etc.)
 - f. Duration of training on each subject
 - g. Instructor for each subject
 - h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
 - i. Instructor and qualifications
- 3. The General Contractor shall develop an overall training plan and shall coordinate and schedule, with the Subcontractors and other consultants, the overall training for the commissioned systems. The Engineer will recommend approval of the training to the Owner upon satisfactory completion using a standard approval form. The Owner and Contractors sign the approval form.
 - 4. Video taping of the training sessions will be provided at the Owners request.
- C. Fire Protection Contractor. The Fire Protection Contractor shall have the following training responsibilities:
- 1. Provide the Fire Protection Engineer and Owner with a training plan two weeks before the planned training.
 - 2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of equipment.
 - 3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
 - 4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
 - 5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
 - 6. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.

7. Training shall include:
 - a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
 - b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
 - c. Discussion of relevant health and safety issues and concerns.
 - d. Discussion of warranties and guarantees.
 - e. Common troubleshooting problems and solutions.
 - f. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.
 - g. Discussion of any peculiarities of equipment installation or operation.
 - h. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.
8. Hands-on training shall include start-up, operation in all modes possible, including manual, start-up shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.
9. The Fire Protection contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls.
10. Training shall occur after functional testing is complete, unless approved otherwise by the Owner.
11. Minimum Duration of Training. The Fire Protection contractor shall provide training on each piece of equipment according to the following schedule.

<u>Hours</u>	<u>System</u>
1	Piping Systems
1	Fire Protection System
1	Fire Sprinklers

END OF GENERAL PROVISIONS – FIRE SUPPRESSION

SECTION 21 4000

FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SCOPE:

- A. Section 21 0500 - "General Provisions - Fire Suppression" shall apply to and become part of this Section.
- B. It is the Contractor's responsibility to verify flow test data prior to ordering any equipment. If results do not meet demand, he is to notify the Architect prior to preparing shop drawings. If the test is more than one year old, the Contractor shall have the system retested.
- C. All materials, components and appurtenances are required to be UL/FM listed.

1.2 SHOP DRAWINGS:

- A. Hydraulic calculations and sprinkler shop drawings for building fire protection systems must be prepared under the supervision of an engineer licensed in the State of Alabama. Layout to show precise locations and elevations of sprinkler heads and piping with sizes indicated. Coordinate location of piping and sprinkler heads with other work, including piping, ducts, diffusers and lighting fixture layout. When submitted to Architect, drawings and calculations shall bear the stamps of approval from Owner's Underwriter and local Fire Marshal's office.
- B. **(Shop drawings, hydraulic calculations and material data may be submitted in PDF format electronically by e-mail)**
- C. Provide all information on drawings as required by NFPA 13.

1.3 CODES:

- A. Refer to section 21 0500 "General Provisions – Fire Suppression" for a list of applicable codes and standards.
- B. Provide all equipment, piping, valves, fire and jockey pumps with environmental enclosure, switches and complete operating system to standard of NFPA 13 in compliance with local, county and state authorities, Owner's Insurance Provider, and these Specifications.

1.4 SERVICE:

- A. Coordinate with Civil and provide for connection at approximately 5 feet outside of building foundation as shown on drawings.

PART 2 - PRODUCTS Unless otherwise noted, provide new, standard, first-grade materials throughout. Unless otherwise noted, all products and materials shall be manufactured in the U.S.A. This shall include but not limited to: Pipe, fittings, hangers, valves, switches, gauges, sprinklers, pumps and all other associated equipment.

2.1 GENERAL:

- A. Refer to Electrical Drawings and Specifications for alarms, wiring of supervisory switches and related equipment.

2.2 FIRE PROTECTION PIPING:

- A. System shall comply with NFPA 13.
- B. All fire protection piping within building: black steel. Nonstandard OD, Thin wall, Hybrid, Schedule 5, or any Black steel piping with a wall thickness less than Schedule 10: **NOT ALLOWED**.
- C. Black steel pipe 2" and smaller: schedule 40, ASTM A-53, A-106 or A-135. Threaded fittings on piping.
- D. Black steel pipe 2-1/2" and larger: schedule 10, rolled groove with Victaulic, Anvil or Gustin Bacon fittings, ASTM A-47 or welded fittings, ANSI B 16.9.
- E. Joints on black steel screwed piping: Make up with Teflon tape applied to male threads.
- F. Joints on black steel welded piping: Comply with ANSI standard. B 16.9 and B 16.25.
- G. Joints on black steel rolled groove piping: Victaulic, Anvil or Gustin Bacon couplings, ASTM-A-47. Note: Victaulic #920 or #922 Mechanical T's are approved for use only where connections to existing systems are required. All joints must be cut or roll grooved.
- H. Arrange for connection to existing water main, backflow preventer as required by local utility, service line from main to building as required by local utility. Pay all charges, fees, temporary deposits, etc.

2.3 PIPE HANGERS:

- A. Pipe hangers above ceiling / high in space shall be attached to structure as allowed by structural engineer. Hangers shall not be attached to roof deck or other non-structural items.
- B. General: Pipe hangers, Anvil, PHD, Michigan Hanger, B-Line or Elcen. Anvil figure numbers are given for reference.
- C. Provide pipe hangers with vibration isolators as specified under Vibration Isolators.
- D. Pipe hangers for lines 8" and smaller: Anvil Fig. 69.
- E. Pipe hangers for 3" and smaller: adjustable wrought ring hangers, Anvil Fig. 97, Fig. 69 or wrought clevis hangers.
- F. Pipe hangers for 4" and larger: adjustable wrought clevis hangers.
- G. Trapezes where required to bridge between structural members, Unistrut P2000 channel, or equal, with rods sized as specified below for largest pipe on trapeze.
- H. Parallel piping graded in the same direction may be grouped on trapezes. Trapezes for 4" and smaller, Unistrut P2000 channel, or equal, with rods sized as specified below, for largest pipe on trapeze. Provide Unistrut series P1100 rigid steel conduit clamp for each pipe. Trapeze shall not exceed 36" in length. Maintain minimum 3" separation between adjacent pipe or pipe covering and hanger rods. Trapezes shall be spaced based on the smallest pipe size being supported.
- I. Provide riser clamps on pipe risers on each floor.
- J. Beam Clamps: Anvil Fig. 92.
- K. Inserts for hangers in concrete structures: Underwriter's listed cast iron inserts. Anvil Fig. 282.
- L. For fasteners in existing concrete structures use drilled in expansion anchors with load rating at least 150% of pipe hanger rating (powder driven anchors are not acceptable).
- M. Size rods for pipe hangers not smaller than the following: 3/8" rods for pipe 3" and smaller, 1/2" rods for 4", 5", 6" and 8", 5/8" rods for pipe 10" and larger.
- N. Pipe hanger spacing for screwed, cut or roll groove joint and welded piping in strict accord with NFPA 13. Install additional hangers at change of direction, valve clusters, and at ends of branch lines.
- O. Provide sway bracing where sprigs are 4'-0" or longer.

2.4 GAUGES:

- A. Provide 4-1/2" dial pressure gauges per NFPA 13. Gauges shall have bronze or stainless steel bourdon tubes, 316 steel movement, aluminum or polypropylene solid front cases, adjustable micrometer pointer and accuracy grade 2A (not less than 1/2% of full scale over the entire range) without mounting flange.
- B. Gauges shall be Ashcroft 1279, Marsh series P01, Trerice 450-B, Weksler AA44-2 or US Gauge 1980L with minimum bourdon tube diameter of 3".
- C. Provide ball valves for all pressure gauges.

2.5 FIRE PROTECTION VALVES:

- A. Ball valves for pipe sizes 1" to 2": all bronze, 2-piece, full port chrome plated brass ball, 400 WP, UL/FM listed, gear operated, slow close, threaded connections and tamper switch. AMES LFAFBV-FP series..
- B. Gate valves 2" and smaller: all bronze, 175 psig WP, UL/FM listed, OS&Y, solid disc, Stockham B-133, Nibco T-104-0, Milwaukee Valve BB-SC100.
- C. Gate valve 2 1/2" and larger: iron body, bronze trim, flanged, 175 psig WP, UL/FM listed, OS&Y, Stockham G-634, American Darling 55, Kennedy 68, Mueller A2073-6, Nibco F-607-0.
- D. Butterfly Valves: Central Figure 570 or 580 complete with supervisory switch for indoor or waterproof on exterior UL/FM approved.
- E. Check valves: iron body, bronze trim, 175 psig WP, UL/FM listed, Stockham G-939, American Flow Control 50-SC, Kennedy 126, Mueller A2120-6, Nibco F-908-B.

2.6 SPRINKLER WATER FLOW INDICATOR AND SUPERVISORY SWITCHES:

- A. UL/FM approved paddle switch type water flow indicator, 120/1/60, two single pole, double throw contacts, one set for remote alarm, one set for alarm bell, complete with supervised cover on device. Automatic, Viking, or Anvil.
- B. UL/FM approved 6" electric bell, 120/1/60, or water motor alarm gong, paint exterior of bell as required by Architect.
- C. Verify location of any bells or alarms with Architect and authority having jurisdiction.

2.7 SPRINKLERS:

- A. Sprinklers shall be Quick Response commercial type, UL/FM listed by Reliable, Victaulic, Tyco, Viking, Globe or approved equal. Sprinkler heads shall be centered both directions in ceiling tile.
- B. Provide quick response brass upright sprinklers in areas without ceilings.
- C. Provide quick response recessed chrome plated pendent type sprinklers with chrome plated removable escutcheons in areas with acoustical ceiling tiles.
- D. Provide quick response concealed style pendent sprinklers with factory painted cover plates in hard gypsum ceilings or soffits. Where ceilings or soffits are a color other than white, the cover plate shall be factory painted to match the surrounding surface. Coordinate all color options with architect.
- E. Where sidewall sprinklers are used provide quick response type.
- F. Submit sample of any proposed alternate sprinklers prior to bid date. See Substitutions Section.
- G. Sprinklers subject to mechanical damage or installed at an elevation of 8'-0" or less above finished floor shall be protected with listed guards.

2.8 SPARE SPRINKLERS:

- A. Provide sprinklers in a metal storage cabinet per NFPA 13. Provide one wrench for each type of sprinkler.

2.9 EQUIVALENT MANUFACTURERS:

- A. Where Croker/Standard is listed above Potter/Roemer, Elkhart, Guardian or Sierra may be utilized.
- B. Where Aurora is listed above Allis Chalmers, Patterson or Peerless may be utilized.

PART 3 - EXECUTION

3.1 PIPING:

- A. Provide drain piping to approved locations for all low points. Provide inspectors test piping to the building exterior at approved locations. Provide splash blocks for all exterior drains. (All drain piping to be galvanized.)
- B. Install using tradesmen certified in sprinkler pipe and system installations.

- C. Fire protection piping may be factory cut to lengths, but field modifications will be required to coordinate with other trades.

3.2 PERIODIC INSPECTION:

- A. Make two periodic inspections within the first year after completion and acceptance of the work. Furnish a complete written report of each inspection to the Architect and the Underwriter.

3.3 HYDROSTATIC TESTING:

- A. Fire protection piping tests: Test in accordance with NFPA 13, and 25. Architect, Owner's Underwriters and local Fire Marshal shall witness tests. Provide certificate of inspection to the Architect including the names of those witnessing the test.
- B. On completion of installation test all piping and attached appurtenances subjected to system working pressure at 200 psi or 50 psi in excess of the system working pressure, whichever is greater, the system shall maintain that pressure for 2 hours. Pressure loss shall be determined by a drop in gauge pressure or visual leakage. The test pressure shall be read from one of the following, located at the lowest elevation of the system or the portion of the system being tested:
 - 1. A gauge located at one of the hydrant outlets
 - 2. A gauge located at the lowest point where no hydrants are provided
- C. To reduce the possibility of serious water damage in case of a break, pressure can be maintained by a small pump, the main controlling gate meanwhile being kept shut during the test.
- D. Hydrostatic tests should be made before the joints are covered so that any leaks can be readily detected.
- E. The test procedure is as follows: Apply additional pressure, by temporary pump or compressed air connection. The water pressure is to be increased in 50 psi increments until the test pressure described above is attained. After each increase in pressure, observations are to be made of the stability of the joints. These observations are to include such items as protrusion or extrusion of the gasket, leakage, or other factors likely to affect the continued use of a pipe in service. During the test, the pressure is not to be increased to the next increment until the joint has become stable. This applies particularly to movement of the gasket. After the pressure has been increased to the required maximum value and held for 1 hour, the pressure is to be decreased to 0 psi while observations are made for leakage. The pressure is again to be slowly increased to the value specified above and held for 1 more hour while observations are made for leakage.
- F. Loss shall be determined by a drop in gauge pressure or visual leakage.

- G. The test pressure shall be read from a gauge located at the low elevation point of the system or portion being tested.

END OF FIRE SUPPRESSION

DIVISION 22

PLUMBING

22 0500 GENERAL PROVISIONS – PLUMBING
22 1000 MATERIALS AND METHODS – PLUMBING
22 1500 THERMAL AND ACOUSTICAL INSULATION FOR PLUMBING SYSTEMS
22 2000 PLUMBING FIXTURES AND EQUIPMENT

END OF SECTIONS



10-26-2026

SECTION 22 0500

GENERAL PROVISIONS – PLUMBING

PART 1 – GENERAL

1.1 SCOPE:

- A. Provisions of this Section apply to all Plumbing work.
- B. Include the provisions of General Conditions as part of this Section.
- C. Provide all labor, materials, equipment, and services necessary for the completion of all Plumbing work shown or specified, complete and ready for operation, consisting in general of the following:
 - 1. A system of sanitary drain, waste, and vent piping.
 - 2. A system of domestic water piping.
 - 3. A system of compressed air piping.
 - 4. Providing plumbing fixtures and equipment as shown on drawings.
- D. Give required notices, file drawings, obtain and pay for permits, deposits and fees necessary for the installation of the Plumbing work. Obtain and pay for inspections required by laws, ordinances, rules, regulations or public authority having jurisdiction. Obtain and pay for certificates of such inspections, and file such certificates with Owner.
- E. "Provide" means to furnish and install, complete and ready for operation.

1.2 DRAWINGS:

- A. Plumbing Drawings are diagrammatic and subject to requirements of Architectural Drawings and conditions existing in the field. Plumbing Drawings indicate generally the location of components and are not intended to show all fittings or all details of the work.
- B. Follow the drawings closely, coordinate dimensions with Architectural Drawings and field conditions. DO NOT scale Plumbing drawings for location of system components.
- C. Make no changes without Architect's written permission. In case of doubt, obtain Architect's decision before proceeding with work. Failure to follow this instruction shall make the Contractor liable for damage to other work and responsible for removing and repairing defective or mislocated work in proper manner.
- D. Contractor for Plumbing work is responsible for coordinating with all trades.

1.3 APPLICABLE CODES AND STANDARDS:

- A. Comply with the current editions of the following Codes and Standards:
1. ANSI/B31.9 - Code for Building Services Piping
 2. ASME Boiler and Pressure Vessel Code
 3. NFPA 54 - National Fuel Gas Code
 4. NFPA 70 - National Electrical Code, 2023
 5. NFPA 90A – Installation of Air Conditioning and Ventilating Systems
 6. NFPA 101 - Safety to Life from Fire in Buildings and Structures
 7. Other standards as referenced in other sections of Division 22
 8. 2021 International Building Code
 9. 2021 International Plumbing Code
 10. 2021 International Fuel Gas Code
 11. 2021 International Mechanical Code
 12. 2021 International Energy Conservation Code

1.4 QUALIFICATIONS OF SUBCONTRACTOR:

- A. The Plumbing Subcontractor shall meet the following minimum qualifications:
1. He shall have been in business as a Plumbing Contractor for at least 3 years prior to the date of opening bids.
 2. He shall have a current Master Plumber's Certificate of competency issued by the State of **Alabama** and the City and County in which work occurs.
 3. He shall have a satisfactory experience record with Plumbing installation of character and scope comparable with this project and shall have completed three such installations in the past three years.
 4. If the Plumbing Subcontractor, with the Engineer's approval, uses a Sub-Subcontractor to provide another discipline that the Subcontractor does not normally furnish, that Sub-Subcontractor shall meet the same qualifications as the Subcontractor.

1.5 CONFLICTS AND INTERFERENCES:

- A. If systems interfere or conflict, the Architect shall decide which equipment to relocate regardless of which was first installed.

1.6 WORKMANSHIP:

- A. Do all work in a neat and first-class manner. Remove and replace work not done in such manner as directed by the Architect.

1.7 COOPERATION:

- A. Cooperate with all other crafts. Perform work in a timely manner. Do not delay the execution of other work.

1.8 VISITING SITE:

- A. Visit site and become familiar with location and various conditions affecting work. No additional allowance will be granted because of lack of knowledge of such conditions.

1.9 MATERIALS:

- A. Unless otherwise noted, provide new, standard, first-grade materials throughout. **Unless otherwise noted, all pipe, fittings and valves shall be made in the United States of America.**
- B. Where materials or products are specified by manufacturer's name, brand, trade name, or catalog reference, such named materials or products shall be the basis of the estimate, without substitution, and shall be furnished under the contract unless requests for equivalents are approved as noted below. Where two or more brands are named the choice of these shall be optional with the Contractor.
- C. Equivalents will be considered only if written request for approval has been received by the Architect (from a general contract bidder) 10 days prior to the date established for receipt of Proposals. Each request shall include the name of the material or equipment for which an equivalent is proposed and a complete description of the proposed equivalent including drawings, cuts, performance and test data, and deviation from the specification and any other information necessary for evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the equivalent may require shall be included. The burden of proof of the merit of the proposed equivalent is upon the proposer. The Architect's decision of approval or disapproval of a proposed equivalent is final.
- D. If the Architect approves any proposed equivalent prior to receipt of Proposals, approval will be set forth in an Addendum. **DO NOT RELY UPON APPROVALS MADE IN ANY OTHER MANNER.**
- E. No proposed equivalent will be considered after the Contract has been executed, except as described in the General Conditions.

- F. Within 45 days of execution of contract and before ordering materials or equipment, submit to Architect and obtain his approval of a detailed list showing each item which is to be furnished by make, trade name, catalog number, or the like; together with manufacturer's specifications, certified prints, and other data sufficient for making comparisons with items specified. When approved, such schedule shall be of equal force with these specifications in that no variation there from shall be allowed except with Architect's written approval. Submit PDF format files for approval. Provide PDF files of approved data for project close-out.
- G. All pressure vessels shall be constructed and tested in accordance with applicable ASME codes and shall bear ASME stamps. Certificates of inspection and approval shall be submitted to Architect.
- H. Similar items of equipment shall be the product of the same manufacturer.

1.10 RECORD DRAWINGS:

- A. When work starts the Architect will furnish two complete sets of white prints of the Plumbing Drawings. All corrections, variations, and deviations, including those required by change orders, if any, must be recorded in colored ink or colored pencil at the end of each working day on these drawings. The marked prints shall be available at all times for the Architect's inspection.
- B. Prior to examining the request for final payment or making any response thereto, the Architect shall receive from the Contractor one complete set of the white prints, marked as stated above, indicating the actual completed installation of the work included under this contract.
 - 1. Accurately show location, size and elevation of new exterior utility work and its relationship to any existing utilities, obstructions, etc., contiguous to the area of work.
 - 2. Block out areas modified by change-order & identify them by change-order number.
 - 3. The Architect will forward the marked white prints to the Consulting Engineers for review. They will then be returned by the Architect to the Contractor for use in preparing record drawings.
- C. When work is completed, the Engineers' CAD/electronic drawing files will be made available upon request for the convenience to the contractor and for use in preparing record drawings. Contractor shall transfer the information from the marked white prints to the CAD files, removing all superseded data in order to show the actual completed conditions.

1.11 PROTECTION OF EQUIPMENT:

- A. During construction, protect Plumbing equipment from damage or deterioration.
- B. When installation is complete, clean equipment and make ready for painting.

1.12 INSTALLATION OF EQUIPMENT:

- A. Install equipment to provide normal service access to all components.

- B. Where drawings show sufficient space for removing components, install equipment to provide such clearance. ***Provide space at all equipment power and control panels as required by local codes.***
- C. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with contract documents, obtain Architect's decision before proceeding.
- D. All equipment shall be firmly fastened in place:
 - 1. Pad mounted equipment shall be secured to pads using poured in place anchor bolts or cinch anchors.
 - 2. Vibration isolators shall be secured to floors or pads and equipment shall be bolted to the isolators.

1.13 EQUIPMENT SUPPORTS:

- A. Provide supports for piping and equipment. Hot dip galvanize after fabrication all grillage, supports, etc., located outdoors. Prime coat and paint all grillage, supports, etc. located indoors. Where noted provide 304 stainless steel supports. At the Contractor's option, all grillage, supports, etc. located outdoors may be 304 stainless steel instead of hot dip galvanized.
- B. Set floor-mounted equipment on concrete pads or platforms (as indicated) of height shown, but not less than 3-1/2" high. Chamfer pads 1". Extend pad 6" beyond equipment in all directions. Provide pads as follows:
 - 1. Water heaters and air tank: 6" high, No. 4 rebar 12" o.c. both ways.

1.14 CUTTING AND PATCHING AND INCIDENTAL WORK:

- A. Set sleeves and inserts and lay out and form openings in walls, beams, girders and structural floors in this Section.
- B. Cut, patch and repair as required to accomplish Plumbing Work and finish to match adjacent work. Architect's approval required before cutting any part where strength or appearance of finished work is involved.
- C. Provide all motors incidental to the Plumbing systems. Wiring of motors, switches and starters is included in "Electrical Sections".
- D. Furnish motor starters as specified below.

1.15 FLASHING:

- A. General: Furnish all pitch cups, metal base flashing and counter flashing required for Plumbing Work. Installation of above items is specified in Roofing Section.
- B. Pitch Cups: 20 gauge galvanized steel, at least 8" deep, bases mitered and soldered and extending at least 4" horizontally.

- C. Metal Base Flashing: Galvanized steel for ferrous items, and stainless steel for stainless steel items. Minimum thickness 22 gauge (0.034") galvanized steel, 20 gauge (0.038") stainless steel, 0.032" aluminum. Bases mitered and soldered extending out at least 4" horizontally and 8" vertically.
- D. Metal Counter Flashing: Of material and gauges specified for base flashing, lapping base flashing at least 3".
- E. Vent Pipe and Roof Drain Flashing: Specified in "Roofing Section".

1.16 EXCAVATION & BACKFILLING:

- A. Include all excavation and backfilling required to bring the work to line and grade shown, including excavation of rock and all other materials which may be encountered.
- B. Excavate trenches wide enough for proper installation of work. Grade trench bottoms evenly. Provide bell holes as necessary to insure uniform bearing for pipes. Excavate minimum 6" below pipe. Refill cuts below required pipe grade with sand or compacted gravel. Support pipe continuously along its entire length. (Do not use piers to support piping.)
- C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas (engineered fill) with sand or fine gravel (89/10) in accordance with requirements of "Sitework" no less than 95% compactancy. Backfill paved areas with sand or fine gravel (89/10) compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe. Restore or repair pavements and the like after backfilling, matching adjacent work.
- D. Resod grassed areas and replace bushes, etc.

1.17 MOTORS, STARTERS & ELECTRICAL EQUIPMENT:

- A. Provide electrical equipment compatible with the current shown on electrical drawings. Verify current characteristics before ordering equipment.
- B. Should the Contractor with the Architect's approval make changes in electrical equipment from that shown on the Electrical Drawings, the Contractor shall be responsible for the cost of required changes.
- C. Provide factory installed fuses in all equipment requiring fusing for branch circuit protection.

1.18 SLEEVES:

- A. For pipe through floors inside fire rated chases or through non-fire-rated walls: 20 gauge galvanized steel, 1" larger than pipe or pipe covering.
- B. For pipe through concrete beams: schedule 40 black steel pipe, 1" larger than pipe or pipe covering.

- C. For pipe passing through floors outside fire rated chases and fire rated wall and partitions, provide 20 gauge steel sleeve leaving the annular space between pipe or pipe covering as required by UL systems. Where pipe is insulated, insulation shall be continuous thru sleeve. Refer to Section Through-Penetrations Firestop Systems where included in the contract documents, Otherwise, seal between sleeve and pipe or pipe covering with 3M Brand Fire Barrier CP 25WB caulk, Flamestop V, Specified Technologies, Inc. "Spec Seal Sealant", Rectorseal Corp. Metacaulk 950 or Hilti FSTONE bearing UL listing for actual conditions of installation, thickness and application in strict accord with UL reference for each type installation. Any equivalents must meet the 10 day prior approval provision and must show UL approval for all conditions, bare pipe, insulated pipe, etc. For plastic piping material submittal must show UL approval for each application and if caulk comes in direct contact with pipe, it must be compatible and not injurious to the pipe.
- D. Set sleeves before concrete is poured or masonry is erected. In existing construction, grout sleeves firmly in place.
- E. Extend floor sleeves 1-1/2" above finish floor in areas where floor is subject to being wet during normal usage (Plumbing rooms, toilets, etc.).
- F. Where exposed pipes pass through walls and partitions in finished spaces, provide chrome plated F & C plates or escutcheons.

1.19 PAINTING:

- A. Refinish equipment damaged during construction to new condition.
- B. Paint all non-potable water pipe and insulation yellow in accordance with Plumbing Code using paint of type specified in Painting Section.
- C. Prime and paint all bare, exposed, exterior piping using type specified in Painting Section. Gas piping shall be painted yellow unless otherwise noted.
- D. Prime and paint all grillage, supports, etc. located indoors, except where noted to be galvanized.
- E. Other painting is specified in Painting Section, Finishes Division.

1.20 PIPE IDENTIFICATION:

- A. Identify all piping exposed to view or accessible through removable ceilings or access panels with plastic snap-on pipe line markers. Color code markers in accordance with ANSI A13.1. Show pipe contents and direction of flow. (Markers on lines 8" OD and smaller shall be taped in place; on lines over 8" OD secure with spring clips.) Markers shall be equal to Craftmark, Brady, Seton or Brimar.
- B. Protect all factory identification tags, nameplates, model and serial numbers, stenciling, etc., during construction and replace if damaged.

C. Label Spacing and Extent:

1. On straight run of pipes: Above suspended ceilings space labels approximately 10 feet on center; elsewhere, 20 feet on center.
2. Wherever a pipe enters or leaves a room or building.
3. At change of direction.
4. At main valves and control valves (not equipment valves).
5. At manifolds.
6. On risers, just above and below floors.
7. All natural gas piping in the 2 psig system: label at the beginning, at all gas cocks, at ends and at 6'-0" intervals with labels reading "2 psig".

1.21 EQUIPMENT IDENTIFICATION:

- A. Provide 2" x 3" or larger laminated plastic nameplates with 1/2" numbers and letters in colors specified below. Screw tags to equipment in obvious locations. Engrave equipment designation and numbers as shown on plans and drawings on upper half of tag, leaving lower half of tag for future engraving by Owner.
- B. Provide similar nameplates for motor starters furnished under Division 26.
- C. Secure nameplates with acorn head screws.
- D. Colors:
 1. Equipment connected to utility power only - black letters on white nameplates.
 2. Equipment connected to emergency power - red letters on white nameplates.

1.22 ACCESS DOORS:

- A. Furnish and install access doors for valves, fire dampers, dampers, controls, air vents, and other items located above non-liftout ceilings or behind partitions or walls. Doors in non-fire rated walls and ceilings: 16-gauge steel with hinges and screwdriver latches. Doors in fire rated walls and ceilings: UL labeled with fire rating equal to fire rating of wall or ceiling. Doors in security ceilings to be 10 ga. steel panels, white powder coat, 2" x 2" x 3/16" steel angle frame heavy duty butt hinges with security screws. Provide door styles compatible with adjoining surfaces as selected by Architect. Size doors to permit removal of equipment and/or maintenance. Doors: Bar-Co, Nystrom, Williams Bros., or equal.
- B. Mark lay-in ceilings with colored vinyl self adhering disc stuck on grid adjacent to maintenance access points.

1.23 TESTS, CLEANING & ADJUSTMENTS:

- A. All tests shall be witnessed by the Architect in addition to authorities having jurisdiction. A minimum of 72 hour notice is required prior to performance of test.
- B. After systems have been installed complete, adjust and test systems for proper operation and correct all noise or vibration conditions. Perform all tests as required by local codes. Contractor shall furnish testing equipment. **All piping pressure tests shall be hydrostatic tests.**
- C. If local codes are more stringent than the following, local codes shall govern.
- D. Sanitary Systems:
 - 1. Test piping by stopping lower outlets and filling with water to 10' hydrostatic head. Stop leaks and repeat test until watertight. All joints shall be exposed throughout test.
 - 2. Provide "Ball Test" on all piping 3" and larger with ball 1/2" smaller than pipe diameter.
- E. Domestic water piping: Test by applying pressure (by temporary pump or compressed air connection) to total hydrostatic pressure 1-1/2 times street pressure but not less than 150 psig for not less than 4 hours. Immediately and completely stop all leaks. On completion of roughing-in, cap all outlets, make connections with house supply line, and put under full water pressure. After testing, leave general pressure on until ready to install fixture (except when necessary to drain to avoid freezing during construction). After completion of all tests, repairs and installation of fixtures, flush all domestic hot and cold water piping with water to remove sediment and scale and then disinfect. Disinfect piping with hypochlorite solution of chlorine or compressed chlorine gas applied through an approved chlorinator. Operate valves and faucets several times to insure the chlorine reaches all parts of the system. Feed water and chlorination agent into the system at rates that will provide a residual chlorine content of not less than 50 ppm after a retention period of 6 hours. Upon completion of treatment, flush treated water from each system until the water supply is satisfactory to the public health authority having jurisdiction. Provide Architect a certificate of compliance from the local Health Department as required.
- F. Start-Up and Service:
 - 1. The Contractor and factory authorized service representative for the air compressors, and water heaters shall place each item of such equipment into satisfactory operation with all automatic and safety devices. Further, all adjustment service required shall be performed during the warranty period.
 - 2. In addition, submit equipment manufacturers' start-up reports for items listed above. See Paragraph "Project Close-Out", below.
 - 3. The Contractor shall balance all hot water pumps and circuit setters to flow shown on drawings. Balancing shall not be started until 1) Systems have been completed, including leak testing and cleaning and until systems have been refilled, pumps are rotating correctly, and strainers have been cleaned and baskets used for the ultimate installation have been installed, and 2) Expansion tanks have been installed and correct system pressure is being maintained, and system has been vented and is free from air.
 - a. Adjust circuit setters to meet design GPM requirements. Measure and record GPM.

- b. Produce a report documenting the measured flows and submit three (3) copies of the report to the Architect.

1.24 WARRANTY & INSTRUCTIONS:

- A. See General Conditions - One-Year Warranty.
- B. Contractor shall and hereby does warrant all materials, workmanship and equipment furnished and installed by him to be free from defects for a period of one year after date of substantial completion of the Contract. Should any defects in material, workmanship, or equipment be made known to Contractor within the one-year warranty period, Contractor shall replace such materials, workmanship, or equipment without charge.
- C. ***After completion of the work, Contractor shall operate the equipment which he installs for a period of 7 working days, as a test of satisfactory operating conditions. During this time, Contractor shall instruct the Owner's operating personnel in the correct operation of the equipment.***
- D. Provide PDF of manufacturer's operating and maintenance manuals and parts lists for all equipment and materials furnished. Provide a maintenance schedule listing routine maintenance operations and suggested frequency thereof. Include all warranty dates on equipment and guarantees.
- E. During the period of tests, adjust all controls, regulators, etc., to comply with these Specifications.
- F. Make available to the Owner, without additional cost, service and adjustment of the equipment for the guarantee period.

1.25 PROJECT CLOSE-OUT:

- A. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following:
 - 1. Record drawings – plumbing: PDF files and CAD files.
 - 2. Equipment Submittal Data PDF files.
 - 3. Equipment operating and maintenance manuals PDF files.
 - 4. Maintenance schedule.
 - 5. Equipment warranty dates and guarantees.
 - 6. Certificate of disinfection of domestic water lines as required by local authority.
 - 7. Submit factory start-up reports for:
 - a. air compressors
 - b. Water heaters

8. Include with insulation material submittal letters from the insulation material manufacturer certifying that the insulation material does not contain asbestos in any shape, form or quantity.

END OF GENERAL PROVISIONS - PLUMBING

SECTION 22 1000

MATERIALS AND METHODS – PLUMBING

PART 1 - GENERAL

1.1 SCOPE:

- A. Section 22 0500 - "General Provisions - Plumbing" shall apply to and become part of this Section.

PART 2 - MATERIALS: (Unless otherwise noted, all pipe, fittings and valves shall be manufactured in the United States of America)

NOTE: All materials used in systems that may be used for potable water shall meet the Reduction of Lead in Drinking Water Act.

2.1 SANITARY, WASTE AND VENT PIPING:

- A. Inside building to foundation wall: Vent piping smaller than 3": Cast iron. Waste piping above floor 2" or smaller: Cast iron, or DWV copper. Other waste and vent piping above slab on grade: Cast iron. Piping below slab on grade: PVC-DWV plastic. Piping from discharge of equipment that will convey water at a temperature greater than 140°F shall be cast iron. Pipe exposed in mechanical rooms or housekeeping rooms shall be cast iron. Piping in return air plenums shall not be PVC.
- B. Outside building (from foundation wall to sewer provided under the Civil Section) 2'-0" or more below grade in non-traffic areas: PVC-DWV, or cast iron. Less than 2'-0" cover and in traffic areas: Cast iron or Ductile iron.
- C. Cast iron hub-and-spigot soil pipe: tar coated with cast iron fittings of corresponding weight. Service weight, ASTM Specification A 74.
- D. Cast iron soil pipe: cast iron no-hub pipe and fittings, CISPI Standard 301, ASTM A888 shall be used only above slab on grade.
- E. Ductile iron pipe: Class 52, ASTM A746, ANSI/AWWA C151/A21.51 cement lined, fittings of corresponding weight, but not cement lined.
- F. Galvanized steel pipe: Schedule 40, ASTM A53, with 150 lb. cast iron screw pattern fittings, ASTM A-126.
- G. DWV copper pipe: copper drainage tube DWV meeting ASTM B 306 with cast bronze solder joint drainage fittings, ANSI B-16-23.

- H. PVC-DWV plastic pipe: PVC-DWV, ASTM D-2665 shall not be used in ceiling plenum return. Solid core only permitted. Cell core not allowed. Provide PVC to cast iron adaptors below slab on grade for caulking or compression joint. No hub bands are not allowed. As an alternative provide coupling equal to Mission Heavyweight at the finish floor.
- I. Joints for cast iron piping: compression gasket especially made for cast iron soil pipe, ASTM FC-564-85.
- J. Joints for no-hub cast iron piping: no-hub neoprene gasket and stainless steel coupling CISPI Standard 310 & ASTM C1277. Joints for 4" and larger shall be 4-band heavy-weight equal to Husky. No hub bands are not allowed below slab on grade.
- K. Joints in galvanized pipe: screwed with Teflon tape applied to male threads.
- L. Joints in ductile iron pipe: push on joints applied as directed by manufacturer meeting ANSI/AWWA C111/A21.11 requirements.
- M. Joints for PVC-DWV plastic pipe: solvent welded cement, ASTM D-2564, made in accord with ASTM D-2855. Provide cast iron to PVC adaptors, for caulking or compression joint when connecting to a cast iron drain or when converting from cast iron to PVC.
- N. Install vent stacks through roof. Terminate 6" above finish roof or according to local code. Flashing is specified under Roofing Section.

2.2 DOMESTIC WATER PIPING:

- A. Domestic Water piping within building: copper tube. Water piping outside building smaller than 3": copper tube.
- B. Copper tube, ASTM B-88, copper water tube, type "L" hard temper inside building, type "K" outside building. Fittings: wrought copper water tube fittings, ANSI B 16.18 or B 16.22. For pipe 4" and larger: Victaulic copper fittings may be substituted for soldered joints.
- C. Joints on copper tube: soldered as recommended by manufacturer, using 95-5 solder. Lead free solder, flux, etc. is required. Mechanically formed tee fitting, as created by T-Drill, is an acceptable method of installation. All joints created in this manner shall be brazed in compliance with code and in accordance with manufacturer's recommendation. Soft solder joints are prohibited. Installation shall be performed by certified T-Drill crafts people.
- D. Provide temporary construction water at site as required.

2.3 COMPRESSED AIR PIPING:

- A. All compressed air pipe: Aluminum tube equal to Champion "Quick-Lock" aluminum air-specific tubing with nickel plated brass fittings. Non-metallic fittings are not acceptable. Approved equal.
- B. Connect to air compressor or dryer where shown.

- C. Hose Reels: 50 feet x 1/2", equal to Reelcraft. Mounted on wall or attached to structure. Coordinate hose end connection with Owner.

2.4 PLUMBING VALVES:

- A. Supply water piping valves as specified. All valves shall meet the Reduction of Lead in Drinking Water Act.
 - 1. Ball valves: (2" and smaller) all bronze, 600 psig WOG, 150 psig WSP, stainless ball and stem, full port, Teflon seats, stem packing seal and thrust washer. Nibco T585-66-LF or S-585-66-LF, Watts, Apollo, Milwaukee or Josam. Provide extension stem capable of clearing 2" insulation, with memory stop, when operated will not disturb vapor seal of insulation.
 - 2. Check valves 2" and smaller: All bronze, 125 psig WSP, swing check, Nibco S-413-Y-LF, Milwaukee or Watts.
- B. Compressed Air Valves:
 - 1. Ball valves (2" and smaller): Stainless steel, compatible with aluminum piping specified.
 - 2. Air pressure reducing valve: Watts, Wilkens, Cash Acme, or approved equal, complete with strainer and unions. Sizes as shown on drawings, with outlet pressure gauge, reading 0-100 psi.

2.5 PIPE HANGERS:

- A. General: Pipe hangers, Anvil, PHD, Michigan Hanger, B-Line or Elcen. Anvil figure numbers are given for reference. Provide copper clad or plastic coated hangers on bare copper lines.
- B. Equip pipe hangers with vibration isolators as specified under Vibration Isolators.
- C. Pipe hangers for lines 3" and smaller: adjustable wrought ring hangers, Anvil Fig. 97 or 69 or wrought clevis hangers.
- D. Pipe hangers for piping 4" and larger: adjustable wrought clevis hangers.
- E. Parallel piping graded in same direction may be grouped on trapezes. Trapezes for line 4" and smaller, Unistrut P2000 channel, or equal, with rods sized as specified below for largest pipe on trapeze. Guide lines on (but not anchor to) trapezes using Unistrut Series P1100 clamps. Trapezes shall not exceed 3' in length. Space lines to allow at least 3" clear between adjacent pipe or pipe covering and between pipes or pipe covering and rods. Space trapezes as specified for pipe hangers based upon smallest size of pipe on trapeze.
- F. Provide riser clamps on pipe risers on each floor. Clamps in contact with copper or plastic pipe, plastic coated.
- G. Beam Clamps: Anvil Fig. 228.
- H. Inserts for hangers in concrete structures: Underwriter's listed cast iron inserts. Anvil Fig. 282.

- I. For fasteners in existing concrete structures use drilled in expansion anchors with load rating at least 150% of pipe hanger rating (powder driven anchors are not acceptable).
- J. Size rods for pipe hangers not smaller than the following: 3/8" rods for pipe up to 2", 1/2" for 2-1/2" and 3" pipe, 5/8" rods for 4" and 5" pipe, 3/4" rods for 6" pipe, and 7/8" rods for 8", 10" and 12" pipe, 1" rods for 14" and 16" pipe and 1-1/8" rods for 18" pipe.
- K. Support plumbing water, medical gas and vacuum piping within stud partitions with brackets as manufactured by P&M Bracket Company, Sumner Products, B-Line Ruff-in or Holdrite. Wire is expressly prohibited. Support horizontal plumbing soil and waste piping within stud partitions with Unistrut anchored to floor. Provide fire treated wood backing where required to anchor fixtures and brass securely.
- L. Space pipe hangers at maximum: 5' intervals for cast iron pipe. Pipe hanger spacing for screwed, solder joint and welded piping: 1/2" and 3/4", 6 ft.; 1" to 1-1/4", 8 ft.; 1-1/2" to 2-1/2", 10 ft.; 3" and over, 12 ft. Install additional hangers at change of direction and valve clusters.
- M. Install pipe hangers on insulated pipe over pipe covering. Provide factory fabricated insulated pipe shields equal to Pipe Shields, Inc. "Thermal Hanger Shields" or Tru-Balance insulated saddles at hangers. Provide shield insulation of rigid calcium silicate indoors or rigid Perlite Silicate outdoors, the same thickness as adjacent pipe covering. (At Contractor's option, pipe shields may be field fabricated using rigid calcium silicate or foamglass insulation with ASJ and 20 gauge galvanized steel protector. Shield length: 1.5 times nominal pipe size but not less than 4".)

2.6 THERMOMETERS AND GAUGES:

- A. Non-mercury in glass blue reading separable socket industrial thermometers with die cast aluminum or high impact plastic casings of appropriate pattern for each installation, 9" scale lengths and ranges shown, Palmer, Terice or Weksler. Install thermometers in brass or stainless steel wells. Equip thermometers installed in insulated lines with 1" extension stems or stems long enough to permit unions to clear insulation whichever is greater.
- B. Where shown install brass thermometer wells with screwed caps. Install wells at an angle to retain oil. Size well to fit thermometers specified.
- C. Enlarge pipe 2" and smaller to 2-1/2" at thermometers and thermometer wells.
- D. Install 4-1/2" dial pressure gauges where shown. Gauges shall have bronze or stainless steel bourdon tubes, 316 stainless steel movement, aluminum or polypropylene solid front cases, adjustable micrometer pointer and accuracy Grade 2A not less than 1/2% of full scale over the entire range, without mounting flange. Gauges shall be Ashcroft 1279, Marsh Series P01, Terice 450-B, Weksler AA44-2 or U.S. Gauge 1980L with minimum bourdon tube diameter of 3". Provide ball valves for all pressure gauges. Provide siphons for steam gauges.
- E. Where shown, provide temperature and pressure measurement plugs and caps equal to Peterson Equipment Co., Inc. "Pete's plug with Nordel seats and seals". Provide one Pressure and Temperature Kit consisting of a 0-100 psi pressure gauge with adaptors, and two thermometers (25-125°F and 0-220°F), all in carrying cases. Provide nipples for Pete's plugs as required to extend through pipe insulation.

PART 3 - EXECUTION

3.1 PIPE INSTALLATION:

- A. Cut pipe square and ream full size after cutting. Clean pipe. Make threaded joints with Teflon tape. Do not spring pipe into place.
- B. Slope Sanitary Drain Lines:
 - 1. 3" and larger: minimum 1/8" per 1'.
 - 2. Less than 3": minimum 1/4" per 1'.
- C. Provide welding material and labor in accordance with the welding procedures of the Heating, Piping, and Air Conditioning Contractors' National Association or other approved procedure conforming to the requirements of ANSI B31.9 "Building Service Piping". Employ only welders fully qualified in the above specified procedure and currently certified by recognized testing authority. Use either electric arc or oxyacetylene welding. Provide full perimeter welds at both face end and collar end of each slip-on flange.
- D. Install piping to allow for expansion. Make connections to plumbing fixtures and all equipment to eliminate undue strains in piping and equipment. Furnish necessary fittings and bends to avoid springing of pipes during assembly.
- E. Install chrome plated floor and ceiling plates on pipe passing through finished surfaces in finished spaces.
- F. Make horizontal water line size reductions using eccentric reducers (tops flat).
- G. Install 3/4" ball valve drains with hose adaptors at low points of water piping and at bases of all risers (where shown provide larger drains). Provide screwed caps with chains on hose adaptors.
- H. Make connections to equipment using screwed unions in sizes 2" and smaller and flanged unions in sizes 2-1/2" and larger. Install unions in all piping connections to each piece of equipment. Provide unions on all sides of control valves.
- I. Wherever ferrous pipes or tanks and copper tubing connect, provide dielectric insulating unions or couplings, equal to Victaulic style 47, "V-line" insulating couplings as manufactured by Lochinvar, thread to thread or CTS fabrication flange adaptors for flange connections.
- J. Near heating and air conditioning equipment requiring water provide valved and capped water outlets of sizes shown for connection to equipment, including reduced pressure principal backflow preventers. Make final connections under HVAC work. ***Note that all piping and insulation downstream from backflow preventer must be painted yellow.***
- K. Run piping concealed, except where specifically shown or specified to be exposed. Plumb all vertical lines and run mains parallel to building walls unless specifically shown otherwise.
- L. Lay underground pressure piping so top of pipe is at least 18" below finished grade. Support all underground piping solidly along body of pipe. Strongly suspend other piping from building construction.

- M. Pipe shall be braced at flexible connections to prevent blowouts under operating conditions.
- N. Run no piping or tubing in direct contact with slag fill. Where necessary to pass through slag, protect piping with not less than two wrappings of polyvinyl chloride tape or equivalent protection approved by Architect.
- O. Provide water hammer arrestors equal to Wilkins WH2950XL. Refer to drawings for location and P.D.I. size. Shock arrestors are required on all equipment with solenoid shutoff valves such as washing machines and dishwashers whether shown or not. Select WH2950XL for use with fixtures which may supply drinking water. Equal by Josam, J.R. Smith, Wade, or Sioux Chief is acceptable.
- P. All water piping shall be installed within the heated envelope of the building, or otherwise protected from freezing.

3.2 INSTALLATION OF VALVES:

- A. Provide shut-off valves in supply and return connections to each item of equipment. Locate valves to isolate each item to facilitate maintenance and/or removal.
- B. Provide check valve in discharge line adjacent to each pump.
- C. Locate valves in piping connections to heat exchangers, water heaters, etc., so heads and tube bundles can be removed without disconnecting equipment or piping other than union or flange connections immediately adjacent to the equipment.
- D. Provide sweat to screw adaptors where required.
- E. Install with valve stems upright or horizontal.

END OF MATERIALS AND METHODS - PLUMBING

SECTION 22 1500

THERMAL AND ACOUSTICAL INSULATION FOR PLUMBING SYSTEMS

PART 1 - GENERAL

1.0 GENERAL:

- A. All insulation shall be installed by an insulation contractor in business a minimum of 3 years as an insulation contractor and has completed projects similar in scope to this project.

1.1 SCOPE:

- A. Section 22 0500 - "General Provisions – Plumbing" shall apply to and become part of this Section.
- B. Repair existing insulation at points of connection and/or alterations to existing work.
- C. "Exposed" is defined as: Exposed to view when construction is complete. (Items which are not "exposed" are considered "concealed".)
- D. The use of any material containing asbestos is strictly prohibited.
- E. Include with insulation material submittal letters from the insulation material manufacturer certifying that the insulation material does not contain asbestos in any shape, form or quantity.

1.2 INSULATION:

- A. Comply with NFPA 90A.
- B. Pipe hanger shields are specified in Section 22 1000 - "Materials and Methods - Plumbing."
- C. Use insulation and adhesives with Underwriter's Laboratories and ASTM E-84 flame spread rating not over 25 without evidence of continued progressive combustion, and smoke developed rating not exceeding:
 - 1. 50 for pipe covering located in air ducts, plenum or casings.
 - 2. 150 for all other pipe and equipment insulation.

PART 2 - MATERIALS

2.1 FIBERGLASS PIPE COVERING:

- A. Snap-on glass fiber insulation minimum density 5#/cu. ft. maximum thermal conductivity at 75°F mean temperature 0.25 BTU/(hr)(sq. ft.)(°F/in) with UL rated vinyl coated and embossed vapor barrier laminate of aluminum foil and kraft reinforced with glass fiber yarns (ASJ). For domestic hot water circulating system, thermal conductivity shall be 0.27 BTU/(h)(sq.ft.)(°F/in.) at 75°F mean temperature.
- B. For all lines seal jacket with self sealing lap. Butt adjoining sections of insulation tightly and seal with self-adhering butt joint strips.
- C. Cover fittings to thickness of adjacent covering with factory pre-molded fitting covers. Cover flanged valve bodies and flanged unions. Do not cover screwed unions on hot lines. Finish concealed fittings with a skim-coat of mastic and when mastic is dry, fitting shall be covered with glass fab and vinyl acrylic mastic unless otherwise noted below. Zeston type fitting covers may be substituted for glass fab and final coat of mastic on concealed fittings provided fire and smoke ratings are met. Finish fittings exposed in equipment rooms, boiler room, and in finished spaces with vinyl acrylic mastic over glass fab over mastic.
- D. At contractor's option, concealed tees may be insulated with field fabricated tee covers consisting of straight pipe covering on run of tee with notch at branch together with pipe covering on branch contoured to fit notch. Glass fab over skim coat of mastic shall be applied around main, lapping contoured joint at branch by 2" minimum for the full 360° of joint. Cover entire fitting covering with vinyl-acrylic mastic over glass fab, 1/8" thick (dry) coat. Submit sample of fabricated tee covering to Architect for approval before work is begun.

2.2 FOAMED PLASTIC PIPE COVERING: (DO NOT USE IN PLENUMS UNLESS COMPLIES WITH PARAGRAPH 1.2 ABOVE):

- A. Fire retardant foamed plastic pipe covering, maximum K factor at 75°F mean temperature not exceeding 0.27 BTU/(hr)(sq.ft.)(°F/in).
- B. Pipe covering may be seamless insulation slipped over piping before erection or may be slit longitudinally and installed over erected piping.
- C. Make fitting covers from segments of pipe covering.
- D. Cement all joints and seams in accordance with manufacturer's instruction.
- E. Fit pipe hangers over insulation (see PIPE HANGERS). Use hanger shields as specified under pipe hangers.
- F. Where exposed outside, cover insulation with aluminum jacket.
- G. Armacell, Aeroflex or Normaco.

PART 3 - INSTALLATION

3.1 PLUMBING PIPING:

- A. Bodies of floor drains and floor sinks serving refrigeration equipment, AC units and ice machines and traps and waste piping between such drains and waste stack: "Foamed plastic pipe covering", 1" thick.
- B. Domestic water piping exterior, above grade: "Cellular glass pipe covering, rigid," 1" thick. Include aluminum jacket and electric pipe line heaters.
- C. Cold water piping, interior, above grade: "Fiberglass pipe covering", 1" thick. Pipe insulation in partitions and chases may be 1/2" thick when needed for tight spaces.
- D. Hot water piping, interior, above grade: "Fiberglass pipe covering", 1" thick insulation for up to 1-1/4" pipe, and 1-1/2" thick insulation for 1-1/2" and larger pipe.

END OF THERMAL AND ACOUSTICAL INSULATION FOR PLUMBING SYSTEMS

SECTION 22 2000

PLUMBING FIXTURES AND EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE:

- A. Section 22 0500 - "General Provisions - Plumbing" and Section 22 1000 - "Materials and Methods - Plumbing" shall apply to and become part of this Section.

PART 2 - PRODUCTS

2.1 DRAINS:

- A. See Piping Specialties Connection Schedule – Non-Pressure schedule on Sheet P6.01.

2.2 WALL HYDRANT:

- A. See Plumbing Specialties Connection Schedule – Pressure schedule on Sheet P6.01.

2.3 CLEANOUTS:

- A. Furnish and install cleanouts where indicated on drawings and at all 90-degree bends, angles, upper terminals and not over 50' apart on straight runs. All cleanouts on cast iron piping to have bronze countersunk rectangular tapered slotted plugs. PVC or acid waste piping cleanouts shall be standard of piping system used. Flush-with-floor cleanout access covers shall have non-skid covers. All wall cleanout access covers shall have polished satin finish. All cleanouts shall be full size of pipe, 8" and less.
- B. Exposed Cleanouts: Cast brass plug type, J.R. Smith 4470T.
- C. Wall type cleanout plug and access covers, J.R. Smith 4472T. Cleanout plug must be within 1" of finish wall and must be tapped for access cover. On PVC plastic and acid waste pipe in wall: Cleanout access cover J.R. Smith 4710.
- D. Floor type cleanout access covers in unfinished areas: J.R. Smith 4239L/LXH-NB. Finished areas: J.R. Smith 4111L/LXH-NB. Plug must be within 3" of finished floor. Provide 4193L/LXH-NB covers where installed in terrazzo floors. Grout cleanout below access cover to seal watertight. Provide option 14 cleanout carpet markers where installed in carpeted floors.
- E. Floor type cleanouts for acid waste piping: Orion FCO-NB.
- F. **Coordinate the exact location of all cleanouts with the Architect.**

2.4 PLUMBING FIXTURES:

- A. Unless otherwise specified, all fixtures complete as catalogued, white color, exposed metal trim chromium plated. Fixtures shall be without discoloration, chips or flaws and shall be free from cracks. Warped or otherwise imperfect fixtures will not be acceptable.
- B. Clean all fixtures to a clean and sanitary condition.
- C. Fixtures and brass shall be securely anchored. Carriers shall be securely anchored to floor with lag bolts, as recommended by the manufacturer. Do not conceal until Architect has observed anchors.
- D. Flush valve supports equal to Sloan "YJ" shall be installed 1" below vacuum breaker, on all flush valves. Flush valves on A.D.A. water closets must be set so that handle is to the wide side of the stall and handle is no more than 44" above finish floor. Urinal flush valves on A.D.A. urinals shall be no more than 44" above finish floor.
- E. Seal wall hung fixtures at wall with white caulk. Seal countertop fixtures with clear silicone sealant. Seal floor mounted fixtures at floor with grout.
- F. All fixtures noted to be A.D.A. approved must be set with great care to assure proper mounting height and proper distance from wall. Elevation of flush valves shall be coordinated with grab bars (see Architect). All shower control valves for ADA showers shall be set with centerline 44" above finish floor. Trip levers for tank type water closets shall be installed to the wide side of the stall.
- G. All supplies, stops, faucets, etc. on fixtures that could be used for drinking water shall meet the Reduction of Lead in Drinking Water Act.
- H. Contractor shall coordinate all sinks and faucets with casework/millwork shop drawings prior to purchase of sink/faucet. In particular, coordinate A.D.A. vs. non-A.D.A. fixtures with casework/millwork. Failure to do so will make contractor liable for incorrect fixtures.
- I. See Plumbing Fixture Connection and Description Schedule on Sheet P6.01.

2.5 PLUMBING EQUIPMENT:

- A. See plumbing equipment schedules on Sheet P6.01.

2.6 EQUIVALENT MANUFACTURERS:

- A. Where Kohler fixtures are listed above, Zurn, American Standard, or Toto may be utilized.
- B. Where Sloan flush valves are listed above, Zurn or Delaney may be utilized.
- C. Where Smith is listed above, Josam, Watts, Zurn or Wade may be utilized.
- D. Where Elkay water coolers are mentioned above, Halsey Taylor, Sunroc, or Oasis may be utilized.

- E. Where B&G is listed above, the equal of Armstrong, Taco, or Thrush may be utilized.
- F. Where Elkay sinks are listed above, Just may be utilized.
- G. Where Zurn water closet seats are listed above, Church, Beneke, Bemis, Centoco or Olsonite may be utilized.
- H. Where Lawler combination pressure balanced and thermostatic mixing valves are listed above, Powers, Symmons, or Leonard may be utilized.
- I. Where Weil is listed above, Chicago Pump Co., Enpo or Federal may be utilized.
- J. Where T&S Brass is listed above, Chicago Brass, Cambridge or Zurn may be utilized.
- K. Where T&S Brass is listed above, Chicago Brass, American Standard, Kohler, Zurn, Cambridge, Delta HDF or Speakman may be utilized provided that manufacturer can furnish all fixture brass specified.
- L. Where Delta is listed above, Moen, Symmons or Elkay may be utilized.
- M. Where A.O. Smith water heaters are listed above, Lochinvar, State or Bradford White may be utilized.
- N. Where Stern Williams is listed above, Fiat, or Zurn may be utilized.
- O. Where Zurn is listed above, the equal of McGuire, Watts, Dearborn or Brasscraft may be utilized.
- P. Where Navien is listed, Bosch may be utilized.
- Q. Where Eemax is listed, Chronomite or Stiebel may be utilized.
- R. Where Acorn is listed, Haws or Guardian may be utilized.
- S. Where Symmons is listed above, Zurn or Powers may be used.
- T. Where Advance Tabco is listed above, Zurn may be used.

PART 3 - EXECUTION:

3.1 MANUFACTURER'S INSTRUCTIONS:

- A. Install all plumbing equipment and fixtures as recommended by the manufacturer's recommendations.

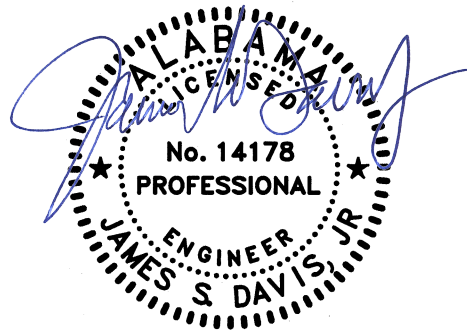
END OF PLUMBING FIXTURES AND EQUIPMENT

DIVISION 23

HVAC

23 0500 GENERAL PROVISIONS – HVAC
23 1000 MATERIALS AND METHODS – HVAC
23 1500 THERMAL AND ACOUSTICAL INSULATION FOR HVAC SYSTEMS
23 5000 HEATING AND AIR CONDITIONING EQUIPMENT AND SPECIALTIES
23 6000 AIR DISTRIBUTION
23 7000 HVAC TESTING AND BALANCING
23 8000 CONVENTIONAL AUTOMATIC CONTROLS
23 8100 BUILDING AUTOMATION SYSTEM (BAS)

END OF SECTIONS



10-26-2026

SECTION 23 0500

GENERAL PROVISIONS – HVAC

PART 1 – GENERAL

1.1 SCOPE:

- A. Provisions of this Section apply to all Heating, Ventilating, and Air Conditioning (HVAC), Controls, HVAC Commissioning and Test and Balance work.
- B. Include the provisions of General Conditions as part of this Section.
- C. Provide all labor, materials, equipment, and services necessary for the completion of all HVAC work shown or specified, complete and ready for operation, consisting in general of the following:
 - 1. Air handlers with medium pressure supply duct.
 - 2. VVR terminal units with hot water heating coils and low pressure supply duct.
 - 3. Low pressure return duct system.
- D. Give required notices, file drawings, obtain and pay for permits, deposits and fees necessary for the installation of the HVAC work. Obtain and pay for inspections required by laws, ordinances, rules, regulations or public authority having jurisdiction. Obtain and pay for certificates of such inspections, and file such certificates with Owner.
- E. "Provide" means to furnish and install, complete and ready for operation.

1.2 USE OF BUILDING SYSTEMS FOR TEMPORARY HEAT/AIR CONDITIONING DURING CONSTRUCTION:

- A. Building HVAC systems shall not be used during construction unless the following conditions are met:
 - 1. Cleaning of water systems shall have been completed.
 - 2. All return air and outside air openings shall have temporary filter media installed over inlet side of openings and secured air tight there-to.
 - 3. Air filters of quality specified for ultimate use shall be installed in the air handling units.
 - 4. Motors shall have correct overload elements installed in the starters.
 - 5. Water treatment chemicals will be furnished by the Owner for all open and closed water systems as hereinafter specified. Contractor shall maintain such charges during construction use of the system.
 - 6. All safety controls shall be in operation.

- B. Contractor shall turn system over to Owner in condition equal to that which would have occurred if the systems had not been used during construction.

1.3 DRAWINGS:

- A. HVAC Drawings are diagrammatic and subject to requirements of Architectural Drawings and conditions existing in the field. HVAC Drawings indicate generally the location of components and are not intended to show all fittings or all details of the work.
- B. Follow the drawings closely, coordinate dimensions with Architectural Drawings and field conditions. DO NOT scale HVAC drawings for location of system components.
- C. Make no changes without Architect's written permission. In case of doubt, obtain Architect's decision before proceeding with work. Failure to follow this instruction shall make the Contractor liable for damage to other work and responsible for removing and repairing defective or miss-located work in proper manner.
- D. DO NOT scale drawings to locate ceiling diffusers. COORDINATE with lighting and ceiling grids. Contractor for HVAC work is responsible for coordinating with all trades.
- E. Drawings and specifications are complementary. Work shown or specified in one is binding as if shown or specified in both. Any discrepancies between the drawings and specifications shall be brought to the attention of the Consultant for clarification during the bidding period. No allowance shall be subsequently made to the Contractor by reason of his failure to have brought said discrepancies to the attention of the Consultant during the bidding period or by reason of any error on the Contractor's part.
- F. No attempt has been made to establish the required sections or splits of equipment relative to the size of access into the space, building, etc. Contractor shall establish all said splits, sections, etc. necessary to install equipment complete without undue disassembly of equipment or demolition of building parts at site of work.

1.4 APPLICABLE CODES AND STANDARDS:

- A. Comply with the current editions of the following Codes and Standards:
 - 1. ANSI/B31.9 - Code for Building Services Piping
 - 2. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration
 - 3. ASHRAE 62.1 - Ventilation for Acceptable Indoor Air Quality
 - 4. ASHRAE 90.1 – Energy Compliance
 - 5. NFPA 70 - National Electrical Code
 - 6. NFPA 90A - Installation of Air Conditioning and Ventilating Systems
 - 7. NFPA 91 - Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids

8. NFPA 96 - Ventilation Control and Fire Protection of Commercial Cooking Operations
9. NFPA 101 - Safety to Life from Fire in Buildings and Structures
10. Other standards as referenced in other sections of Division 23
11. 2021 International Building Code
12. 2021 International Plumbing Code
13. 2021 International Fuel Gas Code
14. 2021 International Mechanical Code
15. 2021 International Energy Conservation Code

1.5 QUALIFICATIONS OF SUBCONTRACTOR:

- A. The HVAC Subcontractor shall meet the following qualifications:
 1. He shall have been in business as a HVAC contractor for at least 3 years prior to the date of opening bids, and shall have held a license from the **Alabama** State Licensing Board for General Contractors for at least 3 years.
 2. He shall have a satisfactory experience record with HVAC installations of character and scope comparable with this project, and for at least 3 years prior to the date of opening bids shall have had an established service department capable of providing service inspection or full maintenance contracts.
 3. If the HVAC subcontractor, with the Engineer's approval, uses a sub-subcontractor to provide another discipline that the subcontractor does not normally furnish, that sub-subcontractor shall meet the same qualifications as the subcontractor.

1.6 CONFLICTS AND INTERFERENCES:

- A. If systems interfere or conflict, the Architect shall decide which equipment to relocate regardless of which was first installed.

1.7 WORKMANSHIP:

- A. Do all work in a neat and first-class manner. Remove and replace work not done in such manner as directed by the Architect.

1.8 COOPERATION:

- A. Cooperate with all other crafts. Perform work in a timely manner. Do not delay the execution of other work.

1.9 VISITING SITE:

- A. Visit site and become familiar with location and various conditions affecting work prior to bid. No additional allowance will be granted because of lack of knowledge of such conditions. No consideration shall be given to future claims due to existing conditions. Any discrepancies or interferences shall be reported immediately to the Architect/Consultant.

1.10 MATERIALS:

- A. Unless otherwise noted, provide new, standard, first-grade materials throughout. **Unless otherwise noted, all pipe, fittings and valves shall be made in the United States of America.**
- B. Where materials or products are specified by manufacturer's name, brand, trade name, or catalog reference, such named materials or products shall be the basis of the estimate, without substitution, and shall be furnished under the contract unless requests for equivalents are approved as noted below. Where two or more brands are named the choice of these shall be optional with the Contractor.
- C. Equivalents will be considered only if written request for approval has been received by the Architect (from a general contract bidder) 10 days prior to the date established for receipt of Proposals. Each request shall include the name of the material or equipment for which an equivalent is proposed and a complete description of the proposed equivalent including drawings, cuts, performance and test data, and deviation from the specification and any other information necessary for evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the equivalent may require shall be included. The burden of proof of the merit of the proposed equivalent is upon the proposer. The Architect's decision of approval or disapproval of a proposed equivalent is final.
- D. If the Architect approves any proposed equivalent prior to receipt of Proposals, approval will be set forth in an Addendum. **DO NOT RELY UPON APPROVALS MADE IN ANY OTHER MANNER.**
- E. No proposed equivalent will be considered after the Contract has been executed, except as described in the General Conditions.
- F. Within 45 days of execution of contract and before ordering materials or equipment, submit to Architect and obtain his approval of a detailed list showing each item which is to be furnished by make, trade name, catalog number, or the like; together with manufacturer's specifications, certified prints, and other data sufficient for making comparisons with items specified. When approved, such schedule shall be of equal force with these specifications in that no variation there from shall be allowed except with Architect's written approval. Submit PDF format files for approval. Provide PDF files of approved data for project close-out.
- G. All pressure vessels shall be constructed and tested in accordance with applicable ASME codes and shall bear ASME stamps. Certificates of inspection and approval shall be submitted to Architect.
- H. Similar items of equipment shall be the product of the same manufacturer.

1.11 SHOP DRAWINGS:

- A. Before starting work, submit and obtain approval of detailed drawings of the following, fully dimensioned (including elevations of ductwork and piping) and drawn to 1/4" to 1'-0" scale.

Submit a minimum of 2 sets of bond shop drawings and PDF format digital files of shop drawings. Piping shop drawings shall include drain and vent locations, pipe slopes down to drains and up to vents, piping elevations, piping connection details, and a list of piping materials. Ductwork shop drawings shall include elevations, construction methods, re-inforcements, gauges, and access door locations and sizes. Provide section drawings of locations where ducts cross or demonstrate with elevations that ducts will fit. All shop drawings shall be produced using AutoCad and a copy of the shop drawing files shall be provided in PDF format on CD-ROM disks for shop drawing review. A CD-ROM with a copy of all approved shop drawings in CAD and PDF format shall be provided for project closeout. Shop drawings shall be received within 60 days of the execution of the contract and before consideration of a request for payment.

1. Ductwork (do not scale for diffuser locations, but coordinate with ceiling grids and lighting layout). See Section "Air Distribution". Shop drawings shall include material type (stainless steel, galvanized), finish (paint grip, etc.), actual sizes increased to allow for internal insulation and gauges along with fabrication section notes for individual sections. In addition, include elevations of bottom of duct above finished floor level. Show building sections through congested areas for coordination with structure and other disciplines. Provide joint details, duct seal methods, insulation type, etc.
 2. Complete mechanical equipment and fan room plans showing location of equipment, conduit stubs for motors, floor drains, and equipment pads and foundations.
 3. Equipment piping.
- B. Submit complete control and power wiring diagrams for approval before installing controls. See Controls Section.
- C. Engineers' CAD/electronic drawings files will be available upon request for the convenience of the contractor and for use in preparation of shop drawings. A service fee of \$100.00 per drawing sheet file shall be remitted to the Engineer prior to delivery of CAD/electronic drawing files along with a signed agreement between the Engineer and Contractor.

1.12 COORDINATION SHOP DRAWINGS:

- A. Coordination shop drawings (2 sets of bond and PDF digital format files) will be required of the following areas, drawn to a scale not smaller than 1/4" = 1'-0":

1. Mechanical Room.
- B. Start drawings as HVAC shop drawings indicating all ductwork piping, equipment and locations of mechanical room floor drains, and electrical connections to motors. Indicate elevations of all ductwork and piping. Draw sections as required to clarify congested situations. **Indicate elevations of all ductwork and piping. Include walls, ceilings, structure, and lighting.**

- C. Engineers' CAD/electronic drawings files will be available upon request for the convenience of the contractor and for use in preparation of shop drawings. A service fee of \$100.00 per drawing sheet file shall be remitted to the Engineer prior to delivery of CAD/electronic drawing files along with a signed agreement between the Engineer and Contractor.
- D. Next, the Plumbing Contractor shall add all piping and plumbing to the drawings.
- E. Next, the Fire Protection Contractor shall add all sprinkler heads and fire protection piping.
- F. Next, the Electrical Contractor shall add all electrical fixtures, conduit and equipment.
- G. Next, the drawings shall be submitted to the General Contractor for final coordination.
- H. Finally, after the General Contractor has approved the drawings they shall be submitted to the Architect for his review and comments.

1.13 RECORD DRAWINGS:

- A. When work starts the Architect will furnish two complete sets of white prints of the HVAC Drawings. All corrections, variations, and deviations, including those required by change orders, if any, must be recorded in colored ink or colored pencil at the end of each working day on these drawings. The marked prints shall be available at all times for the Architect's inspection.
- B. Prior to examining the request for final payment or making any response thereto, the Architect shall receive from the Contractor one complete set of the white prints, marked as stated above, indicating the actual completed installation of the work included under this contract.
 - 1. Accurately show location, size and elevation of new exterior utility work and its relationship to any existing utilities, obstructions, etc., contiguous to the area of work.
 - 2. Block out areas modified by change-order & identify them by change-order number.
 - 3. The Architect will forward the marked white prints to the Consulting Engineers for review. They will then be returned by the Architect to the Contractor for use in preparing record drawings.
- C. When work is completed, the Engineers' CAD/electronic drawing files will be made available upon request for the convenience to the contractor for a service fee of \$100.00 per CAD/electronic drawing sheet file and for use in preparing record drawings. Contractor shall transfer the information from the marked white prints to the CAD files, removing all superseded data in order to show the actual completed conditions.
- D. Ductwork and Control Drawings (may be CAD files or a set of mylar reproducible shop drawings), up-dated to show actual conditions at completion of work. Include the contract drawings equipment schedules and details edited to show actual completed conditions.
- E. HVAC piping drawings may be prepared as noted above, or HVAC piping may be added to the ductwork shop drawings noted above.

1.14 PROTECTION OF ROTATING PARTS:

- A. For this paragraph only, "exposed" shall mean located in a casing or room or plenum with door large enough to admit a man.
- B. Equip exposed belt drives with belt guards with holes for measuring speeds of driven shafts.
- C. Provide exposed couplings with coupling guards.
- D. Equip propeller fan wheels with wheel guards.
- E. Equip inlets and outlets of exposed centrifugal fans with 1-1/2" #10 Diamond mesh galvanized steel screens.
- F. Equip all exposed plug fans with wheel screens.

1.15 PROTECTION OF EQUIPMENT:

- A. During construction, protect HVAC equipment and ductwork from damage or deterioration and prevent water, dust, etc. from entering the equipment or ductwork. Cover ends of ductwork before delivery to site with Duro-Dyne Dyn-O-Wrap. Cover all openings in equipment with Dyn-O-Wrap until ductwork is attached.
- B. During construction, keep all stored ductwork securely covered for protection from water and dust. Do not store directly on the floor. Immediately remove all ductwork that is wet or dirty from the job site.
- C. During construction, seal joints and seams in ductwork as it is installed.
- D. When installation is complete, clean equipment and make ready for painting.

1.16 INSTALLATION OF EQUIPMENT:

- A. Install equipment to provide normal service access to all components.
- B. Where drawings show sufficient space for removing components, install equipment to provide such clearance. Provide space at all equipment power and control panels as required by local codes.
- C. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with contract documents, obtain Architect's decision before proceeding.
- D. All equipment shall be firmly fastened in place:
 - 1. Roof curbs shall be secured to deck and structure and curb mounted items shall be secured to curbs.
 - 2. Pad mounted equipment shall be secured to pads using poured in place anchor bolts or cinch anchors.
 - 3. Vibration isolators shall be secured to floors or pads and equipment shall be bolted to the isolators.

4. Air devices connected by flexible duct shall be secured independently of all other building systems to prevent falling if grid shifts.

1.17 EQUIPMENT SUPPORTS:

- A. Provide supports for ductwork, piping and equipment. Hot dip galvanize after fabrication all grillage, supports, etc., located outdoors. Prime coat and paint all grillage, supports, etc. located indoors. Where noted provide 304 stainless steel supports. At the Contractor's option, all grillage, supports, etc. located outdoors may be 304 stainless steel instead of hot dip galvanized.
- B. Set floor-mounted equipment on concrete pads or platforms (as indicated) of height shown, but not less than 3-1/2" high. Chamfer pads 1". Provide pads for all pumps, boilers, chemical tanks and miscellaneous mechanical equipment.
- C. Provide factory fabricated equipment roof supports with tops 16" above roof line for roof mounted items. Supports shall have integral cants, pressure treated wood nailers, and counter flashing. Supports shall be galvanized steel, gauge as required for loads, 18 gauge minimum.

1.18 CUTTING AND PATCHING AND INCIDENTAL WORK:

- A. Set sleeves and inserts and lay out and form openings in walls, beams, girders and structural floors in this Section.
- B. Cut, patch and repair as required to accomplish HVAC Work and finish to match adjacent work. Architect's approval required before cutting any part where strength or appearance of finished work is involved.
- C. Provide all motors incidental to the HVAC systems. Wiring of motors, switches and starters is included in "Electrical Sections".
- D. Do all control wiring required for HVAC work and all power wiring required by Control Panels, Control System, and Control Devices.
- E. Furnish motor starters as specified below.
- F. Final water connections to services are included in this Section.
- G. Permanent drain connections from AC units, etc., and auto air vents to nearest floor drain are included in this Section.
- H. Door louvers are not included in this Section.

1.19 FLASHING:

- A. General: Furnish all fan curbs, pitch cups, metal base flashing and counter flashing required for HVAC Work. Installation of above items is specified in Roofing Section.
- B. Fan curbs for power roof ventilators are specified with the fans.

- C. Pitch Cups: 20 gauge galvanized steel, at least 8" deep, bases mitered and soldered and extending at least 4" horizontally.
- D. Metal Base Flashing: Galvanized steel for ferrous items, and stainless steel for stainless steel duct items. Minimum thickness 22 gauge (0.034") galvanized steel, 20 gauge (0.038") stainless steel, 0.032" aluminum. Bases mitered and soldered extending out at least 4" horizontally and 8" vertically.
- E. Metal Counter Flashing: Of material and gauges specified for base flashing, lapping base flashing at least 3".

1.20 EXCAVATION & BACKFILLING:

- A. Include all excavation and backfilling required to bring the work to line and grade shown, including excavation of rock and all other materials which may be encountered.
- B. Excavate trenches wide enough for proper installation of work. Grade trench bottoms evenly. Provide bell holes as necessary to insure uniform bearing for pipes. Excavate minimum 6" below pipe. Refill cuts below required pipe grade with sand or compacted gravel. Support pipe continuously along its entire length. (Do not use piers to support piping.)
- C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas (engineered fill) with sand or fine gravel (89/10) in accordance with requirements of "Sitework" no less than 95% compactancy. Backfill paved areas with sand or fine gravel (89/10) compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe. Restore or repair pavements and the like after backfilling, matching adjacent work.
- D. Resod grassed areas and replace bushes, etc.

1.21 MOTORS, STARTERS & ELECTRICAL EQUIPMENT:

- A. Provide electrical equipment compatible with the current shown on electrical drawings. Verify current characteristics before ordering equipment.
- B. Should the Contractor with the Architect's approval make changes in electrical equipment from that shown on the Electrical Drawings, the Contractor shall be responsible for the cost of required changes.
- C. Provide factory installed fuses in all equipment requiring fusing for branch circuit protection.
- D. Motors: 1750 RPM open drip-proof construction unless otherwise shown or specified. Integral horsepower motors shall meet NEMA premium efficiency levels as stated in the latest version of NEMA MG-1. Allis-Chalmers, General Electric, Goulds, Louis Allis, Westinghouse.
- E. Where motors are shown or scheduled to be connected to a variable frequency drive, this motor shall be an inverter duty rated by the motor manufacturer and shall comply with NEMA MG1, Article 31.
- F. Do not run motors until correct overload elements are installed in starters. Trading overload elements for elements of correct size for motors actually furnished shall be included in this Section.

- G. Furnishing all starters is included in this Section. Starter installation is specified under "Electrical Section". Starters shall be equipped with melting alloy thermal overload and phase loss protection, in all 3 phases.
 - H. Starters for chillers are specified with the equipment:
 - I. Unless otherwise shown or specified for single phase motors provide manual starters equal to Square D Class 2510. When installed in equipment rooms provide surface mounted enclosure, and when installed in finished walls outside equipment rooms provide flush mounted enclosure, key operated.
 - J. Provide magnetic line voltage starters with NEMA 1 enclosures with melting alloy overload elements and phase loss protection for: all equipment with 3-phase power except where noted to have variable frequency drives.
 - K. Provide H-O-A switches, fused control circuit transformers, auxiliary contacts, etc., as shown on control diagrams or required by control sequences.
 - L. All starters shall be the product of the same manufacturer.
 - M. All control panels, electrical assemblies, etc. must bear a label from a recognized testing laboratory as an assembly, not as individual components.
- 1.22 SLEEVES:
- A. For pipe through floors inside fire rated chases or through non-fire-rated walls: 20 gauge galvanized steel, 1" larger than pipe or pipe covering.
 - B. For pipe through concrete beams: schedule 40 black steel pipe, 1" larger than pipe or pipe covering.
 - C. For pipe passing through floors outside fire rated chases and fire rated walls and partitions, provide 20 gauge steel sleeve leaving the annular space between pipe or pipe covering as required by UL systems. Where pipe is insulated, insulation shall be continuous thru sleeve. Refer to Through-Penetration Firestop Systems where included in the contract documents. Otherwise, seal between sleeve and pipe or pipe covering with 3M Brand Fire Barrier CP 25WB caulk, Flamestop V, Specified Technologies, Inc. "Spec Seal Sealant", Rectorseal Corp. Metacaulk 950 or Hilti FSTONE bearing UL listing for actual conditions of installation, thickness and application in strict accord with UL reference for each type installation. Any equivalents must meet the 10 day prior approval provision and must show UL approval for all conditions, bare pipe, insulated pipe, etc. For plastic piping material submittal must show UL approval for each application and if caulk comes in direct contact with pipe, it must be compatible and not injurious to the pipe.
 - D. Set sleeves before concrete is poured or masonry is erected. In existing construction, grout sleeves firmly in place.
 - E. Sleeves for ducts: see fire dampers (Section: Air Distribution).
 - F. Extend floor sleeves 1-1/2" above finish floor in areas where floor is subject to being wet during normal usage (mechanical rooms, toilets, etc.).

- G. Where exposed ducts pass through walls and partitions, provide 4" wide 20 gauge galvanized steel closure plates except at grilles and registers. Fit closure plates snugly to duct and secure to wall. Grout around ducts and sound absorbers at equipment room walls.
- H. Where exposed pipes pass through walls and partitions in finished spaces, provide chrome plated F & C plates or escutcheons.

1.23 PAINTING:

- A. Refinish equipment damaged during construction to new condition.
- B. Paint all non-potable water pipe and insulation yellow in accordance with Plumbing Code using paint of type specified in Painting Section.
- C. Paint un-insulated duct surfaces visible through grilles and registers flat black.
- D. Prime and paint all bare, exposed, exterior piping using type specified in Painting Section.
- E. Prime and paint all grillage, supports, etc. located indoors except where noted to be galvanized.
- F. Other painting is specified in Painting Section, Finishes Division.

1.24 PIPE IDENTIFICATION:

- A. Identify all piping exposed to view or accessible through removable ceilings or access panels with plastic snap-on pipe line markers. Color code markers in accordance with ANSI A13.1. Show pipe contents and direction of flow. (Markers on lines 8" OD and smaller shall be taped in place; on lines over 8" OD secure with spring clips.) Markers shall be equal to Craftmark, Brady, Seton or Brimar.
- B. Protect all factory identification tags, nameplates, model and serial numbers, stenciling, etc., during construction and replace if damaged.
- C. Label Spacing and Extent:
 - 1. On straight run of pipes: Above suspended ceilings space labels approximately 10 feet on center; elsewhere, 20 feet on center.
 - 2. Wherever a pipe enters or leaves a room or building.
 - 3. At change of direction.
 - 4. At main valves and control valves (not equipment valves).
 - 5. At manifolds.
 - 6. On risers, just above and below roof.

1.25 VALVE TAGS:

- A. 2" X 3" laminated plastic with 1/2" numbers engraved at top, leaving space for further engraving by others. Secure tags with chains to valve yoke or stem, not handles.
- B. Valve tag colors:
 - 1. HVAC: White tags with black numbers.
- C. Valve tag locations: At all valves on mains, risers and branches (not equipment service valves).
- D. Valve tag numbers: Starting with Number 1, number tags in sequence from the lowest point to the highest point in the building. In existing buildings extend existing sequences.

1.26 VALVE CHARTS:

- A. In all mechanical rooms, provide charts showing number and locations of all labeled valves, type of service, etc. Laminate in heavy plastic and provide brass grommets for attaching to wall. Attach to wall with anchors and brass screws.
- B. In existing buildings include existing valves in the charts of new valves.

1.27 EQUIPMENT IDENTIFICATION:

- A. Provide 2" x 3" or larger laminated plastic nameplates with 1/2" numbers and letters in colors specified below. Screw tags to equipment in obvious locations. Engrave equipment designation and numbers as shown on plans and drawings on upper half of tag, leaving lower half of tag for future engraving by Owner.
- B. Provide similar nameplates for motor starters furnished under Division 23.
- C. Secure nameplates with acorn head screws.
- D. Colors:
 - 1. Equipment connected to utility power only - black letters on white nameplates.
 - 2. Equipment connected to emergency power - red letters on white nameplates.

1.28 EXHAUST FAN IDENTIFICATION:

- A. 2" X 3" or larger laminated plastic nameplates with red letters and numbers on white background, identifying type of fan, number according to plans, and rooms served. Engrave on upper half of tag, leaving lower half for engraving by Owner. Fasten with acorn head screws.

1.29 ACCESS DOORS:

- A. Furnish and install access doors for valves, fire dampers, dampers, controls, air vents, and other items located above non-liftout ceilings or behind partitions or walls. Doors in non-fire rated walls and ceilings: 16-gauge steel with hinges and screwdriver latches. Doors in fire rated walls and ceilings: UL labeled with fire rating equal to fire rating of wall or ceiling. Doors in security ceilings to be 10 ga. steel panels, white powder coat, 2" x 2" x 3/16" steel angle frame heavy duty butt hinges with security screws. Provide door styles compatible with adjoining surfaces as selected by Architect. Size doors to permit removal of equipment and/or maintenance. Doors: Bar-Co, Nystrom, Williams Bros., or equal.
- B. Mark lay-in ceilings with colored vinyl self adhering disc stuck on grid adjacent to maintenance access points.

1.30 TESTS, CLEANING & ADJUSTMENTS:

- A. General:
 - 1. All tests shall be witnessed by the Architect in addition to the authorities having jurisdiction. A minimum of 72-hours notice is required prior to performance of tests.
 - 2. All air duct pressure tests are specified in Section Air Distribution.
 - 3. All HVAC air and water balance work and HVAC equipment tests (other than hydrostatic tests) are specified in section 23 7000, "HVAC Testing & Balancing". Notify the Testing and Balancing Agency when systems are ready for balancing - see Section 23 7000, "HVAC Testing & Balancing".
 - 4. Testing and Balancing other than that noted above is specified in Section "HVAC Testing & Balancing".
 - 5. All instruments used for testing and balancing work shall have been calibrated within 6 months and checked for accuracy prior to start of work.
 - 6. Cooperate in the execution of work specified in Section 23 7000 HVAC Testing and Balancing and provide assistance as noted in Section 23 7000.
 - 7. Perform all tests as required by local codes. Contractor shall furnish testing equipment.
 - 8. If local codes are more stringent than the following, local codes shall govern.
- B. Chilled Water and Hot Water Systems:
 - 1. Before pipe covering has been installed, test all new work and make tight at two times operating pressure but not less than 45 psig. (Provide temporary crossovers and temporary pumps as required for cleaning new work before valves at connections to existing work are opened.)
 - 2. Correct or replace defective workmanship or materials shown by tests, and retest as necessary to insure tightness.

3. After systems have been made tight, provide a supervised program of chemical cleaning and degreasing prior to start-up. Program shall be supervised by the manufacturer of the chemicals involved and upon completion of the cleaning operation manufacturer shall provide a letter certifying that the cleaning program has been completed in accordance with these specifications. Sufficient chemicals shall be added to each system to establish a concentration of 0.5% detergent dispersant chemical containing a minimum of dioctylcufosuccinate or equal detergent and 10% dispersants containing polyacrylate and/or diphosphonate or equal. Systems shall then be circulated for a minimum of 8 hours, dumped, flushed, and refilled, with the correct corrosion inhibitors added for operation. Hand clean strainers after flushing.
 4. When systems have been refilled with water, vent air from system, turn on pumps and insure that flow has been established in all portions of systems.
- C. Refrigeration System: When system is complete, but before the pipe covering has been installed, test components with dry nitrogen and make tight at equipment manufacturer's recommended test pressures. Then evacuate the system to 26" Hg. vacuum which the system shall hold for 24 hours. After passing the above tests, charge and leak test under operating conditions using electronic leak detector.
- D. Air System:
1. Duct Cleaning:
 - a. Clean new duct system(s) before testing, adjusting, and balancing.
 - b. Use service openings for entry and inspection.
 - 1) Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation as recommended by insulation manufacturer. Comply with Section 236000 "Air Distribution" for access panels and doors.
 - 2) Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 - 3) Remove and reinstall ceiling to gain access during the cleaning process.
 - c. Particulate Collection and Odor Control:
 - 1) When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
 - 2) When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
 - d. Clean the following components by removing surface contaminants and deposits:
 - 1) Air outlets and inlets (registers, grilles, and diffusers).

- 2) Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 - 3) Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
 - 4) Coils and related components.
 - 5) Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
 - 6) Supply-air ducts, dampers, actuators, and turning vanes.
 - 7) Dedicated exhaust and ventilation components and makeup air systems.
- e. Mechanical Cleaning Methodology:
- 1) Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
 - 2) Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
 - 3) Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
 - 4) Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
 - 5) Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
 - 6) Provide drainage and cleanup for wash-down procedures.
 - 7) Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.
2. When system has been completed, remove all trash and dirt, leave all balancing dampers open and install specified filters in all equipment. Check all fan motors for rotation. Provide all items as required for work specified in Section 23 7000 "HVAC Testing & Balancing".
 3. Make pitot tube openings in kitchen range hood exhaust ducts by welding 1/2" pipe nipples to duct and capping nipples with pipe caps. Locate as required by Test and Balance Contractor.

- E. At the beginning of the first heating season, adjust and balance operating phases and repeat at the beginning of the first cooling season or vice-versa, as the case may be, all without charge.
- F. Start-Up and Service:
 - 1. The Contractor and factory authorized service representative for the variable frequency drives, and chillers shall place each item of such equipment into satisfactory operation with all automatic and safety devices. Further, all adjustment service required shall be performed during the warranty period. Adjustment services do not include lubricating fans or motors and does not include changing filters or adjusting belts.
 - 2. In addition, submit equipment manufacturers' start-up reports for items listed above. See Paragraph "Project Close-Out", below.

1.31 WARRANTY & INSTRUCTIONS:

- A. See General Conditions - One-Year Warranty.
- B. Contractor shall and hereby does warrant all materials, workmanship and equipment furnished and installed by him to be free from defects for a period of one year after date of substantial completion of the Contract. Should any defects in material, workmanship, or equipment be made known to Contractor within the one-year warranty period, Contractor shall replace such materials, workmanship, or equipment without charge.
- C. All reciprocating and scroll refrigeration compressors shall bear 5-year non-pro-rated parts warranty.
- D. After completion of the work, Contractor shall operate the equipment which he installs for a period of (10) working days, as a test of satisfactory operating conditions. During this time, Contractor shall instruct the Owner's operating personnel in the correct operation of the equipment.
- E. Provide PDF of manufacturer's operating and maintenance manuals and parts lists for all equipment and materials furnished. Provide a maintenance schedule listing routine maintenance operations and suggested frequency thereof. Include all warranty dates on equipment and guarantees.
- F. Any work performed on new or existing air conditioning/refrigeration equipment, whether inside or out, that requires removing the refrigerant from the system will require the use of a recovery/recycling unit. Intentional release of the refrigerant, regardless of type, will not be allowed.
- G. Any refrigerant removed from a system that has been properly recycled and has not been exposed to "burn out" can and should be reused in the system. Refrigerant that has been contaminated and cannot be reused after being properly recycled shall be reclaimed by the contractor and returned to the proper company representative.
- H. During the period of tests, adjust all controls, regulators, etc., to comply with these Specifications.
- I. Supply initial charges of refrigerant, refrigeration lubricating oil and anti-freeze necessary for the correct operation of the equipment. Maintain these charges during the guarantee period, with no additional cost to the Owner, unless loss of charge is the fault of the Owner.

- J. Make available to the Owner, without additional cost, warranty service and adjustment of the equipment for the guarantee period. Due to critical temperature guidelines Contractor shall respond to Owner's call for service within a 6 hour time period.

1.32 PROJECT CLOSE-OUT:

- A. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following:
1. A letter signed by the subcontractors for HVAC, electrical, temperature control work stating that they have jointly checked each power circuit and control circuit and mutually agree that each item is properly wired and that controls and power circuits will function properly.
 2. Record drawings - sheet metal work: PDF files and CAD files.
 3. Record drawings – piping: PDF files and CAD files.
 4. Record drawings - control systems: PDF files and CAD files.
 5. Control manufacturer's letter of certification.
 6. Air balance report PDF files. (See Section 23 7000 "HVAC Testing & Balancing").
 7. Water balance report PDF files. (See Section 23 7000 "HVAC Testing & Balancing").
 8. Equipment Submittal Data PDF files.
 9. Equipment operating and maintenance manuals PDF files.
 10. Maintenance schedule.
 11. Equipment warranty dates and guarantees.
 12. Pressure vessel certificates.
 13. List of Owner's Personnel who have received maintenance instructions.
 14. Install valve charts in Mechanical Rooms.
 15. Letter certifying that the cleaning program for the chilled water, and hot water systems has been completed in accordance to the specifications.
 16. Letter certifying and signed by Owner or his representative that the Owner or his representative has received the spare filters and pump seals specified for each HVAC system.
 17. Submit factory start-up reports for:
 - a. Variable frequency drives

18. Include with insulation material submittal letters from the insulation material manufacturer certifying that the insulation material does not contain asbestos in any shape, form or quantity.
19. Pete's plug test kits.
20. The Alabama Department of Environmental Management Permit.

1.33 TRAINING OF OWNER PERSONNEL:

- A. The General Contractor shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.
- B. The Engineer shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.
 1. The HVAC Engineer shall determine the special needs and areas where training will be most valuable. The Owner and Engineer shall decide how rigorous the training should be for each piece of commissioned equipment. The HVAC Engineer shall communicate the results to the Subs and vendors who have training responsibilities.
 2. Each Sub and vendor responsible for training shall submit a written training plan to the HVAC Engineer for review and approval prior to training. The plan will cover the following elements:
 - a. Equipment (included in training)
 - b. Intended audience
 - c. Location of training
 - d. Objectives
 - e. Subjects covered (description, duration of discussion, special methods, etc.)
 - f. Duration of training on each subject
 - g. Instructor for each subject
 - h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
 - i. Instructor and qualifications
 3. For the primary HVAC equipment, the Controls Contractor shall provide a short discussion of the control of the equipment during the HVAC or electrical training conducted by others.
 4. The General Contractor shall develop an overall training plan and shall coordinate and schedule, with the Subcontractors and other consultants, the overall training for the commissioned systems. The Engineer will recommend approval of the training to the Owner upon satisfactory completion using a standard approval form. The Owner and Contractors sign the approval form.

5. Video taping of the training sessions will be provided at the Owners request.
- C. HVAC Contractor. The HVAC Contractor shall have the following training responsibilities:
 1. Provide the HVAC Engineer and Owner with a training plan two weeks before the planned training.
 2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of HVAC equipment including, but not limited to, pumps, boilers, furnaces, chillers, heat rejection equipment, air conditioning units, air handling units, fans, terminal units, controls and water treatment systems, etc.
 3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
 4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
 5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
 6. The controls contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
 7. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
 8. Training shall include:
 - a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
 - b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
 - c. Discussion of relevant health and safety issues and concerns.
 - d. Discussion of warranties and guarantees.
 - e. Common troubleshooting problems and solutions.
 - f. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.

- g. Discussion of any peculiarities of equipment installation or operation.
 - h. The format and training agenda in The Commissioning Process, ASHRAE Guideline 0-2005.
 - i. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.
- 9. Hands-on training shall include start-up, operation in all modes possible, including manual, start-up shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.
 - 10. The HVAC contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not *controlled* by the central control system.
 - 11. Training shall occur after functional testing is complete, unless approved otherwise by the Owner.
 - 12. Minimum Duration of Training. The HVAC contractor shall provide training on each piece of equipment according to the following schedule.

Hours	System
8	Chillers and System
4	Piping Systems
1	Chemical Treatment
8	Air Handler Units
4	Variable Speed Drives
4	Air Terminal Units
4	Split System AC or Heat Pumps

1.34 GENERAL COMMISSIONING REQUIREMENTS

A. SUMMARY

- 1. This Section includes general requirements that apply to implementation of commissioning without regard to systems, subsystems, and equipment being commissioned.

B. DEFINITIONS

- 1. BoD: Basis of Design.
- 2. CxA: Commissioning Authority.
- 3. OPR: Owner's Project Requirements.
- 4. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.
- 5. TAB: Testing, Adjusting, and Balancing.

C. COMMISSIONING TEAM

1. Members Appointed by Contractor(s): Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.
2. Members Appointed by Owner:
 - a. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
 - b. Representatives of the facility user and operation and maintenance personnel.
 - c. Architect and engineering design professionals.

D. OWNER'S RESPONSIBILITIES

1. Provide the OPR documentation to the CxA and each Contractor for use in developing the commissioning plan; systems manual; operation and maintenance training plan; and testing plans and checklists.
2. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:
 - a. Coordination meetings.
 - b. Training in operation and maintenance of systems, subsystems, and equipment.
 - c. Testing meetings.
 - d. Demonstration of operation of systems, subsystems, and equipment.
3. Provide utility services required for the commissioning process.
4. Provide the BoD documents, prepared by Architect and approved by Owner, to the CxA and each Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

E. CONTRACTOR'S RESPONSIBILITIES

1. Provide utility services required for the commissioning process.
2. Each Contractor shall assign representatives with expertise and authority to act on behalf of the Contractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
 - a. Participate in design- and construction-phase coordination meetings.
 - b. Participate in maintenance orientation and inspection.
 - c. Participate in operation and maintenance training sessions.
 - d. Participate in final review at acceptance meeting.
 - e. Certify that Work is complete and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.
 - f. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
 - g. Review and approve final commissioning documentation.
3. Subcontractors shall assign representatives with expertise and authority to act on behalf of subcontractors and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
 - a. Participate in design- and construction-phase coordination meetings.
 - b. Participate in maintenance orientation and inspection.
 - c. Participate in procedures meeting for testing.
 - d. Participate in final review at acceptance meeting.
 - e. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to CxA for incorporation into the commissioning plan. Update schedule on a weekly basis throughout the construction period.
 - f. Provide information to the CxA for developing construction-phase commissioning plan.
 - g. Participate in training sessions for Owner's operation and maintenance personnel.
 - h. Provide updated Project Record Documents to the CxA on a daily basis.
 - i. Gather and submit operation and maintenance data for systems, subsystems, and equipment to the CxA, as specified in Division 1 Section "Operation and Maintenance Data."

- j. Provide technicians who are familiar with the construction and operation of installed systems and who shall develop specific test procedures and participate in testing of installed systems, subsystems, and equipment.

F. CxA'S RESPONSIBILITIES

1. Organize and lead the commissioning team.
2. Prepare a construction-phase commissioning plan. Collaborate with each Contractor and with subcontractors to develop test and inspection procedures. Include design changes and scheduled commissioning activities coordinated with overall Project schedule. Identify commissioning team member responsibilities, by name, firm, and trade specialty, for performance of each commissioning task.
3. Review and comment on submittals from each Contractor for compliance with the OPR, BoD, Contract Documents, and construction-phase commissioning plan. Review and comment on performance expectations of systems and equipment and interfaces between systems relating to the OPR and BoD.
4. Convene commissioning team meetings for the purpose of coordination, communication, and conflict resolution; discuss progress of the commissioning processes. Responsibilities include arranging for facilities, preparing agenda and attendance lists, and notifying participants. The CxA shall prepare and distribute minutes to commissioning team members and attendees within five workdays of the commissioning meeting.
5. At the beginning of the construction phase, conduct an initial construction-phase coordination meeting for the purpose of reviewing the commissioning activities and establishing tentative schedules for operation and maintenance submittals; operation and maintenance training sessions; TAB Work; and Project completion.
6. Observe and inspect construction and report progress and deficiencies. In addition to compliance with the OPR, BoD, and Contract Documents, inspect systems and equipment installation for adequate accessibility for maintenance and component replacement or repair.
7. Prepare Project-specific test and inspection procedures and checklists.
8. Schedule, direct, witness, and document tests, inspections, and systems startup.
9. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning report.
10. Certify date of acceptance and startup for each item of equipment for start of warranty periods.
11. Review Project Record Documents for accuracy. Request revisions from Contractor to achieve accuracy. Project Record Documents requirements are specified in Division 1 Section "Project Record Documents."

12. Review and comment on operation and maintenance documentation and systems manual outline for compliance with the OPR, BoD, and Contract Documents. Operation and maintenance documentation requirements are specified in Division 1 Section "Operation and Maintenance Data."
13. Prepare operation and maintenance training program and provide qualified instructors to conduct operation and maintenance training. Operation and maintenance training is specified in Division 1 Section "Demonstration and Training."
14. Prepare commissioning reports.
15. Assemble the final commissioning documentation, including the commissioning report and Project Record Documents.

G. COMMISSIONING DOCUMENTATION

1. Index of Commissioning Documents: CxA shall prepare an index to include storage location of each document.
2. OPR: A written document, prepared by Owner, that details the functional requirements of Project and expectations of how it will be used and operated. This document includes Project and design goals, measurable performance criteria, budgets, schedules, success criteria, and supporting information.
3. BoD Document: A document, prepared by Architect, that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
4. Commissioning Plan: A document, prepared by CxA, that outlines the schedule, allocation of resources, and documentation requirements of the commissioning process, and shall include, but is not limited to the following:
 - a. Plan for delivery and review of submittals, systems manuals, and other documents and reports. Identification of the relationship of these documents to other functions and a detailed description of submittals that are required to support the commissioning processes. Submittal dates shall include the latest date approved submittals must be received without adversely affecting commissioning plan.
 - b. Description of the organization, layout, and content of commissioning documentation (including systems manual) and a detailed description of documents to be provided along with identification of responsible parties.
 - c. Identification of systems and equipment to be commissioned.
 - d. Description of schedules for testing procedures along with identification of parties involved in performing and verifying tests.
 - e. Identification of items that must be completed before the next operation can proceed.
 - f. Description of responsibilities of commissioning team members.

- g. Description of observations to be made.
 - h. Description of requirements for operation and maintenance training, including required training materials.
 - i. Description of expected performance for systems, subsystems, equipment, and controls.
 - j. Schedule for commissioning activities with specific dates coordinated with overall construction schedule.
 - k. Identification of installed systems, subsystems, and equipment, including design changes that occurred during the construction phase.
 - l. Process and schedule for documenting changes on a continuous basis to appear in Project Record Documents.
 - m. Process and schedule for completing prestart and startup checklists for systems, subsystems, and equipment to be verified and tested.
 - n. Step-by-step procedures for testing systems, subsystems, and equipment with descriptions for methods of verifying relevant data, recording the results obtained, and listing parties involved in performing and verifying tests.
5. Test Checklists: CxA shall develop test checklists for each system, subsystem, or equipment including interfaces and interlocks, and include a separate entry, with space for comments, for each item to be tested. Prepare separate checklists for each mode of operation and provide space to indicate whether the mode under test responded as required. Provide space for testing personnel to sign off on each checklist. Specific checklist content requirements are specified in Division 01 Section "HVAC Commissioning Requirements." Each checklist, regardless of system, subsystem, or equipment being tested, shall include, but not be limited to, the following:
- a. Name and identification code of tested item.
 - b. Test number.
 - c. Time and date of test.
 - d. Indication of whether the record is for a first test or retest following correction of a problem or issue.
 - e. Dated signatures of the person performing test and of the witness, if applicable.
 - f. Individuals present for test.
 - g. Deficiencies.
 - h. Issue number, if any, generated as the result of test.

6. Certificate of Readiness: Certificate of Readiness shall be signed by each Contractor, Subcontractor(s), Installer(s), and CxA certifying that systems, subsystems, equipment, and associated controls are ready for testing. Completed test checklists signed by the responsible parties shall accompany this certificate.
7. Test and Inspection Reports: CxA shall record test data, observations, and measurements on test checklists. Photographs, forms, and other means appropriate for the application shall be included with data. CxA shall compile test and inspection reports and test and inspection certificates and include them in systems manual and commissioning report.
8. Corrective Action Documents: CxA shall document corrective action taken for systems and equipment that fail tests. Include required modifications to systems and equipment and revisions to test procedures, if any. Retest systems and equipment requiring corrective action and document retest results.
9. Issues Log: CxA shall prepare and maintain an issues log that describes design, installation, and performance issues that are at variance with the OPR, BoD, and Contract Documents. Identify and track issues as they are encountered, documenting the status of unresolved and resolved issues.
 - a. Creating an Issues Log Entry:
 - 1) Identify the issue with unique numeric or alphanumeric identifier by which the issue may be tracked.
 - 2) Assign a descriptive title of the issue.
 - 3) Identify date and time of the issue.
 - 4) Identify test number of test being performed at the time of the observation, if applicable, for cross-reference.
 - 5) Identify system, subsystem, and equipment to which the issue applies.
 - 6) Identify location of system, subsystem, and equipment.
 - 7) Include information that may be helpful in diagnosing or evaluating the issue.
 - 8) Note recommended corrective action.
 - 9) Identify commissioning team member responsible for corrective action.
 - 10) Identify expected date of correction.
 - 11) Identify person documenting the issue.
 - b. Documenting Issue Resolution:
 - 1) Log date correction is completed or the issue is resolved.

- 2) Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.
- 3) Identify changes to the OPR, BoD, or Contract Documents that may require action.
- 4) State that correction was completed and system, subsystem, and equipment is ready for retest, if applicable.
- 5) Identify person(s) who corrected or resolved the issue.
- 6) Identify person(s) documenting the issue resolution.
- c. Issues Log Report: On a periodic basis, but not less than for each commissioning team meeting, CxA shall prepare a written narrative for review of outstanding issues and a status update of the issues log. As a minimum, CxA shall include the following information in the issues log and expand it in the narrative:
 - 1) Issue number and title.
 - 2) Date of the identification of the issue.
 - 3) Name of the commissioning team member assigned responsibility for resolution.
 - 4) Expected date of correction.
10. Commissioning Report: CxA shall document results of the commissioning process including unresolved issues and performance of systems, subsystems, and equipment. The commissioning report shall indicate whether systems, subsystems, and equipment have been completed and are performing according to the OPR, BoD, and Contract Documents. The commissioning report shall include, but is not limited to, the following:
 - a. Lists and explanations of substitutions; compromises; variances in the OPR, BoD, and Contract Documents; record of conditions; and, if appropriate, recommendations for resolution. This report shall be used to evaluate systems, subsystems, and equipment and shall serve as a future reference document during Owner occupancy and operation. It shall describe components and performance that exceed requirements of the OPR, BoD, and Contract Documents and those that do not meet requirements of the OPR, BoD, and Contract Documents. It may also include a recommendation for accepting or rejecting systems, subsystems, and equipment.
 - b. OPR and BoD documentation.
 - c. Commissioning plan.
 - d. Testing plans and reports.
 - e. Corrective modification documentation.
 - f. Issues log.

- g. Completed test checklists.
 - h. Listing of off-season test(s) not performed and a schedule for their completion.
11. Systems Manual: CxA shall gather required information and compile systems manual. Systems manual shall include, but is not limited to, the following:
- a. OPR and BoD, including system narratives, schematics, and changes made throughout the Project.
 - b. Project Record Documents as specified in Division 1 Section "Project Record Documents."
 - c. Final commissioning plan.
 - d. Commissioning report.
 - e. Operation and maintenance data as specified in Division 1 Section "Operation and Maintenance Data."
12. SUBMITTALS
- a. Commissioning Plan Prefinal Submittal: CxA shall submit two hard copies of prefinal commissioning plan. Deliver one copy to each Contractor, one to Owner, and one to Architect. Present submittal in sufficient detail to evaluate data collection and arrangement process. One copy, with review comments, will be returned to the CxA for preparation of the final construction-phase commissioning plan.
 - b. Commissioning Plan Final Submittal: CxA shall submit two hard copies and two sets of electronically formatted information of final commissioning plan. Deliver one hard copy and one set of discs to Owner, and one copy to Architect. The final submittal must address previous review comments. The final submittal shall include a copy of the prefinal submittal review comments along with a response to each item.
 - c. Test Checklists and Report Forms: CxA shall submit sample checklists and forms to each Contractor quality-control manager and subcontractors for review and comment. Submit two copies of each checklist and report form.
 - d. Certificates of Readiness: CxA shall submit Certificates of Readiness.
 - e. Test and Inspection Reports: CxA shall submit test and inspection reports.
 - f. Corrective Action Documents: CxA shall submit corrective action documents.
 - g. Prefinal Commissioning Report Submittal: CxA shall submit two hard copies of the prefinal commissioning report. Include a copy of the preliminary submittal review comments along with CxA's response to each item. CxA shall deliver one copy to Owner and one copy to Architect. One copy, with review comments, will be returned to the CxA for preparation of final submittal.

- h. Final Commissioning Report Submittal: CxA shall submit two hard copies and two sets of electronically formatted information of the final commissioning report. CxA shall deliver one hard copy and one set of discs to Owner, and one copy to Architect. The final submittal must address previous review comments and shall include a copy of the prefinal submittal review comments along with a response to each item.

13. QUALITY ASSURANCE

- a. Instructor Qualifications: Factory-authorized service representatives, experienced in training, operation, and maintenance procedures for installed systems, subsystems, and equipment.
- b. Test Equipment Calibration: Comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately whenever instruments have been repaired following damage or dropping. Affix calibration tags to test instruments. Instruments shall have been calibrated within six months prior to use.

14. COORDINATION

- a. Coordinating Meetings: CxA shall conduct monthly coordination meetings of the commissioning team to review progress on the commissioning plan, to discuss scheduling conflicts, and to discuss upcoming commissioning process activities.
- b. Pretesting Meetings: CxA shall conduct pretest meetings of the commissioning team to review startup reports, pretest inspection results, testing procedures, testing personnel and instrumentation requirements, and manufacturers' authorized service representative services for each system, subsystem, equipment, and component to be tested.
- c. Testing Coordination: CxA shall coordinate sequence of testing activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1) Schedule times for tests, inspections, obtaining samples, and similar activities.
- d. Manufacturers' Field Services: CxA shall coordinate services of manufacturers' field services.

END OF GENERAL PROVISIONS - HVAC

SECTION 23 1000

MATERIALS AND METHODS – HVAC

PART 1 - GENERAL

1.1 SCOPE:

- A. Section 23 0500 - "General Provisions - HVAC" shall apply to and become part of this Section.

PART 2 - MATERIALS: (All pipe, fittings and valves shall be manufactured in the United States of America)

2.1 CHILLED WATER PIPING:

- A. Schedule 40 black steel pipe, ASTM A53 or A106, grade B. Fittings 2" and smaller, 150 psig WSP black malleable iron. Fittings 2-1/2" and larger, butt welding fittings. No mitering or notching for fittings permitted. Weldolets permitted where branch size is 2 pipe sizes smaller than main. 45 degree saddles permitted where shown.
- B. Unions 2" and smaller black malleable, ground joint, screwed. Union 2-1/2" and larger, flanged.
- C. All flanges shall be flat faced. Flange gaskets shall be nonasbestos compressed material in accordance with ASME B16.21, minimum 1/16 in thickness, full face type. Gaskets shall contain aramid fibers bonded with styrene butadiene rubber (SBR) or nitrile butadiene rubber (NBR). Bolts, nuts, and bolt patterns shall conform to ASME B16.1 Gaskets shall be Garlock Blue-Gard 3000 or approved equal.
- D. At Contractor's option runouts to room fan-coil AC Units may be type L hard copper with wrought copper sweat fittings made with 95-5 solder.

2.2 HVAC DRAIN PIPING:

- A. Standard weight galvanized steel pipe ASTM A106 with galvanized malleable iron fittings, or type L hard copper with wrought copper sweat fittings, at Contractor's option.
- B. Provide drain traps for AC unit drain pans. Size traps as required to drain under operating conditions. See trap detail on drawings.

2.3 HOT WATER PIPING:

- A. Schedule 40 black steel pipe, ASTM A53 or A106, grade B. Fittings 2" and smaller, 125 psig W.P. cast iron screwed fittings. Fittings 2-1/2" and larger, butt welding fittings. No mitering or notching for fittings permitted. Weldolets permitted where branch size is 2 pipe sizes smaller than main. 45 degree saddles permitted where shown.

- B. Unions 2" and smaller black malleable, ground joint, screwed. Union 2-1/2" and larger, flanged.
- C. All flanges shall be flat faced. Flange gaskets shall be nonasbestos compressed material in accordance with ASME B16.21, minimum 1/16 in thickness, full face type. Gaskets shall contain aramid fibers bonded with styrene butadiene rubber (SBR) or nitrile butadiene rubber (NBR). Bolts, nuts, and bolt patterns shall conform to ASME B16.1. Gaskets shall be Garlock Blue-Gard 3000 or approved equal.
- D. At Contractor's option runouts to room fan-coil AC Units may be type L hard copper with wrought copper sweat fittings made with 95-5 solder.

2.4 REFRIGERATION PIPING:

- A. Type L hard drawn copper tubing with wrought copper sweat fittings. Joints: silfossed with continuous flow of dry nitrogen through lines.
- B. Size all lines per manufacturer's recommendations and requirements based on actual line lengths, distances, and elevations, so as to ensure oil return at minimum loading.
- C. Small lines 5/8" OD and smaller may be soft copper with flare fittings, provided that all joints are exposed for visual inspection.
- D. Refrigerant piping shall not be left open for a period longer than necessary to assemble the piping, provide nitrogen flow, and solder. In no case shall any piping assembled or stored be left open at the end of the day. Pipe that is assembled but not soldered is open. Piping that is stored shall not be used if it has lost the manufacturer's nitrogen charge.

2.5 HVAC VALVES:

- A. Hot Water, and Chilled Water Valves:
 - 1. Gate valves 2" and smaller: All bronze, 150 psig WSP, threaded ends, rising stem, union bonnet, solid disc, Nibco #T-134, Milwaukee #1151, or Watts B-3100.
 - 2. Gate valves 2-1/2" and larger: Flanged, iron body, brass trim, 125 psig WSP, wedge disc, non-rising stem, Nibco #F-619, Milwaukee #F-2882-A Domestic, or Watts F502.
 - 3. Globe valves 2" and smaller: All bronze, 150 psig WSP, composition disc, rising stems, Nibco #T-235Y, Milwaukee #590T, or Watts B-4010-T.
 - 4. Globe valves 2-1/2" and larger: Iron bodies, brass trim, 125 psig WSP, flanged, Nibco #F-718B, Milwaukee #F-2981-A, or Watts F-501.
 - 5. Check valves 2" and smaller: 125 psig WSP, threaded ends, brass or bronze body, spring loaded, composition disc, Metraflex, Nibco #T-480Y, Watts #600, or Techno 5002-BR.

6. Check valves 2-1/2" and larger: 125 WSP, spring loaded, non-slam, center guide, globe check valves for installation between faces of 125# cast iron ASA 150 flanges, iron body, bronze seat and disc, stainless steel spring. Metraflex style 900, Nibco F-910, or equal by Keystone, Milwaukee, or Watts. Install a minimum of 5 pipe diameters from pump discharge.
 7. Ball valves for hot water: 600 psig WOG, screwed bodies, chrome plated bronze balls, full port, teflon packing, bronze stem and steel handle, suitable for 350°F operating temperature. Include valve handle extension to clear 2" insulation. Nibco Nib-Seal T585-70 (domestic), full port. Provide extension stem capable of clearing 2" insulation, with memory stop, when operated will not disturb vapor seal of insulation.
 8. Ball valves for chilled water: 600 psig WOG, screwed bodies, chrome plated, full port, bronze ball, TFE packing, bronze stem and extended handle to accommodate 2" of insulation. Nibco Nib-Seal, T585-70 (domestic), Apollo 77C with thermal seal handle, full port. Provide non-metallic extension stem capable of clearing 2" insulation, with memory stop, when operated will not disturb vapor seal of insulation.
 9. Butterfly valves: 200 psi WSP, designed for installation between ASA 150 flanges. Valves shall have ductile iron bodies with tapped lugs for independent bolting to upstream and downstream flanges, bubble tight (rated for bi-directional "dead end" service) under full-rated pressure with no flange on downstream side. Aluminum-Bronze discs, 416 stainless steel stems, EPDM seats and stem seals, extended neck at least 2" beyond OD of flanges, lever handles with infinite throttling and memory stops for valves 6" and smaller, gear operators with memory stops capability for valves 8" and larger. Valves shall be rated for 250°F operating temperature. Provide padlock connections for valves located outdoors. Nibco LD-2000, Demco - NEC5114351 or Dezurik - BG5XLIDIEBS2.
- B. For all valves over 7 feet above the floor, provide chain wheels with chains extending to 6-1/2 feet above the floor.
- C. Control valves: Specified in Control/BAS/DDC Section.
- D. Non-return (Stop-Check) valves: 250 psig, flanged, angle Y pattern, iron body, nickel plated steel stems, bronze seat rings, NIBCO #F-869B, or Watts F-526.

2.6 PIPE HANGERS:

- A. General: Pipe hangers, Anvil, PHD, Michigan Hanger, B-Line or Elcen. Anvil figure numbers are given for reference. Provide copper clad or plastic coated hangers on bare copper lines.
- B. Equip pipe hangers with vibration isolators as specified under Vibration Isolators.
- C. Pipe hangers for lines 3" and smaller: adjustable wrought ring hangers, Anvil Fig. 97 or 69 or wrought clevis hangers.
- D. Pipe hangers for piping 4" and larger: adjustable wrought clevis hangers.

- E. Parallel piping graded in same direction may be grouped on trapezes. Trapezes for line 4" and smaller, Unistrut P2000 channel, or equal, with rods sized as specified below for largest pipe on trapeze. Guide lines on (but not anchor to) trapezes using Unistrut Series P1100 clamps. Trapezes shall not exceed 3' in length. Space lines to allow at least 3" clear between adjacent pipe or pipe covering and between pipes or pipe covering and rods. Space trapezes as specified for pipe hangers based upon smallest size of pipe on trapeze.
- F. Provide riser clamps on pipe risers on each floor. Clamps in contact with copper or plastic pipe, plastic coated.
- G. Beam Clamps: Anvil Fig. 228.
- H. Inserts for hangers in concrete structures: Underwriter's listed cast iron inserts. Anvil Fig. 282.
- I. For fasteners in existing concrete structures use drilled in expansion anchors with load rating at least 150% of pipe hanger rating (powder driven anchors are not acceptable).
- J. Size rods for pipe hangers not smaller than the following: 3/8" rods for pipe up to 2", 1/2" for 2-1/2" and 3" pipe, 5/8" rods for 4" and 5" pipe, 3/4" rods for 6" pipe, and 7/8" rods for 8", 10" and 12" pipe.
- K. Space pipe hangers at maximum: Pipe hanger spacing for screwed, solder joint and welded piping: 1/2" and 3/4", 6 ft.; 1" to 1-1/4", 8 ft.; 1-1/2" to 2-1/2", 10 ft.; 3" and over, 12 ft. Install additional hangers at change of direction, valve clusters, and at all duct and unit mounted coils.
- L. Install pipe hangers on insulated pipe over pipe covering. Provide factory fabricated insulated pipe shields equal to Pipe Shields, Inc. "Thermal Hanger Shields" or Tru-Balance insulated saddles at hangers. Provide shield insulation of rigid calcium silicate indoors or rigid Perlite Silicate outdoors, the same thickness as adjacent pipe covering. (At Contractor's option, pipe shields may be field fabricated using rigid calcium silicate or foamglass insulation with ASJ and 20 gauge galvanized steel protector. Shield length: 1.5 times nominal pipe size but not less than 4".)
- M. Wrap bare copper refrigerant lines with sheet lead or molded plastic sleeve at hangers.

2.7 VIBRATION ISOLATION:

- A. General: Mount piping and rotating equipment using vibration isolators as specified below. Amber Booth, Korfund, Mason Industries, Peabody, Vibration Eliminator Co., or VMC. Mason Industries part numbers are given for reference. Minimum 95% isolation efficiency.
- B. Isolators for Suspended Equipment: Combination steel spring and rubber in shear isolators, #30N. Static deflections: As required to provide 95% isolation efficiency or 1" static deflection, whichever is greater. Provide isolators for all suspended rotating equipment.
- C. Isolators for Pipe Hangers:
 - 1. Equip all pipe hangers on compressed air, vacuum, chilled water, hot water and condenser water lines in equipment rooms with 1" static deflection combination neoprene and spring isolators, #30N.

2. Mount piping riser supports on chilled water and hot water lines using 0.1" static deflection all directional neoprene anchors: #ADA.
- D. Provide snubbing isolators, similar to those specified above for pipe hangers for flexible connections at fans.
- E. Flexible connections in water lines: Laminated 3-ply corrugated 304 stainless joints designed for 150 psig WP. Joints shall be flanged. For each joint furnish a control unit consisting of tie bolts with required nuts, spacers, 1" deflection springs, washers, and stop and lock nuts. Size spring ID to match tie-bolts or provide washers with sleeves to center springs on tie-bolts. Minimum 1/2" diameter bolts for connectors 6" diameter or less and 3/4" diameter bolts for connections larger than 6". All thread rods shall not be used for tie bolts. Nuts and bolts for joints in chilled water lines shall be type 304 stainless steel. Ship from factory with wood blocks at relaxed length with spring tensions factory set. Flexible connections Keflex, Flexonics, Hyspan, Southeastern Hose or approved equal. Provide samples if specifically requested (samples will be returned to vendor).

2.8 THERMOMETERS AND GAUGES:

- A. Non-mercury in glass blue reading separable socket industrial thermometers with die cast aluminum or high impact plastic casings of appropriate pattern for each installation, 9" scale lengths and ranges shown, Palmer, Trerice or Weksler. Install thermometers in brass or stainless steel wells. Equip thermometers installed in insulated lines with 1" extension stems or stems long enough to permit unions to clear insulation whichever is greater.
- B. Where shown install brass thermometer wells with screwed caps. Install wells at an angle to retain oil. Size well to fit thermometers specified.
- C. Enlarge pipe 2" and smaller to 2-1/2" at thermometers and thermometer wells.
- D. Install 4-1/2" dial pressure gauges where shown. Gauges shall have bronze or stainless steel bourdon tubes, 316 stainless steel movement, aluminum or polypropylene solid front cases, adjustable micrometer pointer and accuracy Grade 2A not less than 1/2% of full scale over the entire range, without mounting flange. Gauges shall be Ashcroft 1279, Marsh Series P01, Trerice 450-B, Weksler AA44-2 or U.S. Gauge 1980L with minimum bourdon tube diameter of 3". Provide ball valves for all pressure gauges. Provide siphons for steam gauges.
- E. Where shown, provide temperature and pressure measurement plugs and caps equal to Peterson Equipment Co., Inc. "Pete's plug with Nordel seats and seals". Provide one Pressure and Temperature Kit consisting of a 0-100 psi pressure gauge with adaptors, and two thermometers (25-125°F and 0-220°F), all in carrying cases. Provide nipples for Pete's plugs as required to extend thru pipe insulation.

2.9 ELECTRIC PIPE LINE HEATERS:

- A. Electric heaters equal to Chemetron "Auto-Trace," Letco with "Self Regulator" or Chromolox "Self Regulating Rapid Trace" heating cable, 3.9 watts/foot to prevent freezing in 0°F ambient. Equip heaters with conduit connectors and outdoor thermostat set at 32°F.

B. Extent:

1. All chilled water supply and return lines outdoors.

2.10 UNDERGROUND INSULATED PIPING SYSTEM (CHILLED WATER, AND HOT WATER LINES)

- A. Furnish and install underground, insulated piping as shown. Provide single pipe installed within a prefabricated PVC or FRP conduit casing. Jacketing material: High impact, seamless polyvinylchloride (PVC) Class 12454-B compound conforming to ASTM D1784, Type 1, Grade 1 or filament wound polyester resin/fiberglass reinforced composite (FRP). Minimum jacket thickness 120 mils (PVC) or 85 mils (FRP). Carrier pipe shall be schedule 40 steel, ASTM A-53, Grade B with beveled ends for welding. Piping system shall be rated for minimum 250 °F.
- B. The unloading, handling and installation of the underground-insulated piping system shall be in strict accordance with the manufacturer's recommendations. Before installation, a factory-trained representative of the pipe manufacturer shall examine the pipe for damage. All damaged piping shall be repaired in accordance with manufacturer's recommendations or discarded. A qualified, factory-trained representative of the piping manufacturer shall be present during all critical periods of the installation and testing of the piping system, and shall furnish a certificate upon completion of the installation indicating that the system was installed in accordance with the manufacturer's recommendations. The factory representative shall provide training to the contractor for installation of joints, fittings, etc. and shall supervise the installation of all pipe and jacket joints.
- C. Hydrostatically test all piping in the field under a pressure of 250 psig or twice the working pressure, whichever is greater, and hammer test all piping joints. All pressure testing shall be conducted prior to any joint insulation in the presence of the owner's representative. If any joints are covered prior to observation of testing by the owner's representative, and his submission of a written authorization to proceed, the joints shall be uncovered and the system shall be retested. Give 24 hours prior notice to architect prior to testing.
- D. Piping shall be insulated with two component Polyurethane Foam, none shrinking, 3.0 lbs/cubic foot density, 0.140 BTU-inch/hour-°F-ft², closed cell content of 90-95% in conformance with MIL-1-24172 and ASTM C-591 completely filling the annular space between carrier pipe and jacketing. Minimum insulation thickness shall be 1.5 inches. Carrier pipe shall be concentric to casing pipe within ¼" at the casing center point and within 1/16" at the end seals. After welding and testing, all joints shall be insulated and sealed in accordance with manufacturer's recommendations.
- E. All fittings including elbows, expansion loops, anchor plates, and oversized jacketing for expansion shall be factory fabricated, insulated and jacketed. All expansion capability required for the system shall be provided in expansion loops or expansion elbows. Only straight pipe joints shall be field fabricated and insulated. Submit piping layout with routing, expansion loops, expansion elbows, anchors, thrust blocks, etc. as recommended by the piping manufacturer. Submit details of all factory fabricated fittings, expansion elbows, and expansion loops. All fittings shall be of the same material as the straight pipe. Provide concrete thrust blocks at piping anchors as recommended by the manufacturer.
- F. Provide rubber end seals tight fitting to carrier pipe for each section of pipe and fittings. Rubber end seals shall be high temperature heat resistant Ethylene Propylene Diene Monomer (EPDM). Provide jacket end caps where piping system terminates underground and PVC insulation caps where piping terminates in mechanical rooms. Painted mastic end seals are not acceptable.

- G. Furnish and install a concrete anchor block poured around each steel anchor plate in accordance with details and manufacturer's recommendations. The anchor plates shall be 1/2" thick steel plates welded to the carrier pipe and sealed to the pipe jacketing in accordance with manufacturer's recommendations. Submit anchor plate details.
- H. Base of trench shall be of clean earth, sand, or limestone screening to provide a 4" thick bed properly hand tamped. Backfill shall be clean earth, sand, or limestone screening completely enveloping piping on both sides and top to a minimum thickness of 18". All backfill shall be carefully hand tamped in 6" layers until 18" has been deposited over top of bed and placement of piping prior to beginning backfilling and first 6" thick hand tamped backfill layer. If the owner's representative does not observe the pipe bed or backfill and submit a written authorization to proceed, then all backfill shall be removed and reinstalled in accordance with the above methods. Give 24 hours prior notice to Architect prior to required observation by owner's representative.
- I. The underground piping system shall be Thermacore Ferro – Therm SC. For consideration of other manufacturers, submit complete manufacturer's product data and experience of local representative. Verify existing underground piping manufacturer's for connection to existing.

PART 3 - EXECUTION

3.1 PIPE INSTALLATION:

- A. Cut pipe square and ream full size after cutting. Clean pipe. Make threaded joints with Teflon tape. Do not spring pipe into place.
- B. For glycol solutions, joints on black steel screwed pipe made up with thread sealant compatible with glycol; Rectorseal No. 7, or equal.
- C. Provide welding material and labor in accordance with the welding procedures of the Heating, Piping, and Air Conditioning Contractors' National Association or other approved procedure conforming to the requirements of ANSI B31.9 "Building Service Piping". Employ only welders fully qualified in the above specified procedure and currently certified by recognized testing authority. Use either electric arc or oxyacetylene welding. Provide full perimeter welds at both face end and collar end of each slip-on flange.
- D. Install piping to allow for expansion. Make connections to all equipment to eliminate undue strains in piping and equipment. Furnish necessary fittings and bends to avoid springing of pipes during assembly.
- E. Pitch air conditioning unit drain lines down in direction of flow 1" in 20'. Grade chilled and hot water supply and return lines down to drains and up to air vents.
- F. Install chrome plated floor and ceiling plates on pipe passing through finished surfaces in finished spaces.
- G. Make horizontal water supply line size reductions using eccentric reducers (tops flat in water lines).
- H. Install 3/4" ball valve drains with hose adaptors at low points of water piping and at bases of all risers (where shown provide larger drains). Provide screwed caps with chains on hose adaptors.

- I. Make connections to equipment using screwed unions in sizes 2" and smaller and flanged unions in sizes 2-1/2" and larger. Install unions in all piping connections to each piece of equipment. Provide unions on all sides of control valves.
- J. Wherever ferrous pipes or tanks and copper tubing connect, provide dielectric insulating unions or couplings, equal to Victaulic style 47, "V-line" insulating couplings as manufactured by Lochinvar, thread to thread or CTS fabrication flange adaptors for flange connections.
- K. Near heating and air conditioning equipment requiring water provide valved and capped water outlets of sizes shown for connection to equipment, including reduced pressure principal backflow preventers. Make final connections under HVAC work. Note that all piping and insulation downstream from backflow preventer must be painted yellow.
- L. Run piping concealed, except where specifically shown or specified to be exposed. Plumb all vertical lines and run mains parallel to building walls unless specifically shown otherwise.
- M. Lay underground pressure piping so top of pipe is at least 18" below finished grade. Support all underground piping solidly along body of pipe. Strongly suspend other piping from building construction.
- N. Pipe shall be braced at flexible connections to prevent blowouts under operating conditions.
- O. Run no piping or tubing in direct contact with slag fill. Where necessary to pass through slag, protect piping with not less than two wrappings of polyvinyl chloride tape or equivalent protection approved by Architect.

3.2 INSTALLATION OF VALVES:

- A. Provide shut-off valves in supply and return connections to each item of equipment. Locate valves to isolate each item to facilitate maintenance and/or removal.
- B. Provide check valve in discharge line adjacent to each pump.
- C. Locate valves in piping connections to coils, boilers, heat exchangers, refrigeration machine, etc., so heads and tube bundles can be removed without disconnecting equipment or piping other than union or flange connections immediately adjacent to the equipment.
- D. Provide sweat to screw adaptors where required.
- E. Install with valve stems upright or horizontal.

END OF MATERIALS AND METHODS - HVAC

SECTION 23 1500

THERMAL AND ACOUSTICAL INSULATION FOR HVAC SYSTEMS

PART 1 - GENERAL

1.0 GENERAL:

- A. All external duct insulation and flexible duct shall be legibly printed or identified at intervals not greater than 36 inches with the name of the manufacturer, the thermal resistance R-value at the specified installed thickness and the flame spread and smoke-developed indexes of the composite materials.
- B. All insulation (except duct liner) shall be installed by an insulation contractor in business a minimum of 3 years as an insulation contractor and has completed projects similar in scope to this project. Submit insulation contractor qualifications.
- C. The installation of all insulation shall comply with the requirements of the contract documents unless specifically noted and approved in submittal document. Compliance with contract documentation shall be demonstrated by the insulation contractor as follows:
 - 1. Specific and random selections of the installed insulation shall be removed by the insulation contractor for observation by the owner's representative. The insulation samples removed shall be selected by the owner's representative.
 - 2. The insulation removed per observation selection shall not exceed 6 linear feet of piping insulation (including fittings) or 4 sq. ft. of ductwork or equipment insulation if the sample removed indicates compliance with the contract documents. If the sample removed does not indicate compliance with the contract documents, additional samples shall be removed for observation as directed by the owner's representative up to a total of 4 samples.
 - 3. The total number of observations shall not exceed 10 per project unless the installation of the insulation is found not to comply with the contract documents. Otherwise, the total number of observations shall be as required by the owner's representative to confirm compliance.
 - 4. If the insulation is found not to be installed as required by the contract documents, the insulation shall be removed and new insulation installed to comply with the specifications. After completion of the new insulation, the testing procedure noted above shall be repeated.

1.1 SCOPE:

- A. Section 23 0500 - "General Provisions – HVAC" shall apply to and become part of this Section.
- B. Repair existing insulation at points of connection and/or alterations to existing work.

- C. "Exposed" is defined as: Exposed to view when construction is complete. (Items which are not "exposed" are considered "concealed".)
- D. The use of any material containing asbestos is strictly prohibited.
- E. Include with insulation material submittal letters from the insulation material manufacturer certifying that the insulation material does not contain asbestos in any shape, form or quantity.

1.2 INSULATION:

- A. Comply with NFPA 90A.
- B. Pipe hanger shields are specified in Section 23 1000 - "Materials and Methods - HVAC."
- C. Use insulation and adhesives with Underwriter's Laboratories and ASTM E-84 flame spread rating not over 25 without evidence of continued progressive combustion, and smoke developed rating not exceeding:
 - 1. 50 for pipe covering located in air ducts, plenum or casings.
 - 2. 150 for all other pipe, duct and equipment insulation.

PART 2 - MATERIALS

2.1 FIBERGLASS PIPE COVERING:

- A. Snap-on glass fiber insulation minimum density 5#/cu. ft. maximum thermal conductivity at 75°F mean temperature 0.25 BTU/(hr)(sq. ft.)(°F/in) with UL rated vinyl coated and embossed vapor barrier laminate of aluminum foil and kraft reinforced with glass fiber yarns (ASJ).
- B. For all lines seal jacket with self sealing lap. Butt adjoining sections of insulation tightly and seal with self-adhering butt joint strips.
- C. Cover fittings to thickness of adjacent covering with factory pre-molded fitting covers. Cover flanged valve bodies and flanged unions. Do not cover screwed unions on hot lines. Finish concealed fittings with a skim-coat of mastic and when mastic is dry, fitting shall be covered with glass fab and vinyl acrylic mastic unless otherwise noted below. Zeston type fitting covers may be substituted for glass fab and final coat of mastic on concealed fittings provided fire and smoke ratings are met. Finish fittings exposed in equipment rooms, and in finished spaces with vinyl acrylic mastic over glass fab over mastic.
- D. At contractor's option, concealed tees may be insulated with field fabricated tee covers consisting of straight pipe covering on run of tee with notch at branch together with pipe covering on branch contoured to fit notch. Glass fab over skim coat of mastic shall be applied around main, lapping contoured joint at branch by 2" minimum for the full 360° of joint. Cover entire fitting covering with vinyl-acrylic mastic over glass fab, 1/8" thick (dry) coat. Submit sample of fabricated tee covering to Architect for approval before work is begun.

2.2 CELLULAR GLASS PIPE COVERING, RIGID:

- A. Cellular glass insulation having a maximum K factor at 50°F mean temperature not exceeding 0.28, and a compressive strength not less than 87#/sq. in., Pittsburgh Corning "Foamglas".
- B. Apply pipe covering in a single layer. Tightly butt and butter all joints and seams with vapor barrier mastic. Finish with a UL rated vapor barrier laminate of aluminum foil and Kraft reinforced with fiberglass yarn. Seal all laps and butt strips with suitable adhesive and cover with coat of vinyl acrylic mastic.
- C. Insulate fittings with prefabricated or field fabricated fitting covers of the same material, buttered with mastic, securely held in place with stainless or copper wire with twisted ends turned in or fiberglass packing tape. Finish with glass fab over vinyl acrylic mastic with flooding coat of mastic applied over fabric.
- D. Fit pipe hangers over insulation (See PIPE HANGERS). Hanger Shields are specified under pipe hangers.
- E. Finish piping and fittings on outdoor piping with aluminum jacket (see below).

2.3 FOAMED PLASTIC PIPE COVERING: (DO NOT USE IN PLENUMS UNLESS COMPLIES WITH PARAGRAPH 1.2 ABOVE):

- A. Fire retardant foamed plastic pipe covering, maximum K factor at 75°F mean temperature not exceeding 0.27 BTU/(hr)(sq.ft.)(°F/in).
- B. Pipe covering may be seamless insulation slipped over piping before erection or may be slit longitudinally and installed over erected piping.
- C. Make fitting covers from segments of pipe covering.
- D. Cement all joints and seams in accordance with manufacturer's instruction.
- E. Fit pipe hangers over insulation (see PIPE HANGERS). Use hanger shields as specified under pipe hangers.
- F. Where exposed outside, cover insulation with aluminum jacket (see below).
- G. Armacell, Aeroflex or Normaco.

2.4 ALUMINUM JACKET (PIPING):

- A. 0.016" thick smooth aluminum jacket with laminated polyethylene and kraft paper adhered liner.
- B. Roll jacket slightly smaller than insulation diameter and secure in place with flat aluminum bands 12" o.c. Lap jacket minimum 2" and place overlap at $\pm 120^\circ$ arranged to shed water.
- C. Finish fittings on aluminum jacketed lines with 1/8" thick (dry) coat of vinyl acrylic mastic reinforced with glass cloth. In addition, provide preformed aluminum fitting jackets for outdoor fittings.

- D. Seal all joints on fitting covers with silicone sealant.

2.5 COLD EQUIPMENT INSULATION (RIGID):

- A. Cellular glass insulating board having a thermal conductivity at 75°F mean temperature not exceeding 0.35 BTU/ (hr) (sq ft) (°F/in). Provide beveled lags for the particular diameter fastened in place with stainless steel bands. Butter all joints with vapor sealer mastic and tightly butt joints.
- B. Finish: Cover with white open weave glass cloth, 10-20 mesh embedded in and coated with a 1/8" dry coat Vinyl Acrylic Mastic.

2.6 DUCT INSULATION, EXTERNAL, FOR CONCEALED DUCTS:

- A. Flexible glass fiber insulation with foil-scrim-kraft (FSK) facing. Flame spread classification, 25 or less, smoke developed rating not exceeding 50. Minimum density, 1 lb./cu. ft., maximum thermal conductivity at 75°F mean temperature 0.26 BTU/(hr)(sq. ft.)(°F/in).
- B. Fire-retardant foamed plastic insulating board having a thermal conductivity at 75° mean temperature not exceeding 0.27 BTU/(hr)(sq.ft.)(°F/in.). Fasten in place and seal joints with adhesive in accordance with insulation manufacturer's instructions.
 - 1. Finish: Vimaso 749 vapor-block mastic – color grey.
 - 2. Armacell, Aeroflex or Normaco.

2.7 DUCT INSULATION, EXTERNAL, FOR EXPOSED INDOOR DUCTS:

- A. Fire retardant foamed plastic insulation. Paint with Vimaso 749 vapor-block mastic – color grey. (Do not use in plenums unless complies with Article 1.2.) Armacell, Aeroflex or Normaco.
- B. 6 lb/cu. ft. fiberglass board with FSK facing and thermal conductivity not exceeding 0.22 BTU/(hr)(sq.ft)(°F/in) at 75°F mean temperature.

2.8 DUCT INSULATION, EXTERNAL, FOR EXPOSED OUTDOOR DUCTS:

- A. 6 lb/cu. ft. fiberglass board with FSK facing and thermal conductivity not exceeding 0.22 BTU/(hr)(sq.ft)(°F/in) at 75°F mean temperature.
- B. Cover insulation with aluminum jacket sealed weather tight.

2.9 DUCT INSULATION, EXTERNAL, FOR RANGE HOOD/GREASE DUCTS:

- A. Insulation shall be UL listed board insulation with 0 flame-spread, 0 fuel constructed and 0 smoke developed rating when tested in accordance with ASTM E84/UL723, PABCO "Super Firetemp".

PART 3 - INSTALLATION

3.1 HVAC PIPING:

- A. Hot water supply and return piping; indoors above grade: "Fiberglass pipe covering", thickness per Table 1.

TABLE 1
INSULATION THICKNESS FOR HVAC HOT PIPING

Service	Runouts		Mains & Risers			
	Up to 1-1/2"	Up to 2"	Up to 1-1/2"	2-1/2" to 4"	5" to 6"	8" and Up
Hot Water	1-1/2"	2"	1-1/2"	2"	2"	2"

* Runouts over 12 feet in length shall be classed as mains.

- B. Chilled water supply and return piping indoors above grade: "Cellular glass Pipe Covering, Rigid", 1" thick for lines 2-1/2" and smaller, 1-1/2" thick for lines 3" and larger.
- C. Room fan coil AC unit chilled water runouts: "Foamed plastic Pipe Covering", 3/4" thick.
- D. Chilled water supply and return lines outdoors above grade: Cellular glass pipe covering, 1-1/2" thick over electric pipeline heaters. Jacket with aluminum jacket.
- E. Chilled water supply and return piping outdoors below grade: "Cellular glass pipe covering", 1" thick for lines 2-1/2" and smaller, 1-1/2" thick for lines 3" and larger. Jacket with 2 layers 55# roofing felt or 4 layers 30# secured with 14 gauge stainless steel wire loops 12" on center.
- F. Refrigerant suction lines and hot gas bypass lines: "Cellular glass pipe covering, rigid," 1" thick for lines 2-5/8" OD and smaller, 1-1/2" thick for lines 3-1/8 OD and larger. Jacket lines located outdoors with aluminum jacket.
- G. Refrigerant suction lines and hot gas bypass lines: "Foamed plastic pipe covering", 3/4" thick.
- H. AC Unit drain lines: "Foamed Plastic Pipe Covering", 1/2" thick.
- I. Non-potable water lines outdoors above grade: As specified for chilled water and/or condenser water lines outdoors above grade over electric pipeline heaters.
- J. Non-potable water lines downstream of backflow preventer shall be insulated the same as hot water piping, indoors above grade.

3.2 COLD EQUIPMENT:

- A. Cold water chiller surfaces: cold equipment insulation, rigid, 1-1/2" thick (or foamed plastic 1" thick).
- B. Chilled water compression tanks: cold equipment insulation, rigid, 1" thick (or foamed plastic 1" thick).
- C. Chilled water one-shot chemical feeders: cold equipment insulation, rigid 1" thick (or foamed plastic 1" thick).
- D. Chiller heads and chilled water pumps: 1" thick foamed plastic insulation inside easily removable 20 gauge galvanized steel covers.
- E. Insulation for Strainers in chilled water lines:
 - 1. Equip with 20 gauge galvanized steel covers. Split along strainer centerline and secure with diecast latches. Insulate inside covers with 1" thick foamed plastic insulation. Provide gasketed openings for blow-down valves.
- F. Insulation for flexible connections in water lines:
 - 1. Build up insulation to thickness of adjacent pipe covering using foamed plastic sheet with joints sealed and staggered. Last layer shall lap adjacent pipe covering 3" and be sealed and banded to it.
- G. Insulation for casings, return bends and headers of duct mounted coils: 1/2" thick foamed plastic.

3.3 DUCT INSULATION, EXTERNAL, FOR CONCEALED DUCTS:

- A. For flexible glass fiber insulation:
 - 1. Lap jacket and vapor seal all joints and seams with suitable mastic.
 - 2. On rectangular and flat oval ducts 30" wide (30" flat on flat oval ducts) and wider, support insulation with weld pins and speed clips 18" on centers. Seal weld pins with mastic and FSK tape.
 - 3. Thickness and Extent: All sheet metal supply, return and outside air ducts not specified to be lined: Minimum 2" thick except as noted below. Note: Conical and straight spin-ins on both lined and unlined ducts shall be insulated as noted below. (See Foamed Plastic Insulation below.)
- B. All metal surfaces of ceiling diffuser (CD) located above the ceiling: 2" thick (seal air tight to diffusers).
- C. Foamed Plastic Insulation:
 - 1. Insulate portions of fire damper sleeves in insulated ducts, which are not concealed in walls, partitions and floors as specified with 3/4" thick foamed plastic insulation. Do not extend the insulation through the wall, floor or partition. Seal to wall and glass fiber insulation (or if lined duct seal foamed plastic insulation to duct with 3" lap over liner). On externally insulated duct, lap glass fiber insulation over foamed plastic and seal to foamed plastic.

2. Insulate all flexible connectors in sheet metal ducts with 1" thick foamed plastic sheet with joints sealed. Extend insulation minimum 3" upstream and downstream of flex connector joints and seal to sheet metal duct.
 3. Insulate portions of lined ducts at manual dampers with 3/4" thick foamed plastic insulation overlapping the liner a minimum 3" upstream and downstream of the damper. Seal foamed plastic insulation to duct.
 4. Insulate all casings, headers and return bends on duct-mounted coils, and coils at terminal units with 3/4" thick foamed plastic insulation. Headers and return bends shall be insulated with 3/4" foamed plastic cemented inside galvanized sheet metal covers gasketed to coil casing.
 5. Insulate all unlined ducts with dampers, all conical branch duct fittings and straight branch duct spin-ins with 3/4" thick foamed plastic insulation. Glass fiber insulation on the branch ducts shall overlap foamed plastic insulation on the conical fittings and spin-ins. Seal fiberglass to foamed plastic. For connections of flexible duct to spin-ins or conical branch duct fittings, connect flexible duct inner liner to sheet metal with specified clamps and lap outer liner and insulation over foamed plastic and clamp with Panduit strap. Seal flex duct outer cover to spin-in or conical fitting insulation. Insulation contractor shall submit sample of spin-in and conical fitting insulation and flexible duct connection for approval.
- D. Insulate portions of fire damper sleeves in insulated ducts which are not concealed in walls, partitions and floors as specified in A or B above. Do not extend the insulation through the wall, floor or partition.

3.4 DUCT INSULATION, EXTERNAL, FOR EXPOSED DUCTS:

- A. Insulate all exposed supply, return and outside air ducts and exposed return bends, headers and casings of all duct mounted coils not specified to be lined with 1" thick foamed plastic insulation cemented in place with adhesive in accordance with insulation manufacturer's instructions.
- B. Insulate all exposed supply, return and outside air ducts located in Mechanical Room with 2" thick 6#/cu. ft. fiberglass board with FSK jacket. Secure board with weld pins and speed clips 12" on centers. Seal clip indentations with mastic. Seal all joints and seams with mastic.
- C. Cover all angles, seams and joint reinforcing with insulation and seal vapor tight.

3.5 DUCT INSULATION, EXTERNAL, FOR EXPOSED OUTDOOR DUCTS:

- A. Insulate all exposed outdoor supply, return and outside air ducts with 2" thick 6#/cu. ft. fiberglass board with FSK jacket. Secure board with weld pins and speed clips 12" on centers. Seal clip indentations with mastic. Seal all joints and seams with mastic.
- B. Cover all angles, seams and joint reinforcement with insulation and seal vapor tight. Finish with aluminum jacket cover sealed weather tight.

3.6 DUCT INSULATION, EXTERNAL, FOR RANGE HOOD/GREASE DUCTS:

- A. Install on all range hood / grease duct and many duct where noted on plans.
- B. Insulation shall be installed in accordance with manufacturer's directions to provide a 2 hour fire rating.

END OF THERMAL AND ACOUSTICAL INSULATION FOR HVAC SYSTEMS

SECTION 23 5000

HEATING AND AIR CONDITIONING EQUIPMENT AND SPECIALTIES

PART 1 - GENERAL

1.1 SCOPE:

- A. Section 23 0500 – “General Provisions – HVAC” shall apply to and become part of this Section.

PART 2 - EQUIPMENT AND SPECIALTIES

2.1 DEHUMIDIFIERS

- A. U.L. labeled refrigerated dehumidifiers consisting in general of an evaporator coil, condenser coil, fan motor and fans, refrigeration compressor, drain pan, and controls all enclosed in a heavy gauge steel cabinet with baked enamel finish.
- B. Santa Fe or approved equal.

2.2 WATER TREATMENT EQUIPMENT:

- A. Provide one shot chemical feeders, 5 gallon capacity, with the following closed systems:
 - 1. Hot Water.
 - 2. Chilled Water.

For each one-shot feeder provide inlet, outlet, fill, vent and drain valves together with fill funnel with hinged cover.

2.3 VARIABLE FREQUENCY SPEED CONTROLLERS:

- A. For each motor so scheduled provide a variable frequency, AC, solid state, induction motor speed controller. The speed controller shall be self-contained, with all components enclosed in a NEMA 1 cabinet and be capable of operation 1-40 degrees centigrade. The controller shall be capable in operating with $\pm 10\%$ of system voltage and 60 Hz $\pm 3\%$ frequency variation. It shall have 10-1 frequency range. The speed controller shall be wall or floor mounted.
- B. The speed controller shall be automatically controlled by a pneumatic 3-15 psi signal, 10 volt dc, 4-20 milliamps, control signal. 20 milliamps shall correspond to maximum speed and 4 milliamps shall correspond minimum speed. The controller shall have capability to invert the input signal, if necessary due to process requirements. Coordinate control signal with controls contractor.

- C. The VFD's shall limit harmonic distortion reflected onto the utility system to a voltage and current level as defined by IEEE 519 for general systems applications, by utilizing the standard 3% nominal impedance integral ac three-phase line reactor. An isolation transformer or external line reactor may be substituted as an option. Provide line reactor on the output of the drive to limit standing wave and to prevent damage to the VFD and motor.
- D. Total harmonic distortion shall be calculated under worst case conditions in accordance with the procedure outlined in IEEE Standard 519-1992. Copies of these calculations shall be provided in the submittal. The contractor shall provide any needed information to the VFD supplier three (3) weeks prior to submittal date.
- E. If the system cannot meet the IEEE 519-1992 harmonic levels with VFD's provided with the standard input line reactor or optional input isolation transformer, the VFD manufacturer shall supply a twelve pulse, multiple bridge rectifier ac to dc conversion section with a phase shifting transformer.
- F. The speed controller shall be completely prewired at the factory and shall have one input power connection and one output power connection to the motor. If isolation transformer, line filters, or other equipment is required external to the speed controller cabinet, then all interconnecting wiring shall be provided at no extra cost to the Owner. See Electrical single line wiring diagram for input wire size and lug size required. Each motor connected to the VFSC in a fan array shall have a Manual Motor Protection (MMP) overload device. Note: VFSC to be supplied separate for each application.
- G. Sound power developed by speed controllers shall not numerically exceed NC-75 sound pressure and by motors shall not exceed 4 dB(A) above specific motor across the line delivered sound pressure levels in 2nd through 8th octave bands.
- H. VFD programmable parameters shall be adjustable from the keypad. The display shall be alphanumeric, programmable with status indicators. The display shall be in plain English words for parameters, status and diagnostic messages. Alphanumeric codes and/or tables are unacceptable.
- I. Standard advanced programming and trouble-shooting functions shall be available by using a personal computer's RS-232 port or RS-485 port and Windows™ based software. In addition, the software shall permit control and monitoring via the VFD's RS-232 port or RS-485 port. VFD manufacturer may offer a BAS serial link and field bus adapter for standard protocols.
- J. Provide two (2) programmable Form C contact outputs (one for motor running and one for fault trip) and one (1) programmable 24VDC open collector output (for drive ready).
- K. Provide six (6) digital inputs for start/stop, local/remote, external interlock, two preset speeds and run enable.
- L. The drive shall record and log faults. The VFD shall display all faults in plain English.
- M. The variable frequency drive(s) and all components shall be designed, manufactured and tested and approved in accordance with the latest applicable ANSI, IEC, UL, CUL, CSA and NEMA standards. Each drive shall be rated to withstand a minimum of 65,000 amps fault current. (Verify available fault current with electrical.)
- N. The supplier of the drive assembly shall be the manufacturer of the electromechanical power components used within the assembly, such as bypass contactors, circuit breaker, fused disconnect switch devices when specified.

- O. The supplier of this equipment shall have produced similar electrical equipment for a minimum period of ten (10) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- P. The VFD's shall be of the Pulse Width Modulated (PWM) design converting the utility input voltage and frequency to a variable voltage and frequency output via a two-step operation. Adjustable Current Source VFD's are not acceptable. Insulated Gate Bipolar Transistors (IGBT's) shall be used in the inverter section. Bipolar Junction Transistors, GTO's or SCR's are not acceptable.
- Q. The VFD's shall be capable of operating any NEMA Design B squirrel cage induction motor, regardless of manufacturer, with a horsepower and current rating within the capacity of the VFD. VFD carrier frequency shall be limited to 3-8 kHz for optimum motor performance.
- R. The VFD's shall be able to start into a spinning motor. The VFD's shall be able to determine the motor speed in any direction and resume operation without tripping. If the motor is spinning in the reverse direction, the VFD's shall start into the motor in the reverse direction, bring the motor to a controlled stop, and then accelerate the motor to the preset speed.
- S. The speed controller shall incorporate the following minimum features:
 - 1. Door interlocked circuit breaker or disconnect switch with input fuses capable of being locking in off/open position.
 - 2. All control inputs isolated from ground and power.
 - 3. Hand-off-automatic selector (on face of panel).
 - 4. Ground fault protection, over current, over voltage, under voltage, over temperature, loss of speed reference, and UL 5086 motor overload protection.
 - 5. Pilot light indication for VFD and bypass modes (on face of panel).
 - 6. Individual acceleration/deceleration adjustments.
 - 7. Maximum and minimum speed adjustments.
 - 8. 120V AC control power transformer for low voltage control that can easily interface with building safe interlock circuits.
 - 9. Solid State microprocessor based logic for starting and stopping motors.
 - 10. One analog output signal for output frequency.
 - 11. Insensitivity to incoming phase rotation.
 - 12. Auto reset with coast down timer with 0.05 second dropout (after power or thermal shutdown).
 - 13. Output current limiters.

- 14. Motor stall protection.
- 15. Manufacturer's warranty of 2 years from date of start-up.
- 16. Output isolation contactor.
- 17. Bypass contactor mechanically and electrically interlocked with the output isolation contactor.
- 18. Overload relays for bypass contactor.
- T. Provide factory check-out and start-up service.
- U. Speed controllers shall be suitable for use with current shown on the Electrical drawings.
- V. Speed controllers shall be ABB ACH-580, or approved equal.

2.4 STANDARD AIR HANDLING UNITS:

- A. Horizontal or vertical air handling units: factory fabricated units having capacity shown, consisting in general of a mixing box section, a filter section, a preheat coil section, an access section, a cooling coil section, drip pan and drain sections, and supply and return fan sections, all the product of a single manufacturer. Provide all sections of the same frame size with support rails for all sections. Mount units on ribbed neoprene pads on concrete curbs as shown.
- B. Casing: not lighter than 18 gauge galvanized steel, all sections of casing insulated with 2" thick 3 lb./cu.ft. coated fiberglass insulation. All sections shall be of double wall construction with solid 26 gauge galvanized steel liner on air side of all sections except coil section, which shall be solid.
- C. Drain pans: double construction with insulation between pans and 16 gauge type 304 stainless steel inner pan.
- D. Coil sections shall be double wall solid construction with the coils scheduled. Coils shall comply with the requirements below for coils.
- E. Provide spacer sections for installing control bulbs between pre-heat and cooling coils. At least 18" space must be provided between preheat and chilled water coils.
- F. Provide hinged and latched access doors in casings at fan sections, filter sections, plenum sections, upstream and downstream from cooling coils and elsewhere as shown and/or required for access to equipment and/or controls. Construct doors with 1-1/2" insulation between 2 sheets 24-gauge galvanized steel. Set doors in frames arranged so that doors will be flush with exterior of casing. Equip each door with at least 2 hinges and 2 sets of double acting latches. Latches shall be made from nonferrous metal, with a lever handle on the outside and a lever handle on the inside of the casing. Lever handle on the outside of the casing shall cam over a door pull with a stop. Doors shall be reinforced to prevent wracking and warping. Provide 3" butt hinges and weld to doors and to door frames. Provide galvanized steel nosings on casing insulation at doors. All pressurized access doors shall open into the fan section. Install gaskets at all section connections.
- G. Automatic dampers shall comply with the requirements for automatic dampers below.

- H. Air filters: see equipment schedule and "Air Filters". Provide side access filter sections, complying with the requirements under "Air Filters".
- I. Provide vapor proof marine lights in all sections. Lights shall be factory wired with switches located next to access door. Wiring to be in compliance with NEC and Division 26.
- J. Fans: plug fan forward curved or backward curved blade centrifugal fans, complying with the requirements for "Centrifugal Fans, General" statically and dynamically balanced to a peak vibration velocity of 0.157 inch/second, with corrosion resistant coating. Bearings shall be minimum ***L₅₀ 200,000*** hour self-aligning grease lubricated ball bearings. Grease fittings shall be extended to accessible locations after units are installed. Fan and fan motor shall be mounted on spring isolated base inside unit, and snubbing isolators shall be provided for discharge flexible connections. Isolators shall comply with the requirements for Vibration Isolators (Section Materials & Methods, HVAC). Fan motor shall be mounted on an adjustable base and shall be equipped with V-belt drive sized for 150% motor nameplate rating, adjustable pitch motor pulley for motors 25 H.P. and smaller. For plug fan section access doors provide time delay door switches, chains and screened wheel guards.
- K. AC units shall be Carrier, Trane, Daikin or JCI.

2.5 SPLIT SYSTEM AIR CONDITIONERS - SMALL:

- A. Split system air conditioners shall consist of a wall mounted indoor section, outdoor condensing unit, connecting refrigerant piping, and electronic controls. System shall be UL rated.
- B. Indoor unit shall consist of centrifugal evaporator fan(s), evaporator coil, drain pan with condensate pump and safety switch, all enclosed in a plastic casing equipped with adjustable supply grille and return air grille. Provide 3 pole disconnect switch.
- C. Outdoor unit shall consist of compressor, condenser coil, condenser fan, and controls, all enclosed in a metal grilled cabinet suitable for roof or pad mounting. Provide refrigerant piping kit, pre-insulated, properly sized for capacity shown. (See drawings to determine length.) Provide low ambient operation to 20°Fdb outdoors.
- D. Controls shall consist of a wall mounted remote controller utilizing a microprocessor. Functions shall include:
 - 1. Computerized dehumidification.
 - 2. Operation mode setting.
 - 3. Self-diagnostic display.
 - 4. Room temperature display.
 - 5. Twenty-four hour on-off timer.
 - 6. Fan speed indicator.
 - 7. Memory.
 - 8. Low ambient operation.

- E. Split system air conditioners shall be Trane-Mitsubishi, Carrier, Daikin, Gree or approved equal.

2.6 COILS

- A. Rated in accordance with ARI Standard 410-72 with capacities and dimensions shown.
- B. Provide coils (other than sprayed coils) with aluminum fins and seamless copper tubes.
- C. Sprayed coils shall have copper fins and seamless copper tubes. Solder coat fins and tubes.
- D. Headers may be iron castings or steel or copper tubing. Braze return bends.
- E. Space fins not closer than 10 per inch except that fin spacing may be decreased to maintain maximum coil depth of 8 rows. (Minimum 2 row heating coils and 4 row cooling coils).
- F. Circuit water coils to maintain pressure drops shown.
- G. Prove coils tight with 200 psig under water air test.
- H. Coil casings: 16 gauge stainless steel with flanges drilled for mounting.

2.7 CENTRIFUGAL ROOF EXHAUSTERS:

- A. Centrifugal power roof ventilators with AMCA certified air and sound ratings, belt or direct driven as shown. Provide permanently oiled bearings, statically and dynamically balanced backward curved blade wheels and spun aluminum housing with curb cap, disconnect switches, back-draft damper and outlet bird screen. For belt driven fans provide V-belt drive sized for 50% overload, adjustable pitch motor pulley and adjustable motor base. For each fan furnish an 18 gauge galvanized steel insulated prefabricated curb with integral cant. Furnish baffled sound absorbing curbs where required to obtain noise levels specified. Static pressures scheduled are external to sound curbs.
- B. For kitchen range hood furnish UL762 labeled up-blast discharge fan without sound curb.
- C. Fans shall be Greenheck, Acme, Carnes, Penn or Loren Cook.

2.8 CENTRIFUGAL VENT SET:

- A. AMCA rated direct or belt driven fans as scheduled having capacity shown. Equip belt driven fans with V-belt drives sized for 50% overload, adjustable pitch motor pulleys, and adjustable motor bases. For all fans provide self aligning grease lubricated ball bearings, statically and dynamically balanced (backward curved blade) wheels, and galvanized steel housing with inlet bell and inlet and outlet duct collars and baked enamel finish.
- B. Equip fans located outdoors with weather hoods for motors and drives. Equip fans located indoors with belt guards.
- C. Equip all fans with 95% efficient vibration isolators.

- D. Fans: Acme, Greenheck, Penn, Peerless or Loren Cook.

2.9 IN-LINE CENTRIFUGAL FANS:

- A. AMCA approved air and sound rated direct or belt driven fans as scheduled, complete with V-belt drives sized for 50% overload, self aligning grease lubricated ball bearings, adjustable pitch motor pulleys, adjustable motor bases and statically and dynamically balanced backward curved blade wheels, all enclosed in a galvanized steel housing with inlet bell and outlet duct collars. (Fan wheel and motor assembly shall be hinged for access.)
- B. Fans shall be Greenheck type SQ, Carnes, Peerless, Acme, Penn or Loren Cook.

2.10 CEILING EXHAUST FANS:

- A. AMCA rated direct driven centrifugal fans designed for ceiling mounting, complete with removable white aluminum, ceiling grille insulated housing, fan speed controllers, rubber-in-shear isolators, disconnect switch, and integral back draft damper. Max. noise level: 3 sones.
- B. Fans: Greenheck SP, Acme, Penn or Loren Cook.

2.11 PROPELLER FANS:

- A. AMCA rated fans, belt or direct driven as scheduled. Equip belt driven fans with V-belt drives sized for 50% overload, adjustable pitch motor pulleys and adjustable motor bases.
- B. Equip each fan with belt and wheel guards and a mounting panel not lighter than 16 gauge.
- C. Provide gravity or motor operated shutters where indicated in equipment schedule. Equip motor operated shutters with spring return motors with oil-immersed gear trains.
- D. Where indicated on plans provide fans equipped with panels reversed for supply operation.
- E. Where shown provide penthouses constructed of not lighter than 18 gauge galvanized steel and 18 gauge galvanized steel prefabricated curbs. Equip penthouses with access doors and internal insulation not lighter than 1" x 3 lb/cu. ft.
- F. Fans: Coolair, Greenheck, Acme, Stanley or Loren Cook.

2.12 UNIT HEATERS (ELECTRIC):

- A. UL listed electric unit heaters having capacity shown with resiliently mounted direct driven propeller fan with guard, finned-sheathed heating elements, and enameled steel enclosure not lighter than 20 gauge. Heater shall be equipped with automatic reset high limit controls, power contactors and control transformer for 24 volt control, factory wired to terminal strips.
- B. For horizontal heaters provide adjustable horizontal louvers. For vertical heaters provide louver.

- C. For each unit heater provide room thermostat to cycle contactor and fan.
- D. Electric Unit Heater: Chromalox, Erincraft or Berko.

2.13 UNIT HEATERS (HOT WATER):

- A. Unit heaters: vertical as scheduled propeller fan unit heaters with resiliently mounted direct drive propeller fans with wheel guards, nonferrous heating coils consisting of aluminum fins and copper tubes and steel casing not lighter than 20 gauge with baked enamel finish over bonderizing.
- B. For horizontal heaters provide adjustable horizontal louvers. For vertical heaters provide radial louver.
- C. For each unit heater provide room thermostat to cycle fans subject to low limit surface aquastat.

2.14 EXPANSION JOINTS, ANCHORS AND GUIDES:

- A. Expansion joints: 150 psig WP controlled flexing bellows type packless joints with stainless steel bellows, compression traverses not less than those shown and extension traverses not less than 1/4". Joints 2" and smaller: screwed with union ends. Joints 2-1/2" and larger: flanged.
- B. Alignment guides: prefabricated guides consisting of a steel spider clamped to pipe riding inside a steel cylinder with integral mounting feet. Install guides 4 and 18 pipe diameters upstream and downstream from each expansion joint.

2.15 WATER SPECIALTIES:

- A. Install ASME rated pressure relief valves as noted, providing full size drain lines to within 1 ft. of floor. Relief valves: Watts, McDonnell & Miller, or equal.
- B. Install 1/2" IPS x 75 psig WP float type automatic air vents in water lines as shown and/or required to prevent air binding. Run 3/8" OD line to outdoors or nearest floor drain or AC system drain line from each vent. Install a 1/2" ball valve ahead of each air vent. Vents shall be Armstrong, or equal.
- C. Strainers: 125 psig WP, pot or angle type as shown. Strainers 2" and smaller: bronze or iron bodies with screwed connections; strainers 2-1/2" and larger: iron bodies and flanged connections. Screens: bronze, monel metal or stainless steel with perforations as follows:

Strainer Size	Perforation Size
3/4" to 2" inclusive	1/32"
2-1/2" to 6" inclusive	1/16"
8" to 12" inclusive	1/8"
Over 12"	1/4"

- The free area of each screen shall be not less than three times the area of the strainer inlet pipe. Equip each strainer with 1/2" valved drain, and unless the strainer design is devoid of air pockets, a 1/4" air vent cock.
- D. Compression and expansion tanks: black steel bladder tanks ASME stamped for 125 psig WP. Provide tappings and specialties as shown. Initial air charge: as required to provide 10 psig fill pressure at top of system.
 - E. Line mounted air separators: tangential separators with tappings shown, without strainers. Separators shall be Bell & Gossett.
 - F. Install float type water feeders on expansion tanks as shown. Feeders: McDonnell & Miller #25.
 - G. Install backflow preventers equal to Watts 900 in all (potable) city water connections to HVAC water systems.
 - H. Install air control fittings equal to Bell & Gosset "Airtrol", in all compression tanks and boilers as shown.
 - I. Install drain valve with hose connection and air venting provision on each compression tank.
 - J. Flow control valves: weighted check valves with provision for holding valve open, B&G.
 - K. Install combination flow control and stop valves equal to B&G "triple duty" valves where shown.
 - L. Install cast iron suction diffusers with integral strainers, flanged connections, flanged covers and gauge, vent, and drain tappings in pump suctions as shown. Main strainer screens: as specified for strainers, above. Remove start-up screens after system has been flushed.
 - M. Divertor fittings: B&G monoflo fittings, or equal.
 - N. Radiator valves: union end, 150 psig WP, brass, composition disc, composition mushroom handle, spring packed.
 - O. Pressure reducing valves for make up water connections 125 psig WP, iron, bronze trim, set point range as required to provide 10 psig fill pressure at top of system, B&G or equal.
 - P. Install gauge glass sets with valves, drain cock, and protector rods where shown. Do not install gauge glasses on closed compression tanks.
 - Q. Balancing valves, 2" and smaller: Bronze body, ball type, 125 psig working pressure, 250°F maximum operating temperature, and having threaded ends. Valves shall have fixed orifice or venturi, connections for portable differential pressure meter with integral seals, and be equipped with a memory stop to retain set positions.
 - R. Calibrated balancing valves ("Circuit Setter"): 125 psig WP, 2" and smaller bronze, screwed; 2-1/2" and larger IBBM, flanged plug valves. All with indicator for angular position of valve, meter connections with positive shut-off valves and internal seals to prevent leakage around stem. For each valve provide a flow vs. differential pressure vs. angular position calibration chart and pre-formed foam insulation suitable for temperatures from 35 to 250F. Armstrong, B&G, Illinois, Taco or equal.

- S. Calibrated angle globe balancing valves: 125 psig WP, 2" and smaller bronze, screwed; 2-1/2" and larger IBBM, flanged angle globe valves. All with indicator for rotation of valve, meter connections with positive shut-off valves and internal seals to prevent leakage around stem. For each valve provide a flow vs. differential pressure vs. rotation position calibration chart and pre-formed foam insulation suitable for temperatures from 35 to 250F. Armstrong or equal. Provide one hand held computerized balancing instrument for project.
- T. Flow meters: 150 psig WP venturi flow meters, bronze, screwed in sizes 2" and smaller; steel, butt welded in sizes 2-1/2" and larger, 2% accuracy, maximum line pressure drop 1.0 ft. water. Provide quick connect gauge valves for each venturi meter. For entire job provide one portable cased differential pressure meter with shut-off and vent valves and 40 feet of 150 psig WP hose, together with a calibration curve for each meter. Armstrong, Presco.

2.16 REFRIGERANT SPECIALTIES:

- A. Install moulded desiccant core filter dryer in each liquid line. Provide throwaway dryers for lines 1/2" and smaller. Provide replaceable core dryers for lines 5/8" and larger. Dryers shall be Sporlan "Catchall". For heat pump units filter dryer to be bi-directional flow.
- B. Install moisture indicating sight glass in each liquid line. Install a refrigerant charging valve in each liquid line near each sight glass.
- C. Service valves: wing cap valves, Henry.
- D. Hot gas bypass valves: self contained valves sized to pass gas flow at last step of compressor unloading and shall discharge between expansion valve outlet and distributor. Sporlan.
- E. Evaporator pressure regulating valve: sized to pass full suction gas flow rate with a pressure drop not exceeding 2 psi. Equip valve with external pneumatic connection for operation by pneumatic controls (see CONTROLS).
- F. Install solenoid valve in each liquid and hot gas bypass line. Hot gas solenoid valve shall be equipped with a high temperature coil. Solenoid valves for heat pump units shall be bi-directional flow.

END OF HEATING AND AIR CONDITIONING EQUIPMENT AND SPECIALTIES

SECTION 23 6000

AIR DISTRIBUTION

PART 1 - GENERAL

1.1 SCOPE:

- A. Section 23 0500 – “General Provisions – HVAC” shall apply to and become part of this Section.

1.2 SHOP DRAWINGS:

- A. See Section 23 0500 – “General Provisions – HVAC”.
- B. Ductwork Shop Drawings shall include details of duct construction: seams, joints, gauges, reinforcing, elevations, and hanger details for each pressure class and size range together with details of turning vanes, branch connections, dampers and access doors. Include access door locations and sizes. Identify on the shop drawings duct sections as they will be identified for fabrication and installation. Provide section drawings of locations where ducts cross or demonstrate with elevations that ducts will fit.

PART 2 - PRODUCTS

2.1 GENERAL:

- A. Air terminal submittal data shall include, for each terminal, both radiated and discharge sound power in DB re 10 to the minus 12 watts in octave bands 2 through 7. All air terminal controls shall be installed in a unit mounted control panel and shall be UL listed as an assembly.

2.2 VARIABLE AND CONSTANT VOLUME TERMINAL BOXES:

- A. Variable volume units consisting in general of a single duct attenuating box with automatic volume regulator. Where shown, provide hot water heating coil. Maximum air pressure drop through box, reheat coil and attenuator (where required) shall not exceed 0.5" WG. Air terminal boxes shall be ARI certified and UL listed as an assembly.
- B. Discharge sound power levels referenced to 10 to the minus 12 watt in second through seventh octave bands, respectively, shall not exceed the following for boxes operating with 1" static pressure difference. Boxes up to 300 CFM: 67 DB, 62, 50, 49, 45, 40. Boxes over 300 CFM: 76DB, 69, 67, 62, 58, 52. Provide rectangular sound absorbers if required to meet above noise criteria. Locate sound absorbers at least 5 inlet diameters downstream from boxes.
- C. Radiated sound power for boxes operated with 1" static pressure difference shall not exceed 60 DB re 10 to the minus 12 watt in the second octave band (125 cps).

- D. Attenuating box shall be constructed of G90 galvanized steel sufficiently heavy to prevent oil canning and fluttering but not lighter than SMACNA gauge for 2" pressure class duct of same dimensions as box. Box shall be lined with 1/2" thick glass fiber sound insulation complying with fire hazard classification specified for duct insulation. No insulation edges shall be exposed in box. Each box shall be equipped with an access door for access to coil and volume regulator.
- E. Coils shall comply with the requirements for Coils, Section "Heating and Air Conditioning Equipment and Specialties". Coil casings, return bends and headers shall be equipped with sheet metal covers insulated with 3/4" foamed plastic insulation to prevent sweating. See insulation section for foam plastic insulation specification.
- F. Box controls shall provide pressure independent operation and velocity sensors shall be of multiple point averaging type, unaffected by inlet conditions. (If box manufacturer requires straight duct on box inlet, such straight duct shall be furnished with the box.) All box controls except room thermostat and water coil valve shall be factory installed and shall be calibrated by the box manufacturer. Controls shall be by the control manufacturer (except velocity sensor and volume dampers shall be furnished by the terminal manufacturer), and shipped to the terminal manufacturer for installation and calibration. Controls shall be Direct Digital Control as specified. Pressure taps and a calibration curve or similar method of field measuring box air rate shall be provided for each box. A photostat of the box control diagram shall be cemented to each box. Permanently mount all relays and pressure switches on box and provide control panel with cover for all controls. Controls shall be BACnet compatible.
- G. Provide single point power connection for all components, electric heater fusing and auxiliary protection, and disconnect switch. Provide 24 volt control power transformer as required for single point power connection.
- H. Box control schemes shall be as shown on drawings.
- I. Boxes shall be Enviro-Tec, Price, Titus, or Trane.

2.3 GRILLES, REGISTERS AND DIFFUSERS:

- A. General: Air devices may be Price, Titus, Krueger, Nailor, or approved equal. Titus part numbers are given for reference. Coordinate border and frame types for air devices with ceiling types as shown on Architectural Reflected Ceiling Plan.
- B. Rectangular Louver Face Diffusers One-, Two-, Three-, Four-Way or Corner Throw (LD or CD): Fixed pattern louver face diffusers, all aluminum with white enamel finish, removable cores latched in place, opposed blade dampers, adjustable multiblade scoops, #TDC,-AA.
- C. Curved Blade Diffusers, One-, Two-, Three-, Four-Way Throw (CBD-I, -2, -3, -4): All aluminum adjustable curved blade diffusers with plaster frames, opposed blade dampers and multiblade scoops, white enamel finish #250-AA.
- D. Linear Diffuser/Boot: Fixed pattern extruded aluminum 2-way throw diffuser designed for variable volume use, mounted on outlet of galvanized steel boot with 1/2" internal insulation, and round side inlet collar with damper. Diffuser/Boot shall be designed to lay into ceiling grid and be supported by grid. Provide all necessary mounting clips and accessories. Boot insulation shall comply with the requirements for duct insulation, internal. Diffuser finish: off white enamel, #MLF.

- E. Supply Registers (SR): Adjustable vertical face bars, adjustable horizontal rear bars, opposed blade dampers, plaster frames, adjustable multiblade scoops, all aluminum with prime coat finish: #272.
- F. Wall Return Registers (WRR): All aluminum, aluminum lacquer finish, horizontal bars fixed at about 35° angle, plaster frames, opposed blade damper #350. (Wall Return Grilles {WRG} Delete opposed blade damper).
- G. Wall Exhaust Registers (WER): Same as wall return registers.
- H. Ceiling Return Registers (R): All aluminum, 1/2" x 1/2" x 1/2" cube core, plaster frame, opposed blade dampers, white enamel finish #50F. Omit dampers for registers not attached to return ductwork.
- I. Ceiling Exhaust Registers (E) and Ceiling Transfer Registers (T): Same as Ceiling Return Registers.
- J. Drum Louvers (DL): Adjustable vertical blades and rotating drum with optional opposed blade damper with screwdriver operator accessible through discharge of DL. All aluminum finish with prime coat.

2.4 SHEET METAL SPECIALTIES:

- A. Make rectangular take-offs in low pressure supply, return, and exhaust ducts using 45° entry tap (SMACNA Duct Construction Standards "Branch Connections" figure #2-6) with manual damper with end bearings and locking quadrant in branch. Saw-mark ends of damper rods parallel to blades. End bearings and quadrants shall have air tight duct connections and shaft seals: Duro-Dyne or equal.
- B. Manual balancing dampers: comply with SMACNA HVAC Duct Construction Standards, figure 2-12 and 2-13. Equip all dampers with locking quadrants and end bearings. Saw-mark ends of damper rods parallel to blades. End bearings and quadrants shall have air tight duct connections and shaft seals, Duro-Dyne or equal.
- C. When Damper quadrants are located other than above lay-in ceilings.
 - 1. Substitute Young number 315 or 270-896C adjustable cover concealed regulators or Ventlock #677 regulators and an additional end bearing for the quadrant (regulator covers shall be white). Provide all cable, gears, joints, rods, etc. as required to place the regulator in the ceiling within 6 feet horizontal of the damper, as directed by the Architect.
 - 2. Provide an access door for access to the quadrant (See "Access Doors", hereinafter).
- D. Provide "Stand-offs" (hat sections) for damper quadrants, controls, etc., on externally insulated ducts. "Stand-offs" are required at quadrants on spin-in dampers.
- E. Branch duct connections for connecting round low pressure branches to rectangular low pressure trunks: galvanized steel spin-in or side takeoff fittings with integral dampers, collars, similar and equal to Flexmaster, Series FLD or STOD for sheet metal trunks. Provide integral dampers with 2" insulation build-out, shaft, U-bolt, nylon bushings, locking quadrant and handle. Gauges: as required for pressure class. (26 gauge minimum.)
- F. Branch duct connections for connecting round medium pressure duct to rectangular medium pressure duct: galvanized steel bellmouth fitting with neoprene gasket and pre-drilled mounting holes equal to Buckley Air-Tite. Gauges as required for pressure class (24 gauge minimum). Flexmaster STO or approved equal may be

substituted at contractor's option (24 gauge minimum). Branch duct connections for connecting round medium pressure duct to round or flat oval medium pressure duct: galvanized steel conical saddle or flanged fitting equal to United. Gauges as required for pressure class (22 gauge minimum).

2.5 FLEXIBLE DUCT CONNECTIONS:

- A. Install Neoprene coated glass cloth flexible connections at all duct connections to all fans, all AC Units and all powered induction units.
- B. Install flexible connections in all ducts at building expansion joints.

2.6 ELECTRICAL GROUNDING:

- A. Ground supply fans.
- B. Install braided copper jumpers around all flexible connections, taking care that jumpers do not bind flexes.

2.7 DUCTWORK - GENERAL:

- A. Unless otherwise shown or specified construct ducts of galvanized steel sheet metal using gauges and recommended details as contained in the current edition of the SMACNA HVAC Duct Construction Standards. Ductwork shall include supply air, exhaust air, return air, and outdoor air ducts, together with all necessary fittings, splitters, dampers, quadrants, flexible connections, sleeves, hangers, support, braces, etc. Hang and install ducts in a neat and workmanship manner with adequate bracing and cross bracing to prevent breathing, rattling, and vibration. **DO NOT USE SNAP-LOCK SEAMS.**
- B. Install Duro-Dyne locking quadrants and Duro-Dyne end bearings on all splitters and manual volume dampers located above accessible ceiling and Young #315 regulator, and Duro-Dyne end bearings elsewhere. Provide stand-offs for quadrants on externally insulated ducts. (Refer also to "Sheet Metal Specialties.")
- C. Duct dimensions are **net dimensions inside insulation**. Determine gauges by actual duct size.
- D. All duct turns (except as noted below for 90 degree turns) shall be radiused with a centerline radius of 1.5 times the duct width in the plane of the turn. At the contractor's option, 90 degree turns may be square throat elbows vanned to provide a dynamic loss coefficient ("C") not greater than 0.2 or shall be radiused. Do not use "push on" vane runners. Duct turns less than 20 degrees may be mitered. Do not use off-sets that reduce the cross-sectional area of the duct.
- E. Duct Sealing: Seal duct seams and joints after assembly as noted below. Seal entire circumference of all branch duct connections, tapping collars and spin-ins. Seal ducts using mastic sealant equal to solvent based United Duct Sealer.
 - 1. Class A Seal: Seal all joints and seams and leak test at pressure specified. Leakage cfm per 100 sq. ft. duct surface area shall not exceed 8 times the square root of the test pressure in inches of water and no leaks shall be audible.

2. Class B Seal: Seal entire circumference of all transverse joints, seal all longitudinal joints.
3. Class C Seal: Seal entire circumference of all transverse joints.
4. Class D Seal: Seal corners of transverse joints.

2.8 DUCTWORK - MEDIUM PRESSURE, RECTANGULAR:

- A. Ductwork medium pressure, rectangular shall include all supply duct from air handler to VAVR Terminal Unit.
- B. Provide galvanized steel sheet metal ducts of sizes shown on plans, and construct gauges and recommended detail for 4" pressure class as contained in current edition of the SMACNA Duct Construction Standards. **DO NOT USE SNAP-LOCK SEAMS.** Use reinforcement noted for the longest side on all sides of the duct and bolt together at corners with minimum 5/16" diameter bolts. Do not penetrate duct at reinforcement or hangers.
- C. Rectangular plenums at air handling unit discharge for connections of flat oval supply ductwork or rectangular return ductwork shall be factory insulated galvanized steel consisting of an 18 ga. outer shell, 1" fiberglass insulation, and 24 gauge perforated steel liner with mylar film between insulation and perforated liner. United Rectangular K-27, Eastern Sheet Metal or approved equal.
- D. Provide hangers for medium pressure rectangular ducts consisting of a P2000 Unistrut trapeze and 3/8" diameter rods. Do not penetrate the ductwork with screws at the hangers.
- E. Seal all ducts to SMACNA Class (A) classification and pressure leak test at 6" WG.
- F. All exposed ductwork shall be provided with "paint grip" finish to accept epoxy paint finish. No adhesive labels shall be placed on the exposed surface of exposed ductwork.

2.9 DUCTWORK - MEDIUM PRESSURE ROUND DOUBLE WALL:

- A. Medium pressure round double wall ductwork includes all round ducts between AC Unit discharges and terminal units.
- B. Ductwork: Factory fabricated and insulated galvanized steel round spiral lock seam ducts with outer shell, 1" thick fiberglass insulation inside shell, interior perforated steel liner with mylar film between insulation and liner. Duct gauges shall be 26-gauge for ducts up to 8" in diameter, 24 gauge for ducts from 9" to 22", and 22-gauge for ducts 24" through 36" in diameter and 20 gauge for ducts over 36" in diameter. Lock seams shall be spaced on not more than 3" centers for ducts up to 5" in diameter, 6" centers for ducts from 6" through 10", and 8" centers for ducts 12" and over in diameter. Interior perforated steel liner shall be minimum 24 gauge.
- C. Fabricate fittings by continuous brazing or continuous electric welding. Thickness of metal for round fittings: 20-gauge for ducts up to 36" in diameter, 18-gauge for 37" to 50", and 16-gauge for ducts over 51" in diameter.

- D. Elbows shall have centerline radius of 1.5 diameters, 5 piece construction over 8" diameter, die stamped 8" and smaller. 90-degree take-offs shall be made with conical tees. Make connections to plenums with bellmouths. Fittings shall have insulation and liner same as ductwork noted above.
- E. Make transverse joints using beaded slip couplings, sealing compound equal to solvent based United "Duct Seal", and sheet metal screws.
- F. Seal all ducts to SMACNA Class (A) classification and pressure and leak test ducts at 1-1/2 times pressure class, 6" WG.
- G. Hang ducts using 1" x 12-gauge straps at transverse joints but not more than 8'-0" apart. Straps shall completely encircle duct and shall be secured to construction with powder driven studs. Do not penetrate ductwork at hangers.
- H. Secure vertical ducts at floors using riser clamps.

2.10 DUCTWORK - LOW PRESSURE:

- A. Ductwork, Low Pressure, shall include: All supply duct downstream of VAVR Terminal Units, outside air, return air and exhaust ducts.
- B. Construct ducts in accordance with SMACNA Duct Construction Standards for pressure and seal classes noted below. Do not use snap-lock seam.
- C. Pressure and Seal Classes: 1" Pressure Class, Seal Class "C".
- D. Hang ducts using 1"x12-gauge galvanized straps at transverse joints but not greater than 8 ft. apart.
- E. Provide galvanized sheet steel metal ducts of sizes shown on plans, construct, hang, support and reinforce in accordance with 2" Pressure Class as contained in the current edition of the SMACNA Duct Construction Standards. Use reinforcement noted for the longest side on all sides of the duct and bolt together at corners with minimum 5/16" diameter bolts. Do not penetrate duct at reinforcement with screws. **DO NOT USE SNAP-LOCK SEAMS.**

2.11 DUCTWORK LOW PRESSURE ROUND:

- A. Low pressure round ductwork includes all round supply, return, outside air, and exhaust ductwork except as specified medium pressure round ductwork.
- B. Ductwork: Factory fabricated single-wall galvanized steel round spiral lock seam ducts of 28 gauge for ducts up to 14" in diameter, 26 gauge for ducts from 15" to 26" in diameter, 24 gauge for ducts 27" to 36" in diameter, and 22 gauge for ducts over 36" in diameter.
- C. Fabricate fittings by continuous brazing or electric welding. Thickness of metal for round fittings: 26 gauge for fittings up to 14" in diameter, 24 gauge for fittings 15" to 26" in diameter, 22 gauge for all fittings over 26" in diameter. Elbows shall have a center-line radius of 1.5 diameters, 5 piece construction. Take-offs shall be 45 degree laterals. Splitters (tees) shall be reducing Y-Branch with dampers.

- D. Make transverse joints using beaded slip couplings, sealing compound equal to solvent based United Duct Seal and sheet metal screws.
- E. Provide hanger straps per SMACNA table no more than 8 ft. apart. Straps shall encircle duct. Do not penetrate ductwork at hangers.
- F. No adhesive labels shall be placed on the exposed surface of exposed ductwork.
- G. Ductwork and fittings shall be United McGill Airflow, Semco, Spiral Systems, Spiral Pipe of Texas or Eastern Sheet Metal round duct and fittings, 2" WG standard.

2.12 FLEXIBLE DUCTS:

- A. Flexible duct connectors: 2 element spiral construction composed of galvanized steel supporting spiral and coated woven textile fabric with metal or mineral base, UL listed as Class I Air Duct and Connector (UL 181).
- B. Flexible connectors shall not exceed 5 feet in length and turns shall not exceed 20 degrees with maximum of two turns.
- C. Make connections between flexible ducts and other equipment using galvanized steel draw bands with plated screws and buckles and United Duct seal for high and medium pressure ducts and nylon draw bands for low pressure ducts.
- D. Factory insulate cold flexible ducts using insulation equivalent to that specified for cold ducts minimum R5 rating and provide continuous vapor barrier at connections to other ducts and equipment.
- E. Hang ducts in accordance with manufacturer's instructions.
- F. Flexible ducts: Thermaflex M-KC, EverClean, or Flexmaster Type 4M.

2.13 KITCHEN EXHAUST DUCTS:

- A. Make final duct connections to kitchen hoods and dishwashers under this Section. Hoods and dishwashers will be installed under other Sections.
- B. Kitchen exhaust ducts located below kitchen ceiling shall be 18 gauge type 316 stainless steel with all seams and joints welded.
- C. Kitchen exhaust ducts other than those located below kitchen ceilings: Black steel with all longitudinal and transverse seams continuously welded. Reinforce ducts as specified for low pressure ducts, above.
- D. All kitchen grease hood exhaust ducts shall be leak tested prior to use or concealment by chases, coatings, or wraps that prevent the ductwork from being visually inspected on all sides. The contractor shall provide all necessary equipment and perform the grease duct leakage test. A light test shall be performed to determine that all welded joints are liquid tight. A light test shall be performed by passing a lamp having a power rating of not less than 100 watts through the entire section of ductwork being tested. The lamp shall be open so as to emit light equally in all directions perpendicular to the duct walls. A test shall be performed for the entire duct system, including the hood-to-duct connection. The ductwork shall be permitted to be tested in sections, provided that every joint is tested and complies with local codes and requirements.

- E. Install access doors 20 feet on centers in sides of kitchen exhaust ducts.
- F. Install trapped drain at foot of exhaust riser and extend 1" copper drain line to nearest floor drain or outdoors.

2.14 DUCTWORK LOCATED OUTDOORS:

- A. Construct outdoor ducts as specified for the respective ducts, above. Seal all joints and seams weather tight using glass cloth tape and carbolastic or United Duct Sealer.

2.15 VAPOR EXHAUST DUCTS:

- A. Construct vapor exhaust ducts of aluminum sheet metal with all joints and seams bolted flange and gaskets (TDC or equivalent) Seal Class "A" for 1" Pressure Class using gauges and reinforcing as specified in SMACNA Duct Construction Standard for 1" pressure class.
- B. Provide drain at low points of vapor exhaust ducts and extend trapped type L hard copper drain line to nearest floor drain.
- C. Wrap hanger straps around sides and bottom of ducts. Install no screws in duct.
- D. Fabricate fittings, dampers and other specialties of type 316 stainless steel in accordance with the requirements for low pressure ducts and sheet metal specialties, above.
- E. Use vapor exhaust duct construction for the ducts so indicated on the drawing and all ducts served by a dishwasher.

2.16 WEATHER LOUVERS:

- A. Louvers shall be AMCA certified 6" thick extruded aluminum drainable stationary louvers with minimum 0.08" thick blades and frame and minimum 50% free area nominal. Equip with 1/2" mesh aluminum birdscreen on inside of louver. Color to be selected by Architect. Finish to be manufacturer's Kynar 500 Fluoropolymer coating conforming to AAMA 605.2. Provide samples of color and finish to Architect for approval. Air pressure drop shall not exceed 0.15" WG at maximum air velocity of 850 FPM through free area. Water penetration shall not exceed 0.01 ounces per SF of free area.
- B. Louvers shall be Ruskin ELF6375DX or equivalent by Greenheck, or approved equal.

2.17 AUTOMATIC DAMPERS:

- A. Provide and install automatic dampers as shown on plans, scheduled, or as required. Coordinate size, quantity and locations of automatic dampers with automatic control work as required. Dampers shall be factory fabricated with extruded aluminum blades and frames.
- B. Damper frames shall be 5" x 1" x .125" (minimum thickness) extruded aluminum hat channel with hat shaped mounting flanges on both sides of the frame. Each corner shall be reinforced with two die formed internal braces and machine staked for maximum rigidity or integral overlapping gusset reinforcements in each corner to assure square corners and provide maximum resistance to racking.

- C. Damper blades shall be airfoil type extruded aluminum with metal blade to metal blade overlap. Each blade shall be maximum 6" depth with integral structural reinforcing tube running full length. Minimum thickness of blade shall be 0.070". Each blade shall be symmetrical relative to its axle pivot point, presenting identical performance characteristics with air flowing in either direction through the damper. Provide symmetrical blades of varying size as required to completely fill the damper opening. Blade orientation is horizontal. Blade operation is parallel or opposed. Blades shall be contained within the damper frame.
- D. Blade edge seals shall be flexible and suitable for -72°F to +275°F mechanically locked in extruded blade slots yet easily replaceable in field. Jamb seals shall be flexible stainless steel, compression type to prevent leakage between the end of the blade and the damper frame. Use of blade end to overlap the frame for jamb seal is not acceptable. Adhesive or clip-on type blade or jamb seals are not acceptable.
- E. Bearings shall be non-corrosive molded synthetic. Axles shall be 1/2" plated steel hexagonal shaped and to provide positive locking connection to blade. Linkage shall be concealed out of airstream, within frame to reduce pressure drop, noise and maintenance.
- F. Provide and install Electric, 24 or 120V AC, spring return, 2-position or modulating damper actuator(s) as specified in controls specification sections or as indicated on drawings. Actuator(s) shall be sized as required to sufficiently open/close dampers under operating conditions. Multiple actuators shall be provided as required.
- G. Install dampers in accordance with manufacturer's installation instructions and requirements. Install dampers square and free from racking.
- H. Dampers must be accessible to allow inspection, adjustment, and replacement of components. Provide and install access doors as specified and required.
- I. Provide and install bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Attach multiple damper section assemblies together in accordance with manufacturer's instructions. Install support mullions as reinforcement between assemblies as required.
- J. Submittal shall include leakage, maximum airflow and maximum pressure ratings based on AMCA Publication 500. Damper shall be tested and licensed in accordance with AMCA 511 for Air Performance and Air Leakage. Damper shall meet the leakage requirements of the International Energy Conservation Code by leaking less than 3 cfm/sq. ft. at 1" of static pressure and shall be AMCA licensed as Class 1A.
- K. Saw-mark ends of damper rods parallel to blades.
- L. Rectangular dampers shall be Ruskin Model CD50, Greenheck VCD-43, or preapproved equivalent.
- M. Round dampers shall be Ruskin Model CDRS25, Greenheck VCDR-53, or preapproved equivalent.

2.18 FIRE DAMPERS:

- A. Provide and install UL labeled 1-1/2 hour fire dampers in make-up air connections at kitchen hoods, wherever sheet metal ducts pass through chase walls, floors outside fire chases, and elsewhere as shown or required by local code. See Architectural plans for fire ratings of walls. All fire dampers required may not be shown on mechanical plans.
 - 1. Fire dampers shall be "venetian blind" dampers. Unless otherwise shown folded blades and frames shall not obstruct air stream. Provide type C fire damper in all medium and high pressure supply ducts. Dampers in floors shall be spring loaded.
- B. Install access door in low pressure ducts at each fire damper. Install wall or ceiling access door for access to fire dampers not accessible through lift-out ceilings. See ACCESS DOORS, below.

2.19 AIR FLOW MEASUREMENT STATIONS:

- A. Coordinate size, quantity and location of air flow measuring stations with requirements of Automatic Control work.
- B. Fixed pitot-static rakes together with air straightening devices, all factory mounted in galvanized steel housings not lighter than 20 gauge.
- C. For each monitoring station provide a DDC airflow transmitter, microprocessor based, capable of receiving flow signals from an airflow station and producing dual outputs, linear and scaled for air volume and differential pressure. Transmitter features shall include:
 - 1. Accuracy: +/- 0.25% of Natural Full Span, including non-linearity, hysteresis, and non-repeatability.
 - 2. Temperature Effect:
 - a. Zero: None, corrected by Auto-Zero.
 - b. Span: 0.015% of full span/F.
 - c. Automatic zeroing: Accuracy with 0.1% of calibrated span; frequency every 1 to 24 hours on 1 hour intervals.
 - d. Stability: +/- 0.5% of Natural Span for 6 months.
 - 3. Transmitters shall provide signal proportional to air flow and shall input signal to designated DDC panel.
 - 4. Coordinate transmitter span with actual maximum and minimum duct velocities. Coordinate transmitter output for compatibility with DDC system. Calibrate transmitter at factory. Recalibrate in field after test and balance of system has been performed.

- 5. Transmitters shall include an integral multi-line digital display for use during configuration and calibration and to display transmitter output during normal operation mode.
- D. Maximum static pressure drop through air measurement station 0.04" WG at 1000 FPM face velocity.
- E. Air flow measurement stations shall be Air Monitor or approved equal.
- F. Install an access door in duct immediately upstream from each air flow measuring station.

2.20 STATIC PRESSURE MEASUREMENT STATIONS:

- A. Coordinate size, quantity and location of static pressure measuring stations with requirements of automatic control work.
- B. Fixed static pressure rakes together with air straightening devices all factory mounted in galvanized steel housings not lighter than 20 gauge.
- C. For each static pressure measurement station provide static pressure calibrated magnehelic gauge.
- D. Maximum static pressure drop at 1000 fpm face velocity 0.04" WG.
- E. Install an access door in duct immediately upstream from static pressure measuring stations.
- F. Static pressure measurement stations shall be Air Monitor or equal.

2.21 ACCESS DOORS:

- A. Access doors in low pressure ducts: galvanized steel frame flange mounted permanently secured to duct with a hinged gasketed access port held in place with thumb operated latches. Doors in insulated ducts: double thickness with insulation. Doors in non-insulated ducts: a single thickness. Size doors to permit removal of equipment or maintenance. Minimum 18" x 18" in ducts 20" or greater. Minimum 12" x 12" in ducts 14" to 18" and minimum 8" x 12" in ducts 10" to 12". If duct is less than 10", enlarge duct at access door (and fire damper, if applicable) to allow minimum 8" x 12" access door. Kees "FH" series standard pressure flanged mount. Install for flush interior on double wall doors.
- B. Access doors in medium pressure supply ducts: Factory fabricated combination view/access/vacuum-relief doors consisting of a galvanized steel frame welded to duct with double wall inwardly-opening transparent plastic door. Latches shall secure plastic door to frame but release door into duct to act as a vacuum breaker. Attach a retaining chain to frame and door for doors without hinges. Door size (minimum) 8 x 12 for round ducts up to 12" diameter, and oval or rectangular ducts up to 16" maximum side; 12 x 12 for round ducts 13" to 18" and oval or rectangular ducts 17" to 24" maximum side and 14" x 20" for larger ducts. Doors shall be tight under 10" WC pressure and shall pop open under 6" WC vacuum. Kees FIN-H high pressure flanged mount on rectangular ductwork or flat side of flat-oval ductwork. Kees ADH-HP for round ductwork or round side of flat-oval ductwork.
- C. Access doors in range hood exhaust ducts: Bolted and gasketed with 200°F gaskets, grease tight, bottoms of doors not less than 1-1/2" above bottom of duct. Minimum size 12 x 12. Locate doors 20 feet on centers and at each change of direction.

- D. Mark access points in lift-out ceilings with colored vinyl stick-on discs. Locate discs on grid adjacent to point of access and coordinate location of access doors in non-accessible ceiling with General Contractor.

END OF AIR DISTRIBUTION

SECTION 23 7000

HVAC TESTING AND BALANCING

PART 1 - GENERAL

- A. Provisions of Section 23 0500 - "General Provisions - HVAC" shall apply to and become a part of this section.
- B. The HVAC testing and balancing work specified in this section shall be done by an Associated Air Balance Council (AABC) member or by a National Environmental Balancing Bureau (NEBB) member (and an AABC "National Project Performance Guarantee" shall be provided for the project). The Testing and Balancing Agency's (TABA) project manager shall be an AABC certified or NEBB certified testing and balancing engineer and be responsible for supervision of and certification of the work herein specified.
- C. The Testing and Balancing agency will be employed by the mechanical contractor.
- D. The balancing agency shall submit records of experience in the field of air and hydronic system balancing or any other data as requested by the Engineer. The supervisory personnel for the firm shall have at least five (5) years' experience, and all the employees used in this project shall be qualified technicians in this specific field.
- E. The balancing agency shall furnish all necessary calibrated instrumentation to adequately perform the specified services. An inventory of all instruments and devices in possession of the balancing agency may be required by the Engineer to determine the balancing agency's performance capability.

1.2 SCOPE:

- A. All air and water balance work shall be done in accordance with the AABC National Standards for Testing and Balancing Heating & Air Conditioning Systems (AABC National Standards), or NEBB National Standards edition in force at time of bidding. If these specifications set forth more stringent requirements than the AABC National Standards, these specifications shall prevail.
- B. The systems to be balanced and/or tested shall include but not limited to:
 - 1. Air Handling Units.
 - 2. VAVR Terminal Units.
 - 3. All Fans (Supply or Exhaust).

1.3 DOCUMENTS:

- A. The architect will provide the balancing agency one copy of each of the following documents:
 - 1. Project drawings and specifications.

2. Approved construction revisions pertaining to the HVAC systems.
3. Approved submittal data on HVAC equipment and systems to be installed under Division 23.
4. Approved HVAC shop drawings.
5. Approved HVAC wiring diagrams, control diagrams and equipment brochures, as appropriate.

1.4 COORDINATION:

- A. The TABA shall perform its services in close coordination with the work specified in Division 23.
- B. The plans and specifications indicate meters, valves, dampers, etc. for the purpose of adjusting the HVAC systems to obtain optimum operating conditions. In the event that any of meters, valves, dampers, etc. have been installed in a manner which will not permit their being used for their intended purpose, TABA shall so notify the Mechanical Contractor so that the above items may be correctly installed as specified in the other sections of Division 23.
- C. Work included in this section shall not be started until the systems involved meet the following conditions:
 1. Air Distribution Systems
 - a. Systems have been completed (including sealing and/or leak testing where specified) with all components properly installed and ready for operation, fans are rotating correctly, motor starters have correct overload elements, variable speed drives have been put into operation and clean filters (of the type required for finished system) have been installed.
 - b. All dampers, including automatic dampers, are operating smoothly and without binding and that the automatic dampers close tightly and open wide without binding.
 - c. The spare sheaves as specified in Section 23 0500, General Provisions - HVAC under Tests, Cleaning and Adjustments are on site.
 2. Water Circulating Systems:
 - a. Systems have been completed, including leak testing and cleaning and until systems have been refilled, pumps are rotating correctly, correct overload elements have been installed in pump motor starters (variable speed drives have been put into operation) and strainers have been cleaned and baskets used for the ultimate installation have been installed.
 - b. Compression tanks have been installed and correct system pressure is being maintained, all air vents have been installed and system has been vented and is free from air.

3. Automatic Control System:

- a. Systems have been completed and are operating as designed.
 - 1) Installation is complete, all instruments (including room thermostats) have been field calibrated and operate correctly, and are set for design operating conditions.
 - 2) TABA personnel have been instructed in the proper use of and in changing set points of the various controllers including via computer or keypad if required.

1.5 NOTIFICATION FOR TESTING & BALANCING WORK TO BEGIN:

- A. When the above conditions have been met, the Mechanical Contractor shall notify the TABA in writing that the system(s) are ready for Testing and Balancing.
- B. When the TABA has been notified that the systems are ready for testing and balancing, the TABA shall inspect the various systems involved and notify Mechanical Contractor of any condition which may impede the TAB work (missing dampers, valves, incomplete control or electrical work, etc.).
- C. When the deficiencies noted above have been corrected, Mechanical Contractor shall again notify TABA that the system(s) are ready for testing and balancing.

1.6 INSPECTIONS:

- A. During construction the TABA shall inspect the installation of the piping systems, sheet metal work, control system and mechanical equipment.
- B. The inspections should be made when 60% of the ductwork has been installed and when 90% of the equipment has been installed.
- C. The TABA shall submit a brief written report of each inspection to the Mechanical Contractor.

1.7 TESTING AND BALANCING PROCEDURES:

- A. All testing and balancing work shall be done in accordance with the AABC National Standards.
- B. Air Systems:
 - 1. Fan Speed: Test and adjust fan RPM to achieve design CFM requirements.
 - 2. Current and Voltage: Measure and record motor current and voltage of each fan.
 - 3. Pitot-tube Traverse: Perform a Pitot-tube traverse of main supply and return ducts to obtain total CFM. If a Pitot-tube traverse is not practical, the summation of the outlets or inlets may be used. An explanation why a traverse was not made must appear on the appropriate data sheet.

4. Outside Air: Test and adjust system minimum outside air by Pitot-tube traverse. If a Pitot-tube traverse is not practical, the percentage of outside air may be determined by calculations from the return air, outside air, and discharge air temperatures with heating and cooling coil valves shut. Make allowances for heat of compression and motor heat where applicable.
 5. Static Pressure: Test and record system static pressures, including suction and discharge static pressure of each fan.
 6. Air Temperature: Take wet-bulb and dry-bulb air temperatures on the entering and leaving side of each cooling coil. Dry-bulb temperature shall be taken on the entering and leaving side of each heating coil.
 7. Zone Ducts: Adjust zone ducts to within design CFM requirements. At least one zone balancing damper shall be completely open.
 8. Main Ducts: Adjust main ducts to within design CFM requirements and traverse for total CFM quantities.
 9. Branch Ducts: Adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
 10. Tolerances: Test and balance each diffuser, grille and register to within -5% and +10% of design requirements.
 11. Identification: Identify the location and area of each grille, diffuser, register, and terminal box. This information shall be recorded on air outlet data sheets.
 12. Description: Record the size, type and manufacturer of each diffuser, grille and register on air outlet data sheets.
 13. Terminal Boxes: Set volume regulators on all terminal boxes to meet design maximum and minimum CFM requirements. All associated temperature controls shall be checked for proper operation and calibration. If the terminal boxes have separate settings for heating and cooling CFM, the CFM quantities for each shall be recorded on air outlet data sheets. All diffusers connected to the terminal box shall be read in the heating and cooling modes and their readings recorded on air outlet data sheets.
 14. Minimizing Drafts: Set grille bars for throws, diffusers for patterns and adjust all diffusers, grilles, and registers to minimize drafts in all areas.
- C. Water Circulating System Procedures:
1. The various water circulating systems shall be filled, purged of air and put into operation by the contractor before hydronic balancing is begun.
 2. The flow of water through all coils shall be adjusted by manipulating balancing valves until the rated pressure drop through the coil or metering device is obtained.

3. Water Treatment: Examine the water in the system and determine if the water has been treated and cleaned. If it has not, request the contractor to clean and treat the water.
4. Strainers: Request that the contractor clean all strainers.
5. Air Vents: Check all air vents at the high points of the water system and determine if they are installed and operating.
6. Valves: Set all balancing valves and automatic temperature control bypass valves to the full-open position for balancing. For three-way valves, the rated pressure drop shall first be adjusted with the three-way valve set so that all water flows through the coil. The bypass balancing valve shall then be adjusted on each coil until equal pressure drop between supply and return connections is obtained, with the three-way valve set to bypass the coil.
7. Pumps: Adjust circulating pumps to meet design GPM requirements. Check pumps for proper operation. Pumps shall be free of vibration and cavitation. Measure and record operating current and voltage.
8. Central Plant: Adjust water flow from the central plant if applicable.
9. Tolerances: Proceed to balance all chilled-water and hot-water coils within 10 percent of design requirements.
10. Marking: Mark all settings and record all data after completing the flow readings and coil adjustments.

D. Verification of Temperature Control:

1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water reset, and fire and freeze stats.
2. Verify that all controlling instruments are calibrated and set for design operating conditions.
3. Verify the accuracy of the final settings by taking temperature readings. The readings shall be in a typical conditioned space for each separately controlled zone.

1.8 TEST AND BALANCE REPORT:

- A. The test and balance report shall be complete with logs, data, and records as required herein. All logs, data, and records shall be typed on white bond paper and bound. The report shall be certified accurate and complete by the balancing agency's certified test and balance engineer. Any drawings submitted must be to a scale of 1/8" per foot or larger.
- B. Six (6) copies or PDF electronic file of the test and balance report are required and shall be submitted to the Architect and Engineer.
- C. The report shall contain the following general data in a format selected by the balancing agency:
 1. Project Number

2. Contract number
 3. Project title
 4. Project location
 5. Project architect
 6. Project mechanical engineer
 7. Test and balance agency
 8. Test and balance engineer
 9. General contractor
 10. Mechanical subcontractor
 11. Dates tests were performed
 12. Certification
- D. The test and balance report shall be recorded on report forms conforming to the recommended forms in the AABC or NEBB National Standards. At a minimum, the report shall include:
1. Preface: A general discussion of the system, any abnormalities and problems encountered.
 2. Instrumentation List: The list of instruments including type, model, manufacturer, serial number and calibration dates.
 3. System Identification: In each report, the VAV boxes, zones, supply, return, and exhaust openings, and traverse points shall be numbered and/or lettered to correspond to the numbers and letters used on the report data sheets.
 4. Air handling equipment test report forms: Record the following on each air-handling equipment test form:
 - a. Manufacturer, model number and serial number
 - b. All design and manufacturer-rated data
 - c. Total actual CFM by traverse if practical. If not practical, the sum of the outlets may be used, or a combination of these procedures. For specific systems, such as ones with diversity, see the *AABC National Standards*.

- d. Suction and discharge static pressure of each fan, as applicable.
 - e. Outside air, return air and total CFM.
 - f. Actual operating current, voltage and brake horsepower of each fan motor.
 - g. Final RPM of each fan.
 - h. Fan and motor sheave manufacturer, model, size, number of grooves and center distance.
 - i. Belt size and quantity.
 - j. Static pressure controls' final operating set points.
5. Pump Test Forms: Submit pump curve showing design-, operating-, and no-flow points of operation. Also, record the following items on each pump test form:
- a. Manufacturer, size and serial number.
 - b. All design and manufacturer's rated data.
 - c. Pump operating suction and discharge pressure and final total dynamic head.
 - d. No flow (pump discharge valve closed) suction and discharge pressure and corresponding total dynamic head. This procedure is to determine actual impeller size.
 - e. Rated and actual operating current, voltage, and brake horsepower of each pump motor.
6. Chiller Test Forms: Record the following items for each chiller:
- a. Manufacturer, model number and serial number.
 - b. All design and manufacturers' rated data.
 - c. Rated and actual pressure drop across evaporators and condensers and related GPM.
 - d. Entering and leaving water temperatures.
 - e. Rated and actual operating current and voltage.
7. Heating and cooling-coil test forms: Record the following items on each test form:
- a. Manufacturer.
 - b. All design and manufacturers' rated data.
 - c. Rated and actual water pressure drop through each coil and related GPM.
 - d. Rated and actual static pressure drop across each coil.

- e. Entering and leaving water temperatures.
 - f. Wet-bulb and dry-bulb temperatures entering and leaving each cooling coil; dry-bulb temperatures entering and leaving each heating coil.
8. Boiler test forms: Record the following items on each boiler test form:
- a. Manufacturer and model number.
 - b. All design and manufacturers' rated data.
 - c. Service and location.
 - d. Actual pressure drop and related GPM.
 - e. Entering and leaving temperatures.
 - f. Temperature control setting.
9. Test and balance drawings: Include the following:
- a. Terminal Units: Indicate mark, design maximum airflow, actual maximum airflow, minimum design airflow and minimum actual airflow.
 - b. All air devices: Indicate terminal unit as air handler served from design airflow, actual airflow, neck size and air device type.
 - c. Air Handlers: Indicate mark, design supply airflow, actual supply airflow, design return airflow, actual return airflow, outside air design airflow and outside air actual airflow.
 - d. Fans: Indicate mark, design airflow and actual airflow.

1.9 FINAL ACCEPTANCE:

- A. Before Certificate of Final Payment is issued the TABA shall recheck, in the presence of the Owner's representative, Architect and Engineer, specific and random selections of data recorded in the certified test and balance report.
- B. Points and areas for recheck shall be selected by the Engineer.
- C. Measurements and test procedures shall be the same as the original test and balance.
- D. Selections for recheck, specific plus random, shall not normally exceed 15 percent of the total number tabulated in the report, except where special air systems require a complete recheck for safety reasons.
- E. If random tests demonstrate a measured flow deviation of 10 percent or more from that recorded in the certified test and balance report, the report shall automatically be rejected. In the event the report is rejected, all systems shall be readjusted and tested, new data recorded, a new certified test and balance report submitted, and a new inspection test made, all at no additional cost to the Owner.

1.10 OPPOSITE SEASON TEST:

- A. The TABA shall perform an inspection of the HVAC system during the opposite season from that in which the initial adjustments were made. The balancing agency shall make any necessary modifications to the initial adjustments to produce optimum system operation.

END OF HVAC TESTING AND BALANCING

SECTION 23 8000

CONVENTIONAL AUTOMATIC CONTROLS

PART 1 - GENERAL

1.1 SCOPE:

- A. Section 23 0500 – “General Provisions – HVAC” shall apply to and become part of this Section.
- B. Refer to Section 23 8100 Direct Digital Control (DDC).

1.2 CONTROL SYSTEMS:

- A. Furnish and install complete and ready for operation with control sequences specified. (The automatic control system shall be by the same manufacturer as the DDC System).
- B. Products of a manufacturer maintaining complete service and parts facilities in Alabama continuously for the last three years.
- C. Control equipment, except for items comprising an integral part of the water or refrigeration piping, shall be installed by trained mechanics employed by the control manufacturer.
- D. Include the services of a full time control technician for calibrating and adjusting controls for the first 5 working days after Owner has occupied building.
- E. Before installation, submit for approval 5 copies of complete power and control wiring and piping diagrams and list of control panel locations by room name and number. Hang a photostatic copy of the "as built" diagram, framed behind glass, in each equipment room. Provide one set of reproducible sepias of "as built" control diagrams at completion of project for the Owner's use.
- F. Provide permanent nameplates for control switches and motor starters. Nameplates: engraved laminated plastic with letters legible under normal operating conditions. (Black on white).
- G. Permanently identify control devices and room thermostats or sensors, so they may be identified on control diagrams. Provide engraved plastic nameplates for items mounted outside of or on faces of panels. Mark other instruments with indelible ink.

1.3 CONTROL WIRING:

- A. Include all control and interlock wiring and power wiring for control panel in this Section. Install all control and interlock wiring in EMT. EMT and EMT fittings shall comply with the provisions of Electrical Work.
- B. Waterproof and firestop all conduit floor penetrations. Firestop conduit penetrations of fire rated walls and partitions.

- C. Wire all devices individually to terminal strips in control panels.
- D. Furnish necessary relays and auxiliary contactors and other accessories required. Provide interlock relays per N.E.C. Coordinate start-stop stations, auxiliary contacts, etc., with supplier of Starters and Motor Control Centers specified in Electrical Work.

1.4 CONTROL PANELS:

- A. Local Control Panels: construct of galvanized steel with baked enamel finish or aluminum-plywood-aluminum fronts and backs and extruded tops, bottoms, and ends. All panels shall have piano hinges and key locking latches (key panels alike). Permanently label instruments located in panels consistent with labeling on control diagram. Cement photostat of approved diagram inside each panel cover. (Include Local-Remote switching for control point adjusters on face of each panel.)
- B. Bottom of control panels shall be located not less than 2-1/2 feet above floor and top not more than 6 feet above the floor.

1.5 INTERFACES WITH DIRECT DIGITAL CONTROL SYSTEM (DDC):

- A. Relays actuated by DDC will be mounted in DDC Panels located in Fan Rooms, Equipment Rooms, etc.
- B. Wiring from local panels to DDC panels is included in this Section.
- C. Control point adjusters actuated by DDC System will be located in DDC Panels. Pneumatic tubing between Local Control Panels and DDC Panels is included in this Section.
- D. Fire Control Panel: Furnished and installed under Electrical Work. Connections between Fire control Panel and fan starters, damper air solenoids, etc. shall be included under Controls (See also Section 23 8100 Direct Digital Controls).

END OF CONVENTIONAL AUTOMATIC CONTROLS

SECTION 23 8100

BUILDING AUTOMATION SYSTEM (BAS)

PART 1 - GENERAL:

1.1 SUMMARY:

- A. Furnish all labor, materials, equipment, and service necessary for a complete and operating Temperature Control System (TCS) and Facility Management system (FMCS), utilizing Direct Digital Controls as shown on the drawings and as described herein. Drawings are diagrammatic only.
- B. All labor, material, equipment and software not specifically referred to herein or on the plans, that is required to meet the functional intent of this specification, shall be provided without additional cost to the Owner.
- C. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s).

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). **A Niagara Tridium based WEBS N4 system manufactured by Honeywell International shall be provided and installed by (Walters Controls, Inc. 251-661-4416 attention Trent or Skipper Walters) or another Honeywell ACI as outlined below.** Walters Controls has previously installed Honeywell DDC controls in over 10 Bishop State College buildings and is currently servicing each. It is in the best interest of the owner to have a consistent service provider and spare parts for each of its buildings during construction, warranty and after warranty periods. A Honeywell certified ACI or Branch office may quote the project if they have a local office within with a fully stocked parts warehouse with a street address and have a proof of Certification of Tridium training by at least 3 employees Certification must be provided at the submittal phase. Failure to meet the minimum requirements shall result in the rejection of bids without compensation.
- B. The Temperature Control Systems (TCS) consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and perform functions specified.
- C. 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) and/or BACnet™ (IBC) controllers and other open protocol systems/devices provided under Division 23 or Division 26.

- D. The Facility Management and Control System (FMCS) as provided in this Division shall be based on a hierarchical architecture incorporating the Niagara N4 Framework™. DDC controls shall be as manufactured by Honeywell International
- E. The Facility Management and Control System (FMCS) shall monitor and control equipment as called for by the "Sequence of Operation" and points list.
- F. The Facility Management and Control System (FMCS) shall provide full graphic software capable of complete system operation for up to 34 simultaneous Thin-Client workstations.
- G. The Facility Management and Control System (FMCS) shall provide full graphic operator interface to include the following graphics as a minimum:
 - 1. Home page to include a minimum of six critical points, i.e. Outside Air Temperature, Outside Air Relative Humidity, Enthalpy, KWH, KW etc.
 - 2. Graphic floor plans accurately depicting rooms, walls, hallways, and showing accurate locations of space sensors and major mechanical equipment.
 - 3. Detail graphics for each mechanical system to include; AHUs (Air Handling Units), ERUs (Energy Recovery Units), TUs (Terminal Units), EFs (Exhaust Fans), Chillers and associated controls, Boilers, and Converters as a minimum.
 - 4. Access corresponding system drawings, technical literature, and sequences of operations directly from each system graphic.
- H. The Facility Management and Control System (FMCS) shall provide the following data links to electronically formatted information for operator access and use.
 - 1. Project control as-built documentation; to include all TCS drawings and diagrams converted to Adobe Acrobat .pdf filers.
 - 2. TCS Bill of Material for each system, i.e. AHU, RTU, FCU, Boiler etc.
 - 3. Technical literature specification data sheets for all components listed in the TCS Bill of Material.
 - 4. Sequence of operation for all TCS provided systems.

1.3 SUBMITTAL

- A. Four 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. Division 26 contractors supplying products and systems, as part of their packages shall provide catalog data sheets, wiring diagrams and point lists to the Division 23 contractor for proper coordination of work.
 - 1. Valve Schedule: Valve sizing shall be performed, and a schedule created by the valve manufacturer. The schedule shall include a separate line for each valve and a column for each of the valve attributes: Valve Identification Tag, Location, Valve Type, Valve Size, Configuration, Flow Characteristics, Capacity, Valve Cv, Fail Position, Actuator Identification Tag, and Actuator Type.
- B. Submittal shall also include a trunk cable schematic diagram depicting operator workstations, control panel locations and a description of the communication type, media, and protocol. Though the Division 23 and 26 contractors shall provide these diagrams for their portions of work, the Systems Integrator shall be responsible for integrating those diagrams into the overall trunk cable schematic diagrams for the entire Wide Area Network (WAN) and/or Local Area Network (LAN) utilized by the FMCS.
 - 1. The network infrastructure shall conform to the published guidelines for wire type, length, number of nodes per channel, termination, and other relevant wiring and infrastructure criteria as published. The number of nodes per channel shall be no more than 85% of the defined segment (logical or physical) limit in order to provide future system expansion with minimal infrastructure modifications.
- C. Upon completion of the work, provide a complete set of 'as-built' drawings and application software on compact disk. Drawings shall be provided as AutoCAD™ or Visio™ compatible files. Eight copies of the 'as-built' drawings shall be provided in addition to the documents on compact disk. Division 23 and 26 contractors shall provide as-builts for their portions of work. The Division 23 contractor shall be responsible for as-builts pertaining to overall TCS and FMCS architecture and network diagrams. All as-built drawings shall also be installed into the FMCS server in a dedicated directory.

1.4 SPECIFICATION NOMENCLATURE

- A. Acronyms used in this specification are as follows:

DDC	Direct Digital Controls
FMCS	Facility Management and Control System
GUI	Graphical User Interface
IBC	Interoperable BACnet Controller
IDC	Interoperable Digital Controller

LAN	Local Area Network
NAC	Network Area Controller
OOT	Object Oriented Technology
PICS	Product Interoperability Compliance Statement
PMI	Power Measurement Interface
POT	Portable Operator's Terminal
TCS	Temperature Control System
WAN	Wide Area Network
WBI	Web Browser Interface

1.5 DIVISION OF WORK

- A. The Division 23 and 26 (if applicable) contractors shall be responsible for all controllers (IDC and IBC), control devices, control panels, controller programming, controller programming software, controller input/output and power wiring and controller network wiring.
- B. The Division 23 contractor shall be responsible for the Network Area Controller(s) (NAC), software and programming of the NAC, graphical user interface software (GUI), development of all graphical screens, Web browser pages, setup of schedules, logs and alarms, LonWorks network management and connection of the NAC to the local or wide area network.

1.6 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 26, Electrical:
 - 1. Providing motor starters and disconnect switches.
 - 2. Power wiring and its conduit.
 - 3. Provision, installation and wiring of smoke detectors.
 - 4. Other equipment and wiring as specified in Division 26.

1.7 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 23, Subpart J, Class A Computing Devices

1.8 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.
- B. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s). In addition, the Owner shall receive ownership of all job specific configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and/or configured for use with the NAC, FMCS, and any related LAN / WAN / Intranet and Internet connected routers and devices. Any and all required IDs and passwords for access to any component or software program shall be provided to the owner.
- C. The owner, or his appointed agent, shall receive ownership of all job specific software configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and /or configured for use within Niagara N4 Framework (Niagara) based controllers and/or servers and any related LAN / WAN / Intranet and all connected routers and devices.

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.
- B. The installed system shall provide secure password access to all features, functions and data contained in the overall FMCS.

2.2 ACCEPTABLE MANUFACTURERS

Basis-of-Design: Niagara Tridium Web Honeywell N4 based system. Approved suppliers are Honeywell International by Walters Controls, Inc. or Honeywell Branch office

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 into 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. 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 local 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 100 Megabit/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.

1. 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 DDC contractor shall supply one or more Network Area Controllers (NAC) as part of this contract. Number of area controllers required is dependent on the type and quantity of devices provided under Divisions 23 and 26. It is the responsibility of the DDC contractor to coordinate with the Division 23 and 26 contractors to determine the quantity and type of devices.
- B. 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 controller data and BACnet controller data
 7. Network Management functions for all LonWorks and/or BACnet based devices
- C. The Network Area Controller shall provide the following hardware features as a minimum:
1. One Ethernet Port – 10/100 Mbps

2. One RS-232 port
3. One LonWorks Interface Port – 78KB FTT-10A if Lon controllers are used and/or One RS-485 port if BACnet controllers are used.
4. Battery Backup
5. Flash memory for long term data backup (If battery backup or flash memory is not supplied, the controller must contain a hard disk with at least 1 gigabyte storage capacity)
- D. 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.
- E. The NAC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 32 simultaneous users.
 1. 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. Controller 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 via the owner’s e-mail service. 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 via the owner’s e-mail service
 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 #, access way, 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.

2.6 Data Collection and Storage

- A. The NAC shall have the ability to collect data for any property of any object and store this data for future use.
- B. The data collection shall be performed by log objects, resident in the NAC that shall have, at a minimum, the following configurable properties:
 1. Designating the log as interval or deviation.
 2. For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.
 3. For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
 4. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.
 5. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.
- C. All log data shall be stored in a relational database in the NAC and the data shall be accessed from a server (if the system is so configured) or a standard Web browser.
- D. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.
- E. All log data shall be available to the user in the following data formats:
 1. HTML
 2. XML
 3. Plain Text

4. Comma or tab separated values
 5. PDF
- F. Systems that do not provide log data in HTML and XML formats at a minimum shall not be acceptable.

2.7 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.

2.8 ADVANCED UNITARY CONTROLLER

- A. The controller platform shall be designed specifically to control HVAC – ventilation, filtration, heating, cooling, humidification, and distribution. Equipment includes: constant volume air handlers, VAV air handlers, packaged RTU, heat pumps, unit vents, fan coils, natural convection units, and radiant panels. The controller platform shall provide options and advanced system functions, programmable and configurable using Niagara N4 Framework™, that allow standard and customizable control solutions required in executing the “Sequence of Operation” as outlined in Section 4.
- B. Minimum Requirements:
 1. The controller shall be capable of either integrating with other devices or stand-alone operation.
 2. The controller shall have two microprocessors. The Host processor contains on-chip FLASH program memory, FLASH information memory, and RAM to run the main HVAC application. The second processor for LonWorks™ network communications.
 - a. FLASH Memory Capacity: 116 Kilobytes with 8 Kilobytes for application program.
 - b. FLASH Memory settings retained for ten years.
 - c. RAM: 8 Kilobytes
 3. The controller shall have an FTT transformer-coupled communications port interface for common mode-noise rejection and DC isolation.

4. The controller shall have an internal time clock with the ability to automatically revert from a master time clock on failure.
 - a. Operating Range: 24 hour, 365 day, multi-year calendar including day of week and configuration for automatic day-light savings time adjustment to occur on configured start and stop dates.
 - b. Accuracy: ± 1 minute per month at 77° F (25° C).
 - c. Power Failure Backup: 24 hours at 32° to 100° F (0° to 38° C), 22 hours at 100° to 122° F (38° to 50° C).
5. The controller shall include Sylk Bus, a two wire, polarity insensitive bus that provides both 18 Vdc power and communications between a Sylk-enabled device and a Sylk-enabled controller.
6. The controller shall have Significant Event Notification, Periodic Update capability, and Failure Detect when network inputs fail to be detected within their configurable time frame.
7. The controller shall have an internal DC power supply to power external sensors.
 - a. Power Output: 20 VDC $\pm 10\%$ at 75 mA.
8. The controller shall have a visual indication (LED) of the status of the device:
 - a. Controller operating normally.
 - b. Controller in process of download.
 - c. Controller in manual mode under control of software tool.
 - d. Controller lost its configuration.
 - e. No power to controller, low voltage, or controller damage.
 - f. Processor and/or controller are not operating.
9. The controller shall have sufficient on-board inputs and outputs to support the application.
 - a. Analog outputs (AO) shall be capable of being configured to support 0-10 V, 2-10 V or 4-20 mA devices.
 - b. Triac outputs shall be capable of switching 30 Volts at 500 mA.
 - c. Input and Output wiring terminal strips shall be removable from the controller without disconnecting wiring. Input and Output wiring terminals shall be designated with color coded labels.
 - d. Universal inputs shall be capable of being configured as binary inputs, resistive inputs, voltage inputs (0-10 VDC), or current inputs (4-20 mA).

10. The controller shall provide for “user defined” Network Variables (NV) for customized configurations and naming using Niagara N4 Framework™.
 - a. The controller shall support 240 Network Variables with a byte count of 31 per variable.
 - b. The controller shall support 960 separate data values.
 11. The controller shall provide “continuous” automated loop tuning with an Adaptive Integral Algorithm Control Loop.
- C. The controller platform shall be designed specifically to control HVAC – ventilation, filtration, heating, cooling, humidification, and distribution. Equipment includes: constant volume air handlers, packaged RTU, heat pumps, unit vents, fan coils, natural convection units, and radiant panels. The controller platform shall provide options and advanced system functions, configurable using Niagara N4 Framework™, that allow standard control solutions required in executing the “Sequence of Operation” as outlined in Section 4.
- D. Minimum Requirements:
1. The controller shall be capable of either integrating with other devices or stand-alone operation.
 2. The controller shall have an FTT transformer-coupled communications port interface for common mode-noise rejection and DC isolation.
 3. The controller shall have Significant Event Notification, Periodic Update capability, and Failure Detect when network inputs fail to be detected within their configurable time frame.
 4. The controller shall have a visual indication (LED) of the status of the device:
 - a. Controller operating normally.
 - b. Controller in process of download.
 - c. Controller in manual mode under control of software tool.
 - d. Controller lost its configuration.
 - e. No power to controller, low voltage, or controller damage.
 - f. Processor and/or controller are not operating.
 5. The minimum controller Environmental ratings
 - a. Operating Temperature Ambient Rating: -40° to 150° F (-40° to 65.5° C).
 - b. Storage Temperature Ambient Rating: -40° to 150° F (-40° to 65.5° C).
 - c. Relative Humidity: 5% to 95% non-condensing.

6. The controller shall have the additional approval requirements, listings, and approvals:
 - a. UL/cUL (E87741) listed under UL916 (Standard for Open Energy Management Equipment) with plenum rating.
 - b. CSA (LR95329-3) Listed
 - c. Meets FCC Part 15, Subpart B, Class B (radiated emissions) requirements.

2.9 GRAPHICAL USER INTERFACE SOFTWARE

A. Operating System:

1. The Workstation with GUI shall run on Microsoft Windows latest version.

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 minimal 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:

1. 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 text entry 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 text entry 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 or 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 alarmable and define the alarm state.
 - 7. Select points to be trended over a period of time and initiate the recording of values automatically.
- E. On-Line Help. Provide a context sensitive on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for the currently displayed screen. Additional help information shall be available through the use of hypertext. All system documentation and help files shall be in HTML format.
- F. Security. Each operator shall be required to log on to the system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system administrator shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operators' access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off the system if no keyboard or mouse activity is detected for a specified time. This auto log-off time shall be set per operator password. All system security data shall be stored in an encrypted format.

2.10 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™ or Netscape Navigator™. 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 (if used). Systems that require different graphic views, different means of graphic generation, 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:
1. 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.
 - 1) Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
 - 2) Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.
 - b. 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 text entry shall be required.
 - c. View logs and charts
 - d. View and acknowledge alarms
 - e. Setup and execute SQL queries on log and archive information

2.11 LIBRARY

- A. A standard library of objects shall be included for development and setup of application logic, user interface displays, system services, and communication networks.

- B. The objects in this library shall be capable of being copied and pasted into the user's database and shall be organized according to their function. In addition, the user shall have the capability to group objects created in their application and store the new instances of these objects in a user-defined library.
- C. In addition to the standard libraries specified here, the supplier of the system shall maintain an on-line accessible (over the Internet) library, available to all registered users to provide new or updated objects and applications as they are developed.
- D. All control objects shall conform to the control objects specified in the BACnet specification.
- E. The library shall include applications or objects for the following functions, at a minimum:
 - 1. Scheduling Object. The schedule must conform to the schedule object as defined in the BACnet specification, providing 7-day plus holiday & temporary scheduling features and a minimum of 10 on/off events per day. Data entry to be by graphical sliders to speed creation and selection of on-off events.
 - 2. Calendar Object. The calendar must conform to the calendar object as defined in the BACnet specification, providing 12-month calendar features to allow for holiday or special event data entry. Data entry to be by graphical "point-and-click" selection. This object must be "linkable" to any or all scheduling objects for effective event control.
 - 3. Duty Cycling Object. Provide a universal duty cycle object to allow repetitive on/off time control of equipment as an energy conserving measure. Any number of these objects may be created to control equipment at varying intervals
 - 4. Temperature Override Object. Provide a temperature override object that is capable of overriding equipment turned off by other energy saving programs (scheduling, duty cycling etc.) to maintain occupant comfort or for equipment freeze protection.
 - 5. Start-Stop Time Optimization Object. Provide a start-stop time optimization object to provide the capability of starting equipment just early enough to bring space conditions to desired conditions by the scheduled occupancy time. Also, allow equipment to be stopped before the scheduled un-occupancy time just far enough ahead to take advantage of the building's "flywheel" effect for energy savings. Provide automatic tuning of all start / stop time object properties based on the previous day's performance.
 - 6. Demand Limiting Object. Provide a comprehensive demand-limiting object that is capable of controlling demand for any selected energy utility (electric, oil, and gas). The object shall provide the capability of monitoring a demand value and predicting (by use of a sliding window prediction algorithm) the demand at the end of the user defined interval period (1-60 minutes). This object shall also accommodate a utility meter time sync pulse for fixed interval demand control. Upon a prediction that will exceed the user defined demand limit (supply a minimum of 6 per day), the demand limiting object shall issue shed commands to either turn off user specified loads or modify equipment set points to effect the desired energy reduction. If the list of sheddable equipment is not enough to reduce the demand to below the set point, a message shall be displayed on the users screen (as an alarm) instructing the user to take manual actions to maintain the desired demand. The shed lists are specified by the user and shall be selectable to be shed in either a fixed or rotating order to control which equipment is shed the most often. Upon suitable reductions in demand, the demand-limiting object shall restore the equipment that was shed in the reverse order in which it was shed. Each

shedddable object shall have a minimum and maximum shed time property to effect both equipment protection and occupant comfort.

2.12 DDE DEVICE INTEGRATION

- A. The Network Area Controller shall support the integration of device data via Dynamic Data Exchange (DDE), over the Ethernet Network. The Network Area Controller shall act as a DDE client to another software application that functions as a DDE server.
- B. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of these devices into the FMCS. Objects provided shall include at a minimum:
 - 1. DDE Generic AI Object
 - 2. DDE Generic AO Object
 - 3. DDE Generic BO Object
 - 4. DDE Generic BI Object
 - 5. Read/Write OPC BO Object
 - 6. Read/Write OPC Date/Time Input Object
 - 7. Read/Write OPC Date/Time Output Object
 - 8. Read/Write OPC String Input Object
 - 9. Read/Write OPC String Output Object
- C. All scheduling, alarming, logging and global supervisory control functions, of the OPC system devices, shall be performed by the Network Area Controller.
- D. The FMCS supplier shall provide an OPC client communications driver. The equipment system vendor that provided the equipment utilizing OPC shall provide documentation of the system's OPC server interface and shall provide factory support at no charge during system commissioning.

2.13 GRAPHICAL USER INTERFACE COMPUTER HARDWARE – by owner

2.14 OTHER CONTROL SYSTEM HARDWARE

- A. Space Temperature Wall Module: Temperature sensing modules mounted on the wall in occupied spaces. Optional setpoint, indication, and override switches must be provided as specified.
1. Manufacturers: Subject to compliance with requirements. Provide products by one of the manufacturers specified.
 - a. Alerton
 - b. ACI
 - c. Honeywell
 2. Wall module shall have a thermistor temperature sensor with operating range of 45 to 99 deg. F. under a locking cover/enclosure designed for mounting on a standard electrical switch box.
 3. Space temperature sensors shall be accurate to plus or minus 0.5 deg. F at 77 deg. F.
 4. Where specified, space temperature sensors shall have a setpoint knob calibrated for warmer-cooler adjustments
 5. Where specified, wall module shall also have an after-hours override pushbutton and LED override indicator.
- B. Duct Mount, Pipe Mount, and Outside Air Temperature Sensors:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - a. Alerton
 - b. ACI
 - c. Honeywell
 - d. Mamac
 2. Outside air sensors shall include an integral sun shield.
 3. Temperature sensors shall have an accuracy of plus or minus 1.0 deg. F. over operating range.
 4. Duct sensors shall have sensor approximately in center of the duct, and shall have selectable lengths of 6, 12, and 18 inches.
 5. Multipoint averaging element sensors shall be provided where specified, and shall have a minimum of one foot of sensor length for each square foot of duct area (provide multiple sensors if necessary).

6. Pipe mount sensors shall have copper, or stainless steel separable wells.
- C. Current Switches: Solid state, split core, current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point shall be provided where specified. Current switches shall include an integral LED for indication of trip condition.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - a. ACI
 - b. Honeywell
 - c. RIB, Inc.
 - d. Veris Industries
 2. Sensing range 0.5 – 250 Amps.
 3. Output 0.3 A @ 200 VAC/VDC / 0.15 A @ 300 VAC/VDC
 4. Operating frequency 40 Hz -1 kHz.
 5. Operating Temperature 5-104 deg. F (-15 – 40 deg. C), Operating Humidity 0-95% non-condensing
 6. Approvals CE, UL.
- D. Current Sensors: Solid state, split core linear current sensors shall be provided where specified.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - a. ACI
 - b. Honeywell
 - c. RIB, Inc.
 - d. Veris Industries
 2. Linear output of 0-5 VDC, 0-10 VDC, or 4-20 mA.
 3. Scale sensors so that average operating current is between 20-80% full scale.
 4. Accuracy plus or minus 1.0% (5-100% full scale)
 5. Operating frequency 50-600 Hz.
 6. Operating Temperature 5-104 deg. F (-15 – 40 deg. C), Operating Humidity 0-95% non-condensing

7. Approvals CE, UL.
- E. Water Flow Meters: Water flow meters shall be axial turbine style flow meters which translate liquid motion into electronic output signals proportional to the flow sensed.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - a. Badger
 - b. BelimoMeters
 - c. Onicon Meters
 2. Flow sensing turbine rotors shall be non-metallic and not impaired by magnetic drag.
 3. Flow meters shall be 'insertion' type complete with 'hot-tap' isolation valves to enable sensor removal without water supply system shutdown.
- F. Low Temperature Limit Switches. Safety low limit shall be manual reset twenty foot limited fill type responsive to the coolest section of its length.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - a. Honeywell
 - b. Johnson Controls
 2. Low Limit Setpoint shall be adjustable between 20 and 60 deg. F. (-5 and 15 deg. C.)
 3. Switch enclosure shall be dustproof and moisture-proof.
- G. High Temperature Limit Switches. Safety high limit (fire stats) shall be manual reset type.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - a. Honeywell
 - b. Johnson Controls
 - c. TAC
 2. High Limit Setpoint shall be adjustable between 100 and 240 deg. F. (38 and 116 deg. C.)
 3. Switch enclosure shall be dustproof and moisture-proof.

H. CO2 Sensors.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - a. Honeywell
 - b. TelAire
 - c. Vaisala
 - d. Senva
2. Carbon Dioxide sensors shall be 0-10 Vdc, 2-10 Vdc, or 4-20 mA linear analog output type, with corrosion free gold-plated non-dispersive infrared sensing, designed for duct or wall mounting.
3. Sensor shall incorporate internal diagnostics for power, sensor, analog output checking, and automatic background calibration algorithm for reduced maintenance. Sensor range shall be 0-2000 PPM with +/- 75 PPM accuracy at full scale.
4. Where specified, sensor shall have an LCD display that displays the sensor reading and status.

I. Differential Pressure Sensors

1. Manufacturers:
 - a. Senva
 - b. Honeywell
 - c. RIB, Inc.
 - d. Veris Industries

J. Humidity Sensors.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - a. Honeywell
 - b. Mamac
 - c. Belimo
2. Humidity transducer shall be accurate to +/- **3%** between 20-95% RH NIST traceable calibration.
3. Sensors shall have a field selectable output of 0-10 Vdc, 0-5 Vdc, or 4-20 mA.

4. Sensors shall provide field calibration option using non-interacting zero and span potentiometers, and/or toggle switches that increment or decrement the RH value in steps of 0.5% RH.
5. Accuracy of the sensor shall not be adversely affected by condensation.
- K. Control Valves: (Globe Type) Control valves shall be 2-way or 3-way pattern as shown constructed for tight shutoff and shall operate satisfactory against system pressures and differentials.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - a. Honeywell
 - b. Belimo
 2. Two-position valves shall be line size.
 3. Proportional control valves shall be sized for a nominal pressure drop of 5.0 psi at rated flow (except as may be noted on the drawings). Manufacturer's specified maximum differential pressure shall not be exceeded in order to prevent cavitation.
 4. Two-way proportional valves shall have equal percentage flow characteristics. Three-way valves shall have equal percentage flow characteristics straight through, and linear through the bypass. Rangeability shall be 50:1 or greater.
 5. Provide valve position indicator and a method to operate valves manually during system start-up, or actuator power loss or failure on all valves.
 6. Leakage rate shall be no more than ANSI Class III (for heating) or ANSI Class IV (for cooling).
 7. Valves 1/2 inch through 3 inches shall be screwed pattern except where solder connections are specified for valves 1/2 or 3/4 inches.
 8. Three-way valve bypass ports shall be of Cv to provide constant flow through the control loop.
 9. Two-way valves shall close off against the net differential pressure resulting from the maximum head pressure of the system pumps less all loop pressure losses. Three-way valves shall close off against the difference in head pressure between the controlled load and the bypass line.
 10. Valves 2-1/2 inch and larger shall be flanged and ANSI/ASME-rated to withstand the pressures and temperatures specified.
 11. Valves shall have stainless-steel stems and spring loaded Teflon packing with replaceable discs.

- L. Butterfly Control Valves: Where specified, butterfly control valves 2" to 20" in size shall be cast iron body type for 2-way applications and constructed for tight shutoff and shall operate satisfactorily against system pressures and differentials. Three-way applications shall consist of 2-way valves assembled to a "Tee" fitting with common actuators and operating linkage.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - a. Bray
 - b. Honeywell
 - c. Belimo
 - d. Tyco International
 2. Valves shall have tapped lugs for standard flange connection, and meet ANSI/ASME requirements to withstand the pressures and temperatures encountered.
 3. Valve shall have a corrosion, ultra-violet, and wear-resistant coating for outdoor applications.
 4. Valves shall be designed for isolation and the absence of downstream piping at rated differential pressure.
 5. Proportional control valves shall be sized for a nominal pressure drop of 5.0 psid at rated flow (except as may be noted on the drawings) up to a maximum stroke of 60° disk rotation. Manufacturer's maximum fluid velocity shall not be exceeded in order to prevent cavitation.
 6. Valves shall be rated for bubble tight shutoff at no less than 150 psi differential pressure for full cut valves, or 50 psi for under cut valves.
 7. Valve stems shall be stainless steel, with inboard top and bottom bearings, and an external corrosion resistant top bearing to absorb actuator side thrust.
 8. Actuator shall be available with NEMA 4X (IP65) rated enclosure suitable for outdoor installation.
 9. Valves shall be tagged with Cv rating and model number.
- M. Variable Frequency Drives.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - a. ABB
 - b. Honeywell
 - c. Schneider Electric

2. Variable frequency drives shall be UL listed and sized for the power and loads applied.
 3. Drives shall include built-in radio frequency interference (RFI) filters and be constructed to operate in equipment rooms and shall not be susceptible to electromagnetic disturbances typically encountered in such environments. Similarly, the drives must not excessively disturb the environment within which it is used.
 4. VFDs shall be installed in strict conformance to the manufacturer's installation instructions, and shall be rated to operate over a temperature range of 14 to 104 F.
 5. VFD automatic operation shall be suitable for an analog input signal compatible with the digital controller output.
 6. Each VFD shall be fan cooled and have an integral keypad and alphanumeric display unit for user interface.
 7. The display unit keypad shall allow setting operational parameters including minimum and maximum frequency, and acceleration and deceleration times. The display shall offer user monitoring of frequency, unit temperature, motor speed, current, torque, power, voltage, and temperature.
- N. Actuators, General. All automatically controlled devices, unless specified otherwise elsewhere, shall be provided with actuators sized to operate their appropriate loads with sufficient reserve power to provide smooth modulating action or two-position action and tight close-off. Valves shall be provided with actuators suitable for floating or analog signal control as required to match the controller output. Actuators shall be power failure return type where valves or dampers are required to fail to a safe position and where specified.
- O. Non-Spring Return Low Torque Direct Coupled 35 & 70 lb-in Actuators. Actuators shall be 35 or 70 lb-in. with strokes adjustable for 45, 60, or 90 degree rotation applications and designed for operation between 20 and 125 F.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - a. Honeywell
 - b. Belimo
 2. Each actuator shall also have a minimum position adjustable rotation of 0 to 30 degrees.
 3. Actuators shall be for floating or two position (ML 6161 or ML6174) control, or for 4-20 mA or 2-10Vdc (ML7161 or ML7174) input signals.
 4. Analog control actuators shall have a cover mounted direct/reverse acting switch.
 5. Actuator motor shall be magnetically coupled or shall have limit switch stops to disengage power at the ends of the stroke.

6. Actuators shall be direct connected (no linkages) and provided with a manual declutch for manual positioning.
 7. Actuators shall have NEMA 1 environmental protection rating and be 24 volt and UL listed with UL94-5V plenum requirement compliance.
- P. Non-Spring Return High Torque 177 and 300 lb-in Actuators. Actuators shall be UL listed 24 Vac in NEMA 2 enclosures designed for operation between -5 and 140 F.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - a. Honeywell
 - b. TAC
 - c. Belimo
 2. Rotation direction shall be switch selectable.
 3. Minimum design life of actuators shall be for 1,500,000 repositions and for 60,000 open-close cycles.
 4. Actuators shall be suitable for the controller output signals encountered, floating or analog, and shall have full cycle timing of 95 seconds.
 5. Actuators shall be direct connected (no linkages) and provided with a manual declutch for manual positioning.
- Q. Spring Return Direct Coupled Actuators. Actuators shall have torque ratings of 44lb-in., 88 lb-in., or 175 lb-in. Actuators shall be modulating 90 seconds nominal timing or two-position 45 seconds nominal timing types with strokes for 90 degree rotation applications and designed for operation between -40 and 140 F.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - a. Honeywell
 - b. Belimo
 - c. TAC
 2. Each torque rating group shall have optionally selected control types, floating control, 2-position 24 Vac, 2-position line voltage, or analog input which is switch selectable as 0-10Vdc, 10-0 Vdc, 2-10 Vdc, or 10-2 Vdc.
 3. Actuator spring return direction (open or closed) shall be easily reversed in the field, and actuators shall spring return in no greater than 20 seconds.
 4. Actuators shall be direct connected (no linkages), and shall have integral position indication.

- 5. Actuators shall have NEMA 2 environmental protection rating, and UL approved and plenum rated per UL873.
- 6. Each actuator shall be provided with a manual power-off positioning lever for manual positioning during power loss or system malfunctions, including a gear-train lock to prevent spring action.
- R. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. **A complete set of 'as-built' control drawings shall be furnished within each major 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.

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 this contractor.
- B. The electrical contractor (Div. 26) shall furnish all power wiring to electrical starters and motors.
- C. All wiring shall be in accordance with the Project Electrical Specifications (Division 26), the National Electrical Code and any applicable local codes. All FMCS wiring shall be installed in EMT conduit except accessible concealed locations. 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.

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 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 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.

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 8 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.
- C. The training shall be in three sessions as follows:

Training: One day session (8 hours) after system is started up and at least one week before final acceptance test. Manual shall have been submitted at least two weeks prior to training so that the owners' personnel can start to familiarize themselves with the system before classroom instruction begins.

PART 4 - SEQUENCES OF OPERATION – See plans

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. Contractor shall provide written documentation to archive the system operation as accepted by the owner.

PART 5 - GRAPHICAL REPRESENTATION POINT LISTS

5.1 SUMMARY

- A. The DDC points in this project shall be accessible from the Graphical User Interface (GUI) and/or the Web browser interface (WBI). The supplier of the IDC and IBC devices shall ensure that the points are accessible on their respective networks, by the Network Area Controller (NAC).
- B. The graphics shall provide detailed 2 or 3 -dimensional building site, 2-dimensional floor plans; and 2 or 3-dimensional equipment illustrations with fan, pump, damper, and valve animation for system operation. Each graphic shall be provided with a tabular "hot button" navigational structure enabling a "one-mouse click" access to other building systems and the return, without the use of the browser "back button".
- C. The graphics shall provide a real-time continuous display of critical points; Outside Air Temperature, Outside Air Relative Humidity, KWH, and KW visible within the HTML frame on all graphic screens.

5.2 GRAPHIC DESCRIPTION

- A. Home Page:
 - 1. The graphic shall provide a geographical overview of the multiple-site enterprise or campus buildings. Each building image shall be a "hot button" to access the building floor plans. The image "hot button" is indicated by a "mouse over" function highlighting the building and changing cursor icon, enabling a "one-mouse click" access the building floor plans.
- B. Floor Plans:
 - 1. The graphic shall provide an accurate dimensional layout of the building floor(s); including all rooms, room numbers, walls, elevators, doors, entrances, hallways, and stairwells. Room numbering and naming conventions shall be provided by the architect/engineer.
- C. Mechanical Systems:
 - 1. The graphic shall provide an accurate representation of the system being controlled; including all sensors, heat exchangers, heating and cooling coils, dampers, CW/HW piping and pumps, humidifiers, flow directions, safety devices, actuators, and limit devices with fan, pump, damper, and valve animation for real-time system operation.

END OF BUILDING AUTOMATION SYSTEM (BAS)

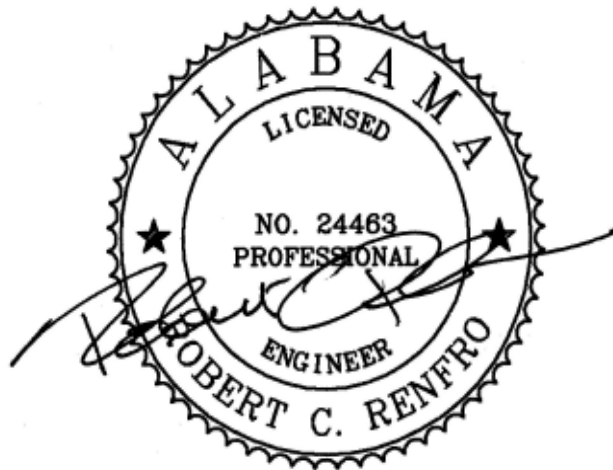
SECTION 26 00 00

COVER - RCR

DIVISION 26/27/28

ELECTRICAL SPECIFICATIONS

PREPARED BY



10/23/2026

SECTION 26 05 00

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. General Conditions:
 - 1. The accompanying General Conditions (front-end specifications) shall apply to and form a part of this section.
- B. General Requirements:
 - 1. Carefully examine General Conditions, other specification sections, and other drawings (in addition to Electrical) in order to be fully acquainted with their effect on electrical work.
 - 2. Do all work in compliance with all applicable codes, laws, and ordinances, the National Electrical Safety Code, the National Electrical Code (hereinafter referred to as "Code"), applicable energy codes, and the regulations of the local utility companies. Obtain and pay for any and all required permits, inspections, certificates of inspections and approval, and the like.
 - 3. Cooperate with other trades and contractors at job. Perform work in such manner and at such times as not to delay work of other trades. Complete all work as soon as the structure and installations of equipment will permit. Patch, in a satisfactory manner and by the proper craft, any work damaged by electrical workmen.
- C. Electrical Contractor Experience Requirements:
 - 1. Electrical contracting firm shall be licensed as an electrical contractor in the state where work will be performed.

1.2 GENERAL SCOPE OF ELECTRICAL WORK (REFER TO DRAWINGS FOR OTHER SPECIFIC SCOPE ITEMS)

- A. Furnish all labor and materials to complete electrical work as shown on drawings and/or herein specified.
- B. Remove all existing electrical equipment and wiring made obsolete by this project and remove or relocate all electrical services located on or crossing through the project property, either above or below grade, which would obstruct the construction of the project or conflict in any manner with the completed project or any code pertaining thereto. Dispose of salvageable materials as directed by the Architect. Contractor shall schedule meeting to review scope of electrical demolition and to confirm scope and phasing of proposed demolition with the owner in the presence of the prime consultant prior to start of any electrical demolition.
- C. Furnish and install complete power, telephone and other electrical services as shown on drawings and/or specified herein.

- D. Pay all electrical utility company service charges (if any) in connection therewith, including permanent meter deposit. Meter deposits will be refunded to Contractor at time of Owner's acceptance.
- E. Furnish and install complete power distribution system as shown on drawings and/or specified herein.
- F. Furnish and install disconnect switches for motors as shown on drawings and/or specified herein.
- G. Furnish and install complete electrical grounding systems as shown on drawings and/or specified herein.
- H. Install and connect electrical equipment mentioned in Division 26/27/28 Specifications or noted in drawings, whether furnished by electrical contractor or by others.
 - 1. Where shown or specified, equipment furnished by others shall be installed and connected under this Contract.
 - 2. Where shown or specified, Contractor shall receive, unpack, check and assume custody of equipment furnished by Others. Contractor shall assume responsibility for care and safekeeping of this equipment, when delivered into his custody. He shall protect it from moisture, dust and damage during construction and until Owner acceptance of project.
- I. Furnish and install complete electrical lighting systems as shown on drawings and/or specified herein.
- J. Furnish and install all electrical items shown on drawings and/or herein specified, unless shown or specified otherwise.
- K. Furnish and install complete controls & auxiliary systems as shown on drawings and/or specified herein.
- L. Furnish and install complete telephone/data raceway (including all outlet boxes, face plates, conduit raceways, telephone backboards, terminal cabinets, etc.), wiring and devices system as shown on drawings and/or specified herein.
- M. Furnish and install a complete Fire Alarm System as shown on drawings and/or specified herein.
- N. Furnish and install a complete Surge Protection System as shown on drawings and/or specified herein.
- O. Furnish and install a complete Building Lightning Protection System as shown on drawings and/or specified herein.
- P. Procure and pay for permits and certificates as required by local and state ordinances and fire underwriter's certificate of inspection.

- Q. Balance loads as equally as practicable on services, distribution feeders, circuits and buses. Provide typewritten directory for each panel.
- R. Unless specifically indicated or required otherwise, terminate all circuitry/cabling provided within this contract at associated equipment/devices/etc. in accordance with all applicable codes, standards and supplier requirements, whether associated equipment/device/etc. is furnished within this contract or by others.
- S. Complete field testing, adjustment & startup of all systems listed above as shown on drawings and/or specified herein.

PART 2 - PRODUCTS

2.1 APPROVED MATERIALS AND DEVICES

- A. Where not otherwise specified, provide only new, standard, first-grade materials/systems throughout, conforming to standards established by Underwriter's Laboratories, Inc., and so marked or labeled, together with manufacturer's brand or trademark. All equipment/systems subject to approval of Architect before installation. All like items and associated equipment/systems shall be of one manufacturer.
- B. To ensure proper coordination, it is intended that all electrical equipment and materials specified in Division 26/27/28 of these specifications and shown on the electrical drawings be furnished and installed by the electrical sub-contractor, for proper coordination. It will not be permissible for any of these items to be furnished directly by the general contractor.
- C. To ensure commonality of spare parts, it is required that the electrical contractor provide the same brand for all circuit breakers, starters, power equipment, etc. provided under the following divisions of these specifications:
 - 1. SECTION 26 05 73: POWER DISTRIBUTION SYSTEM ELECTRICAL STUDIES
 - 2. SECTION 26 24 17: LIGHTING PANELBOARDS
 - 3. SECTION 26 28 16: SAFETY SWITCHES AND FUSES

2.2 SUBMITTALS

- A. All submittals to the design team shall be accompanied by a letter summarizing all proposed deviations from specified products or pre-approved substitutions. The absence of such a letter shall be understood to indicate that the contractor intends to meet all contract requirements, regardless of cut-sheets/data-sheets provided within the submittal.
- B. Submit to Architect ten (10) days prior to bid date three (3) copies of any items and/or manufacturers which are proposed as substitutes for those specified.
- C. Submit to Architect promptly after award of Contract and prior to purchasing, the number of copies required by the contract. All drawings of a specific item or system

shall be made in one submittal, and within thirty (30) days after award of Contract. Shop drawings of all power equipment shall contain exact details of device placement, phasing and numbering, in form of elevations, for each major piece of equipment. Shop drawings shall be submitted on the following:

1. SECTION 26 05 36: CABLE TRAYS
2. SECTION 26 05 73: POWER DISTRIBUTION SYSTEM ELECTRICAL STUDIES
3. SECTION 26 09 43: LIGHTING CONTROL SYSTEM
4. SECTION 26 09 44: DISTRIBUTED DIGITAL LIGHTING MANAGEMENT SYSTEM
5. SECTION 26 24 17: LIGHTING PANELBOARDS
6. SECTION 26 25 00: PLUG-IN AND FEEDER BUSWAY
7. SECTION 26 28 16: SAFETY SWITCHES AND FUSES
8. SECTION 26 41 00: LIGHTNING PROTECTION SYSTEM
9. SECTION 28 31 00: FIRE ALARM SYSTEM
10. SECTION 28 78 00: EMERGENCY RESPONDER COMMUNICATIONS ENHANCEMENT SYSTEM
11. ALL POWER DISTRIBUTION EQUIPMENT (i.e. SWITCHBOARDS, PANELBOARDS, DRY TYPE TRANSFORMER, ETC.)
12. ALL ELECTRICAL AND TELECOMMUNICATION EQUIPMENT LAYOUTS - Submittals shall include ¼" = 1'-0" CAD drawings (hand drawn sketches will not be accepted) of each electrical room, IT room, electrical equipment stand, generator area, or any other similar area with electrical equipment. Drawings shall indicate all panelboards, transformers, switchboards, generators, equipment racks, control panels, HVAC equipment, etc. that are located in each electrical/IT area. Layouts shall show that each piece of electrical equipment has the clearances, working space and dedicated equipment space required by applicable codes. Additionally, drawings shall demonstrate a pathway a minimum of 24" wide with all equipment doors open to 90 degrees. No conduits to equipment within these areas shall be installed until submittals have been provided and returned without exception by the design team.

- D. The contractor shall fully review, comment upon and correct all shop drawings as required to assure compliance with contract documents prior to submittal to Architect. The failure of the contractor to properly review and correct shop drawings prior to submittal will result in rejection of shop drawings by the engineer. Review by the Architect will be for general conformance with contract documents. The contractor shall be fully responsible for correctness of all submitted dimensions, details, quantities and locations.
- E. None of the above items shall be installed until shop drawings or catalog data have been reviewed by Architect without rejection or required resubmittal. Any listed item not submitted, even if specified, shall be considered not acceptable and shall be removed if directed.
- F. Any required resubmittal will be reviewed by the Architect for conformance with previously issued comments only. The contractor shall be responsible for verifying that all items not specifically requiring resubmittal have not been altered from the previously reviewed submittal.

- G. Material proposed for substitution shall be of the same quality, perform the same functions, conform to such physical dimensions and appearance as are required by the Architect. All material proposed for substitution is subject to the approval of the Architect and his authority for approval is final. No material proposed for substitution will be considered unless all submittal data complies with the drawings and specifications of Section 16 as to time of submission, number of copies of submittal, and detail requirements.
- H. Samples of material shall be furnished where required by drawings or Division 26/27/28 Specification, or as requested by the Architect on items proposed as substitutes.
- I. Submit to Architect a certificate of final inspection from local inspection department.

PART 3 - EXECUTION

3.1 SITE VISIT

- A. The Contractor shall visit the site to determine existing dimensions and conditions affecting electrical work. Failure to do so in no way relieves Contractor of his responsibility under Contract.

3.2 CLEARANCE WITH UTILITIES

- A. It shall be the responsibility of this Contractor, prior to bid, to reaffirm with the utility companies involved, that the locations, arrangement (and with power company voltage, phase, and metering required) and connections to utility service are in accordance with their regulations and requirements. If their requirements are at variance with these drawings and specifications, the Contract price shall include any additional cost necessary to meet those requirements without extra cost to Owner after a contract is entered into.
- B. On many projects the utility company may levy charges due to locations, size or type service involved. The Contractor shall be responsible for these charges (including permanent meter deposit), unless such charges are not available prior to bid and Contractor so documents as described below. The meter deposit will be refunded to the contractor at time of Owner's acceptance.
- C. Should above cost not be available, prior to bid, Contractor must submit a letter signed by a responsible utility company person so stating with his bid and in turn must be submitted by Prime Contractor with his bid to Owner. The cost will then be deleted from the Contract and become responsibility of the Owner.
- D. The contractor shall be fully responsible for scheduling and coordinating all required utility company work with associated utility companies prior to start of work. Contractor shall be responsible for notifying the owner of any required utility company costs/fees, forms, contracts, etc. as required to keep the project on schedule as early as possible, and for providing necessary forms from utility company to owner for signing where

necessary.

- E. Arrange with utility companies for such services as shown or herein specified and installation of meter where shown. Furnish with shop drawings a signed document from utility companies describing the location and type of services to be furnished and any requirements they may have. This document shall be signed for each utility company by a person responsible for granting such service.

3.3 WORKMANSHIP

- A. All work shall be in accordance with the latest editions of NFPA 70 (National Electrical Code), NFPA 101 (Life Safety Code), National Electric Safety Code, International Building Code, applicable NECA standards and the rules and regulations of State and Local Authorities Having Jurisdiction.
- B. All work shall be executed in a workmanlike manner and shall present a neat and mechanical appearance upon completion.
- C. All equipment, devices, etc. shall be installed in accordance with manufacturer's recommendations.
- D. All items shall be installed straight and plumb in a workmanlike manner and care shall be exercised so that like items are mounted the same position, heights and general location.
- E. Keep site clean of accumulation of cartons, trash and debris.

3.4 SAFETY

- A. The contractor is solely responsible for all job safety. Architect assumes no responsibility for job safety. Maximum consideration shall be given to job safety and only such methods as will reasonably ensure the safety of all persons shall be employed. The codes and regulations of OSHA shall be given strict compliance as well as such other codes, laws, and regulations as may be applicable.

3.5 CONTRACT DOCUMENTS

- A. Contract documents indicate diagrammatically, extent, general character and approximate location of work. Where work is indicated but minor details omitted, furnish and install it complete so as to perform its intended functions. For details and mechanical equipment, follow drawings provided by other disciplines (Architectural, Mechanical, Structural, Civil, etc.) and fit electrical work thereto.
- B. Contract documents consist only of the hardcopy documents issued by the Prime Architect. Electronic documents issued directly by the electrical engineer to the contractor and/or its sub-contractors/vendors are issued for convenience only (electronic documents are not formal contract documents).
- C. If the contractor and/or one of its suppliers require a one-time transfer of electronic files

of the current electrical construction documents to prepare shop drawings (or for another similar purpose), it shall:

1. Sign a waiver prepared by the electrical engineer prior to the transmittal of these files.
2. Agree to pay the electrical engineer a fee of \$50.00 per drawing, up to a maximum of \$400 per transfer, payable upon receipt of the files.
3. To the fullest extent permitted by law, indemnify, hold harmless, and defend JRA from all claims, damages, losses and expenses, including attorneys' fees arising out of or resulting from the use of the CAD files.

- D. Take finish dimensions at job in preference to scaled dimensions.
- E. Except as above noted, make no changes in or deviations from work as shown or specified except on written order of Architect.

3.6 UNDERGROUND UTILITY/EQUIPMENT COORDINATION

- A. Prior to commencement of work, verify exact locations of all existing or proposed underground utilities and/or underground equipment and verify that proposed electrical installation does not conflict with these items. Notify Architect immediately if any conflict is found.

3.7 EQUIPMENT STORAGE

- A. Store all electrical equipment in dry, covered locations as directed by equipment manufacturers. Contractor shall be responsible for replacing or repairing improperly-stored equipment as directed by Architect.

3.8 EXCAVATION, CUTTING AND PATCHING

- A. Perform all cutting and excavating as necessary for installation of electrical systems, unless specifically covered under another section. After Architect's observation, complete all excavation, filling and backfilling as directed under specifications for preparation of site and earthwork. Foundations for equipment shall be as specified under concrete section. Concrete pads shall be minimum of 6" thick; unless greater thickness required by equipment manufacturer. Obtain specific approval of Architect before cutting into any structural members.
- B. For all such work employ competent workmen, and finish up in neat and workmanlike manner, equal to quality and appearance to adjacent work.

3.9 PENETRATIONS

- A. All penetrations in water tight barriers shall be made so that barrier rating is not compromised. Furnish roof flashing for all equipment installed under Division 26/27/28 that penetrates through the roof. Appropriate flashing is specified under roofing and sheet metal section. Supply these flashings for installation under roofing and sheet metal section.

- B. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly to maintain the fire/smoke rating of the associated membrane.
- C. Where penetrations are required through structural elements, verify penetration locations and sizes with structural engineer. In no case shall the structural integrity be compromised without written approval from structural engineer.

3.10 INSTALLATION OF EQUIPMENT - GENERAL

- A. Care shall be exercised in exact routing and location of all items so as not to obstruct access to equipment, personnel walkways, or expose it to potential mechanical damage.
- B. Items shall be securely anchored and/or fastened. Provide proper support for all equipment, devices, conduits, boxes, panels, etc. as required by code and for a workmanlike installation. Provide guy wiring for wood poles where required to prevent leaning. All construction shall meet the seismic design requirements of the building code. Items (especially transformers, light fixtures, equipment racks, freestanding gear, etc.) installed in seismic zones C, D, E or F shall be supported and braced per applicable codes and standards.
- C. All wall, pole or frame-mounted electrical equipment shall be mounted to metal unistrut (or similar) frames of same material as electrical equipment. For example, pole-mounted painted or galvanized steel disconnect switches shall be mounted to galvanized steel unistrut frames.
- D. All electrical equipment, furnished by Contractor or by others shall be covered and protected during construction.
- E. All control cabinets, panels, motor control centers and other electrical cabinets and enclosures shall have all trash removed and be vacuumed clean. All foreign paint, etc., shall be removed from exterior and all scratches in finish touched up with same color and material as original. Any rusted areas shall be sanded, primed and repainted.
- F. All relays, starters, push-button and other control devices shall be cleaned and if necessary, lubricated with CRC 2-26 to assure free operation.

3.11 MOTORS, STARTERS AND CONTROLS

- A. Unless otherwise specified or shown, all motors will be furnished and installed under other sections of this specification.
- B. Electrical Contractor shall install all starters and all electrical power wiring and connections to motors and starters.
- C. Unless otherwise specified or shown, all control items for motors shall be furnished, installed and wired in conduit under other divisions of this specification.

3.12 CIRCUITS AND BRANCH CIRCUITS

- A. Outlets shall be connected to branch circuits as indicated on drawings by circuit numbers. No more outlets than are indicated shall be connected to a circuit.
- B. Branch circuit homeruns shall be installed as shown on drawings. Multiple homerun conduits shall not be combined by contractor into larger, single homerun conduits unless specific permission is granted by the Engineer.

3.13 LUG/TERMINAL RATINGS

- A. All lug/terminal ratings, sizes, locations, types, etc. shall be coordinated with the associated conductor sizes, types, routings, etc. by the contractor.
- B. All lugs/terminals/etc. shall be rated for 75 degree C terminations (minimum, unless specified otherwise).

3.14 EQUIPMENT FAULT CURRENT RATINGS

- A. All equipment and breakers shall meet the minimum RMS symmetrical interrupting capacity ratings shown on plans for the associated distribution equipment. All interrupting ratings shall be full ratings. Where new devices or breakers are added to existing distribution equipment, the new devices/breakers shall have interrupting ratings matching or exceeding that of the existing distribution equipment.

3.15 OUTLET LOCATION

- A. Symbols shown on drawings and mounting heights indicated on drawings and in specifications are approximate only. The exact locations and mounting height must be determined on the job and it shall be the Contractor's responsibility to coordinate with other trades to ensure correct installation.

3.16 IDENTIFICATION

- A. Each panel shall have each circuit identified. Panels without branch circuit nameplates shall have typewritten directories.
- B. Each individually mounted switch, circuit breaker, starter and/or any other control or protective device shall identify equipment fed and fuse size, if any, by engraved plastic nameplate, white with black letters, screw attached.
- C. See Specification Section 26 05 53 for additional requirements.

3.17 GROUNDING

- A. All equipment shall be grounded and bonded in accordance with all state/local regulations, The National Electrical Code and as specified herein.

3.18 TELEPHONE WORK

- A. Provide telephone raceways, outlets and backboards, as shown. Provide additional work as described in Specification Section 27 10 00 and/or shown on drawings. Bond all

raceways together at backboards and provide No. 6 ground wire extending from raceway bonds to cold water pipe, in 1/2 inch raceway. Carefully ream ends of all raceways.

3.19 PAINTING

- A. Refer to Painting/Finishing specifications for requirements regarding field painting of exposed conduit. Any scratches, dents or rust spots in conduit electrical enclosures, panels, motor control or any other electrical items shall have the dents removed, and they, along with any rust spots or scratches, sanded and touched up with the same exact color paint as original finish.

3.20 ACCEPTANCE TESTING

- A. Upon completion of work, the entire electrical system installed within this project shall be tested and shall be shown to be in perfect working condition, in accordance with the intent of the specifications and drawings. It shall be the responsibility of the Electrical Contractor to have all systems ready for operation and to have an electrician available to operate same in accordance with and under the supervision of the observation representative(s) of the Architect. The Electrician shall be available to assist in removal of panel fronts, etc., to permit inspection as required.
- B. The electrical sub-contractor shall include in bid price start-up assistance and training from a certified representative of the manufacturer for the following systems:
 - 1. SECTION 26 09 43: LIGHTING CONTROL SYSTEM
 - 2. SECTION 26 09 44: DISTRIBUTED DIGITAL LIGHTING MANAGEMENT SYSTEM
 - 3. SECTION 27 10 00: STRUCTURED CABLING SYSTEM
 - 4. SECTION 28 31 00: FIRE ALARM SYSTEM
 - 5. SECTION 28 78 00: EMERGENCY RESPONDER COMMUNICATIONS ENHANCEMENT SYSTEM

3.21 OPERATION AND MAINTENANCE DATA

- A. One set of marked "AS BUILT" drawings, three (3) sets of all equipment catalog and maintenance data and three (3) sets of all final shop drawings, on all equipment requiring same shall be turned over to owner. These items shall be bound in hard back book. Contractor shall explain and demonstrate all systems to Owner's representative.

3.22 GUARANTY-WARRANTY

- A. Furnish a written Guarantee-Warranty, countersigned and guaranteed by General Contractor, stating:
 - 1. That all work executed under this section will be free from defects of workmanship and materials for a period of one (1) year from date of final acceptance of this work.
 - 2. Above parties further agree that they will, at their own expense, repair and replace all such defective work, and all other work damaged thereby, which becomes defective during the term of the Guaranty-Warranty.

END OF SECTION 26 05 00

SECTION 26 05 19

POWER CONDUCTORS AND CABLES 51V-600V

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Power Wires and Cables
- B. Low Voltage Wires and Cables

PART 2 - PRODUCTS

2.1 POWER WIRES AND CABLES - 600 VOLT

- A. General: Conductors shall have current carrying capacities as per N.E.C. and with 600 volt insulation, #12 minimum except for controls and fixture wire. Conductors shall be copper.
- B. General Application (see below for exceptions):
 - 1. At or Below Grade (including within slab-on-grade):
 - a. #8 or larger conductors:
 - 1) XHHW or RHH/RHW/USE stranded (in conduit).
 - b. #10 or smaller conductors for circuits terminating at motors:
 - 1) THHN/THWN or XHHW stranded (in conduit).
 - c. #10 or smaller conductors (excluding circuits terminating at motors):
 - 1) THHN/THWN or XHHW solid (in conduit).
 - 2. Above Grade:
 - a. #8 or larger conductors:
 - 1) THHN/THWN, XHHW or RHH/RHW/USE stranded (in conduit).
 - b. #10 or smaller conductors for circuits terminating at motors:
 - 1) THHN/THWN, XHHW or RHH/RHW/USE stranded (in conduit).
 - c. #10 or smaller conductors (excluding circuits terminating at motors):
 - 1) THHN/THWN, XHHW or RHH/RHW/USE solid (in conduit).
 - 3. Power Wire and cable shall be as manufactured by Southwire, Rome, Encore Wire, American Insulated Wire, Okonite, Phelps-Dodge, Americable, Aetna or approved equal.
- C. Emergency Feeder Wiring
 - 1. Where specifically required by NEC articles 700, 701, or other similar sections, feeder-circuit wiring for emergency systems and legally-required standby systems shall be a listed electrical circuit protective system consisting of 2-hour fire-rated, mineral insulated, copper-sheathed wiring cable (Pyrotenax System 1850 or equal).
- D. Class 1 Control Cabling (120VAC Control Circuits, Etc.)
 - 1. Unless specified otherwise, Class 1 control cabling shall:

- a. Be rated for exposed cable tray installation.
 - b. Be plenum rated.
 - c. Be UL-rated for the proposed application.
 - d. Be multi-conductor with overall outer sheath as required by the application. The insulation of each conductor within the overall multi-conductor cable shall be uniquely color-coded. Ground conductors (when provided) within the multi-conductor cable shall have green insulation. Conductors with green insulation shall not be used for conductors other than ground.
 - e. Utilize copper conductors.
 - f. Have wire gauge as required to limit voltage drop to acceptable limits determined by the system supplier and to meet all applicable code requirements.
 - g. Where installed underground, within slab-on-grade or in exterior locations, be rated for wet locations.
 - h. Where required for specific systems, meet the specific requirements (conductor quantity, wire gauge, insulation type, shielding, etc.) of the system supplier.
 - i. Be rated for 600V.
 - j. Be industrial grade.
 - k. Have stranded conductors.
 - l. Have sunlight/oil-resistant PVC/Nylon insulation and jacket with ripcord.
 - 2. Control cabling shall be as manufactured by Belden, AlphaWire or General Cable.
- E. Fixture Wiring
- 1. Conductor Types:
 - a. Type TFFN or XFF.
 - 2. Minimum Sizes:
 - a. For fixtures up to 300 watts: #16.
 - b. For fixtures over 300 watts up to 1500 watts: #14.
 - c. For fixtures over 1500 watts: as required.
 - d. Conductors to concrete pour fixtures: #12.
 - 3. Fixture wire shall extend only from fixture to first junction, and not over 6 feet, except for concrete pour units.

2.2 WIRE CONNECTIONS:

- A. All connector types:
 - 1. Shall be properly rated for the proposed application by UL and per the manufacturer.
- B. At Motor Connections (within motor terminal boxes):
 - 1. On Unshielded Wire:
 - a. Single conductor per phase: shall be made with insulated set screw connectors or 3M 5300 Series 1kV Motor Lead Connections kits with mechanical lugs as required.
 - b. Multiple conductors per phase: shall be made with insulated mechanical lugs, rated for the associated motor cable types, by Polaris or Ilsco.
 - 2. On Shielded Power Wire:

- a. The braided shields and internal grounding conductors of shielded power (not instrumentation) cables shall be grounded at BOTH ends (at VFD/starter and at motor) with a termination kit provided by the cable supplier. This termination kit shall include a connection ring that makes contact around the full circumference of the braided shield, and connects all internal grounds to a common external ground point.
 3. Cabling within motor terminal boxes shall be trained such as to prevent any splice/termination/connection kits from contacting inside edge(s) of the motor terminal boxes (to prevent chaffing of the insulation/splice/wiring which could lead to faults). Contractor shall carefully coordinate all required motor terminal box sizes to ensure proper capacity for all required conductors/splices.
- C. Other Dry locations:
 1. On Wire larger than #10: shall be made with solderless, non-insulated compression-type connectors meeting requirements of Federal Specification WS-610e for Type II, Class 2 and shall be covered with Scotch #33 electrical tape so that insulation is equal to 150% of conductor insulation.
 2. On Wire #10 and smaller: shall be made with one of the following:
 - a. Ideal Wing Nuts or equal by 3M .
 - b. Ideal Push-In Wire Connectors (for #12 and smaller only).
- D. Other Wet/Damp locations:
 1. On Wire larger than #10: shall be made with underground/direct-burial, waterproof rated EPDM or TPE-insulated connectors by IlSCO, Burndy or T&B.
 2. On Wire #10 and smaller: shall be made with one of the following:
 - a. Ideal Weatherproof or Underground Wire Connectors pre-filled with 100% silicone sealant as required by the application.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

- A. All wires and cables shall be installed in conduit unless specifically noted otherwise.
- B. All joints and splices on wire shall be made with solderless connectors, and covered so that insulation is equal to conductor insulation.
- C. No splices shall be pulled into conduit.
- D. No conductor shall be pulled until conduit is cleaned of all foreign matter.
- E. Wire and cable shall be neatly formed, bundled and tied in all panelboards, wireways, disconnect switches, pullboxes, junction boxes, cabinets and other similar electrical enclosures.
- F. All wires and cables installed in underground or other wet locations shall be rated by the manufacturer for wet locations.

- G. Network cabling shall be continuous from endpoint to endpoint and shall not be spliced unless specifically noted otherwise.
- H. All conductors/cabling (including spare conductors) shall be properly terminated unless specifically directed otherwise. See above for general termination hardware requirements.

3.2 POWER WIRE AND CABLE INSTALLATION:

- A. No power conductor shall be smaller than #12 except where so designated on the drawings or hereinafter specified.
- B. Multi-wire lighting branches shall be used as indicated.
- C. Where more than three current-carrying conductors are installed in a single raceway or cable, conductors shall be derated as indicated in NEC Table 310.15(B)(3)(a).
- D. Raceways/cables shall generally not be installed exposed to sunlight on roofs unless specifically required. Where raceways or cables are installed exposed to sunlight on roofs, conductors shall be derated with ampacities adjusted per NEC Table 310.15(B)(3)(c).
- E. In installing parallel power conductors, it is mandatory that all conductors making up the feeder be exactly the same length, the same size, the same type of conductor with the same insulation. Each group of conductors making up a phase or neutral must be bonded at both ends in an approved manner.
- F. In installing overhead main power services, a minimum of 5'-0" of cable per run shall be extended beyond the weatherhead(s) for connection to service drop. Confirm exact requirements with local utility company.

3.3 WIRE CONNECTIONS

- A. See Part 2 above for material types.
- B. Aluminum Wire Connections:
 - 1. Where aluminum wiring is allowed, connections shall utilize compression fittings, no exceptions (Anderson Versa Crimp or equal).
- C. Any stranded wire connection to wiring devices shall be made with crimp type terminals.
- D. All electrical connections and terminals shall be tightened according to manufacturer's published torque-tightening values with calibrated torque wrenches as required to clearly indicate final torque value to the contractor. Where manufacturer's torque values are not provided, those specified in UL 486A & 486B shall be used.
- E. All connections and connector types shall be installed in strict compliance with all requirements of the connector manufacturer.

- F. Under no condition shall the specified conductors be connected to terminals rated less than 75°C. Where conductors sized #1 or smaller are shown to be terminated at equipment and the terminals of that equipment are rated for less than 75°C, contractor shall install junction box near equipment to capture the specified conductors, splice with compression connections (rated for a least 75°C) and extend conductors with ampacity rating as required by NEC (based on terminal temperature rating) to equipment terminals. The length of the conductors to be terminated shall be as directed by the AHJ but not less than 48 inches.

3.4 LOW VOLTAGE (LESS THAN 50V) CONTROL AND NETWORK CABLE INSTALLATION:

- A. All wires and cables shall be installed in conduit unless specifically noted otherwise. Low voltage control and/or network cabling located within concealed, accessible ceiling spaces (such as above lay-in ceilings) may be run without conduit if the following requirements are met:
1. Cabling shall be plenum-rated, multi-conductor.
 2. Cabling shall be supported by cable tray or with J-hook supports on intervals not to exceed 5'-0" on center. Cabling shall be supported solely from the cable tray or j-hooks supported from the building structure, without using piping, ductwork, conduit or other items as supports.
 3. Cabling shall be properly bundled with plenum-rated Velcro straps on intervals not to exceed 30" on center.
 4. Properly-sized conduit(s) shall be provided wherever cabling enters an inaccessible or exposed area (such as above gyp board ceilings or through walls). End bushings shall be provided on both ends of all raceway terminations. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly.

3.5 CIRCUITS AND BRANCH CIRCUITS

- A. Outlets shall be connected to branch circuits as indicated on drawings by circuit number adjacent to outlet symbols, and no more outlets than are indicated shall be connected to a circuit.

3.6 LABELING AND COLOR CODING OF WIRE AND CABLE

- A. Refer to Specification Section 26 05 53 for all labeling requirements.
- B. A color coding system as listed below shall be followed throughout the network of branch power circuits as follows:

PHASE	120/208/240/ COLOR	120/240 HIGH LEG DELTA COLOR	277/480 VOLT COLOR
A	BLACK	BLACK	BROWN
B	RED	ORANGE (FOR HI- LEG)	ORANGE
C	BLUE	BLUE	YELLOW
NEUTRAL	WHITE	WHITE	GRAY
GROUND	GREEN	GREEN	GREEN

- C. Where dedicated neutrals are installed for multi-wire branch circuits, the neutral conductors shall be color coded as follows:

PHASE	120/208/240/ COLOR	120/240 HIGH LEG DELTA COLOR	277/480 VOLT COLOR
NEUTRAL A	WHITE W/ BLACK TRACER	WHITE W/ BLACK TRACER	GRAY W/ BROWN TRACER
NEUTRAL B	WHITE W/ RED TRACER	WHITE W/ ORANGE TRACER (FOR HI-LEG NEUTRAL)	GRAY W/ ORANGE TRACER
NEUTRAL C	WHITE W/ BLUE TRACER	WHITE W/ BLUE TRACER	GRAY W/ YELLOW TRACER

- D. Control Conductors: Shall be color coded by use of colored "tracers". No control circuit shall contain two identical conductors. For example, a set of five (5) control conductors for a pushbutton station represents one (1) control circuit which would require five (5) uniquely-colored control conductors.

3.7 TESTING

- A. The insulation resistance of all feeder conductors (feeding electrical distribution equipment such as switchboards, panelboards, transfer switches, transformers, etc.) shall be tested at the load side of the feeder breaker with a 1000-volt DC Megger Tester prior to energization or final termination. Any feeder conductor with an insulation resistance less than the recommended minimums in the latest version of NETA Acceptance Testing Specification ("ATS") standard shall be replaced by the contractor at the contractor's expense. All final test results shall be clearly documented (with date, time, feeder, results, test equipment, etc.), and the final test results shall be submitted to the design team for review.

END OF SECTION 26 05 19

SECTION 26 05 26

GROUNDING

PART 1 - GENERAL

1.1 GENERAL

- A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO GROUNDING OF THE FOLLOWING:
1. Service Equipment.
 2. Transformers.
 3. Non-current carrying conductive surfaces of equipment.
 4. Metal Buildings.
 5. Structures.
 6. Other Equipment.

1.2 GENERAL REQUIREMENTS

- A. All equipment, building steel, and main service shall be effectively and permanently grounded with a conductor cross section as required by the National Electrical Code and of capacity sufficient to ensure continued effectiveness of the ground connections for fault current. Ground conductors shall be as short and straight as possible, protected from mechanical injury and, if practicable, without splice or joint.
- B. All grounding connections shall be installed in accordance with the National Electrical Code and all local codes and requirements. Such codes shall be considered minimum requirements and the installation of the grounding system shall ensure freedom from dangerous shock voltage exposure and provide a low impedance ground fault path to permit proper operation of overcurrent and ground fault protective devices.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. All grounding conductors shall be insulated with green colored, 600 volt insulation unless noted otherwise.
- B. Motors having power supplied by single conductor wire in conduit shall be grounded through the conduit system. Flexible conduit shall be "jumped" by an appropriate bonding conductor.

2.2 GROUNDING ELECTRODES

- A. Grounding electrodes shall be copper-clad steel rods 3/4 inch in diameter and ten feet long. Where longer electrodes are necessary to reduce the ground resistance, Contractor shall provide sectional rods, connectors, drive heads, etc.

2.3 CONNECTIONS

- A. All conductor-to-conductor, conductor-to-ground rod, conductor-to-structure, conductor-to-fence connections of #6 and larger sized conductors and underground ground connections shall be permanent exothermic welded connections (Cadweld or equal) unless otherwise noted on applicable drawings.
- B. Connections to equipment shall be by bolted compression type lugs (except for motors). When the conductor is #6 and larger, the lug shall be joined to the conductor by an exothermic weld (Cadweld or equal).
- C. Motors to be grounded by the grounding conductors run with the power conductors shall have a split-post grounding stud installed in the connection box.
- D. Each cast pull box or junction box shall have a ground lug, connected to largest ground conductor to enter box.
- E. Ground connections at conduit terminations shall be made by approved grounding bushings (see Raceways Specification Section for additional requirements).

2.4 MANUFACTURERS

- A. Conduit clamps and connectors shall be manufactured by Raco, OZ., or Ercon.
- B. Lugs shall be as manufactured by Square "D", Burndy, or T and B.
- C. Exothermic weld connections shall be as manufactured by Cadweld, or approved equal.
- D. Ground rods shall be as manufactured by Joslyn or McGraw Edison.
- E. Split post grounding shall be as manufactured by Burndy or T and B.

PART 3 - EXECUTION

3.1 MAIN SERVICE GROUND

- A. The main service grounding electrode system shall consist of the following items bonded together by the grounding electrode conductor:
 - 1. The main underground cold water pipe (metal).
 - 2. The metal frame of the building.
 - 3. Driven ground rods. Ground rods shall be embedded at the lowest point in the building and below the permanent moisture level. Ground rods shall be spaced a minimum of ten (10) feet apart and connected in parallel until resistance to ground does not exceed five (5) ohms.
- B. The grounding electrode system shall be connected to the grounded conductor (neutral) on the supply side of the service disconnecting means by a grounding electrode conductor not smaller than that shown in Table 250.66 of the N.E.C. The main service

equipment grounding conductor shall be connected to the grounding conductor on the supply side of the service disconnecting means in accordance with Table 250.122 of the N.E.C. for the ampere rating of the service entrance equipment. Where in a service entrance switchboard, the equipment grounding conductor shall not be less than 25% of the main bus rating. These connections shall be made inside the service entrance equipment enclosure.

3.2 TRANSFORMER GROUNDS

- A. Dry type insulation transformers with a grounded conductor in the secondary shall be grounded in accordance with N.E.C. Section 250-30.

3.3 EXPOSED NON-CURRENT-CARRYING METAL PARTS

- A. General: Ground connections to equipment or devices shall be made as close to the current carrying parts as possible, that is, to the main frame rather than supporting structures, bases or shields. Grounding connections shall be made only to dry surfaces that are clean and dry. Steel surfaces shall be ground or filed to remove all scales, rust, grease, and dirt. Copper and galvanized steel shall be cleaned to remove oxide before making welds or connections.
- B. Code size ground conductors shall be run in all power conduits and properly terminated at each end.
- C. Ground conductors shall be routed as straight as possible. Where possible, ground conductors shall be routed such as to avoid bends exceeding 90 degrees or with a radius of less than 8".
- D. Exposed ground conductors shall generally be routed in raceways where possible. Raceway types and installation shall comply with Specification Section 26 05 33 (Raceways) requirements.
- E. Motors: Exposed non-current-carrying metal parts, shall be grounded by a grounding conductor either run with power conductors, and/or separate grounding conductors. Drawings will show method(s) to be used. The ground conductors with all motor conductors shall be connected to the ground buss in the motor connection box. Jumper connections shall be installed between frames and rigid conduit for equipment having flexible conduit connections (sealtight). All AC motor grounds shall provide a low impedance path to ground.
- F. Raceways & boxes: All raceways, conduits, armored or shielded cable and all exposed non-current carrying metal parts shall be grounded. Such items shall be bonded together and permanently grounded to the equipment ground buss. Metallic conduits shall be connected by grounding or clamps to ground buss. Flexible "jumpers" shall be provided around all raceway expansion joints. Bonding straps for steel conduit shall be copper. Jumper connections shall be provided to effectively ground all sections or rigid conduit connected into plastic pipe. No metallic conduit shall be left ungrounded. In conduit

systems interrupted by junction or switch boxes where locknuts and bushings are used to secure the conduit in the box, the sections of conduit and box must be bonded together. If conduit, couplings or fittings have a protective coating or non-conductive material, such as enamel, such coating must be thoroughly removed from threads of both couplings and conduit and the surface of conduit or fitting where the ground clamp is secured.

- G. Enclosures: Metal conduits entering free standing motor control centers, switchboards or other free standing equipment shall be grounded by bare conductors and approved clamp. Any conduits entering low voltage (480 volts or below) equipment through sheet metal enclosure and effectively grounded to enclosure by double locknut or hub, that meets NEC grounding/bonding requirements, need not be otherwise bonded.
- H. Equipment: In addition to equipment grounding provisions mandated by code requirements, additional equipment grounding provisions (including local ground rods, connections, etc.) shall be provided by the contractor as directed by equipment suppliers.
- I. Both ends of ground busses in motor control centers, switchboards, etc., shall be separately connected to the main ground buss to form two separate paths to ground.
- J. Fences and Grills: Fences and metal grills around equipment carrying voltage above 500 volts between phases shall be bonded together and to ground. Fences and grill work shall be grounded at every post, column, or support, and on each side of every gate.

3.4 ACCEPTANCE DOCUMENTATION AND TESTING

- A. Contractor shall take and store photographs of all underground grounding system connections prior to burial of connections, for review by Engineer.
- B. Upon completion of work, the entire ground system shall be shown to be in perfect working condition, in accordance with the intent of the Specifications.
- C. Contractor shall measure the resistance between the main ground bonding jumper to true earth ground using the Fall of Potential method as described by ANSI/IEEE Standard 81 ("Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of an Earth System"). If the measured value is greater than five ohms, additional grounding electrodes shall be installed as described in Part 3.1 above. The final ground resistance value shall be submitted in writing, and documented via picture of the meter reading from the Fall of Potential test, to the Architect prior to the final observation, and shall be included in final O&M documentation.

END OF SECTION 26 05 26

SECTION 26 05 33

RACEWAYS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
 - 1. Conduits
 - 2. Conduit Fittings
 - 3. Couplings & Connectors
 - 4. Bushings
 - 5. Raceway Hardware, Conduit Clamps & Supports
 - 6. Watertight Entrance Seal Devices

PART 2 - PRODUCTS

2.1 CONDUITS

- A. Rigid Galvanized Steel and I.M.C.:
 - 1. Shall be galvanized outside and inside by hot dipping.
 - 2. Shall be as manufactured by Republic, Wheatland, Pittsburg Standard, Youngstown, Allied or equal.
- B. E.M.T.:
 - 1. Shall be Electro-Galvanized.
 - 2. Shall be as manufactured by Republic, Wheatland, Pittsburg Standard, Youngstown, Allied or equal.
- C. Rigid Aluminum:
 - 1. Shall be manufactured of 6063 Alloy, T-1 temper.
 - 2. Shall be manufactured by Republic (Nucor), Wheatland, Allied (Atkore), Penn or equal.
- D. Schedule 40 and 80 PVC:
 - 1. Shall be composed of polyvinyl chloride and shall be U.L. rated type 40 or 80 for use with 90 degree rated conductors. Conduit shall conform to NEMA Standards and applicable sections of N.E.C.
 - 2. The conduit manufacturer shall have had a minimum of 5 years experience in the manufacture of the products. Non-metallic raceways shall be as manufactured by Carlon, Triangle, Can-Tex, Allied or equal.
- E. HDPE Innerduct
 - 1. Shall be composed high density polyethylene and shall be orange in color, unless noted otherwise.

2. Shall be corrugated unless noted otherwise.
 3. Shall be manufactured by Carlon, Ipex or equal.
- F. Flexible Metallic Conduit:
1. Shall be continuous spiral wound and interlocked galvanized material, code approved for grounding.
- G. Liquidtight Flexible Metallic Conduit:
1. Shall be galvanized steel-core sealtite, code approved for grounding.
 2. Shall have an outer liquidtight, nonmetallic, sunlight-resistant jacket over an inner flexible metal core.
 3. Shall be as manufactured by Electric-Flex, Anaconda or equal.

2.2 FITTINGS, COUPLINGS & CONNECTORS

- A. Rigid Galvanized Steel and I.M.C. couplings and connectors shall be standard threaded type, galvanized outside and inside by hot dipping. Threadless and clamp type are not acceptable. Couplings/connectors shall be as manufactured by Racor, Efcor, or Appleton or equal.
- B. All rain tight connectors shall be threaded Myers or approved equal, rated for outdoor application.
- C. E.M.T. couplings and connectors shall be set screw, or steel compression type. All couplings and connectors shall be 720B, 730, 750B, or 760 series of Efcor or equal series of Racor. Pressure indented type connectors or cast metal will not be approved for any location. E.M.T. couplings and connectors shall be as manufactured by O-Z/Gedney, T&B, Efcor, Racor, Midwest or equal. E.M.T. fittings, couplings and connectors located within concrete (where allowed) shall be compression type and shall be adequately sealed with tape to ensure a concrete-tight seal.
- D. Rigid Aluminum couplings and connectors shall be standard threaded type, of the same alloy as the associated conduit. Threadless and clamp type are not acceptable. Fittings shall be as manufactured by Thomas & Betts, Crouse-Hinds, Appleton, Pyle-National or equal.
- E. All PVC couplings, adapters, end bells, reducers, etc., shall be of same material as conduit.
- F. Liquidtight Flexible Metallic Conduit connectors shall be liquidtight with insulating throat or end bushing, designed for application with Liquidtight Flexible Metallic Conduit. Fittings shall be as manufactured by Efcor, Racor, Midwest or equal.
- G. All LB unilets sizes 1 1/4" or larger shall have rollers.
- H. Miscellaneous conduit fittings shall be as manufactured by Appleton, Crouse-Hinds, Pyle-National, Russell & Stoll or equal.

2.3 BUSHINGS

- A. All non-grounding rigid bushings 1-1/4" and larger shall be the insulating type (O-Z/Gedney type "BB" or equal by T&B, Midwest Electric or Penn Union).
- B. All non-grounding rigid bushings 1" and smaller shall be threaded malleable iron with integral noncombustible insulator rated for 150°C. Non-grounding rigid conduit bushings shall be O-Z/Gedney type "B" or equal by T&B, Midwest Electric or Penn Union.
- C. All grounding rigid bushings shall be threaded malleable iron with integral noncombustible insulator rated for 150°C. All grounding rigid conduit bushings shall be O-Z/Gedney type "BLG" or equal by T&B, Midwest Electric or Penn Union.

2.4 HARDWARE, CONDUIT CLAMPS AND SUPPORTS

- A. All hardware such as expansion shields, machine screws, toggle bolts, "U" or "J" bolts, machine bolts, conduit clamps and supports shall be of corrosion resistant materials (stainless steel, aluminum, galvanized or plated steel, or other approved materials).
- B. Hardware in contact with aluminum handrails, plates or structural members and all hardware in exterior, wet or corrosive areas shall be type 316 stainless steel or aluminum (with bitumastic paint coating to isolate aluminum from contact with concrete where necessary) unless specifically noted otherwise.
- C. Supports in exterior, wet or corrosive locations shall be type 316 stainless steel or aluminum (with bitumastic paint coating to isolate aluminum from contact with concrete where necessary) unless specifically noted otherwise.
- D. Supports in extremely corrosive environments (such as chlorine or fluoride storage rooms) shall be PVC-Coated aluminum unless specifically noted otherwise.
- E. Hardware and conduit clamps shall be as manufactured by Efcor, Steel City, G.A., Tinnerman or equal.

2.5 WATERTIGHT ENTRANCE SEAL DEVICES

- A. For new construction, seal devices shall consist of oversized sleeve and malleable iron body with sealing rings, pressure rings, sealing grommets and pressure clamps as required (O-Z/Gedney type FSK/WSK or equal).
- B. For cored-hole applications, seal devices shall consist of assembled dual pressure disks with neoprene sealing rings and membrane clamps as required (O-Z/Gedney type CSM or equal).

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Minimum Diameter: 3/4-inch.
- B. Raceway Type: Raceway types shall be as specified below, unless indicated otherwise on drawings:
 - 1. Exterior, Exposed: Rigid Galvanized Steel or I.M.C. unless otherwise noted.
 - 2. Other Exterior (Concrete-Encased or Direct Earth Buried): Schedule 40 PVC. PVC conduit shall convert to metallic conduit prior to exiting concrete-encasement or direct earth burial. See "transition" items below for additional requirements. Conduits shall be left exposed until after Architect's observation.
 - 3. Interior, Exposed:
 - a. Hazardous Locations: Rigid Galvanized Steel .
 - b. Wet Locations (including, but not limited to, Pump Rooms, Wet Wells, Underground Vaults, and other similar locations): Rigid Galvanized Steel or I.M.C. .
 - c. Dry Locations Where Subject to Mechanical Damage (including, but not limited to, below 10'-0" A.F.F. in shop, storage, warehouse and other similar areas): Rigid Galvanized Steel or I.M.C..
 - d. Extremely Corrosive Locations (Chlorine Storage Rooms, Fluoride Storage Rooms and other similar areas): Schedule 80 PVC.
 - e. Other Dry Locations: E.M.T.
 - 4. Interior, Concealed:
 - a. Embedded inside Poured Concrete Walls, Ceilings or Floors, with a minimum of 2" of concrete between finished surface and outer wall of conduit on all sides, where no anchor bolts, screws or other similar items will be installed: Schedule 40 PVC. PVC conduit shall convert to metallic conduit (exact type as specified elsewhere within this section) prior to exiting poured concrete-encasement of wall, ceiling, floor or ductbank. See "transition" items below for additional requirements.
 - b. Other Raceways Embedded inside Poured Concrete Walls, Ceilings or Floors (not meeting requirements above): Rigid Galvanized Steel or I.M.C. (coated with two (2) spiral-wrapped layers of 3M Scotchrap 50 PVC tape or two coats of asphaltum paint where below grade or within concrete).
 - c. Other Raceways: E.M.T.
 - 5. Terminations at motors, transformers and other equipment which has moving or vibrating parts:
 - a. Exterior or Wet Locations (including, but not limited to, Pump Rooms, Wet Wells, Underground Vaults, and other similar locations): Liquidtight Flexible Metallic Conduit (shall generally not exceed 24 inches in length) with watertight fittings.
 - b. Dry, Interior Locations: Flexible Metallic Conduit (shall generally not exceed 24 inches in length).
 - 6. Terminations at fixtures mounted in grid-type ceilings:
 - a. Flexible Metallic Conduit or MC cabling (shall generally not exceed 72 inches in length and shall run from junction box to fixture, not from fixture to fixture).
 - 7. Transition from underground or concrete-encased to exposed:
 - a. Convert PVC to Rigid Galvanized Steel (coated with two (2) spiral-wrapped layers of 3M Scotchrap 50 PVC tape or two coats of asphaltum paint where below grade or within concrete) utilizing Rigid Galvanized Steel 90 degree bends (and

vertical conduits as required by application) prior to exiting concrete/grade (except at outdoor pull boxes and under freestanding electrical equipment, where terminations shall be by PVC end bells installed flush with top of slab). Exposed portions of these coated conduits shall extend a minimum of 6" above floor level, and shall be installed at uniform heights.

3.2 RACEWAY INSTALLATION

A. General:

1. Follow methods which are appropriate and approved for the location and conditions involved. Where not otherwise shown, specified, or approved in a particular case, run all wiring concealed.
2. Where conduit crosses a structural expansion joint an approved conduit expansion fitting shall be installed.
3. A non-conductive polypropylene pull string, properly tied/secured at either end, shall be installed in all empty conduits.
4. Metal conduit field-cuts shall be cut square with a hacksaw and the ends reamed after threading.
5. PVC conduit field-cuts shall be made with hacksaw, and ends shall be deburred.
6. All PVC joints shall be made as follows:
 - a. Clean the outside of the conduit to depth of the socket, and the inside of socket with an approved cleaner.
 - b. Apply solvent cement as recommended by the conduit manufacturer to the interior of the socket and exterior of conduit, making sure to coat all surfaces to be joined.
 - c. Insert conduit into the socket and rotate 1/4 to 1/2 turn and allow to dry.
7. All metallic conduit installed below grade or within concrete shall be coated with two (2) spiral-wrapped layers of 3M Scotchrap 50 PVC tape or two coats of asphaltum paint prior to installation.
8. Install ground wire sized per N.E.C. Table 250.122 in all conduits.
9. Use of running threads is absolutely prohibited. Conduit shall be jointed with approved threaded conduit couplings. Threadless and clamp type not acceptable.
10. Conduits shall be sized in accordance with latest National Electrical Code except when size shown on drawings. 1/2-inch conduit shall not contain conductors larger than No. 12 or more than four (4) No. 12 conductors.
11. Exposed, field-cut threads on all metal conduits shall be painted with zinc primer (for Galvanized Rigid or I.M.C.).

B. Routing/Locating:

1. Exposed conduit runs shall be run level and plumb and shall, on interior of buildings, be run parallel and/or at right angles to building walls and/or partitions.
2. Conduit with an external diameter larger than 1/3 the thickness of a concrete slab shall not be placed in the slab. Conduits in slab shall not be spaced closer than 3 diameters on center.

3. Conduit run in ceiling spaces shall be run as high as possible, all at same level, and shall be supported from building structure. Do not support conduit from any other installation.
4. Conduit run within exterior CMU, concrete or other similar walls shall be run within the CMU cells / concrete structure / etc. Conduits shall not be run on the outside surface of CMU cells / concrete structure / etc. underneath exterior veneers / etc., which could cause a thermal break in the wall insulation or a future water intrusion problem.
5. Install conduit runs to avoid proximity to steam or hot water pipes. In no place shall a conduit be run within 6" of such pipes except where crossing is unavoidable, then conduit shall be kept at least 3" from the covering of the pipe crossed.
6. Before installing raceways for motors, HVAC equipment and other fixed equipment, check location of all equipment connections/terminal boxes with equipment supplier and locate and arrange raceways appropriately.
7. A minimum of 12" of clearance (or more as required by associated utility companies) shall be provided between the finished lines of exterior, underground conduit runs and exterior, underground utilities (gas, water, sewer, etc.).
8. Where any portion of raceway is installed in a wet environment (such as below grade) and located at a higher elevation than the raceway termination point in a dry environment, install watertight compound inside raceway at termination around cabling to prevent transfer of water through conduit system. Watertight compound shall be rated for the potential water head pressure, based on the assumption that ground water level would be at grade level.

C. Bends:

1. Do not make bends (in any raceway, including flexible conduits) that exceed allowable conductor bending radius of cable to be installed or that significantly restrict conductor flexibility.
2. All bends within concrete-encased ductbanks installed in exterior locations shall be long radius bends (24" minimum bending radius – varies with conduit diameter).
3. Where numerous exposed bends or grouped together, all bends shall be parallel, with same center and shall be similar in appearance
4. All PVC elbows, bends, etc., shall be either factory bends or made with an approved heat bender.

D. Support:

1. Anchor conduit securely in place by means of approved conduit clamps, hangers, supports and fastenings. Arrangement and methods of fastening all conduits shall be subject to Engineer's direction and approval. All conduits shall be rigidly supported (wire supports may not be used in any location). Use only approved clamps on exposed conduit.
2. Conduit in riser shafts shall be supported at each floor level by approved clamp hangers.
3. Right angle beam clamps and U bolts shall be specially formed and sized to snugly fit the outside diameters of conduits.

4. Where installed in seismic zones, suspended raceways shall be braced in two (2) directions as required to prevent swaying and excessive movement.
5. Raceways installed on top of flat roofing shall be supported a minimum of 3 ½" above roof with rubber block supports (Cooper B-Line Dura-Blok or equal). Installation shall be in strict accordance with support manufacturer's instructions and recommendations.

E. Terminations:

1. All conduit connections to sheet metal cabinets or enclosures located in exterior or wet locations shall terminate by use of rain tight (Meyers) hubs.
2. Where rigid or I.M.C. conduits enter sheet metal boxes, they shall be secured by approved lock nuts and bushings.
3. Where metal conduits enter outdoor pull boxes, manholes, under freestanding electrical equipment or other locations where direct metal-to-metal contact does not exist between enclosure and conduit, grounding bushings shall be installed. Each grounding bushing shall be connected to the enclosure ground and all other grounding bushings with properly sized grounding conductors.
4. Where E.M.T. enters sheet metal boxes they shall be secured in place with approved insulating fittings.
5. Where PVC enters outdoor pull boxes, manholes or under freestanding electrical equipment, PVC end bells shall be installed.
6. Contractor shall be responsible for coordinating required conduit sizes with equipment hubs/conduit entry provisions (such as at motor tap boxes) prior to installation of conduit systems. Contractor shall field adjust final conduit sizes at terminations where so required (only as allowed by code) from those indicated on plans to coordinate with equipment hubs/conduit entry provisions.
7. Where conduit terminates in free air such that associated cabling/circuitry becomes exposed (such as at cable trays, etc.), conduit shall generally terminate in a horizontal orientation (to prevent dust/debris/etc. from entering conduit system). Where vertical conduit termination is necessary, the termination shall be provided with cord-grip conduit terminations to seal the conduit system.
8. Conduit ends shall be carefully plugged during construction.
9. Permanent, removable caps or plugs shall be installed on each end of all empty raceways with fittings listed to prevent water and other foreign matter from entering the conduit system.

F. Penetrations:

1. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly. Refer to drawings and other specifications for additional requirements.
2. All penetrations shall be at right angles unless shown otherwise.
3. Structural members (including footings and beams) shall not be notched or penetrated for the installation of electrical raceways unless noted otherwise without specific approval of the structural engineer.
4. Dry-packed non-shrink grout or watertight seal devices shall be used to seal openings around conduits at all penetrations through concrete walls, ceilings or aboveground floors.

5. All raceways entering structures, or where water is otherwise capable of entering equipment/devices through the raceway system, shall be sealed (at the first box or outlet) with foam duct sealant to prevent the entrance of gases or liquids from one area to another or into equipment/devices.
 - a. Where the elevation of the raceway penetration (into the structure) is no more than 15' below the other (higher) end of the same raceway, Polywater FST sealant (rated to hold back up to 22' of continuous water head pressure), or pre-approved equal, shall be used.
 - b. Where the elevation of the raceway penetration (into the structure) is between 15' and 75' below the other (higher) end of the same raceway, Polywater PHRD Custom Mechanical Seals (rated to hold back up to 36psi or 83' of continuous water head pressure), or pre-approved equal, shall be used.
 - c. Where the elevation of the raceway penetration (into the structure) is more than 75' below the other (higher) end of the same raceway, the contractor shall propose a custom solution designed to hold back or to drain the possible water within the associated raceway. Submittals shall be provided to the engineer for review/approval, including a summary of the anticipated elevations/PSIs, details of the proposed installation, cut-sheets of devices/materials, etc.
 6. Additionally, where necessary to ensure that water does not enter equipment/devices through the raceway system (where raceways extend to equipment/devices from wet areas), junction boxes with drain assemblies in bottom shall be located at low point of raceway system near equipment/devices (to drain water out of raceway system before it enters equipment/devices). Contractors shall provide drains in raceway systems where so necessary to prevent water entry into equipment/devices.
 7. All raceways passing through concrete roofs or membrane-waterproofed walls or floors shall be provided with watertight seals as follows:
 - a. Where ducts are concrete encased on one side: Install watertight entrance seal device on the accessible side of roof/wall/floor as directed by equipment manufacturer.
 - b. Where ducts are accessible on both sides: Install watertight entrance seal device on each side of roof/wall/floor as directed by equipment manufacturer.
 8. All raceways passing through walls of rooms containing/storing noxious chemicals (chlorine, ammonia, etc.) or through hazardous locations shall be sealed with conduit seals (Crouse-Hinds type EYS or equal).
 9. All raceways terminating into electrical enclosures/devices/panels/etc. located in hazardous locations shall be sealed with conduit seals (Crouse-Hinds type EYS, EZS or equal) within 18" of the termination.
- G. Exterior Electrical Ductbanks:
1. Where exterior electrical concrete-encased ductbanks are indicated on drawings, conduit runs between buildings or structures shall be grouped in concrete-encased ductbanks as follows:
 - a. A minimum of 3" of concrete shall encase each side of all ductbanks.
 - b. A minimum of 1 ½" of separation shall be provided between each conduit within ductbanks. PVC spacers shall be installed at the necessary intervals prior to

placement of concrete to maintain the required spacing and to prevent bending or displacement of the conduits.

- c. Top of concrete shall be a minimum of 30" below grade. A continuous magnetic marking tape shall be buried directly above each ductbank, 12" below grade.
- d. Exact routing of ductbanks shall be field verified and shall be modified as necessary to avoid obstruction or conflicts.
- e. Underground electrical raceways shall be installed to meet the minimum cover requirements listed in NEC Table 300.5. Refer to drawings for more stringent requirements.

END OF SECTION 26 05 33

SECTION 26 05 34

OUTLET BOXES, JUNCTION BOXES, WIREWAYS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Outlet and Junction Boxes
- B. Pull Boxes
- C. Wireways

PART 2 - PRODUCTS

2.1 OUTLET BOXES & JUNCTION BOXES (THROUGH 4-11/16")

- A. Sheet Metal: Shall be standard type with knockouts made of hot dipped galvanized steel as manufactured by Steel City, Racco, Appleton, Bowers or equal.
- B. Cast: Shall be type FS, FD, JB, GS, or SEH as required for application as manufactured by O-Z/Gedney, Appleton, or equal.
- C. Nonmetallic: Shall be type Polycarbonate/ABS construction as required for application with non-metallic quick-release latches as manufactured by Hoffman, O-Z/Gedney, Appleton, or equal.

2.2 JUNCTION AND PULL BOXES (LARGER THAN 4-11/16")

- A. Oil-Tight JIC: Shall be Hoffman Type CH box or approved equal.
- B. Galvanized Cast Iron or Cast Aluminum: Shall be O-Z/Gedney or approved equal.
- C. Stainless Steel: Shall be as manufactured by O-Z/Gedney, Hoffman or approved equal. Boxes shall have continuous hinges, seamless foam-in-place gaskets and screw-down clamps.
- D. Nonmetallic: Shall be type Polycarbonate/ABS construction as required for application with non-metallic quick-release latches as manufactured by Hoffman, O-Z/Gedney, Appleton, or equal. Boxes shall have hinged covers and screw-down clamps.
- E. Wireways: Shall be standard manufacturer's item as manufactured by Hoffman, Square "D", Burns, B & C or equal. Wireways shall have hinged covers and screw-down clamps.
- F. Pre-cast Polymer Concrete Below-Grade Hand Holes & Pull Boxes:
 - 1. Enclosures, boxes and cover are required to be UL Listed and conform to all test provisions of ANSI/SCTE 77 "Specifications For Underground Enclosure Integrity" for

- Tier 15 applications (15,000lb design load and 22,500lb test load) unless noted otherwise.
 - 2. All covers shall have a minimum coefficient of friction of 0.05 in accordance with ASTM C1028 and the corresponding Tier level shall be embossed on the top surface.
 - 3. Cover shall be bolt-down include factory-labeling to read "Electric", "Communications" or other as directed.
 - 4. Hardware shall be stainless steel.
 - 5. Shall be Quazite PG/LG Style or approved equal.
- G. Galvanized Cast Iron Below-Grade Pull Boxes:
- 1. Enclosures, boxes and cover are required to conform to AASHTO H-20 requirements for deliberate vehicular traffic applications unless noted otherwise.
 - 2. Cover shall be checkered, bolt-down include factory-labeling to read "Electric", "Communications" or other as directed.
 - 3. Hardware shall be stainless steel.
 - 4. Shall be furnished with grounding kit.
 - 5. Shall be O-Z/Gedney Type YR or approved equal.
 - a.

PART 3 - EXECUTION

3.1 APPLICATION

- A. General
- 1. All boxes and wireways shall be of sufficient size to provide free space for all enclosed conductors per NEC requirements. Fill calculations shall be performed by contractor per NEC requirements.
- B. Outlet Boxes & Junction Boxes (through 4-11/16")
- 1. Sheet metal boxes shall be used on concealed work in ceiling or walls and exposed work in dry, interior locations
 - a. Exception: Where exposed and installed within finished/public spaces such as offices, corridors, lobbies, etc., cast boxes shall be used for wiring device outlets. Cast boxes are not required in back-of-house areas such as electrical rooms, mechanical rooms, etc. .
 - 2. Cast boxes shall be used wherever Rigid or I.M.C. conduits are installed.
 - 3. All boxes installed in extremely corrosive areas (such as chlorine and fluoride storage rooms) where non-metallic raceways are used shall be non-metallic.
 - 4. Except when located in exposed concrete block, switch and receptacle boxes shall be 4" square for single gang installation. Appropriate gang boxes shall be used for mounting ganged switches.
 - 5. When installed in exposed concrete block, switch and receptacle boxes shall be square type designed for exposed block installation.
 - 6. Ceiling outlet boxes shall be 4" octagon 1-1/2" deep or larger required due to number of wires.

7. Boxes installed in hazardous locations shall be explosion-proof rated for the associated application, constructed of copper-free cast aluminum.
- C. Junction & Pull Boxes (larger than 4-11/16")
1. For all below grade exterior use and elsewhere as shown:
 - a. In areas subject to future vehicular traffic: shall be galvanized cast iron (rated AASHTO H-20 Loading unless noted otherwise).
 - b. In areas not subject to vehicular traffic: shall be galvanized cast iron or pre-cast polymer concrete (rated for Tier 15 Loading unless noted otherwise).
 2. All boxes installed exposed in exterior or wet areas shall be powder-coated galvanized steel (NEMA 3R).
 3. All boxes installed exposed in corrosive areas shall be stainless steel (NEMA 4X).
 4. All boxes installed in extremely corrosive areas (such as chlorine and fluoride storage rooms) where non-metallic raceways are used shall be non-metallic.
 5. Boxes installed in hazardous locations shall be explosion-proof rated for the associated application, constructed of copper-free cast aluminum.
 6. All others shall be oil tight JIC box not less than 16 gauge.

3.2 INSTALLATION

- A. General
1. All boxes and wireways shall be securely anchored.
 2. All boxes shall be properly sealed and protected during construction and shall be cleaned of all foreign matter before conductors are installed.
 3. All boxes and wireways shall be readily accessible. Contractor shall be responsible for furnishing and installing access panels per architect's specifications. Locations shall be as directed by the architect as required to make boxes, wireways, electrical connections, etc. accessible where above gypsum board ceilings or in other similar locations.
 4. All metallic boxes and wireways shall be properly grounded.
 5. Refer to Specification Section 26 05 53 for identification requirements.
- B. Outlet Boxes & Junction Boxes (through 4-11/16")
1. Boxes shall be provided with approved 3/8" fixture studs were required.
 2. Recessed boxes for wiring devices, surface fixtures, or connections, shall be set so that the edge of cover comes flush with finished surface.
 3. There shall be no more knockouts opened in any sheet metal box than actually used.
 4. Any unused opening in cast boxes shall be plugged.
 5. Back to back boxes to be staggered at least 3 inches.
 6. Under no circumstances shall through-the-wall boxes be used.
- C. Junction & Pull Boxes (larger than 4-11/16")
1. Pull boxes shall be installed as indicated on plans and/or as required due to number of bends, distance or pulling conditions.
 2. Boxes to be imbedded in concrete shall be properly leveled and anchored in place before the concrete is poured.

3. All pull boxes and/or junction boxes installed exterior below grade, shall have their tops a minimum of 1-1/2 inches above surrounding grade and sloped so that water will not stand on lid. A positive drain shall be installed, to prevent water accumulation inside.
 4. Above grade pull boxes shall be installed on concrete anchor bases as shown on Plans.
- D. Wireways and/or wall-mounted equipment
1. Mount each wireway to channels of the same metal type as the wireway.
 2. Conductors serving a wireway shall be extended without reduction in size, for the entire length of the wireway. Tap-offs to switches and other items served by the wireway shall be made with ILSCO type GTA with GTC cap.

END OF SECTION 26 05 34

SECTION 26 05 36

CABLE TRAYS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, tests and services to install complete cable tray systems as shown on the drawings.
- B. Cable tray systems are defined to include, but are not limited to straight sections of cable trays, bends, tees, elbows, drop-outs, supports and accessories.

1.2 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code
- B. ASTM A123 - Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
- C. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
- D. ASTM A1011 - Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High Strength Low Alloy with Improved Formability *(Formerly ASTM A570 & A607)*
- E. ASTM A1008 - Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability *(Formerly ASTM A611)*
- F. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel
- G. NEMA VE 1-2002 - Metallic Cable Tray Systems
- H. NEMA VE 2-2006 - Cable Tray Installation Guidelines
- I. TIA 569-A - Commercial Building Standard for Telecommunications Pathways & Spaces

1.3 DRAWINGS

- A. The drawings, which constitute a part of these specifications, indicate the general route of the cable tray systems. Data presented on these drawings are as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification, of all dimensions, routing, etc., is directed.

- B. Specifications and drawings are for assistance and guidance, but exact routing, locations, distances and levels will be governed by actual field conditions. Contractor is directed to make field surveys as part of his work prior to submitting system layout drawings.

1.4 SUBMITTALS

- A. Submittal Drawings: Submit drawings of cable tray and accessories including clamps, brackets, hanger rods, splice plate connectors, expansion joint assemblies, and fittings, showing accurately scaled components.
- B. Product Data: Submit manufacturer's data on cable tray including, but not limited to, types, materials, finishes, rung spacings, inside load depths and fitting radii. For side rails and rungs, submit cross sectional properties including Section Modulus (Sx) and Moment of Inertia (Ix).

1.5 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of cable trays and fittings of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Provide cable trays and accessories through one source from a single manufacturer.
- C. NEMA Compliance: Comply with NEMA Standards Publication Number VE1, "Cable Tray Systems".
- D. NEC Compliance: Comply with NEC, as applicable to construction and installation of cable tray and cable channel systems (Article 318, NEC).
- E. UL Compliance: Provide products that are UL-classified and labeled in their final installed form.
- F. NFPA Compliance: Comply with NFPA 70B, "Recommended Practice for Electrical Equipment Maintenance" pertaining to installation of cable tray systems.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver cable tray systems and components carefully to avoid breakage, denting and scoring finishes. Do not install damaged equipment.
- B. Store cable trays and accessories in original cartons and in clean dry space; protect from weather and construction traffic. Wet materials should be unpacked and dried before storage.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Wire Mesh Basket type cable tray systems:

1. Subject to compliance with these specifications, wire mesh basket type cable tray systems shall be as manufactured by Eaton B-Line, Inc.; Mono-Systems, Inc, Chalfant or Legrand Cablofil.
- B. Ladder type cable tray systems:
 1. Subject to compliance with these specifications, ladder type cable tray systems shall be as manufactured by Eaton B-Line, Inc.; Mono-Systems, Inc or Chalfant.

2.2 CABLE TRAY SECTIONS AND COMPONENTS

- A. Typical Cable Tray Application (applicable unless noted otherwise on plans):
 1. Containing only low voltage cabling AND concealed above accessible ceilings, below raised access floors or within telecommunications rooms: Wire mesh basket type with:
 - a. Useable Loading Depth: 4".
 - b. Minimum Load Rating: NEMA 12C.
 - c. Material: Black powder coat painted steel.
 - d. Width(s): as shown on plans.
 2. All other applications: Ladder-type with:
 - a. Rung Spacing: 9" o.c.
 - b. Useable Loading Depth: 4".
 - c. Minimum Load Rating: NEMA 12C.
 - d. Material: Aluminum.
 - e. Width(s): as shown on plans.
- B. General: Except as otherwise indicated, provide metal cable trays, of types, classes and sizes indicated; with clamp assemblies, connector/splice plates, splice bars, bolts, nuts and washers for connecting units as required. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards.
- C. Cable tray construction:
 1. Wire Mesh Basket type cable tray systems:
 - a. All straight section longitudinal wires shall be constructed with a continuous top wire safety edge. Safety edge must be kinked and T-welded on all tray sizes.
 - b. Wire mesh basket type cable tray shall be made of high strength steel wires and formed into a standard 2 inch by 4 inch wire mesh pattern with intersecting wires welded together. Minimum wire diameter shall be 5mm (4.5mm for stainless steel). All mesh sections must have at least one bottom longitudinal wire along entire length of straight section.
 - c. All fittings shall be factory-built or shall be formed from straight sections in accordance with manufacturer's instructions to maintain the UL Classification of the system.
 2. Ladder type cable tray systems:
 - a. Two longitudinal members (side rails) fabricated as I-beams with transverse members (rungs) welded (for metallic construction) or mechanically-fastened and adhesively bonded (for fiberglass construction) to the side rails.

- D. Materials and Finish: Specific material and finish types for each tray type (as specified elsewhere) shall comply with the following general requirements:
1. Aluminum: All sections and fitting side rails and rungs shall be extruded from Aluminum Association Alloy 6063. All fabricated parts shall be made from Aluminum Association Alloy 5052.
 2. Pre-galvanized Steel: All sections, fitting side rails, rungs, and covers shall be made from steel meeting the minimum mechanical properties and mill galvanized in accordance with ASTM A653 SS, Grade 33, coating designation G90.
 3. Hot-dip Galvanized Steel: All sections and fitting side rails and rungs shall be made from steel meeting the minimum mechanical properties of ASTM A1011 SS, Grade 33 for 14 gauge and heavier, ASTM A1008, Grade 33, Type 2 for 16 gauge and lighter and ASTM A510, Grade 1008 for wire mesh basket type, and shall be hot-dip galvanized after fabrication in accordance with ASTM A123. All covers and splice plates must also be hot-dip galvanized after fabrication; mill galvanized covers are not acceptable for hot-dipped galvanized cable tray. All hot-dip galvanized after fabrication steel cable trays must be returned to point of manufacture after coating for inspection and removal of all icicles and excess zinc. Failure to do so can cause damage to cables and/or injury to installers.
 4. Stainless Steel: All sections, accessories and fitting side rails and rungs shall be made of AISI Type 316 stainless steel. Transverse members (rungs) or corrugated bottoms shall be welded to the side rails with Type 316 stainless steel welding wire. Wire mesh basket type shall meet minimum mechanical properties of ASTM A580.
 5. Black Powder Coated steel: All sections/components shall be powder coated black with an average paint thickness of 1.2mils (30microns) to 3.0mils (75microns).
 6. Fiberglass: All sections/components shall be pultruded from non-conductive glass fiber reinforced polyester or vinyl ester resin. Pultruded shapes shall be constructed with a surface veil to insure a resin-rich surface and UV resistance, and shall meet ASTM E-84, Class 1 flame rating and self-extinguishing requirements of ASTM D-635.
- E. Accessories and Supports:
1. General:
 - a. Cable Tray Supports: Shall be placed so that the support spans do not exceed maximum spans allowed to achieve the specified cable tray load ratings.
 - b. Center hung supports shall be manufactured of 12 gauge, 1-5/8 inch by 1-5/8 inch B-Line B22 steel strut with a pipe welded at the middle of the support to provide eccentric loading stability. Support shall withstand 700 pounds in a 60 percent vs. 40 percent eccentric loading condition with a safety factor of 3.
 - c. Accessories - special accessories shall be furnished as required to protect, support, and install a cable tray system. Accessories shall consist of but are not limited to; section splice plates, expansion plates, blind-end plates, specially designed ladder dropouts, barriers, conduit-to-tray adapters, etc.
 2. Wire Mesh Basket type cable tray systems:
 - a. Barrier Strips: Shall be provided where specified on plans or where cables/conductors of varying voltage classes are installed within the same tray (per NEC requirements), shall be manufactured by the tray system supplier and shall be fastened into the tray as directed by the tray system supplier.

3. Ladder type cable tray systems:
 - a. Splice plates shall be the bolted type for each tray type. The resistance of fixed splice connections between adjacent sections of tray shall not exceed .00033 ohms. Splice plate construction shall be such that a splice may be located anywhere within the support span without diminishing rated loading capacity of the cable tray.
 - b. Barrier Strips: Shall be placed along full length of all tray sections, shall be manufactured by the tray system supplier and shall be fastened into the tray with self-drilling screws.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 1. Installers of wire mesh basket type cable tray systems shall be certified by the supplier of the cable tray system.
 2. Install cable trays as indicated: Installation shall be in accordance with:
 - a. Equipment manufacturer's instructions.
 - b. Recognized industry practices.
 - c. NEC (Article 392 and others).
 - d. Applicable portions of NFPA 70B.
 - e. NEMA-VE2.
 3. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the owner or owner's representative.
 4. Coordinate cable tray installation with other work as necessary to properly interface installation of cable tray with other work.
- B. Cabling:
 1. All cabling/conductors routed in cable tray shall be rated for cable tray application.
 2. Cabling/conductors of varying voltage classes installed within common trays shall be separated by barrier strips per NEC requirements.
 3. Cable/conductor securing:
 - a. Cables/conductors shall be secured to the transverse elements of the associated trays at the following minimum intervals:
 - 1) Seismic, high-shock or vibration prone areas (such as mechanical rooms, process areas, etc.):
 - a) All cables/conductors: 24".
 - 2) Non-horizontal cable tray sections:
 - a) All cables/conductors: 36".
 - 3) Horizontal cable tray sections:
 - a) All power cables/conductors: 36"
 - b) Control, instrumentation and network cables in cable trays in exposed areas: 36"

- c) Control, instrumentation and network cables in cable trays in concealed interior areas (such as above lay-in ceilings): No cable ties required.
 - b. All cable ties used to secure cables to trays in interior areas shall be plenum-rated plastic. Cable ties used in interior exposed areas (subject to light) in interior areas shall be sunlight/UV-resistant. Cable ties used in exterior environments shall be of non-magnetic stainless steel construction.
 - 4. Cable/conductor arrangement:
 - a. Provide separation between power cables/conductors within cable trays for proper heat dissipation (and conductor ampacity ratings) per NEC requirements.
- C. Bonding:
- 1. Ground and bond metal cable tray in accordance with NEC Articles 392, 250.96 and 250.102.
 - a. Provide continuity between all metal cable tray components.
 - b. Make connections to tray using mechanical, compression or exothermic connectors.
 - 2. Cable trays shall be properly bonded with grounding harnesses or other necessary equipment as required to all metal conduits terminating into the cable trays and between cable tray sections.
- D. Location/Routing:
- 1. Location of cable tray shown on plans is for general routing only. Field coordinate exact cable tray locations/routing with all piping, equipment, ductwork, structure, lighting, etc. & other trades prior to ordering cable tray. Provide vertical & horizontal bends as required, maintaining proper clearance around cable trays.
 - 2. Coordinate cable tray with all other work as necessary to properly integrate installation of cable tray work with other work. Any potential conflicts between locations of cable trays and locations of other items shall promptly be brought to the attention of the engineer prior to installation.
 - 3. Provide a minimum of 6" clearance on top of cable trays and 3" clearance on bottom and sides of cable trays to permit access for installing and maintaining cables unless specifically approved or directed otherwise by engineer.
- E. Support:
- 1. Cable tray fitting supports shall be located such that they meet the strength requirements of straight sections. Install fitting supports per NEMA VE-2 guidelines, or in accordance with manufacturer's instructions.
 - 2. Trapeze hangers and center-hung supports shall be supported by 1/2 inch (minimum) diameter all-thread rods unless noted otherwise. Trapeze hangers supporting wire mesh basket type cable trays 12" wide or less may be supported by 3/8 inch (minimum) diameter all-thread rods.
- F. Penetrations:
- 1. Where cable trays pathways pass through walls, floors, ceilings or other similar partitions that are fire-rated, smoke-rated, designed to prevent water entry, designed to limit sound transmission, or designed to limit air passage (for environmental or

conditioning purposes), cable trays themselves shall not penetrate the partition but shall be terminated on either side of the partition. The partition shall be penetrated with conduit sleeves sealed with suitable fire caulk or other approved material, per specific instructions of the caulk supplier to maintain partition/etc. ratings (such as fire or smoke ratings), after installation of all cabling. Bonding jumpers shall be provided through sleeves to ensure electrical continuity of cable tray system. Interior cross-sectional area of the conduit sleeves shall match or exceed the interior cross-sectional area of the associated cable tray(s).

2. Contractor shall verify arrangement, sizes and locations of all penetrations through load-bearing walls, floors or other structural items with structural engineer. Contractor shall submit sketch of proposed sleeve locations to structural engineer for review prior to rough-in.

G. Marking:

1. Cable trays containing conductors rated over 600 volts shall have a permanent, legible warning notices installed per NEC 392 requirements.

3.2 TESTING

- A. Test cable trays to ensure electrical continuity of bonding and grounding connections. See NFPA 70B, Chapter 18, for testing and test methods.
- B. Manufacturer shall provide test reports witnessed by an independent testing laboratory of the "worst case" loading conditions outlined in this specification and performed in accordance with the latest revision of NEMA VE-1; including test reports verifying rung load capacity in accordance with NEMA VE-1 Section 5.4.

END OF SECTION 26 05 36

SECTION 26 05 53

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Wire and cable identification.
- B. Pullbox & Junction Box Identification
- C. Electrical distribution & utilization equipment identification.
- D. Emergency and Standby Power receptacle identification.

PART 2 - PRODUCTS

2.1 WIRE AND CABLE IDENTIFICATION

- A. Intermediate Locations:
 - 1. Wires and cable labels shall be white, thermal transfer, halogen-free, flame-retardant marker plates (sized to accommodate three lines of text) permanently affixed to the associated cable with UV-resistant plastic wire ties. Labels shall be Panduit #M200X/300X series or equal.
- B. Circuit/Cable Termination Locations:
 - 1. Wires and cable labels shall be non-ferrous identifying tags or pressure sensitive labels unless noted otherwise.

2.2 ELECTRICAL DISTRIBUTION & UTILIZATION EQUIPMENT IDENTIFICATION

- A. Labels on electrical distribution & utilization equipment shall be black-on-white engraved Bakelite nameplates permanently affixed to the equipment with rivets or silicone adhesive unless noted otherwise.
- B. Text used on labels on electrical distribution & utilization equipment shall be sufficiently sized to allow user to quickly/easily read labels while standing a normal/reasonable distance from the equipment. Text sizes shall be adjusted based on types of equipment (large switchgear would require larger labels than small toggle-type disconnect switches). If there is any question about what is reasonable, contractor may submit typical physical sample label(s) for each major application to the engineer for review/approval, at its discretion.
- C. Labels on electrical distribution equipment fed from emergency or legally-required standby sources (such as emergency generators) shall be white-on-red engraved Bakelite nameplates permanently affixed to the equipment with rivets or silicone adhesive.

2.3 EMERGENCY AND STANDBY POWER RECEPTACLE IDENTIFICATION

- A. Receptacles fed from emergency or standby power sources (such as emergency generators) shall be provided with factory-marked engraved coverplates as follows:
 - 1. Emergency System source: Red engraved lettering to read "EMERGENCY".
 - 2. Legally-Required or Optional Standby Generator source:
 - a. If only part of facility is fed with generator backup: Black engraved lettering to read "FED FROM GENERATOR".
 - b. If entire facility is fed with generator backup: No "...GENERATOR..." label required.

PART 3 - EXECUTION

3.1 GENERAL

- A. Any proposed deviation in identification methods and materials from those described herein shall be submitted to Architect for review and comment prior to installation.
- B. Contractor shall provide all labeling or identification required by applicable local, state and national codes. These specifications do not intend to itemize all code-required labeling or identification requirements.
- C. All labels/identification shall be positioned such as to be readable from the normal perspective without adjusting wiring/cables/labels. For example, labels/identification of wires/cables within cable trays shall be positioned to point towards the viewer (typically downward for overhead cable trays, or upward for cable trays within trenches).
- D. All labels/identification (except for handwritten labels on concealed pullbox/junction box covers as noted below) shall be typewritten/printed/engraved in a neat, workmanlike, permanent, legible, consistent and meaningful manner. Labels shall not be handwritten unless specific approval is granted by engineer.

3.2 WIRE AND CABLE IDENTIFICATION

- A. General:
 - 1. Where cabling is exposed (such as within cable trays), provide two wire ties per cable (one on either end of marker plate to provide a flush installation). Where cabling is concealed (such as within pullboxes/wireways), one wire tie per cable will be acceptable.
- B. Intermediate Locations:
 - 1. Thermal transfer labels shall be securely fastened to all wiring and cabling in the following locations:
 - a. Wireways
 - b. Pullboxes/Junction boxes larger than 4-11/16"
 - c. Pullboxes/Junction boxes through 4-11/16" where wires and cables are not easily identifiable via the color coding and box labeling

- d. Vaults & Manholes
 - e. Approximately every 50 feet within cable trays (especially at locations where cables exit or diverge). Labels within cable trays shall be grouped (rather than being pre-labeled on cables and pulled into cable trays).
 - f. Other similar intermediate locations.
- 2. Labels shall be stamped or printed with the following data so that the feeder or cable can be readily identified and traced:
 - a. From where the circuit originates (including panel designation and circuit number):
 - 1) Ex: "FROM: PP-A CIR. 3 (IN MAIN ELEC ROOM)"
 - b. To where the circuit extends (using the common name of the equipment):
 - 1) Ex: "TO: RTU-6 (ON ROOF)"
 - c. The purpose of the circuit:
 - 1) Ex: "POWER"
 - d. The set number (If parallel power feeds are used).
 - 1) Ex: "SET NO. 3 OF 4"
- C. Circuit/Cable Termination Locations:
 - 1. Where multiple termination points exist within a circuit origination point (panelboard, switchboard, MCC, starter, etc.) or other similar circuit endpoint (control panel, etc.), labels shall be securely fastened to all ungrounded and neutral conductors to clearly identify the terminal and/or circuit number associated with each conductor. For example, within lighting panels, each phase and neutral conductor shall be labeled near the terminals at a clearly visible location with the associated circuit number(s), so that if all conductors were unterminated, the labels would clearly indicate which conductor was associated with each circuit.
- D. Refer to Specification Section 26 05 19 for all color-coding requirements of wires and cables.

3.3 PULLBOX & JUNCTION BOX IDENTIFICATION

- A. Concealed pullboxes/junction boxes:
 - 1. Front surface of all pullbox/junction box covers in concealed areas (such as above lay-in ceilings) or within mechanical/electrical rooms (and other similar areas where appearance of boxes is not an issue) shall be neatly marked with the ID of circuits/cables contained with permanent black marker on cover of box (Ex: "RP-1A Cir. 1, 2 & 3"). Additionally, front surface of box shall be painted red where box contains fire alarm system cabling.
- B. Exposed pullboxes/junction boxes:
 - 1. Interior surface of all pullbox/junction box covers in exposed areas shall be labeled "Power", "Telecommunications", "Fire Alarm" or with other similar general text neatly with permanent black marker to indicate function of box. Circuit/cable labeling within box (see above) shall identify specific cables contained. Additionally, interior surface of cover shall be painted red where box contains fire alarm system cabling.

- C. Where pullboxes/junction boxes are named on contract documents (Ex: "PULLBOX #3"), an engraved nameplate shall be installed on the front surface of the box to identify the name.

3.4 ELECTRICAL DISTRIBUTION & UTILIZATION EQUIPMENT IDENTIFICATION

- A. General:
 - 1. All new and existing equipment modified by this project shall include arc-flash warning labels in accordance with NEC article 110.16.
- B. All Panels, Motor Control Centers, Switchboards, Switchgear, Transformers, Etc.:
 - 1. Engraved nameplates identifying name of equipment, nominal voltage and phase of the equipment and where the equipment is fed from shall be installed on front surface of all panels, motor control centers, switchboards, switchgear, transformers, etc.:
 - a. Ex: First Line: "NAME: RP-A", Second Line: "120/208V-3Ø-4W", Third Line: "FED FROM: PP-A CIR. 4 (IN MAIN ELEC ROOM)"
 - 2. Refer to Panelboard Specification Sections for additional labeling requirements (circuit directory cards, permanent circuit labels, permanent circuit numbers, etc.) required inside panelboards.
- C. Safety/Disconnect Switches and Utilization Equipment (HVAC Equipment, Pumps, Powered Valves, Control Panels, Starters, Etc.):
 - 1. Engraved nameplates identifying equipment being fed and where the equipment is fed from shall be installed on front surface of all disconnect switches (including both visible blade type switches and toggle-type switches) and on utilization equipment (where not clearly identified by immediately adjacent local disconnect switch):
 - a. Ex: First Line: "RTU-6", Second Line: "FED FROM: PP-A CIR. 5"
 - 2. Where safety/disconnect switches are installed on the load side of variable frequency drives, the safety/disconnect switch shall be furnished with an additional engraved nameplate to read: "WARNING: TURN OFF VFD PRIOR TO OPENING THIS SWITCH".
 - 3. Safety/Disconnect switches feeding equipment that is fed from multiple sources (such as motors with integral overtemperature contacts that are monitored via a control system) and Utilization Equipment fed from multiple sources shall be furnished with an additional BLACK-ON-YELLOW engraved nameplate to read: "WARNING: ASSOCIATED EQUIPMENT FED FROM MULTIPLE SOURCES – DISCONNECT ALL SOURCES PRIOR TO OPENING COVER".
- D. Emergency Systems:
 - 1. A sign shall be placed at the service entrance equipment (and at any remote shunt trip operators, or similar, for service equipment) indicating the type and location of on-site emergency power sources (such as generators, central battery systems, etc.) per NEC requirements.
 - 2. All boxes and enclosures (including transfer switches, generators, power panels, junction boxes, pullboxes, etc.) dedicated for emergency circuits shall be

permanently marked with white-on-red engraved nameplates so they will be readily identified as a component of an emergency circuit or system.

3. Where an Essential Electrical System (EES) is installed, all enclosures, raceways and equipment that are components of the EES shall be readily identified as such. Raceway shall be identified at intervals not exceeding 25 ft.

E. Services:

1. All Service Equipment:

- a. Engraved nameplates identifying maximum available fault current, including date the fault current calculation was performed, in accordance with NEC article 110.24.
 - 1) Ex: First Line: "AVAILABLE FAULT CURRENT: 16,154 AMPS", Second Line: "DATE CALCULATED: JULY 8, 2013"
- b. All service entrance equipment shall be clearly labeled as being service entrance rated.

2. Where a building or structure is supplied by more than one service (or any combination of branch circuits, feeders and services), a permanent plaque or directory shall be installed at each service disconnect location denoting all other services, feeders & branch circuits supplying that building or structure and the area served by each, per NEC requirements.

F. Generators:

1. Generators shall be labeled with engraved nameplates identifying name of equipment.

3.5 EMERGENCY AND STANDBY POWER RECEPTACLE IDENTIFICATION

- A. Receptacles fed from emergency or standby power sources (such as emergency generators) shall be provided with factory-marked engraved coverplates as described above.

3.6 OTHER IDENTIFICATION

- A. Factory-engraved coverplates identifying functions of light switches and other similar devices shall be installed where so required by plans/specifications.

END OF SECTION 26 05 53

SECTION 26 05 73

POWER DISTRIBUTION SYSTEM ELECTRICAL STUDIES

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
 - 1. Power Distribution System Electrical Studies.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Short Circuit Studies, Protective Devices Evaluation Studies, Protective Device Coordination Studies and Arc Flash Hazard Studies shall be performed by the same entity, which shall be a Professional Engineer registered in the state where the equipment will be installed. The studies shall be per the requirements set forth in the latest edition of NFPA 70E-Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E, Annex D.
- B. The studies shall be submitted to the Architect prior to shipment of any electrical distribution equipment.
- C. The studies shall include all portions of all electrical systems affected by the project (including all existing systems/equipment) from the utility service to all existing equipment at the facility (including all existing equipment fed from the same service point as any new equipment) and to all new equipment installed under this contract. All induction motors 50 HP or below and fed from the same bus may be grouped together. All induction motors greater than 50 HP shall be included individually with associated starters and feeder impedance. See individual study sections below for additional scope requirements.
- D. The studies shall be performed using the latest revision of the SKM Systems Analysis Power*Tools for Windows (PTW) or EasyPower software program.
- E. Normal system connections and those which result in maximum fault conditions shall be adequately covered in the study.
- F. The contractor shall be responsible for collecting data on any existing or proposed electrical equipment, devices, conductors, etc. as required to prepare the study, and shall supply pertinent electrical system conductor, circuit breaker, generator, and other component and system information in a timely manner to allow the studies to be completed prior to shipment of equipment.

- G. The Power Distribution System Electrical Studies shall be performed by Square 'D', G.E., Siemens or Cutler Hammer; or a third-party vendor if specifically approved by the engineer prior to preparation of the studies.
- H. The proposed vendor shall have completed a minimum of five (5) equivalent Arc-Flash Hazard Studies in the past three (3) years.

2.2 SHORT CIRCUIT STUDY

- A. The Short Circuit Study shall be performed with aid of a computer program. The study input data shall include the power company's short circuit contribution, resistance and reactive components of the branch impedances, X/R ratios, base quantities selected, and other source impedances.
- B. Short circuit momentary duty values and interrupting duty shall be calculated on each individual basis with the assumption that there is a three-phase bolted short circuit at the respective switchgear bus, switchboard, low voltage motor control center, distribution panelboard, and other significant locations throughout the system.
- C. The short circuit tabulation shall include symmetrical and asymmetrical fault currents, and X/R ratios. For each fault location, the total duty on the bus, as well as the individual contributions from each connected branch, including motor back EMF current contributions shall be listed with its respective X/R ratio.

2.3 PROTECTIVE DEVICE EVALUATION STUDY

- A. The Protective Device Evaluation Study shall be performed to determine the adequacy of circuit breakers, switches, transfer switches, and fuses by tabulating and comparing the short circuit rating of these devices with the calculated fault currents. Appropriate multiplying factors based on system X/R ratios and protective device rating standards shall be applied.
- B. Any problem areas or inadequacies in the equipment due to short circuit currents shall be promptly brought to the Architect's attention.

2.4 PROTECTIVE DEVICE COORDINATION STUDY

- A. The Protective Device Coordination Study shall be performed to provide the necessary calculation and logic decisions required to select or to check the selection of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated current transformers, and low voltage breaker trip characteristics and settings. The objective of the study is to obtain optimum protective and coordination performance from these devices.
- B. The coordination study shall show the best coordination attainable for all breakers down through the largest breaker at each piece of distribution equipment. Coordination study shall demonstrate selective coordination where required by applicable codes or contract documents.

- C. Phase and ground overcurrent protection shall be included as well as settings of all other adjustable protective devices. Where ground fault protection is used, coordination of the ground fault protection with the first downstream overcurrent phase protection device shall be demonstrated.
- D. All restrictions of the National Electrical Code shall be adhered to and proper coordination intervals and separation of characteristic curves be maintained.

2.5 ARC-FLASH HAZARD STUDY

- A. The Arc-Flash Hazard Study shall be performed with the aid of computer software intended for this purpose in order to calculate Arc-Flash Incident Energy (AFIE) levels and flash protection boundary distances.
- B. The Arc-Flash Hazard Study shall be performed in conjunction with a short-circuit Study and a time-current coordination Study.
- C. The Arc-Flash Hazard Study shall be performed for the following equipment:
 - 1. All Distribution Equipment – This includes but is not limited to the following:
 - a. Switchgear
 - b. Switchboards
 - c. Motor Control Center
 - d. All Lighting and Power Panelboards
 - e. Fused Disconnect Switches rated greater than 100A
 - 2. Separately enclosed devices fed from protection device rated greater than 100A - This includes but is not limited to the following:
 - a. Control Panels
 - b. VFD's
 - c. RVSS
- D. A generic Arc-Flash label shall be applied to other electrical equipment that has not been included in the study. This includes but is not limited to the following equipment:
 - 1. Non-fused Disconnect Switches
 - 2. Fused Disconnect Switches rated 100A or less
 - 3. Transformers
 - 4. Control Panels, VFD's, RVSS, etc. rated 100A or less
- E. Where a main protective device is provided, the study shall be performed on the line side and load side of the main. The worst-case result shall be used for the study result and label.
- F. The Study shall be performed under worst-case Arc-Flash conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.
- G. Where incident energies are calculated to fall within the high marginal region of a given Hazard/Risk Category Level, the Hazard/Risk Category Level shall be increased one level.

- H. The Arc-Flash Hazard Study shall be performed in compliance with the latest IEEE Standard 1584, the IEEE Guide for Performing Arc-Flash Calculations. Where IEEE 1584 does not have a method for performing the required arc-flash calculations (such as for single phase equipment), calculations shall be performed and system shall be modeled using modules/methods as recommended by the arc flash software supplier (for example, using SKM Unbalanced/Single Phase Studies module for modeling single phase systems).
- I. Equipment labels to identify AFIE and appropriate Hazard/Risk Category in compliance with NFPA 70E and ANSI Z535.4 (latest version of these requirements) shall be provided to the Electrical Contractor. The Electrical Contractor shall affix the labels to the distribution equipment devices as directed by the equipment manufacturer. These labels shall, at a minimum, include the following:
 - 1. WARNING label.
 - 2. Hazard/Risk Category.
 - 3. Arc Flash Boundary Distance.
 - 4. Incident Energy (in cal/cm²) at Working Distance.
 - 5. Shock Hazard Voltage.
 - 6. Limited Approach Boundary Distance.
 - 7. Restricted Approach Boundary Distance.
 - 8. Prohibited Approach Boundary Distance.
 - 9. Equipment Name.
 - 10. Name of Firm who prepared the Study.
 - 11. Project Number of the Firm who prepared the Study.
 - 12. Date that the Study was prepared.
 - 13. Method for calculating analysis data.
 - 14. Statement to read: "Any system modification, adjustment of protective device settings, or failure to properly maintain equipment will invalidate this label" (or equivalent).

PART 3 - EXECUTION

3.1 SUBMITTAL REQUIREMENTS

- A. The results of the studies shall be summarized in a final report. The report shall include the following sections:
 - 1. General:
 - a. Description, purpose, basis and scope of the studies
 - b. Single line diagram of the portion of the power system which is included within the scope of the work. The single line diagram shall fit on one sheet of paper (size as required) unless approved otherwise by engineer. The following information shall be shown on the single line diagram:
 - 1) Device Name
 - 2) Branch Fault Currents with directional indicators
 - 3) General Location (for busses only)

- 4) Other basic component information such as cable type, cable length, breaker rating, buss short circuit rating, transformer voltages, transformer size, fuse size, etc..
 2. Short Circuit Study:
 - a. Tabulation of circuit breaker, fuse and other protective device ratings versus calculated short circuit duties, and commentary regarding same.
 3. Protective Device Evaluation/Coordination Study:
 - a. Protective devices time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
 - b. Fault current calculations including definitions of terms and a guide for interpretation of computer printout.
 - c. Documentation from utility company on their letterhead showing their anticipated values of available short circuit currents X/R ratios and protective devices with which the power distribution system will coordinate.
 - d. Time-current characteristics of the respective protective devices shall be plotted on log-log paper. Plots shall be printed in color with a dedicated color and pattern for each curve for clear identification.
 - e. Plots shall include complete titles, respective single line diagrams and legends, and associated power company's relay or fuse characteristics, significant motor starting characteristics, complete parameters of transformers, complete operating bands of low voltage circuit breakers trip curves and fuses.
 - f. The coordination plots shall indicate the type of protective devices selected, proposed relay taps, time dial and instantaneous trip settings, transformer magnetizing inrush and ANSI transformer withstand parameters, cable thermal overcurrent withstand limits and significant symmetrical and asymmetrical fault currents.
 - g. The coordination plots for phase and ground protective devices shall be provided on a system basis.
 - h. A sufficient number of separate curves shall be used to clearly indicate the coordination achieved.
 4. Arc-Flash Hazard Study:
 - a. Tabulation of device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, personal-protective equipment classes and AFIE levels.
 - b. Recommendations for reducing AFIE levels and enhancing worker safety.
- B. Furnish all labor, materials, calculations, electrical equipment, technical data and incidentals required to provide a complete short circuit study, coordination study and arc flash hazard study of protective devices, busses, etc. from the utility service to any existing equipment at the facility and all new equipment installed under this contract.
- C. The study shall comply with the following applicable provisions and recommendations of the latest revisions of the following: ANSI C37.5, IEEE Standard No. 399, and IEEE Standard No. 141.
- D. Submit calculations and results of the short circuit, protective device evaluation and

coordination and arc flash hazard studies prior to submitting shop drawings for new equipment. Contractor shall verify that all proposed equipment is properly rated per the short circuit and protective device evaluation portions of the study prior to releasing equipment for manufacturing.

- E. Submit a copy of a sample typical arc flash label layout (meeting requirements outlined above) that will be used for the project.
- F. Submit final electronic copies of all SKM program files/models/input data/etc. used to perform the study to the owner with final close-out documents. These files shall be complete as required to allow future users to recreate the study.

3.2 INSTALLATION

- A. Contractor shall adjust all breaker settings as recommended by the coordination study prior to energizing equipment.
- B. Contractor shall affix arc flash hazard notification labels (as determined by the results of this study) to each piece of distribution equipment prior to energization of equipment. A generic arc-flash warning label shall be affixed to any electrical equipment not included in the analysis as outlined above.
- C. Where short circuit rating of equipment is dependent on setting of upstream overcurrent device, provide and install label for equipment indicating the required settings of the associated device.

END OF SECTION 26 05 73

SECTION 26 09 43

LIGHTING CONTROL SYSTEM

PART 1 - GENERAL

1.1 INTRODUCTION

- A. The work covered in this section is subject to the requirements in the General Conditions of the Specifications. Contractor shall coordinate the work in this section with the trades covered in other sections of the specification to provide a complete and operable system.

1.2 SYSTEM DESCRIPTION

- A. Extent of lighting control system work is indicated by drawings and by the requirements of this section. Contractor shall furnish and install a complete, integrated, stand alone automatic lighting control system including programmable Lighting Control Panels with internal astronomic timeclock(s), Networking between panels, Dataline low voltage control switch inputs for zone control, Photocell input for outdoor lighting control, Occupancy Sensors, and Daylighting Controls from a single supplier. Contractor is responsible for confirming that the panels and sensors interoperate as a single system.

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in the manufacture of lighting control equipment and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Comply with NEC, NEMA, and FCC Emission requirements for Class A applications.
- C. UL Approvals: Relay panels and accessory devices are to be UL listed under UL 916 Energy Management Equipment. Configured to order or custom relay panels shall be UL Listed under UL 508, Industrial Control Panels.

1.4 SUBMITTALS

- A. Submittals Package: Submit the shop drawings, and the product data specified below at the same time as a package.
 - 1. Shop Drawings: Building floorplans showing all proposed devices and composite wiring and/or schematic diagram of each control circuit as proposed to be installed (standard diagrams will not be accepted).
 - 2. Product Data: Catalog sheets, specifications and installation instructions.

1.5 APPROVED MANUFACTURERS

- A. Watt Stopper/Legrand – Lighting Integrator series
- B. Equal by Acuity Lighting

- C. Any other system wishing to be considered must submit descriptive information 10 days prior to bid. Prior approval does not guarantee final approval by the electrical engineer. The contractor shall be completely responsible for providing a system meeting this specification in its entirety. All deviations from this specification must be listed and individually signed off by the consultant.

PART 2 - PRODUCTS

2.1 LIGHTING CONTROL PANELS

- A. Provide lighting control panels in the locations and capacities as indicated on the plans and schedules. Each panel shall be of modular construction and consist of the following components:
1. Enclosure/Tub shall be NEMA 1, NEMA 3R, or NEMA 4 as indicated on the plans, sized to accept an interior with 1-8 relays, 1-24 relays and six (6) four pole contactors, or 1-48 relays with six (6) four pole contactors, per enclosure. Multiple enclosures shall be provided where required for the specified quantities of relays/contactors.
 2. Cover shall be configured for surface or flush wall mounting of the panel as indicated on the plans. The panel cover shall have a hinged and lockable door with restricted access to line voltage section of the panel.
 3. Interior assembly shall be supplied as a factory assembled component specifically designed and listed for field installation. The interior construction shall provide total isolation of high voltage (class 1) wiring from low voltage (class 2) wiring within the assembled panel. The interior assembly shall include intelligence boards, power supply, DIN rails for mounting optional Class 2 control devices, and individually replaceable latching type relays. The panel interiors shall include the following features:
 - a. Provision for one or two optional control and automation cards.
 - b. Removable, plug-in terminal blocks with screw less connections for all low voltage terminations.
 - c. Individual terminal block, override push button, and LED status light for each relay
 - d. Switch inputs associated with each relay and group channel shall support two or three wire, momentary or maintained contact switches or 24VDC input from occupancy sensors.
 - e. Automatic support for occupancy sensor sequence of operation. Low voltage inputs automatically reconfigure when connected to a Watt Stopper occupancy sensor head. Occupancy sensor shall switch lighting on and off during unoccupied periods but shall not turn lighting off during scheduled occupancy periods.
 - f. Isolated contacts within each relay shall provide true relay state to the electronics. True relay state shall be indicated by the on-board LED and shall be available to external control devices and systems.
 - g. Automatic sequenced operation of relays reduces impact on the electrical distribution system when large loads are controlled simultaneously.
 - h. Group, channel, and pattern control of relays shall be provided through a simple button-press interface within the panel. Any group of relays can be associated

- with a channel for direct on/off control or pattern (scene) control via a simple programming sequence using the relay and channel override push buttons and LED displays.
- i. Relay group status for each channel shall be provided through bi-color operation of the LED indicators. Solid red indicates that all relays in the group are on, solid green indicates that the group is in a mixed state, and blinking green indicates that the relays have blink warned and are currently timing out.
 - j. Each relay and channel terminal block shall provide a 24V pilot light signal. It shall be possible to configure the system for support for any Class 2 pilot light voltage with the use of an auxiliary power supply.
 - k. Single pole latching relays with modular plug-in design. Relays shall provide the following ratings and features:
 - 1) Electrical:
 - a) 30 amp ballast at 277V
 - b) 20 amp ballast at 347V
 - c) 20 amp tungsten at 120V
 - d) 30 amp resistive at 347V
 - e) 1.5 HP motor at 120V
 - f) Short circuit current capacity equal to (or greater than) that of the associated circuits (see associated panelboard schedules on drawings)
 - 2) Mechanical:
 - a) Individually replaceable, ½" KO mounting with removable Class 2 wire harness
 - b) Actuator on relay housing provides manual override and visual status indication, accessible from Class 2 section of panel
 - c) Dual line and load terminals each support two #14 – #12 solid or stranded conductors
 - d) Tested to 300,000 mechanical on/off cycles
 - 3) Isolated low voltage contacts provide for true relay status feedback and pilot light indication.
 - l. Power supply shall be a multi-voltage transformer assembly with rated power to supply all electronics, occupancy sensors, switches, pilot lights, and photocells as necessary to meet the project requirements. Power supply to have internal over-current protection with automatic reset and metal oxide varistor protection.

2.2 LONWORKS® BASED DIGITAL COMMUNICATIONS

- A. The lighting control panel shall support digital communications to facilitate the extension of control to include multiple panels and other intelligent field devices. Digital communications shall be LonWorks® based and use the LonTalk® protocol in an open topology architecture.
 - 1. Dataline communications wire shall be 18 AWG, 4 unshielded copper conductors (two independent twisted pairs) meeting Class 2P NEC code requirements. The dataline shall be topology free and can be run in a serial, "T" or star configuration.

2. The Dataline wire will be supplied by the equipment manufacturer and will include the manufacturers name, catalog number printed on the wire jacket. The contractor, at their own expense will, replace an improper dataline wire.
3. Panels shall be digitally addressed and support bi-directional communication between each other and other intelligent field devices specified elsewhere.
4. Intelligent field devices supported shall include digital dataline switches, network clock/programmer, telephone interface module, BMS interface module, photocell control module, programmable thermostat, and universal switch module.

2.3 BROWSER BASED PROGRAMMING AND CONTROL

- A. The lighting control system shall include a web browser based user interface that shall allow programming and override of the system from any PC browser with network connectivity to the lighting controls. The Automation Appliance shall include as a minimum the following features:
 1. The interface shall be a TCP/IP based server device that is connected to the lighting control system global dataline and shall not require that software be installed on the client PC(s) for operation.
 2. Provide support for connection of one or more personal computers directly via Ethernet or enterprise connectivity via a local area network, wide area network or internet connection.
 3. Provide the option for a plug-in 56K baud modem to enable dial in connection via standard telephone line. All functionality of the browser interface shall be available through the dial-up connection.
 4. Log in to the lighting control system through the browser interfaced shall provide multi-level security. Users shall be assigned log in access levels to restrict program modification to authorized users.
 5. User programming shall include eight independent schedules for each lighting control panel, as well as, eight global schedules that affect channels in all panels on the network. Schedules shall overlap such that a panel specific schedule for any channel will override a global schedule for that channel.
 6. Schedules shall be capable of seven day repeating and calendar date event based formats.
 7. User programming shall be scenario based and shall include the following options:
 - a. Scheduled ON / OFF
 - b. Manual ON / Scheduled OFF
 - c. Manual ON / Auto Sweep OFF (for AS-100 Switches)
 - d. Astro ON / OFF (or Photo ON / OFF)
 - e. Astro and Schedule ON / OFF (or Photo and Schedule ON / OFF)
 8. It shall be possible to view the status of and override any relay or channel group via the browser interface screens.
 9. Provide support and user interface screens for integration of the photocontrol module, dataline switches, touch-tone telephone module, and universal switch module.
 10. Provision for integration with the building automation system shall be via the industry standard BACnet protocol. Any of the eight global schedule channels shall

individually be set to follow the BAS schedules rather than the internal Automation Appliance schedules. Relays in all panels shall be exposed to the BAS as binary output objects. It shall be possible for the BAS to read the status of each relay and to override each relay via BACnet.

11. The interface shall monitor all networked components and automatically generate alarms if any component fails to properly respond to control. Alarms shall be annunciated via the browser screens and via email to selected recipients where a proper SMTP server connection has been set up.
12. The user programming in the lighting control panels and dataline switches shall be available for viewing or download to the client PC as a standard PDF file.
13. A backup function shall permit the complete system program to be saved to the hard drive of any client PC connected to the lighting control system through the browser interface. A restore function shall allow a saved program to be reloaded to the interface.

2.4 EIGHT CHANNEL DIGITAL PHOTOCONTROL MODULE

- A. Provide a weatherproof Class 2 photocell for measuring exterior light levels. The photocell shall be mounted facing north as indicated on the plans. The photocell shall be connected to a photocontrol module mounted on the DIN rail inside the low voltage section of a lighting control panel and connected to the dataline communications wire.
 1. The photocontrol Module shall integrate seamlessly with either the Network Clock, Automation Appliance, or the BMS Interface Module. The control module shall measure the actual exterior light and display this level in foot candles (fc) on the unit LCD display.
 2. The controller shall have eight individual set point adjustments that are available to the lighting control network over the dataline communications wire.
 3. Features
 - a. Real time, 2 line LCD display of actual exterior light level up to 200 fc.
 - b. Channel set points and parameters programmed via the Network Clock or BMS Interface Module.
 - c. Choice of OPERATE or TEST modes, with simulated light level for testing.
 - d. Automatic dead band and 5 minute time delay to avoid cycling.

2.5 DIGITAL DATALINE SWITCHES

- A. Intelligent digital switching shall be provided operating on the dual twisted pair communication wire. Switches shall be available in single, dual, quad, or octal (1-button, 2-button, 4-button, or 8-button) designs. The single, dual, and quad devices shall mount in a standard single-gang box, the octal version in a two-gang box.
 1. Each button shall be individually programmable. Programming of buttons shall not require the use of a computer or other programming device. It shall be possible to assign relays or channels to buttons using a simple button press interface. Each button can control any one of the following options:
 - a. Any individual relay in any single panel.
 - b. Any group of relays in any single panel.

- c. Any group of relays in the system (via network clock, Automation Appliance, or WinControl software package).
2. For applications that require pattern switching, buttons shall function as a scene control using an ON/OFF/Not Controlled pattern of relays instead of the normal All ON/OFF.
3. Switches shall be constructed of non-breakable grey Lexan on all exposed parts and shall include a stainless steel wall plate, unless noted otherwise on plans.
4. Individual buttons shall have a removable clear cover to allow standard 9 mm (3/8 inch) labeling tape to be used to identify the controlled loads.
5. Each switch shall use a bi-color LED pilot light for the individual buttons to indicate status of the controlled relay or group of relays. LED indications are Red for All ON, Green for Mixed State (some relays in the group ON and others OFF), and No LED for All OFF.
6. Switch LED pilot lights shall flash green to indicate impending off sweep during the five-minute grace period following blink warning of the lights. Once the button is pressed, the LED will change to Red to acknowledge the occupant's override command to keep lights ON.
7. Multiple dataline switches programmed to control the same relay or relay group shall indicate the same status automatically.
8. Each switch shall also include a locator light illuminating the switch for easy location in the dark.
9. The dual, quad, and octal switches shall all include a single master button that will override all relays controlled by the individual buttons OFF, or Restore them to their original state. Each switch's master button configuration can be altered to perform a Master ON/OFF, OFF Only, or Disabled function if desired.
10. Switches can be configured to follow a "Cleaning" scenario. This specific scenario shall prevent the cleaners from overriding OFF any relays previously turned ON by an occupant.
11. Each switch is available in a Key lock override version. Once a key is inserted, the individual buttons will function for five minutes.

2.6 AUTOMATIC LIGHTING CONTROLS

- A. System shall provide automatic lighting shutoff for all interior lighting circuits controlled by the system (excluding night lights and other similar circuits) per latest ASHRAE 90.1 & IECC standards, unless specifically shown otherwise on plans.
- B. System shall provide blink-warnings for interior lighting circuits (excluding circuits with HID light fixtures) controlled by the control panel 5 minutes prior to automatic shutoff.
- C. System shall include provisions for holiday scheduling, to allow automatic "ON" programming to be skipped on holidays and other scheduled off days per applicable energy code requirements.
- D. Low voltage remote override switches shall be provided as shown on drawings.
- E. Exact preset times for lighting control zone controls (where applicable) and lighting

control system operation shall be per owner's direction. Contractor shall submit a proposed lighting control schedule indicating type of "ON" control (occupancy, time-of-day, manual, etc.), type of "OFF" control (occupancy, time-of-day, manual, etc.) and proposed preset times for all zones to owner for review prior to implementation. The following general control schemes shall generally be used where the owner has no preferences unless shown otherwise on plans:

1. Exterior Security Lighting (at doorways, etc.):
 - a. On: Photocell or Astronomic – dusk.
 - b. Off: Photocell or Astronomic – dawn.
2. Other Exterior Lighting:
 - a. On: Photocell or Astronomic – dusk.
 - b. Off: Preset Time (as directed by the facility operator).
3. Interior Lighting with Occupancy Sensor Controls:
 - a. Corridors, restrooms, lobbies and other similar public spaces
 - 1) On: Occupancy Sensor.
 - 2) Off: Occupancy Sensor.
 - b. Storage rooms, janitor's closets, telecommunications rooms, and other similar unoccupied spaces:
 - 1) On: Manual Local Switch.
 - 2) Off: Occupancy Sensor.
 - c. Offices, classrooms, breakrooms, conference rooms, work areas, kitchens, gymnasiums, and other similar occupied spaces:
 - 1) On:
 - a) Manual Local Switch (if digital controls are provided) or
 - b) Occupancy Sensor (if hardwired controls are provided). Partial on only where required by code.
 - 2) Off: Occupancy Sensor (A "grace period" shall be provided, in which the occupancy sensor can turn lights back "on" for a short period of time (approximately 15 seconds) after lights are turned off automatically).
4. Interior Lighting with Time-of-Day Controls:
 - a. Corridors, restrooms, lobbies and other similar public spaces
 - 1) On: Preset Time (as directed by the facility operator).
 - 2) Off: Preset Time (as directed by the facility operator).
 - b. Storage rooms, janitor's closets, telecommunications rooms, and other similar unoccupied spaces:
 - 1) On: Manual Local Switch
 - 2) Off: Preset Time (as directed by the facility operator).
 - c. Offices, classrooms, breakrooms, conference rooms, work areas, kitchens, gymnasiums, and other similar occupied spaces:
 - 1) On: Manual Local Switch
 - 2) Off: Preset Time (as directed by the facility operator).

2.7 WIRING

- A. See Specification Section 27 05 00 for additional requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Specification Section 27 05 00 for additional cable installation requirements.
- B. Master/centralized lighting control switches (particularly switches located in areas where not all associated lighting fixtures are visible from the switch) and individual buttons of other lighting control stations with more than two (2) buttons shall be labeled (on switch coverplate or directly on buttons) with factory-engraved labeling. Exact wording of labeling shall be per owner's direction unless shown otherwise on plans.

3.2 SUPPORT SERVICES

- A. Pre-installation Coordination
 - 1. Exact occupancy sensor and daylight sensor types and locations shall be determined by the lighting control system supplier for a fully-functional system with adequate coverage throughout areas controlled by occupancy sensors. Exact locations shall be coordinated with actual HVAC register locations, furniture/casework/etc. locations, sensor coverage patterns, etc. for proper coverage in all areas. In no case may fewer devices or lower-quality devices be used in each area than indicated on contract documents.
- B. System Start Up and Commissioning
 - 1. The electrical contractor shall provide the manufacturer, the facility owner and the electrical engineer with ten working days written notice of the system startup and adjustment date.
 - 2. Manufacturer shall provide a factory authorized technician to confirm proper installation and operation of all lighting control system components. The startup requirement is intended to verify:
 - a. That all occupancy and daylighting sensors are located, installed, and adjusted as intended by the factory and the contract documents.
 - b. The occupancy sensors and daylighting sensors are operating within the manufacturers specifications.
 - c. The sensors and relay panels interact as a complete and operational system to meet the design intent.
 - 3. Manufacturer to provide a written statement verifying that the system meets the above requirements.
- C. Re-commissioning – After 30 days from occupancy re-calibrate all preset times, sensor time delays and sensitivities and relocate occupancy sensors if so required to meet the Owner's Project Requirements. Provide a detailed report to the Design Team and Owner of re-commissioning activity.
- D. System Training

1. Manufacturer shall provide factory authorized technician to train owner personnel in the operation, programming and maintenance of the lighting control system including all occupancy sensors and daylighting controls.
- E. System Programming
 1. Manufacturer shall provide system programming including:
 - a. Wiring documentation.
 - b. Switch operation.
 - c. Telephone overrides.
 - d. Operating schedules.

3.3 WARRANTY

- A. The contractor shall warrant the completed lighting control system to be free from inherent mechanical and electrical defects for a period of one (1) year from the date of the completed and certified test or from the date of first beneficial use.

END OF SECTION 26 09 43

SECTION 26 09 44

DISTRIBUTED DIGITAL LIGHTING MANAGEMENT SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Digital Occupancy and Daylighting Sensor Control
 - 2. Emergency Lighting Control (if applicable)
- B. Related Section
 - 1. Section 26 09 43 – Lighting Control System
 - 2. Section 26 27 26 - Wiring Devices
 - 3. Section 27 05 00 – Auxiliary System Cables, 0-50V
 - 4. Section 26 50 00 – Lighting Materials and Methods
 - 5. Drawings and general provision of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section
 - 6. Electrical Sections, including wiring devices, apply to the work of this Section.
- C. Control Intent – Control Intent includes, but is not limited to:
 - 1. Defaults and initial calibration settings for such items as time delay, sensitivity, fade rates, etc.
 - 2. Initial sensor and switching zones
 - 3. Initial time switch settings
 - 4. Task lighting and receptacle controls
 - 5. Emergency Lighting control (if applicable)

1.2 REFERENCES

- A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE)
- B. Underwriter Laboratories of Canada (ULC)
- C. International Electrotechnical Commission
- D. International Organization for Standardization (ISO)
- E. National Electrical Manufacturers Association (NEMA)
- F. WD1 (R2005) - General Color Requirements for Wiring Devices.
- G. Underwriters Laboratories, Inc. (UL):
 - 1. 916 – Energy Management Equipment.

2. 924 – Emergency Lighting
3. 2043 – Plenum Rating

1.3 SYSTEM DESCRIPTION & OPERATION

- A. The Lighting Control and Automation system as defined under this section covers the following equipment:
1. Digital Room Controllers – Self configuring, digitally addressable one, two or three relays controllers with 0-10v control for ballasts (if applicable) and single relay application specific plug load controllers.
 2. Digital Occupancy Sensors connected to Digital Room Controllers – Self configuring, digitally addressable and calibrated occupancy sensors with LCD screens and two way active Infra-Red (IR) communications.
 3. Digital Switches connected to Digital Room Controllers – Self configuring, digitally addressable push button switches, dimmers, and scene switches with two way active Infra-Red (IR) communications.
 4. Analog and digital closed loop daylighting sensors connected to Digital Room Controllers – self-calibrating daylighting sensors that provide closed loop control to Room Controllers. Sensors and Room Controllers can provide single or multi-zone, on/off or dimming control for daylight harvesting.
 5. Hand held remotes for room configuration – provides two way infrared communications to digital devices and allows complete configuration and reconfiguration of the device / room from 30 feet away. Unit to have Organic LED display, simple pushbutton interface, and allow send / receive / store of room variables.
 6. Hand held remotes for personal control – One, two, or four (scene) button remotes provide Infrared communications to a room. Remote controls will support ON/OFF, dimming, scene control and may be configured in the field to provide specific occupant requirements without special tools.
 7. Digital Lighting Management (DLM) local network – Free topology, plug in wiring system (Cat 5e) for power and data to room devices.
 8. Network Bridge – provides BACnet MS/TP compliant digital networked communication between rooms, panels and the Segment Manager or BAS.
 9. Segment Manager – provides web browser based user interface for system control, scheduling, power monitoring, room device parameter administration and reporting.
 10. Emergency Lighting Control Unit (ELCU)- allows any standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building

1.4 LIGHTING CONTROL APPLICATIONS

- A. Unless relevant provisions of the applicable local Energy Codes are more stringent, provide a minimum application of lighting controls as follows:
1. Space Control Requirements – Provide occupancy/vacancy sensors with manual-on functionality in all spaces except toilet rooms, storerooms, library stacks, or other applications where hands-free operation is desirable and automatic-on occupancy sensors are more appropriate. Provide manual ON occupancy/vacancy sensors for

any enclosed office, conference room, meeting room, open plan system and training room. For spaces with multiple occupants or where line-of-sight may be obscured, provide ceiling- or corner-mounted sensors with manual-on switches.

2. Bi-Level Lighting – Provide multi –level switched dimming controls where indicated on plans.
3. Task Lighting / Plug Loads – Provide automatic shut off of non essential plug loads and task lighting where indicated on plans. Provide automatic ON of plug loads whenever spaces are occupied. For spaces with multiple occupants a single shut off consistent with the overhead lighting may be used for the area.
4. Daylighted Areas. Provide daylighting controls where indicated on plans. Daytime set points for total illumination (combined daylight and electric light) level that initiate dimming shall be programmed to be not less than 125% of the nighttime maintained designed illumination levels.
5. Multiple-leveled switched daylight harvesting controls may be utilized for areas marked on drawings.
6. Provide smooth and continuous daylight dimming for areas marked on drawings. Daylight system may be designed to turn off ambient lighting when daylight is at or above required lighting levels, only if system functions to turn lamps back on at dimmed level, rather than turning full-on prior to dimming.

1.5 SUBMITTALS

- A. Submittals Package: Submit the shop drawings, and the product data specified below at the same time as a package.
 1. Shop Drawings: Building floorplans showing all proposed devices and composite wiring and/or schematic diagram of each control circuit as proposed to be installed (standard diagrams will not be accepted).
 2. Product Data: Catalog sheets, specifications and installation instructions.

1.6 QUALITY ASSURANCE

- A. Manufacturer: Minimum [10] years experience in manufacture of lighting controls.

1.7 PROJECT CONDITIONS

- A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
 1. Ambient temperature: 0° to 40° C (32° to 104° F).
 2. Relative humidity: Maximum 90 percent, non-condensing.

1.8 WARRANTY

- A. Provide a five year complete manufacturer's warranty on all products to be free of manufacturers' defects.

1.9 MAINTENANCE

- A. Spare Parts:
 1. Provide two (2) of each product to be used for maintenance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer:
 - 1. Watt Stopper Digital Lighting Management (DLM)
 - 2. Equal by Acuity Lighting
- B. Basis of design product: Watt Stopper Digital Lighting Management (DLM) or subject to compliance and prior approval with specified requirements of this section, one of the following:
 - 1. Watt Stopper Digital Lighting Management (DLM)
 - 2. Acuity
 - 3. Substitutions:
 - a. All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional a minimum of 10 working days prior to the bid date and must be made available to all bidders. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.
 - b. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring. The contractor shall provide complete engineered shop drawings (including power wiring) with deviations for the original design highlighted in an alternate color to the engineer for review and approval prior to rough-in.

2.2 SINGLE / DUAL RELAY WALL SWITCH VACANCY SENSORS

- A. Type PW: Manual ON, Automatic OFF Wall switch type passive infrared occupancy sensor with built-in override control (off-auto). Furnish the Company's model which suits the electrical system parameters, and accommodates the square footage coverage and wattage requirement for each area (and type of lighting) controlled; Watt Stopper PW-100, PW-200 .
- B. Type UW: Manual ON, Automatic OFF Wall switch type ultrasonic occupancy sensor with built-in override control (off-auto). Furnish the Company's model which suits the electrical system parameters, and accommodates the square footage coverage and wattage requirement for each area (and type of lighting) controlled; Watt Stopper UW-100, UW-200.
- C. Type DW: Manual ON, Automatic OFF Wall switch type dual technology, passive Infrared and ultrasonic occupancy sensor with built-in override control (off-auto). Furnish the Company's model which suits the electrical system parameters, and accommodates the square footage coverage and wattage requirement for each area (and type of lighting) controlled; Watt Stopper DW-100, DW-200.

2.3 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR SYSTEM

- A. Wall or ceiling mounted (to suit installation) passive infrared, ultrasonic or dual

technology digital (passive infrared and ultrasonic) occupancy sensor. Furnish the Company's system which accommodates the square footage coverage requirements for each area controlled, utilizing Room Controller modules and accessories which suits the lighting and electrical system parameters.

- B. Digital Occupancy Sensors shall provide graphic LCD display for digital calibration and electronic documentation . Features include the following:
 - 1. Digital calibration and LCD entry for the following variables:
 - a. Sensitivity 0-100% in 10% increments
 - b. Time Delay – Fixed (1-30 minutes in 1 minute increments), and automatic
 - c. Test mode – Five second time delay
 - d. PIR, Ultrasonic or Dual Technology activation and/or re-activation.
 - e. Walk-through mode
 - f. Load parameters including auto/manual ON, blink warning, and daylight enable/disable.
 - 2. RJ-45 digital connections for DLM local network.
 - 3. Two-way infrared communications port to allow remote programming through hand held commissioning tool.
 - 4. Self contained push buttons for programming and control of room devices.
 - 5. Device Status LED's including:
 - a. PIR Detection
 - b. Ultrasonic detection
 - c. Configuration mode
 - d. Load binding
 - 6. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.
- C. Units will provide for digital calibration and commissioning and will not have any dip switches or potentiometers for field settings
- D. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required
- E. Watt Stopper product numbers: LMPX, LMDX, LMPC, LMUC, LMDC

2.4 DIGITAL WALL SWITCHES

- A. Low voltage (RJ-45) momentary push button switches in 1,2,3,4 and 8 button configuration, decorator opening. Wall switches will include the following features:
 - 1. Two way infrared communications port for use with personal and configuration remote controls.
 - 2. Engraveable buttons
 - 3. Dimming switches shall include seven LED's to indicate load levels.
 - 4. Scene switches shall include pilot indication of scene selection.
 - 5. Device Status LED's including:
 - a. One pilot LED for each button.
 - b. Power Indication

- c. One locator LED per switch
 - d. Network status LED to indicate data transmission
 - e. Power LED to indicate the device has power
 - f. Configuration mode
- B. Switches shall have two RJ-45 ports to allow connection to any other digital room device.
- C. Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required to achieve multi-way switching
- D. Watt Stopper product numbers: LMSW-101 / LMSW-102 / LMSW-103 / LMSW-104 / LMSW-108.

2.5 ROOM CONTROLLERS

- A. Room Controllers automatically bind the room loads to the connected devices in the space without any tools or configuration requirements. Room Controllers shall be provided to match the room lighting load and control requirements and sequences. The controllers will be simple to install and will not have screw type connections, dip switches, potentiometers or require special mounting or configuration. The control units will include the following features:
 - 1. Automatic room configuration to the most energy efficient sequence of operation based upon the devices in the room.
 - 2. One or two relay configuration
 - 3. Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an Off-the-Shelf unit without requiring any configuration or setup.
 - 4. Device Status LED's to indicate:
 - a. Data transmission
 - b. Device has power
 - c. Status for each load
 - d. Configuration status
 - 5. Quick installation features including:
 - a. Standard junction box mounting (inside or outside)
 - b. Quick low voltage connections using standard RJ-45 patch cable
 - 6. Plenum rated
 - 7. Manual override and LED indication for each load
 - 8. Universal voltage (120/230/277 VAC, 50-60 Hz)
 - 9. Zero cross circuitry for each load.
 - 10. Efficient 150 ma switching power supply
 - 11. Three RJ-45 DLM local network ports
 - 12. Watt Stopper product numbers: LMRC-101 / LMRC-102
- B. 0-10 Volt enhanced Room Controllers shall include all the features of the Room Controller plus the following enhancements:

1. One, two or three relay configuration
 2. Efficient 250 ma switching power supply
 3. Four RJ-45 DLM local network ports.
 4. One zero to 10 volt analog output per relay for control of dimmable ballasts.
 5. Optional BACnet MS/TP communications port.
 6. Current monitoring
 7. Watt Stopper product numbers: LMRC-301 / LMRC302 / LMRC303.
- C. Plug Load Room Controllers provide dedicated control of plug loads within the space. The controllers plug into the DLM local network using the RJ-45 free topology network. The room controllers include the following features
1. One relay configuration only
 2. Automatic ON/OFF configuration
 3. Default 30 minute (adjustable) time delay from lighting shut off to allow for electronic component use after an area is vacant
 4. Watt Stopper product number: LMPL-101.

2.6 DIGITAL PHOTOSENSORS

- A. Provide automatic daylight harvesting capabilities to the Room Controllers. The photo sensor / room controller configuration automatically configures the daylighting set points for ON/OFF or Dimming control. Using the automatic configuration replacing a photo sensor or room controller can be done without any special tools, programming or configuration. Photosensors include the following features:
1. The digital photosensor shall utilize an internal photodiode that measures light in a 100 degree angle cutting the unwanted light from bright sources outside of this cone
 2. The digital photosensor shall be capable of turning lighting on and off or Raise / Lower depending on the type of Room Controller (on/off or dimming). Sensor range shall be from 1 - 1400fc.
 3. For ON/OFF daylight harvesting the controller provides a "hold on while occupied" feature that prohibits high levels from turning OFF the controlled lights as long as the space remains occupied.
 4. The sensor has a threaded nipple that mounts on a ceiling tile and for more challenging applications such as a side wall or hard rock ceiling the nipple pops off and the unit can be screwed down
- B. Watt Stopper Product Numbers: LMLS-400 or equivalent.

2.7 ROOM NETWORK

- A. The DLM local network is a free topology lighting control network and protocol designed to control a small area of a building. Digital room devices connect to the network using RJ-45 patch cords which provide both data and power to room devices. Features of the DLM local network include
1. Automatic configuration and binding of sensors, switches and lighting loads to the most energy efficient sequence of operation based upon the device attached.

2. Simple replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup.
3. Push and Learn configuration that can change the automatic binding process and load parameters by using only the digital devices in the room.
4. Two way infrared communications that allow load parameters, sensor configuration and binding operations to be configured through a hand held configuration tool up to 30 feet from any device

2.8 NETWORK BRIDGE

- A. Each local network shall include a network bridge component to provide a connection between the room devices and the segment network. The network bridge shall use industry standard BACnet MS/TP network communication and allow direct connection to the Segment Manager or BAS where required.
- B. The network bridge may be incorporated directly into the room controller hardware or be provided as a separate module connected on the local network through an available RJ local network port
- C. Provide Plug and Go operation to automatically discover all room devices connected to the local network and make all device parameters visible to the segment manager via the segment network. No commissioning shall be required for set up of the network bridge on the local network.
- D. The network bridge shall automatically create standard BACnet objects for selected room device parameters to allow any BACnet compliant BAS to include lighting control and power monitoring features as provided by the DLM room devices on each local network. Standard BACnet objects shall be provided .

2.9 SEGMENT MANAGER

- A. The Digital Lighting Management system shall include at least one segment manager to manage network communication. It shall be capable of serving up a graphical user interface via a standard web browser. Each segment manager shall have support for one, two or three segment networks as required and allow for control of a maximum of 127 local networks (rooms) and or lighting control panels per segment network.
- B. Operational features of the Segment Manager shall include the following:
 1. Connection to PC or LAN via standard Ethernet TCP/IP
 2. Easy to learn and use Adobe Flex based GUI compatible with Internet Explorer 8 or equal browser
 3. Log in security capable of restricting some users to view-only or other limited operations
 4. Automatic discovery of all DLM devices on the segment network(s). Commissioning beyond activation of the discovery function shall not be required.
 5. After discovery all rooms and panels shall be presented in a standard navigation tree format

6. View and modify room device operational parameters. It shall be possible to set device parameters independently for normal hours and after hours operation.
7. Set up schedules for rooms and panels. Schedules shall automatically set controlled zones or areas to either a normal hours or after hours mode of operation.
8. Group rooms and loads for common control by schedules, switches or network commands. Monitor connected load current for rooms or zones equipped with room controllers incorporating the current monitoring feature
9. Provide seamless integration with the BAS via BACnet IP

2.10 EMERGENCY LIGHTING

- A. Emergency Lighting Control Unit – A UL 924 listed device that monitors a switched circuit providing normal lighting to an area. The unit provides normal ON/OFF control of emergency lighting along with the normal lighting. Upon normal power failure the emergency lighting circuit will close, forcing the emergency lighting ON until normal power is restored. Features include
 1. 120 - 277 volts, 50/60 Hz., 20 amp ballast rating
 2. Push to test button
 3. Auxiliary contact for test / Fire Alarm system

2.11 WIRING

- A. Refer to Specification Section 27 05 00 for additional requirements.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION COORDINATION

- A. Exact occupancy sensor and daylight sensor types and locations shall be determined by the lighting control system supplier for a fully-functional system with adequate coverage throughout areas controlled by occupancy sensors. Exact locations shall be coordinated with actual HVAC register locations, furniture/casework/etc. locations, sensor coverage patterns, etc. for proper coverage in all areas. In no case may fewer devices or lower-quality devices be used in each area than indicated on contract documents.

3.2 INSTALLATION

- A. When using wire other than RJ-45 connections provide detailed point to point wiring diagrams for every termination. Provide wire specifications and wire colors to simplify contactor termination requirements
- B. Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated.
- C. Provide all connections between system components and network connections to building LAN (via Ethernet cabling) as directed by system supplier for a fully functional networked system.

- D. Calibrate all sensor time delays and sensitivity to guarantee proper coverage of occupants and energy savings.
- E. Provide written or computer generated documentation on the commissioning of the system including room by room description including:
 - 1. Sensor parameters, time delays, sensitivities, daylighting set points.
 - 2. Sequence of operation, manual ON, Auto OFF. Etc.
 - 3. Load Parameters - blink warning, etc.
- F. Refer to Specification Section 27 05 00 for additional installation requirements.

3.3 SUPPORT SERVICES

- A. System Start Up and Commissioning
 - 1. The electrical contractor shall provide both the manufacturer and the electrical engineer with ten working days written notice of the system startup and adjustment date.
 - 2. Manufacturer shall provide a factory authorized technician to confirm proper installation and operation of all lighting control system components. The startup requirement is intended to verify:
 - a. That all occupancy and daylighting sensors are located, installed, and adjusted as intended by the factory and the contract documents.
 - b. The occupancy sensors and daylighting sensors are operating within the manufacturers specifications.
 - c. The sensors and relay panels interact as a complete and operational system to meet the design intent.
 - 3. Manufacturer to provide a written statement verifying that the system meets the above requirements.
- B. Re-commissioning – After 30 days from occupancy re-calibrate all preset times, sensor time delays and sensitivities to meet the Owner's Project Requirements. Provide a detailed report to the Design Team and Owner of re-commissioning activity.
- C. System Training
 - 1. Manufacturer shall provide factory authorized technician to train owner personnel in the operation, programming and maintenance of the lighting control system including all occupancy sensors and daylighting controls.
- D. System Programming
 - 1. Manufacturer shall provide system programming including:
 - a. Wiring documentation.
 - b. Switch operation.
 - c. Telephone overrides.
 - d. Operating schedules.

END OF SECTION 26 09 44

SECTION 26 24 17

LIGHTING PANELBOARDS

PART 1 - GENERAL

1.1 GENERAL

- A. The work under this section includes but is not limited to the following:
1. Lighting Panelboards
 2. Circuit Breakers

PART 2 - PRODUCT

2.1 PANELBOARDS

- A. Enclosure:
1. Panelboards shall be dead front type and shall be in accordance with Underwriter's Laboratories, Inc., standard of panelboards and enclosing cabinets and so labeled.
 2. Panelboards installed in dry locations shall have enclosures fabricated from sheet steel and shall be finished in ASA #49. Panelboards installed in exterior or wet locations shall have NEMA 3R enclosures.
 3. The door shall have a cylinder type lock. Lock shall be held in place by concealed screw to a captive nut, welded to inside of door. All locks shall be keyed alike.
 4. A metal framed circuit directory card holder with clear plastic covering shall be factory-mounted on the inside of door.
 5. Panels for 20 or more circuits, including spares and spaces, shall be 20 inches wide.
 6. Panelboards enclosures shall be as shown on panel schedule on plans for surface, flush or motor control center mounting.
 7. Provide hinged trim with piano-hinge down full length of one side to allow access to wiring without complete removal of outer trim.
 8. Each section of multi-section panelboards shall be of matching heights and depths.
- B. Bussing/Lugs:
1. Ampacity and service voltage of main buss, lugs or main breakers and branch circuit breakers shall be as shown on drawings.
 2. All bussing and associated connectors shall be tin-plated aluminum or tin-plated copper.
 3. All panelboards shall contain ground buss.
 4. Entire panelboard shall be capable of withstanding a short circuit not less than the interrupting capacity of any breaker in the panel. When a power distribution system electrical study (including short circuit stud, etc.) is a part of the project, contractor shall further verify that all proposed equipment is properly rated (per the results of the study) prior to submitting shop drawings. Interrupting ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.
 5. Buss connectors shall be for distributed phase arrangement.

6. Top/bottom feed arrangement and lug sizes/quantities shall be coordinated by the contractor.
 7. Entire panelboard assembly, including all bussing, shall have SCCR ratings meeting or exceeding the minimum AIC ratings listed on the plans for the panel. When a power distribution system electrical study (including short circuit stud, etc.) is a part of the project, contractor shall further verify that all proposed equipment is properly rated (per the results of the study) prior to submitting shop drawings. All ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.
 8. Service entrance panelboards shall be provided with barrier such that no uninsulated, ungrounded service busbar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations
- C. Breaker arrangement and numbering:
1. Panelboards shall be factory assembled with branch breakers arranged exactly as indicated on plans.
 2. Breakers shall be numbered vertically beginning top left. Multi-section panelboards shall be numbered consecutively through all sections.
 3. Breaker numbers shall be permanently attached to trim.
 4. Main breakers shall be vertically-mounted (branch-mounted or back-fed main breakers will not be acceptable unless specifically so shown on plans).

2.2 CIRCUIT BREAKERS

- A. Circuit breakers shall be quick break, quick make, thermal magnetic type, for alternating current. Breakers shall trip free for the handle and tripping shall be indicated by the handle assuming a position between OFF and ON.
- B. Circuit breakers shall be of the bolt-on type.
- C. Multi-pole breakers shall be internal common trip with single operating handle; external handle ties are not acceptable, unless specifically noted otherwise (such as for multi-wire branch circuits described below).
- D. Circuit breakers feeding multiwire branch circuits (as defined by NEC) consisting of separate single phase loads sharing a common neutral shall be provided with multi-pole breakers or handle ties to simultaneously disconnect all ungrounded conductors per NEC Article 210.4(B). The necessary locations of these multi-pole breakers or handle ties shall be coordinated by the contractor. Where necessary, the contractor may rearrange circuit breakers (as minimally as possible) as required to meet this requirement.
- E. All breakers shall meet the minimum RMS symmetrical interrupting capacity ratings shown on plans for the associated panel. All interrupting ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.
- F. All branch circuit breakers shall be listed to UL489 or shall be specially-tested to be HACR listed.

2.3 SPECIAL REQUIREMENTS

- A. Any special requirements on the drawings, such as for increased interrupting rating, ground fault protection, etc., shall supersede these specifications, but only insofar as that particular requirement is concerned.
- B. Lighting panels larger than 400A shall conform to the requirements for power panels.

2.4 MANUFACTURER

- A. Panelboards shall be as manufactured by Square 'D', G.E., Siemens or Cutler Hammer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All panelboard dimensions and clearances shall be carefully checked and coordinated with the proper trades to ensure proper mounting space and support prior to roughing in equipment. In no case shall any circuit breaker be located above 6'-7" A.F.F..
- B. Wiring in panelboard wireways shall be done in a neat and workmanlike manner. Wiring shall be grouped into neat bundles and secured with approved tie wraps.
- C. For all flush-mounted panelboards, a minimum of three (3) one-inch empty conduits shall be stubbed out above the nearest accessible ceiling space for future use.

3.2 PANEL IDENTIFICATION

- A. Refer to Specification Section 26 05 53.

END OF SECTION 26 24 17

SECTION 26 25 00

PLUG-IN AND FEEDER BUSWAY

PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. Busway and fittings. All busway shall be plug-in type except where designated feeder type on drawings.
- B. Plug-In Units

1.2 REFERENCES:

- A. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
- B. NEMA BU 1 - Busways
- C. NEMA KS 1 - Enclosed Switches
- D. NFPA 70 - National Electrical Code
- E. UL 857 - Underwriter's Busway Standard

1.3 DELIVERY, STORAGE, HANDLING AND MAINTENANCE:

- A. Refer to NEMA Publication BU1.1 which is a guide for proper installation, operation, and maintenance of busway products.

PART 2 - PRODUCT

2.1 MANUFACTURERS:

- A. All busway shall be I-Line busway manufactured by Square D Company, General Electric, Cutler Hammer or approved equal.

2.2 MANUFACTURED UNITS:

- A. GENERAL
 1. Furnish and install a complete low impedance prefabricated busway distribution system as shown on the plans.
 2. Busway shall be rated for voltage as indicated on plans with 50% capacity integral ground bus.
 3. The ampere ratings, approximate footage, fitting, plug-in units etc. are shown on the plan. The electrical contractor shall be responsible for routing the busway to coordinate with the other trades. Final field measurements shall be made by the contractor prior to release of the busway for fabrication by the manufacturer.

B. SHORT CIRCUIT RATING AND TESTS

1. The short circuit rating of the busway shall be as indicated on plans.
2. The short circuit rating of the busway shall be determined according to UL standards No. 857. This rating must be based upon actual tests at the rated short circuit current.

2.3 BASIC CONSTRUCTION:

A. HOUSING

1. The busway housing shall be constructed of code gauge steel and aluminum to reduce hysteresis and eddy current losses and shall be provided with a suitable protective finish of ANSI 49 gray epoxy paint.
2. The busway housing shall be totally enclosed non-ventilated for protection against mechanical damage and dust accumulation.
3. The totally enclosed housing shall be manufactured by the busway manufacturer. Modifications of busway to make it totally enclosed by other than the busway manufacturer voids the manufacturer's warranty. Busway so modified is unacceptable without the written consent of the manufacturer.
4. **Busway installed in wet or damp locations shall be rated NEMA 3R. All other busway installed in dry interior locations shall be rated IP54.**
5. Furnish with 50% capacity internal ground bus.

B. JOINTS AND TAP BOXES

1. The busway joint shall be of the one-bolt type which utilizes a high strength steel bolt(s) and Belleville washers to maintain proper pressure over a large contact surface area.
2. The bolt shall be torque indicating and at ground potential.
3. The bolt shall be two-headed design to indicate when proper torque has been applied and require only a standard long handle wrench to be properly activated.
4. Access shall be required to only one side of the busway for tightening joint bolts. Coordinate with other trades to ensure that all joints are accessible.
5. Where tap boxes are indicated, they shall be manufactured by the same manufacturer as the busway.

C. BUS BARS

1. Bus bars shall be copper.
2. Each bus bar shall be insulated with Class B rated (130° C vendor certified) polyester film or epoxy powder coated materials.
3. The temperature rise at any point in the busway shall not exceed 55° C rise above ambient temperature when operating at rated load current.
4. Plug-in busway (800 A and above) shall be of sandwich construction, meaning no air gap shall exist between bus bars except at plug-in in openings.

D. PLUG-IN OPENINGS

1. On plug-in busway there shall be five dead front, hinged cover type plug-in openings on each side of ten foot lengths.
2. All openings shall be usable simultaneously.
3. Busway shall be installed so that plugs are side mounted to permit practical use of all ten plug-in openings.
4. Each phase position of a plug-in opening shall be individually insulated.
5. It shall be possible to inspect the plug-in opening and bus bars prior to the installation of the plug-in unit.

2.4 SUPPORT OF BUSWAY:

- A. Hanger spacing shall be noted on layout drawings and shall not exceed manufacturer's recommendations.
- B. Indoor feeder and plug-in busway shall be approved for hanger spacing of up to 10 ft for horizontally mounted runs and 16 ft for vertically mounted runs.

2.5 VOLTAGE DROP:

- A. The voltage drop (input voltage minus output voltage) specified shall be based on the busway operating at full rated current and at stabilized operating temperature in 30° C ambient.
- B. The three-phase, line-to-line voltage drop shall not exceed 3.1 volts per hundred feet at 40% power factor concentrated load which may exist during motor starting.
- C. The line-to-line voltage drop shall not exceed 4.0 volts per hundred feet at the load power factor which produces maximum voltage drop in the busway.

2.6 PLUG-IN UNITS:

- A. Plug-in units shall be fusible switch type with visible blade quick-make and quick-break mechanism].
- B. Plug-in units which cannot be operated directly from the floor shall be equipped with suitable means for hookstick operation.
- C. Furnish one hookstick for every three runs of busway.
- D. The interrupting rating of fusible switch plug-in units shall be as indicated on plans.

2.7 PLUG-IN UNIT SAFETY DEVICES:

- A. Each plug-in unit rated 100 amperes or below shall be mechanically interlocked with the busway housing to prevent installation or removal of plug-in units while the switch is in the ON position, and be equipped with an operating handle which always remains in control of the switching mechanism.
- B. Plug-in enclosures shall make positive ground connection with the ground bus before the

jaws make contact with the phase bars.

1. The ground method shall be such that it cannot be defeated by future painting of the busway housing.
- C. The plug-in units shall be equipped with internal barriers to prevent accidental contact of fish tape and conductors with live parts on the line side of the protective device during time of wire pulling.
- D. Covers of all plug-in units must have interlocks to prevent the cover from being opened when the switch is in the ON position.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Install busway and accessories in accordance with manufacturer's instructions. Additional instructions are detailed in NEMA publication BU1.1 which is provided with the equipment by the electrical manufacturer.
- B. Provide curb around interior floor penetrations per NFPA-70.

END OF SECTION 26 05 33

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Wiring Devices
- B. Plates
- C. Finishes

PART 2 - PRODUCTS

2.1 WIRING DEVICES AND PLATES

- A. Switches shall be AC type, extra-heavy duty industrial grade (unless otherwise shown) of ratings shown on drawings. Switches shall be as manufactured by Hubbell, P & S, Sierra, Bryant, GE, Arrow Hart or equal.
- B. Receptacles shall have blade configuration and shall be heavy duty industrial grade (unless otherwise shown) of current and voltage rating as shown on drawings. Receptacles shall be as manufactured by Hubbell, P & S, Sierra, Bryant, GE, Arrow Hart or equal.
- C. All GFCI-type receptacles shall continuously self-test and shall trip/deny power if the receptacle does not provide proper GFCI protection or if the line/load terminations are miswired and shall provide visual indication of power status, trip conditions, ground fault conditions and end-of-life status.
- D. Each wiring device shall have a plate (see "Finishes" section below for specific requirements).

2.2 FINISHES

- A. All wiring devices (switches, receptacles, etc.) shall be colored to match the coverplates described below. For instance, all items covered by stainless steel, aluminum or malleable iron plates shall be gray in color.
 - 1. Exceptions:
 - a. Emergency wiring devices shall be red.
 - b. Isolated ground wiring devices shall be orange.
- B. Coverplates for recessed, wall-mounted electrical items (switches, receptacles, telephone outlets, etc.) shall be stainless steel unless shown otherwise.
- C. Coverplates, trim rings, etc. for recessed, floor-mounted electrical items (floor outlets,

underfloor duct junctions, etc.) shall match finish of building hardware (302/304 stainless steel, brass, etc.) in area installed.

- D. Coverplates for exposed electrical items (switches, receptacles, telephone outlets, etc.) shall be of same material as exposed boxes (see Outlet Box Specification for required material type) and shall have beveled edges.
- E. Coverplates for receptacles in wet locations shall be low-profile, expandable, metallic, extra-duty, in-use type, rated for wet locations per NEC requirements unless noted otherwise. TayMac #MX4280/MX5280/MX7280 or equal.
- F. See "Electrical Identification" specification section for coverplate labeling requirements.

PART 3 - EXECUTION

3.1 GENERAL MOUNTING

- A. Symbols on drawings and mounting heights are approximate. The exact locations and mounting heights shall be determined on the job, and it shall be the Contractor's responsibility to coordinate with all trades to secure correct installation. For example, Contractor shall coordinate exact mounting heights over counters, in or above backsplashes, in block walls, and at other specific construction features.
- B. Verify all door swings with Architectural. Locate boxes for light switches within four inches of door trim on swing side (not hinge side) of door.
- C. Devices and associated plates shall not be used as support; outlet boxes shall be rigidly supported from structural members.
- D. Mount all straight-blade receptacles vertically with ground pole up, unless specifically noted otherwise.
- E. Unless otherwise shown or required by local handicap codes, outlet boxes shall be the following distances above the finished floor unless otherwise noted.
 - 1. Receptacles and telephone outlets in offices and other finished areas: 1'-6" to the center of the box.
 - 2. Receptacles and telephone outlets in equipment rooms and other unfinished areas: 4'-0" to the center of the box.
 - 3. Receptacles over counters: As Noted
 - 4. Switches, general: 4'-0" to the top of the box.
 - 5. Fire Alarm Pull Stations: 4'-0" to the top of the box.
 - 6. Fire Alarm Audio/Visual Devices: As shown on fire alarm shop drawings (Entire lens shall be above 80" and below 96" per NFPA 72).
 - 7. Push-button, etc., general: 4'-0" to the top of the box.
 - 8. Other device types: verify with engineer prior to rough-in.

END OF SECTION 26 27 26

SECTION 26 28 16

SAFETY SWITCHES AND FUSES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Safety Switches
- B. Fuses
- C. Branch Feeders
- D. Feeders

PART 2 - PRODUCTS

2.1 SAFETY SWITCHES

- A. Safety switches shall be quick-make, quick-break, NEMA heavy duty type HD, fused or nonfused as shown. Switch blades shall be fully visible in the off position.
- B. Safety switches shall be furnished with transparent internal barrier kits to prevent accidental contact with live parts. Barriers shall provide finger-safe protection when the switch door is open and shall allow use of test probes and removal of fuses without removing barrier.
- C. Fused switches shall have provisions for class R, rejection type fuses.

2.2 FUSES (600V)

- A. Fuses for all branch switches shall be Bussman Mfg. Co., Dual Element, Class "R" Fusetron.
- B. Fuses for main switch/switches shall be Bussman Mfg. Co. Hi-Cap.

2.3 MANUFACTURER

- A. Safety switches shall be as manufactured by Square 'D', G.E., Siemens or Cutler Hammer.
- B. Fuses shall be as manufactured by Bussman Mfg. Co. or equal.

PART 3 - EXECUTION

3.1 SAFETY SWITCHES

- A. Safety switches shall be installed as shown on the plans and in accordance with N.E.C.
- B. Locations shown for safety switches on plans are diagrammatical only. Exact locations

shall be field coordinated by contractor as required to provide code-required clearances.

- C. Switch enclosures shall be rated NEMA I indoors in dry locations and NEMA3R outdoors and in wet areas.
- D. Adequate support shall be provided for mounting safety switches. Safety switches shall not be mounted to the associated equipment (unless the safety switch is furnished with the equipment).

3.2 FUSES

- A. Fuses shall be sized as shown on drawings, unless a smaller size is required by the associated equipment supplier, in which case the contractor shall provide fuses sized as directed by the associated equipment supplier at no additional cost.
- B. Provide not less than one spare set of fuses for each size used. Provide an additional spare set for each five sets of same size fuses used.

END OF SECTION 26 28 16

SECTION 26 41 00

LIGHTNING PROTECTION SYSTEM

PART 1 - GENERAL

1.1 SCOPE

- A. This facility has an existing lightning protection system. The contractor shall inspect the existing lightning protection system and shall re-certify the system in accordance with these specifications. Any system deficiencies shall immediately be brought to the attention of the architect. Any required repairs shall be made in accordance with these specifications, and shall be paid for via a project allowance. The costs associated with system inspection and re-certification shall be included in the base bid.
- B. Furnish and install all materials and labor required to provide a complete and functional Lightning Protection and Common Grounding System as indicated, in strict accordance with this section of the Specifications and the applicable Contract Drawings.

1.2 STANDARDS & QUALITY ASSURANCE

- A. The lightning protection system shall comply with all requirements of the latest edition of each of the following codes and standards. The latest edition of these codes and standards form a part of this specification:
 - 1. U.L. Standard 96A.
 - 2. Lightning Protection Institute - Installation Code LPI-175.
 - 3. N.F.P.A. 780.
- B. Equipment manufacturer shall be certified by the Lightning Protection Institute, and products approved for UL listing. All materials shall be manufactured by one of the following manufacturers:
 - 1. Bonded Lightning Protection Systems
 - 2. East Coast Lightning Protection
 - 3. Erico/Eritech Lightning Protection
 - 4. Harger Lightning Protection
 - 5. Preferred Lightning Protection
 - 6. Robbins Lightning
 - 7. Thompson Lightning Protection
- C. For approval of LPI manufacturer other than specified, complete proposed material data and installation drawings shall be submitted to Engineer for review not less than 10 days prior to bid date.
- D. In order to insure integrity of installation, the system shall be installed under the direct jobsite supervision of a Certified Master Installer/Designer, who has qualified under the LPI's Certification Program as a Master Installer/Designer.

1.3 SUBMITTALS

- A. Complete shop drawings of the entire lightning protection system showing the type, size, mounting details, and location of all equipment, grounds, cable routings, roof materials (for coordination of lightning protection system materials), etc., shall be submitted to the Architect-Engineer for approval prior to start of work.
- B. Submittals shall document the local manufacturer's representative's Certified Master Installer/Designer qualifications from LPI.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. System materials in general shall be copper, copper alloy or aluminum with high-copper content bronze castings or aluminum castings (all compatible with associated surface materials and installed per UL, NFPA & LPI standards), and shall comply in weight, size and composition for the class of structure to be protected. The system shall consist of all necessary cables, air terminals, mounting bases, fittings, couplings, connectors, fasteners, surge protection devices, etc., as required to give a complete and coordinated system.
- B. Copper conductors shall be utilized for all downleads and below-grade conductors.
- C. Aluminum components shall be utilized in cases where copper is not compatible with mounting surfaces.
- D. All ground rods shall be copper-clad steel.
- E. All cable and all air terminals shall bear proper UL labels.
- F. Air terminals shall have blunt tips.
- G. System design shall be concealed wherever practical, with roof perimeter cables concealed in parapet walls, and mid-roof cables installed under roof slabs. Exposed cable on parapet walls will only be accepted if structural details preclude cable concealment. Cable drops for roof penetrations at downlead locations shall be made with solid-bar thru-roof connectors, with copper rod flashings. Bond rebars top and bottom at each downlead position and risers. Primary and secondary bonding of roof metals and equipment shall also be under roof slabs. Ground level, intermediate and roof level potential equalization shall be provided per current building Code classifications.
- H. All system fittings except cable holders, regardless of Structure classification, shall be heavy-duty type made from bronze or aluminum castings and secured with bolted-pressure clamps. Pressure plates made from stamped or pressed metal parts, or fittings utilizing crimp-type pressure devices will not be allowed. All bolts, screws, and related type hardware shall be stainless steel.

- I. Contractor shall coordinate with the roofing contractor to insure compatibility of any adhesive with the roofing system in use.
- J. Cable fasteners shall be substantial in construction, electrolytically compatible with the conductor and mounting surface, and shall be spaced according to LPI, UL, and NFPA code requirements.
- K. Where applicable, an approved bimetal transition fitting shall be used at the roof level to change from aluminum roof conductor to copper downlead cable.
- L. Surge protection devices shall be provided on the power, telecommunications and other conductive electrical services at the points of entrance into the building(s) as required by UL96A in order to obtain the UL Master Label Certificate of Inspection. It shall be the responsibility of the electrical contractor to install or verify that a proper surge protection device has been installed on the each of the building electrical services to meet this requirement. This may require surge protection devices in addition to those specifically shown on plans or called out within other specifications.

PART 3 - EXECUTION

3.1 SUPERVISION AND CERTIFICATION

- A. The manufacturer's local representative shall be a Certified Master Installer/Designer under the LPI program, and shall provide direct jobsite technical supervision to Contractor's personnel during installation to insure compliance with all Code requirements. Upon job completion, Contractors shall furnish Owners with written certification on UL Master Label "C", that system is installed in compliance with above Standards.

END OF SECTION 26 41 00

SECTION 26 43 00

SURGE PROTECTIVE DEVICES

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 field-mounted SPDs for low-voltage (<1000 V) power distribution and control equipment.
- B. The specified unit(s) shall provide effective high energy transient voltage surge suppression, surge current diversion and high frequency noise attenuation in all electrical modes for equipment connected downstream from the facility's meter or load side of the main overcurrent device. The unit(s) shall be connected in parallel with the facility's wiring system.
- C. The unit(s) shall be designed and manufactured in North America by a qualified manufacturer of suppression filter system equipment. The qualified manufacturer shall have been engaged in the commercial design and manufacture of such products for minimum of ten (10) years.
- D. All products that are submitted according to these specification will be required to meet this specification in its entirety for both service and distribution TVSS systems. Any product that is submitted and does not comply with all parts of this specification will be subject to rejection.

1.3 DEFINITIONS

- A. VPR: Voltage Protection Rating.
- B. SPD: Surge Protective Device(s)
- C. $I_{(n)}$: Nominal Discharge Current

1.4 SUBMITTALS

- A. See specification section 26 05 00.
- B. Product Data: For each type of product indicated. Include:
 - 1. Maximum Single Impulse Surge Current Rating.
 - 2. Surge Life (Repetitive Surge) Rating.
 - 3. UL1449 (Latest Edition) Voltage Protection Ratings (VPR).

4. UL1449 (Latest Edition) Nominal Discharge Current (In).
5. Product dimensions and weights.
6. Furnished specialties and accessories.

- C. Qualification Data:
- D. Safety Agency File Number.
- E. ISO 9001-2008 Certification.
- F. ISO 1401-2001 Certification.
- G. Operation and Maintenance Data: For SPDs to include all submittal data and any applicable operation and maintenance manuals.
- H. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency, and marked for intended location and application.
- B. The unit shall be UL 1449 Listed and CUL Approved as a Surge Protective Device and UL 1283 Listed as an Electromagnetic Interference Filter
- C. Provide 2nd party certified data demonstrating SPD response to ANSI/IEEE C62.41.2-2002 standard waveforms when tested according to IEEE C62.45.
- D. Comply with NFPA 70.
- E. All SPDs provided within this project at the service entrance, distribution panels, and sub-panels shall be from the same manufacturer.

1.6 PROJECT CONDITIONS

- A. Service Conditions: Rate SPDs for continuous operation under the following conditions unless otherwise indicated:
 1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
 2. Operating Temperature: 30 to 150 deg F.
 3. Humidity: 0 to 95 percent, non-condensing.
 4. Altitude: Less than 13,000 feet above sea level.

1.7 COORDINATION

- A. Where field-mounted SPD's are specifically shown on plans, coordinate locations of field-mounted SPDs to allow adequate clearances for maintenance.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

1.9 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Replaceable Protection Modules: 1 of each size and type installed, where field-replaceable modular SPDs are provided.
 - 2. Fuses: 1 of each size and type installed, where field-replaceable fuses are provided.

PART 2 - PRODUCTS

2.1 SURGE PROTECTIVE DEVICES

- A. Manufacturer:
 - 1. Integral Devices: Surge Protective Devices shall be as manufactured by the distribution equipment manufacturer (Square D, etc.), or by Surge Suppression Inc. if all of the performance of this specification are met and all UL listing of the equipment manufacturer are met.
 - 2. External Devices (where specifically specified on plans): Surge Protective Devices shall be as manufactured by the distribution equipment manufacturer (Square D, etc.) or Surge Suppression Inc.
- B. Each Surge Protective Device shall:
 - 1. Be internal to the associated distribution equipment (without violating any applicable UL listings) unless specifically shown otherwise on plans.
 - 2. Be UL 1449 (Latest Edition) listed.
 - 3. Have short-circuit current rating complying with UL 1449 (Latest Edition), that matches or exceeds the short-circuit rating of the associated distribution equipment.
 - 4. Be designed to withstand a maximum continuous operating voltage (MCOV) of not less than 115% of nominal RMS voltage.
 - 5. Have fuses, rated at 200-kA interrupting capacity.
 - 6. Have a minimum UL 1449 Nominal Discharge Current (I_n) Rating of 20kA.
 - 7. Be fabricated using bolted compression lugs.
 - 8. Provide suppression for seven (7) modes of protection.
 - 9. Have LED indicator lights for power and protection status of each phase.
 - 10. Have audible alarm, with silencing switch, to indicate when protection has failed.
 - 11. Have form-C contacts rated at 2 A and 24-V ac minimum, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with facility monitoring and control system if monitoring by that system is required by plans or other specifications.

12. Have six-digit transient-event counter, mounted to front of equipment door, set to totalize transient surges (externally mounted SPD's may have the transient –event counter monted on the visible face of the SPD).
 13. Meet all UL 96A requirements (for Lightning Protection Systems) where the device is installed at a service entrance of the facility. At a minimum, these devices shall:
 - a. Be marked as Type 1 or Type 2 SPDs with product Identity consisting of “Surge Protective Device” or “SPD”, and identifying all ratings so required by UL96A and the 4 digit alpha numeric Control Number.
 - b. Have a minimum UL 1449 Nominal Discharge Current (I_n) Rating of 20kA.
 - c. Be UL listed and labeled with holographic label.
- C. Peak Single-Impulse Surge Current Rating shall be meet the following minimums unless specifically shown otherwise on plans:

Application	Per Phase	Per Mode
Service Entrance Devices	240 kA	120 kA
Downstream Devices	160 kA	80 kA

- D. The ANSI/UL 1449 voltage protection rating (VPR) in grounded wye circuits, the SPDs shall not exceed the following:

Modes	208Y/120V	480Y/277V	600Y/347V
L-N,L-G, N-G	800	1200	1500
L-L	1200	2000	2500

- E. The ANSI /UL 1449 VPR for 240/120 V, 3-wire or 4-wire circuits with high leg shall not exceed the following:

Modes	240/120V
L-N,L-G, N-G	1200/800

2.2 ENCLOSURES

- A. Where external units are specifically specified on plans, units not mounted within electrical distribution equipment (such as switchboards, MCC's, etc.) shall be provided in enclosures with NEMA enclosure ratings that match or exceed the NEMA enclosure ratings of the equipment from which the units are fed. For example, a unit fed from a NEMA 4X stainless steel panelboard shall also be mounted within a NEMA 4X stainless steel enclosure.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All SPD's shall be integrally-mounted within the associated distribution equipment unless specifically shown otherwise on plans.
- B. Install SPDs at service entrance on load side, with ground lead bonded to service entrance ground.
- C. Install SPDs downstream of the service entrance with conductors or buses between suppressor and points of attachment as short and straight as possible. The lead lengths between the TVSS unit and the equipment being protected shall not exceed fourteen (14) inches without approval from the engineer. Do not bond neutral and ground. Leads shall be as straight as possible with no sharp bends.
- D. Where externally-mounted SPD's are specifically shown on plans, provide circuit breaker as directed by the SPD supplier as a dedicated disconnecting means for SPD unless otherwise indicated.

3.2 FIELD QUALITY CONTROL

- A. Ensure that interiors are free of foreign materials and dirt.
- B. Check and test switches, pushbuttons, meters for proper operation.
- C. Check and test indicating lights for proper operation and color.
- D. Perform manufacturer's on site field test procedures.

3.3 STARTUP SERVICE

- A. Do not perform insulation resistance (MEGGER) tests of the distribution wiring equipment with the SPDs installed. Disconnect all wires, including neutral, before conducting insulation resistance tests, and reconnect immediately after the testing is over.

3.4 SYSTEM WARRANTY

- A. The SPD system manufacturer shall warranty the entire SPD system against defective materials and workmanship for a period of ten (10) years from the date of substantial completion. This warranty is in effect as long as the unit is installed in compliance with the manufacturer's installation, operation, and maintenance manual, UL Listing requirements, and any applicable national or local electrical codes.
- B. Any SPD device which shows evidence of failure or incorrect operation, including damage as the result of lightning strikes, during the warranty period shall be replaced by the manufacturer at no charge to the owner. Warranty will provide for multiple exchanges of any inoperable devices at any time during the warranty period which starts at the date of substantial completion of the system to which the surge suppressor is

installed.

- C. The manufacturer is required to have a nationwide network of factory-authorized local service representatives for repair and service of this product. The manufacturer shall have a dedicated 1-800 telephone number for service problems and questions. This number shall be manned by a knowledgeable factory employee to ensure prompt response to any emergency situation that may arise.

END OF SECTION 26 43 00

SECTION 26 50 00

LIGHTING MATERIALS AND METHODS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Lighting Fixtures
- B. Drivers

1.2 SUBMITTALS

- A. Complete submittals shall be provided identifying all lighting fixture types and options, all lamp types (where applicable) and compliance with all contract requirements. The absence of clear submittal information specifically listing exceptions/deviations from detailed contract requirements will be understood to indicate that the contractor/supplier intends to meet all contract requirements. Refer to specification section 26 05 00 for additional requirements.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Lighting fixtures shall be furnished as shown on plans and specified herein. It shall specifically be the responsibility of Contractor to verify exact types ceilings, walls, etc. and recessing depth of all recessed fixtures and furnish the specific mounting trims and accessories of the specified and/or accepted fixture specifically for the ceiling, wall etc. in which each fixture is to be installed.
- B. Base bid manufacturers are listed on the lighting fixture schedule. Manufacturers listed without accompanying catalog numbers are responsible for meeting the quality standards, efficiency, maximum wattages and photometric distributions set by the specified product.
- C. All lighting fixtures shall be so designed and shall have drivers and other similar items so installed as to function without interruptions or failures when operating in the environment in which they are proposed to be installed. Special attention shall be given to environments with potentially high ambient temperatures such as attic spaces, exterior soffits, confined interior soffits, coves, unconditioned spaces, etc. and shall be addressed by providing fixtures with suitable high ambient temperature ratings, remote mounting of drivers/ballasts, providing approved ventilation, etc. as directed by fixture manufacturer and approved by engineer, at contractor's expense.
- D. All fixtures installed such as to create penetrations through fire rated ceiling or wall assemblies shall be labeled as suitable for that purpose or installed with covers, tenting

or other means as required to maintain the fire rating of the assembly.

2.2 LED LUMINAIRES

- A. For the purpose of these specifications, LED Luminaires shall be defined as the entire LED fixture assembly including LED array, drivers, housing, electronics, etc. that compose the lighting fixture.
- B. Furnish and install LED Luminaire of proper size, type, efficacy, delivered lumen output, color temperature, distribution pattern, operational life, and CRI as shown on drawings.
- C. LED Luminaires shall be tested in accordance with LM-79 and LM-80 standards.
- D. LED drivers shall comply with NEMA 410 standards for inrush current, etc.
- E. Exterior, pole mounted LED Luminaires shall be provided with an easily-serviceable, UL recognized surge protection device that meets a minimum 10kA Category C Low operation (IECC C62.41.2-2002). Device shall be wired in front of light engine(s) and driver(s) and shall fail "open" such as to prevent fixture operation after a surge protection failure.
- F. LED Luminaires shall have a guarantee-warranty of at least five years unless specifically noted otherwise on contract documents.
- G. LED Luminaire assembly shall comply with ambient temperature requirements specified in General section above.

2.3 STEMS/PENDANTS

- A. Hangers shall be approved ball aligner type swivel, 30 degrees from vertical with swivel below canopy.
- B. Stems/Pendants shall be rigid or IMC conduit unless specified otherwise on plans. Proposed stem/pendant types shall be submitted for review prior to shipment of light fixtures from factory.
- C. Stems/Pendants shall be provided as required to prevent swaying of fixtures due to HVAC system airflow or other similar occurrences.
- D. Shall be painted the same color as the fixture trim unless noted otherwise.

2.4 MANUFACTURER

- A. Fixtures and stems shall be manufactured as shown in fixture schedule or approved equals.
- B. Drivers shall be as manufactured by Philips/Advance, GE, Lutron, Magnatec, Motorola, EldoLED or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION OF LIGHTING FIXTURES

A. Support:

1. Support of all lighting fixtures shall be responsibility of electrical contractor. All lighting fixture supports shall be installed in accordance with lighting fixture supplier's recommendations.
2. Contractor shall coordinate installation requirements for all wall-mounted fixtures (especially for wall-mounted fixtures on uneven wall surfaces, etc.) as required to assure a level/flat mounting surface and level/plumb/secure finished installation. Contractor shall provide flat mounting plates or other mounting provisions where necessary. Any proposed mounting plates, etc. shall be submitted to and approved by project architect prior to ordering materials.
3. Fixtures shall be supported independent of ceiling from structural members of building.
4. Lay-in fixtures shall be supported by four (4) taut 12 gauge hanger wires connected from each corner of the fixture to the structure above so that fixture is supported independent of the ceiling.
5. Other recessed light fixtures (including recessed downlights) shall be supported with two (2) taut 12 gauge hanger wires connected from opposing corners of the light fixture to the structure above so that fixture is supported independent of the ceiling.
6. Pendant mounted fixtures shall be directly supported from the structure above using a 9 gauge hanger wire or an approved alternate support without using the ceiling suspension system for direct support.
7. Tandem fixtures may utilize common hanger wires.
8. All lay-in fixtures shall be attached to ceiling grid by means of approved clips and in accordance with the N.E.C.
9. Contractor shall submit typical hanging detail to Engineer before installing any fixtures.

B. Connections:

1. All grid fixtures shall be wired by flex individually to junction and not wired fixture to fixture.
2. All flex shall contain 3 conductors (3rd wire ground). Ground wire shall be securely grounded at each end. Other conductors shall be connected by approved connectors.

C. Row-Mounted fixtures:

1. All stems on row-mounted fluorescent fixtures shall be installed as follows (except fixtures with slide grip hangers):
 - a. One stem shall be installed in the first fixture knockout from end of row (on the first and last fixture of the row).
 - b. One stem shall be installed between each two fixtures. Stem shall center joint where fixtures join and shall attach by use of "joining plates".

2. All fixtures in continuous rows other than recessed grid type shall be connected by nipples with locknuts bushings.
- D. Coordination:
1. Contractor shall coordinate all dimensions & locations of light fixtures prior to rough-in to ensure proper fit and coordination with other trades.
 2. Contractor shall verify exact location of light fixture with Reflected Ceiling Plan. If there are any discrepancies, verify exact location with architect.
 3. Contractor shall verify exact ceiling types being installed and shall adjust fixture trim types accordingly (prior to submitting light fixture shop drawings).

END OF SECTION 26 50 00

SECTION 27 05 00

AUXILIARY SYSTEM CABLES, 0-50V

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Cables rated for 0V-50V application

PART 2 - PRODUCTS

2.1 GENERAL

- A. Unless specified otherwise, all cables within the scope of this specification section shall:
1. Be rated for exposed cable tray installation.
 2. Be plenum rated.
 3. Be UL-rated for the proposed application.
 4. Be multi-conductor with overall outer sheath as required by the application. The insulation of each conductor within the overall multi-conductor cable shall be uniquely color-coded. Ground conductors (when provided) within the multi-conductor cable shall have green insulation. Conductors with green insulation shall not be used for conductors other than ground.
 5. Utilize copper conductors.
 6. Have wire gauge as required to limit voltage drop to acceptable limits determined by the system supplier and to meet all applicable code requirements.
 7. Where installed underground, within slab-on-grade or in exterior locations, be rated for wet locations.
 8. Where required for specific systems, meet the specific requirements (conductor quantity, wire gauge, insulation type, shielding, etc.) of the system supplier.

2.2 CLASS 1 CONTROL CABLING (120VAC CONTROL CIRCUITS, ETC.)

- A. In addition to above requirements, and unless specified otherwise, Class 1 control cabling shall:
1. Be rated for 600V.
 2. Be industrial grade.
 3. Have stranded conductors.
 4. Have sunlight/oil-resistant PVC/Nylon insulation and jacket with ripcord.
 5. Be manufactured by Belden, AlphaWire or General Cable.

2.3 CLASS 2 & 3 CONTROL CABLING (FED FROM CLASS 2 OR 3 POWER SUPPLIES)

- A. In addition to above requirements, and unless specified otherwise, Class 2 & 3 control cabling shall:
1. Be rated for 300V.
 2. Be shielded if so recommended by the system supplier/integrator.

3. Have twisted conductors.
4. Have plenum-rated insulation/jacket with ripcord.
5. Be manufactured by AlphaWire, Belden, General Cable, Superior Essex or West Penn.

2.4 NETWORK CABLING

- A. Furnish and install all Ethernet, Fiber Optic and Backbone Copper Telephone cabling in accordance with all BICSI requirements and in accordance with other applicable specification sections.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

- A. Routing:
 1. All wires and cables shall be installed in conduit unless specifically noted otherwise. Where conduit is not otherwise required by contract documents, 0-50V Cabling located within concealed, accessible ceiling spaces (such as above lay-in ceilings) may be run without conduit if the following requirements are met:
 - a. Cabling is plenum-rated, multi-conductor.
 - b. Cabling is supported by cable tray or with J-hook supports on intervals not to exceed 5'-0" on center. Cabling shall be supported solely from the cable tray or j-hooks supported from the building structure, without using piping, ductwork, conduit or other items as supports.
 - c. Cabling is neatly formed, bundled and tied with plenum-rated Velcro straps on intervals not to exceed 30" on center.
 - d. Properly-sized conduit(s) are provided wherever cabling enters an inaccessible or exposed area (such as above gyp board ceilings, within walls or through walls).
 - e. Cabling is not a part of a Fire Alarm System, Smoke Control System, Emergency Generator Control System or other life-safety related system.
 2. End bushings shall be provided on both ends of all raceway terminations.
 3. No splices shall be pulled into conduit.
 4. No cabling shall be pulled until conduit is cleaned of all foreign matter.
- B. Penetrations:
 1. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly.
 2. For cabling not installed in conduit:
 - a. Fire/smoke barrier penetrations shall be sealed utilizing an enclosed fire-rated pathway device (STI EZ Path or equal) containing a built-in fire sealing system sufficient to maintain the hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed or retrofitted without the need to remove or reinstall firestop materials. The pathway shall be UL Classified and tested to the requirements of applicable ASTM/UL1479 standards.
 3. For cabling installed within conduit from endpoint to endpoint:

- a. Fire/smoke barrier penetrations shall be sealed utilizing fire caulk or other equivalent firestop systems around perimeters of conduits per UL requirements.
- 4. For cabling installed within cable trays:
 - a. Fire/smoke barrier penetrations shall be sealed with one of the following methods:
 - 1) Continuous cable tray through the penetration, with a combination of large firestop pillows and small firestop pillows contained, supported and secured (to prevent unauthorized removal) on both sides by aluminum wire mesh and firestop putty. Firestop pillows shall be STI Series SSB or equal and Firestop putty shall be STI Spec Seal or equal.
 - 2) Cable tray broken at the penetration, with fire/smoke barrier penetrations sealed utilizing an enclosed fire-rated pathway device (STI EZ Path or equal) containing a built-in fire sealing system sufficient to maintain the hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed or retrofitted without the need to remove or reinstall firestop materials. The pathway shall be UL Classified and tested to the requirements of applicable ASTM/UL1479 standards.
- C. Excess Cabling:
 - 1. Excess cabling shall be neatly coiled within all junction boxes, pullboxes, wireways, etc. and at all terminations as required to allow future re-termination of cabling.
- D. Terminations:
 - 1. All conductors/cabling (including spare conductors) shall be properly terminated unless specifically directed otherwise. See below for general termination hardware requirements.
 - 2. Cabling shall be neatly formed, bundled and tied at all terminations.

3.2 SPLICES/CONNECTIONS/TERMINATIONS:

- A. Network Cabling:
 - 1. Network and fiber optic cabling shall be continuous from endpoint to endpoint and shall not be spliced unless specifically noted otherwise.
- B. Control Cabling:
 - 1. Connections shall be made with T & B Sta-Kon wire joints EPT66M, complete with insulating caps. To be installed with WT161 Tool or C nest of WT11M Tool, Ideal Super - Nuts (not wire nuts), Ideal Wing Nuts, or Buchanan Elec. Products B Cap or Series 2000 Pressure connectors complete with nylon snap on insulators to be installed with C24 pressure tool.
- C. Shielded cabling:
 - 1. Unless directed otherwise by the system supplier, 0-50V cable shielding shall be grounded at the PLC/control panel end only (not at the field device end) with a termination kit as directed by the PLC/control panel supplier.

2. Shielded cabling shall be continuous from endpoint to endpoint and shall not be spliced without prior written approval from the Engineer.

3.3 LABELING

- A. Refer to Specification Section 26 05 53 for all labeling requirements.

END OF SECTION 27 05 00

SECTION 27 10 00

STRUCTURED CABLING SYSTEM

PART 1 - GENERAL

1.1 SCOPE:

- A. This document describes the products and execution requirements relating to furnishing and installing Telecommunications Cabling. Backbone and Horizontal cabling comprised of copper and fiber cabling, and support systems are covered under this document.
- B. All cables and related terminations, support and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the structured cabling contractor as detailed in this document.
- C. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types are indicated on the plans. If the bid documents are in conflict, this specification shall take precedence.
- D. Refer to Specification Section 26 05 53 (Electrical Identification) for additional identification requirements.
- E. Refer to Specification Section 27 05 00 (Auxiliary System Cables, 0-50V) for additional material and installation requirements.

1.2 REGULATORY REFERENCES:

- A. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the National Electrical Code, local ordinances and present manufacturing standards.
- B. All materials shall be UL Listed and shall be marked as such. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.
- C. All modular jacks, patch cords, consolidation point, and patch cords shall be ETL Verified (not just tested) to be category 6 component and channel compliant.
- D. The cabling system described in this specification is derived from the recommendations made in recognized telecommunications industry standards. The following documents are incorporated by reference:
 - 1. ANSI/TIA/EIA - 568-B.1, Commercial Building Telecommunications Cabling Standard Part 1: General Requirements, April, 2001

2. ANSI/TIA/EIA - 568-B.2, Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components, April, 2001
 3. ANSI/TIA/EIA - 568-B.2-1, Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted Pair Cabling Components, Addendum 1 – Transmission Performance Specifications for 4-pair 100 Ω Category 6 Cabling
 4. ANSI/TIA/EIA - 568-B.3, Commercial Building Telecommunications Cabling Standard Part 3: Optical Fiber Cabling Components, March, 2000
 5. ANSI/TIA/EIA – 569-E, Commercial Building Standard for Telecommunications Pathways and Spaces, 2019
 6. ANSI/TIA/EIA – 606-A, Administration Standard for Telecommunications Infrastructure of Commercial Buildings, February, 2002
 7. ANSI/TIA/EIA – 607-AJ, Commercial Building Grounding and Bonding Requirements for Telecommunications, August 1994
 8. ANSI/ TIA/EIA – 758, Customer-Owned Outside Plant Telecommunications Cabling Standard, April 1999
 9. BICSI - TDDMM, Building Industries Consulting Services International, Telecommunications Distribution Methods Manual (TDDMM) 10TH edition.
 10. National Fire Protection Agency (NFPA – 70), National Electrical Code (NEC) –2002
 11. ANSI/TIA/EIA – 45-B, Test Procedures for Fiber Optic Connections.
 12. ANSI/TIA/EIA – 526-14, Power Test for Fiber Runs.
 13. FCC 47 CFR 68
 14. NEMA 250
 15. NEC Articles 770 and 800
 16. ADA, Americans with Disabilities Act
- E. If this document and any of the documents listed above are in conflict, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to the most recent release.
- F. This document does not replace any code, either partially or wholly. The contractor must be aware of local codes that may impact this project. All local State and federal codes are to be followed.

1.3 APPROVED CONTRACTOR:

- A. The Structured Cabling Contractor must meet the following requirements:
1. Contractor must have a certified RCDD on staff. The project manager for this project shall have an RCDD certification, and RCDD shall be responsible for reviewing all aspects of the design, submittals and installation of all products.
 2. All required submittal information shall be stamped by the RCDD.
 3. Contractor must have a minimum of 3 years experience with projects of similar size and scope to this project.
 4. The company performing the work must have been in business for a minimum of 3 years.
 5. The company must have an office within 75 miles of the job site.

- B. The Structured cabling contractor is responsible for workmanship and installation practices in accordance with the requirements of the standards described in these specifications and manufacturer's requirements.

1.4 WORK INCLUDED:

- A. The work included under this specification consists of furnishing all labor, equipment, materials, and supplies and performing all operations necessary to complete the installation of this structured cabling system in compliance with the specifications and drawings. The structured cabling contractor will provide and install all of the required material to form a complete system whether specifically addressed in the technical specifications or not.
- B. The work shall include, but not be limited to the following:
 - 1. Furnish and install a complete telecommunications wiring infrastructure.
 - 2. Furnish, install, and terminate all UTP and Optical Fiber cable
 - 3. Furnish and install all wall plates, jacks, patch panels, and patch cords at equipment racks and at work outlets (unless shown otherwise on plans).
 - 4. Furnish and install all required cabinets and/or racks as required and as indicated.
 - 5. Furnish any other material required to form a complete system.
 - 6. Perform channel testing (100% of horizontal and/or backbone links/channels) and certification of all components.
 - 7. Furnish test results of all cabling to the owner on disk and paper format, listed by each closet, then by workstation ID.
 - 8. Provide owner test results and documentation. (Testing documentation and As-built drawings)

1.5 SUBMITTALS:

- A. Within thirty (30) days of notice to proceed the structured cabling contractor shall submit the following items:
 - 1. Submit copies of the certification of the company and names of staff that will be performing the installation and termination of the installation to provide proof of compliance of this spec.
 - 2. Submit proof from manufacturer of contractor's good standing in manufacturer's certification program.
 - 3. Submit copy of contractor's RCDD certification.
 - 4. Submit listing of five (5) projects of similar size and scope to this project that have been completed within the last five years. Include in this submittal owner's contact information for each project.
 - 5. Submit letter from the manufacturer stating that the manufacturer will provide a twenty-five year (25) warranty in accordance with the requirements paragraph 1.03 (B) of these specifications.
 - 6. Submit appropriate cut sheets and samples for all products, hardware and cabling.
 - 7. Submit 1/8" = 1'-0" drawings of floor plans indicating all work outlets and the labeling designation for each jack.

8. Submit ½" = 1'-0" drawings of each MDF and each IDF showing all racks, patch panels, 110 blocks, etc.
- B. Work shall not proceed without the engineer's approval of the submitted items.
- C. The structured cabling contractor shall receive approval from the engineer on all substitutions of material. No substituted materials shall be installed except by written approval from the engineer.

1.6 DRAWINGS:

- A. It shall be understood that the electrical details and drawings provided with the specification package are diagrammatic. They are included to show the intent of the specifications and to aid the structured cabling contractor in bidding the job. The structured cabling contractor shall make allowance in the bid proposal to cover whatever work is required to comply with the intent of the plans and specifications.
- B. The structured cabling contractor shall verify all dimensions at the site and be responsible for their accuracy.

PART 2 - PRODUCTS

2.1 EQUIVALENT PRODUCTS:

- A. Due to the nature and type of communications all products, including but not limited to faceplates, jacks, patch panels, racks, 110 blocks, and patch cords, for the purpose of this document, shall be manufactured by Hubbell, Ortronix, Panduit, Amp or Systimax. See below for acceptable cable manufacturers.

2.2 WORK AREA OUTLETS:

- A. Work area cables shall each be terminated at their designated work area location in the connector types described in the subsections below. Included are modular telecommunication jacks. These connector assemblies shall snap into a faceplate.
- B. The Telecommunications Outlet Assembly shall accommodate:
 1. A minimum of two (2) modular jacks
 2. Additional accommodations for specific locations as noted in the plans for optical fiber and/or additional copper cables as necessary
 3. A blank filler will be installed when extra ports are not used.
 4. A dust cap shall be provided on all modular jacks with the circuit number on the identifier strip.
 5. Multiple jacks will be placed as documented on the plans.
 6. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation. Prior to installation, the structured cabling contractor shall submit the proposed configuration for each outlet assembly for review by the architect.

7. The modular jack shall incorporate printed label strip on the dust cap module for identifying the outlet. Printed labels shall be permanent and compliant with ANSI/TIA/EIA-606-A standard specifications. Labels shall be printed using a printer such as a Brady hand held printer. Hand printed labels shall not be accepted.
- C. Faceplates: The faceplates shall:
1. be UL listed and CSA certified.
 2. be constructed of stainless steel (except where noted otherwise). All faceplate colors/materials in public areas shall be approved by the architect. In all cases the material and color of the faceplate shall match the adjacent electrical faceplate.
 3. (where plastic faceplates are specifically allowed by the architect/engineer) shall match the faceplate color used for other utilities in the building or match the color of the raceway if installed in surface raceway.
 4. be compliant with the above requirements along with the following when incorporating optical fiber:
 - a. be a low profile assembly,
 - b. incorporate a mechanism for storage of cable and fiber slack needed for termination,
 - c. position the fiber optic couplings to face downward or at a downward angle to prevent contamination and,
 - d. incorporate a shroud that protects the optical couplings from impact damage.
 5. be available as single-gang or dual-gang.
 6. possess recessed designation windows to facilitate labeling and identification.
 7. shall include a clear plastic cover to protect labels in the designation window.
 8. have mounting screws located under recessed designation windows.
 9. comply with ANSI/TIA/EIA-606-A work area labeling standard.
 10. allow for the UTP modules to be inverted in place for termination purposes.
 11. be manufactured by an ISO 9001 registered company.
- D. Voice / Data Jacks
1. Voice/Data jacks shall be 8-position modular jacks and shall be Category 6 performance as defined by the references in this document including ANSI/TIA/EIA-568-B.2-1. All pair combinations must be considered, with the worst-case measurement being the basis for compliance. Modular jack performance shall be third-party verified by a nationally recognized independent testing laboratory including, but not limited to, ETL.
 2. The wiring scheme shall be T568A or T568B as directed by the owner.
 3. The modular jack shall use dual reactance modular contact array.
 4. The modular jack shall have low emission IDC contacts.
 5. The modular jack shall use standard termination practice using 110 impact tool
 6. The modular jack shall be backwards compatible to Category 3 and 5.
 7. The modular jack shall be center tuned to category 6 test specifications.
 8. Dust cover shall be used on each termination.

2.3 110 COPPER TERMINATION BLOCK:

- A. The voice cross connect shall be a passive connection between the horizontal termination blocks and the backbone termination blocks. The wall mount frames shall be field terminated kits including all blocks, connecting blocks, and designation strips. Management rings shall be mounted between vertical columns of blocks to provide management of cross-connect wire. Backbone and horizontal blocks shall use 4-pair connecting blocks. Blocks shall be oriented so that backbone terminations are located on the left and horizontal frames are located on the right of the termination field when facing the frame assembly.
- B. 110 Block Kits shall
 1. include both the wiring block and connecting block in a 50, 100 and 300 pair footprint as required
 2. be manufactured using fire retardant molded plastic.
 3. include 4-pair 110C connecting blocks for field termination.
 4. support termination of 22-24 AWG solid conductor
 5. wiring blocks shall contain back openings for the feed through of cable
 6. meet category 6 component compliance and be verified by a third-party nationally recognized independent testing laboratory
 7. have color-coded tips on the wiring block and color coding on the connector blocks for installation identification.
 8. shall use standard termination practice requiring a single conductor 110 impact tool
 9. Termination hardware shall maintain the paired construction of the cable to facilitate minimum untwisting of the wires.
 10. be backwards compatible to category 3 and 5.
 11. be labeled in compliance with ANSI/TIA/EIA-606-A labeling specifications using permanent labels and label printer.
 12. be manufactured by an ISO 9001 registered company.

2.4 MODULAR PATCH PANELS:

- A. The Modular Patch Panels shall
 1. be modular design.
 2. meet category 6 component compliance and be verified by a third-party nationally recognized independent testing laboratory
 3. use low emission IDC contacts
 4. use dual reactance technology to enhance the signal-to-noise ratio
 5. require standard termination practices using a 110 impact tool
 6. use a single piece IDC housing designed to accept larger Category 6 conductors
 7. support both T568B and T568A wiring
 8. include easy to follow wiring labels
 9. include label fields
 10. allow for the use of icons
 11. include full length metal rear cable management
 12. be available in standard or high density
 13. be backward compatible to category 3 and 5.
 14. be center tuned to category 6 test specifications

15. be sized to accommodate number of data or data and phone cables (where phone cables are terminated on patch panels in lieu of 110 blocks) served by each equipment room plus 30% spare capacity.
16. be separated by horizontal cable management sections.

2.5 RACKS:

- A. The equipment rack shall provide vertical cable management and support for the patch cords at the front of the rack and wire management, support, and protection for the horizontal cables inside the legs of the rack.
- B. Waterfall cable management shall be provided at the top of the rack for patch cords and for horizontal cables entering the rack channels for protection and to maintain proper bend radius and cable support. Double-sided wire management shall also be mounted above each patch panel and/or piece of equipment on the rack. The rack shall include mounting brackets for cable tray ladder rack to mount to the top of the rack. Velcro cable ties shall be provided inside the rack channels to support the horizontal cable. Rack shall be black in color to match the patch panels and cable management.
- C. Free-Standing Racks shall:
 1. have a minimum capacity of 45U
 2. have the necessary strain relief, bend radius and cable routing for proper installation of high performance cross connect products, meeting all specifications of ANSI/TIA/EIA-568-B.
 3. have top cable trough with waterfall and built in patch/horizontal cable distribution separator.
 4. have horizontal front and rear cable management above, below and between each 48-port patch panel.
 5. have a rack-mounted power strip.
 6. have EIA hole pattern on front and rear.
 7. be available with a 6.0" channel depth.
 8. be available with hook and loop straps for securing bulk cables inside the vertical U-channels.
 9. assemble as 19" (483 mm) or 23" (584 mm) with no additional hardware.
 10. be available with three styles of vertical patch cord management: interbay with latches, cable management rings, or fingerduct with covers.
 11. provide floor and ceiling access for cable management and distribution.
 12. provide pre-drilled base for floor attachment of rack.
 13. be available in standard color of black.
 14. be manufactured by an ISO 9001 registered company.
- D. Wall-Mounted Racks shall:
 1. provide the necessary strain relief, bend radius and cable routing for proper installation of high performance cross connect products, meeting all specifications of ANSI/TIA/EIA-568-B.

2. have top cable trough with waterfall and built in patch/horizontal cable distribution separator.
3. have horizontal front and rear cable management above, below and between each 48-port patch panel.
4. have a rack-mounted power strip.
5. have EIA hole pattern on front and rear.
6. be available with a 6.0" channel depth.
7. be available with hook and loop straps for securing bulk cables inside the vertical U-channels.
8. assemble as 19" (483 mm) or 23" (584 mm) with no additional hardware.
9. provide usable depth as required for standard network ethernet switch and other equipment
10. be available with three styles of vertical patch cord management: interbay with latches, cable management rings, or fingerduct with covers.
11. provide floor and ceiling access for cable management and distribution.
12. provide pre-drilled base for wall attachment of rack.
13. be available in standard color of black.
14. be manufactured by an ISO 9001 registered company.
15. be constructed to swing-out from wall (for rear access) via heavy-duty hinged corner and configurable for either left or right opening.

2.6 HORIZONTAL DISTRIBUTION CABLE:

- A. Horizontal Distribution Cabling shall meet the following requirements:
1. Shall be 100 Ohm Enhanced Category 6 Unshielded Twisted Pair (UTP) Cable.
 2. Physical Characteristics:
 - a. Unless directed otherwise by owner (contractor shall verify with owner), Cat6 cable coloring shall be based on system type as follows, unless specifically approved otherwise:
 - 1) Data (or IP Voice): Blue
 - 2) Analog Voice: Grey
 - 3) Lighting Control System: White
 - 4) Fire Alarm or other Life-Safety System: Red
 - 5) CCTV Surveillance Cameras: Yellow
 - 6) Other: As directed by owner
 - b. Shall be plenum-rated.
 - c. Shall meet applicable requirements of ANSI/ICEA S-80-576.
 - d. The diameter of the insulated conductor shall be .023 in. maximum.
 - e. Shall consist of (4) 22-26 AWG twisted pairs.
 - f. The overall diameter of the cable shall be no larger than 0.240 inches.
 - g. The ultimate breaking strength measured in accordance with ASTM D 4565 shall be 400 N minimum.
 - h. Cable shall withstand a bend radius of 1 inch at -20 degrees Celsius without jacket or insulation cracking.
 - i. Cable shall be third party verified to meet ANSI/TIA/EIA-568-B.2-1.

- j. Where installed underground, within slab-on-grade or in exterior locations, be gel-filled and rated for wet locations.
- 3. Transmission Characteristics:
 - a. DC resistance of any conductor shall not exceed 9.38 Ohms per 100m max. at 20° C. Measured in accordance with ASTM D 4566.
 - b. The mutual capacitance of any pair at 1 kHz for 100m of cable shall not exceed 4.4 nF nominal.
 - c. DC resistance unbalance any two conductors of any pair shall not exceed 5% when measured at or corrected to 20° C in accordance with ASTM D 4566.
 - d. Structural return loss swept measurement for 100m or longer shall meet or exceed Category 6 requirements.
- 4. Shall be manufactured by Amp NetConnect, Berk-Tek, Leviton, General Cable, Mohawk or Superior Essex.

2.7 BACKBONE - FIBER:

- A. Backbone Fiber Optic Cabling shall meet the following requirements:
 - 1. All optical fiber shall be Indoor/Outdoor, Tight-Buffered, All-Dielectric, Plenum rated (unless specified otherwise on plans) with Enhanced Multimode OM4-rated 50/125 Optical Fibers.
 - 2. Each Multimode Fiber shall:
 - a. Be graded-index optical fiber wave-guide with nominal 50/125µm-core/cladding diameter.
 - b. Comply with ANSI/EIA/TIA-492AAAC-A
 - c. Have attenuation measured in accordance with ANSI/EIA/TIA-455-46, 53 or 61.
 - d. Have information transmission capacity measured in accordance with ANSI/EIA/TIA-455-51 or 30.
 - e. Have measurements performed at 23 degrees C +/- 5 degrees.
 - f. Have Maximum attenuation dB/Km @ 850/1300 nm: 3.5/1.0
 - g. Have bandwidth $\geq$ 4700 MHz-km @ 850nm. (EMB)
 - h. Have bandwidth $\geq$ 500 MHz-km @ 1300nm.
 - i. Be laser optimized and guarantee a 1 Gb/s distance of 1000 meters @ 850nm and 10 Gb/s at 600 meters @ 850nm.
 - j. Terminate on fiber patch panel using SC Type fiber connectors.
 - 3. Each indoor/outdoor fiber optic cable shall:
 - a. Be suitable for use in both outdoor and indoor applications without the use of a transition at the building entrance.
 - b. Be suitable for use in risers, plenums and horizontal applications.
 - c. Have a dry water blocking system for cable.
 - d. Have a fiber strand count of 12 (unless shown otherwise on plans).
 - e. Have a nominal 2.21 mm sub-unit diameter.
 - f. Have and be marked with an UL-OFNP Flame Rating (unless engineer specified otherwise on plans).
 - g. Comply with Bellcore GR-409 and GR20
 - h. Be independently verified to comply with ICEA S-104-696
 - i. Have strength members of FGE/Aramid yarn.

- j. Be suitable for underground or above ground conduits.
 - k. (Where applicable) Have Tight Buffered fibers color coded in accordance with EIA / TIA 598 with an overall black jacket.
 - l. Be suitable for operation between -40° to +70° C
 - m. Be UV resistant
 - n. Be of an all dielectric design
4. Shall be manufactured by Berk-Tek, Corning, General Cable or Superior Essex.

2.8 BACKBONE - COPPER:

- A. Backbone Copper Cabling shall meet the following requirements:
- 1. Shall be Cat 3 rated.
 - 2. Shall be RDUP PE-39 rated.
 - 3. Where installed underground or in wet locations, shall include fully-flooded waterblocking compound to provide wet-location rating of cable.
 - 4. Size of the backbone cables shall be determined by multiplying the number of horizontal voice cables to be terminated in each IDF by 200% and rounding up to the nearest 50 pair group. For Example if 94 horizontal voice cables are to be terminated in IDF1, install $94 \times 1 \text{ pr} \times 200\% = 188 \text{ pr}$ rounded up to nearest 50 pr = 200 pr cable to IDF1.
 - 5. Shall be manufactured by Berk-Tek, Corning, General Cable, Mohawk or Superior Essex.

2.9 COPPER CABLE SURGE PROTECTION DEVICES:

- A. All copper circuits routed between or outside of buildings shall be provided with a surge protection device at each end. The surge protection device shall be labeled as meeting the requirements of the latest edition of UL 96A (exact requirements shall be coordinated with the lightning protection system supplier, where applicable).
- B. The surge protection device shall be connected with a #6 AWG copper bonding conductor between the protector ground lug and the TC ground point.

2.10 PATCH CORDS:

- A. The structured cabling contractor shall provide factory terminated and tested UTP and optical fiber patch cords and equipment cords for the complete cabling system. Patch cords shall be provided by the structured cabling contractor to connect patch panels to owner furnished electronics. The UTP patch cables shall meet the requirements of ANSI/TIA/EIA-568-B.2 and ANSI/TIA/EIA-568-B.2-1 for patch cord testing. Provide one set of optical fiber patch cables per fiber run that terminates on fiber patch panel and provide one category 6 patch cord for each category 6 work outlet that terminates on patch panel.
- B. Copper (UTP) patch cords shall:
- 1. Be furnished to connect each patch panel jack to owner supplied electronics.
 - 2. Be furnished for each work outlet jack.
 - 3. Be a Category 6 patch cord manufactured by Panduit, Amp or Systimax.

4. Use 8 position connector with impedance matched contacts and designed using dual reactance.
 5. Be constructed of 100 ohm, 4 pair, 24 AWG, stranded conductor, unshielded twisted pair copper per the requirements of the ANSI/TIA/EIA-568-B.2 and ANSI/TIA/EIA-568-B.2-1 standard.
 6. Meet TIA category 6 component specifications in ANSI/TIA/EIA-568-B.2-1 100% factory tested to meet category 6 performance and ETL or any other nationally recognized 3rd party verification
 7. Be capable of universal T568A or T568B wiring schemes.
 8. Have modular connector that shall maintain the paired construction of the cable to facilitate minimum untwisting of the wires.
 9. Have a performance marking indelibly labeled on the jacket (by the manufacturer).
 10. Have the ability to accept color-coded labels and icons to comply with ANSI/TIA/EIA-606-A labeling specifications.
 11. Have "snagless" protection for the locking tab to prevent snagging and to protect locking tab in tight locations and provide bend relief
 12. Be available in three standard colors
 13. Be available in 3 foot, 5 foot, 7 foot, 10 foot, and 14 foot standard lengths
 14. Be backwards compatible to Category 3, 5 and 5e
- C. Fiber Optic patch cords shall:
1. Be furnished in the quantity of two (2) per IDF in each IDF and two (2) per IDF in each MDF.
 2. Be manufactured by Panduit, Amp or Systimax.
 3. Be multimode OM4 type.
 4. Have connector type as directed by owner.
 5. Have a performance marking indelibly labeled on the jacket (by the manufacturer).
 6. Have the ability to accept color-coded labels and icons to comply with ANSI/TIA/EIA-606-A labeling specifications.
 7. Be available in three standard colors
 8. Be available in 3 foot, 5 foot, 7 foot, 10 foot, and 14 foot standard lengths

2.11 GROUNDING AND BONDING:

- A. The facility shall be equipped with a Telecommunications Bonding Backbone (TBB). This backbone shall be used to ground all telecommunications cable shields, equipment, racks, cabinets, raceways, and other associated hardware that has the potential to act as a current carrying conductor. The TBB shall be installed independent of the building's electrical and building ground and shall be designed in accordance with the recommendations contained in the ANSI/TIA/EIA-607 Telecommunications Bonding and Grounding Standard.
- B. The main entrance facility/equipment room in each building shall be equipped with a telecommunications main grounding bus bar (TMGB). Each telecommunications room shall be provided with a telecommunications ground bus bar (TGB). Each grounding bus shall be 12"W x 4"H x ¼"THK and be mounted to the backboard with porcelain isolators.

- C. All wires used for telecommunications grounding purposes shall be identified with a green insulation. Non-insulated wires shall be identified at each termination point with a wrap of green tape. All cables and bus bars shall be identified and labeled in accordance with the System Documentation Section of this specification.

2.12 FIRESTOP:

- A. A firestop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Firestop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water stream.
- B. All penetrations through fire-rated building structures (walls and floors) shall be sealed with an UL listed firestop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly firestopped.

2.13 INNERDUCT:

- A. Innerduct, shall be:
 - 1. Non-metallic, corrugated with pre-installed pull tape.
 - 2. Plenum-rated, where installed within buildings.
 - 3. UL listed for the application.
 - 4. Size as required by the application.
 - 5. Orange in color in concealed areas or within telecommunications or electrical rooms. Color shall be custom as selected by owner in exposed areas (such as within cable trays overhead in areas without ceilings outside telecommunications/electrical rooms).

PART 3 - EXECUTION

3.1 PRE-INSTALLATION SITE SURVEY:

- A. Prior to start of work, meet at the project site with the owner's representative and representatives of trades performing related work to coordinate efforts. Review areas of potential interference and resolve conflicts before proceeding with the work. Facilitation with the General Contractor will be necessary to plan the crucial schedule completions of the equipment rooms and telecommunication closets.
- B. Examine areas and conditions under which the system is to be installed. Do not proceed with work until satisfactory conditions have been achieved.

3.2 WORK AREA OUTLETS:

- A. Cables shall be coiled in the in-wall or surface-mount boxes if adequate space is present to house the cable coil without exceeding the manufacturer's bend radius. In hollow wall installations where box-eliminators are used, excess wire can be stored in the wall. No

more than 12" of UTP and 36" of fiber slack shall be stored in an in-wall box, modular furniture raceway, or insulated walls. Excess slack shall be loosely coiled and stored in the ceiling above each drop location when there is not enough space present in the outlet box to store slack cable.

- B. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-B.1 document, manufacturer's recommendations and best industry practices.
- C. Pair untwist at the termination shall not exceed 12 mm (one-half inch).
- D. Bend radius of the horizontal cable shall not be less than 4 times the outside diameter of the cable.
- E. The cable jacket shall be maintained to within 25mm (one inch) of the termination point.
- F. Data jacks, unless otherwise noted in drawings, shall be located in the bottom position(s) of each faceplate. Data jacks in horizontally oriented faceplates shall occupy the right-most position(s).
- G. Voice jacks shall occupy the top position(s) on the faceplate. Voice jacks in horizontally oriented faceplates shall occupy the left-most position(s).

3.3 HORIZONTAL DISTRIBUTION CABLE INSTALLATION:

- A. All horizontal voice and data cabling shall be terminated on modular patch panels except for horizontal voice cables serving life safety related functions (fire alarm systems, security systems, elevator communications, etc.). All horizontal voice cabling serving life safety related functions shall be terminated on 110 blocks.
- B. The voice and data cables shall be installed in separate patch panels.
- C. All wiring above ceilings shall be installed in cable tray or open top cable hangers or in provided conduit.
- D. Cable above accessible ceilings shall be supported 60" on center from cable support attached to building structure.
- E. Do not untwist cable pairs more than 0.5 in. when terminating.
- F. The Contractor shall be responsible for replacing all cables that do not pass Category 6 requirements for data and 5e for the voice applications.
- G. Maximum horizontal cable length shall be 90 meters.
- H. Cable shall have no physical defects such as cuts, tears or bulges in the outer jacket. Cables with defects shall be replaced.

- I. Install cable in neat and workmanlike manner. Neatly bundle and tie all cable in closets. Leave sufficient cable for 90° sweeps at all vertical drops.
- J. Do not install Category 6 cable with more than 110N (25 lbs) pull force, as specified in ANSI/TIA/EIA and BICSI TDDM practices. Utilize appropriate cable lubricant in sufficient quantity to reduce pulling friction to acceptable levels on long pulls inside conduit, pulls of multiple cables into a single small bore conduit, on conduit runs greater than 100 lineal feet with bends of opposing directions, and in conduit runs that exceed 180 degrees of accumulated bends. Use of tensile rated cords (i.e. fishing line) should be used for difficult or questionable pulls - to judge to go/no-go condition of the conduit and pulling setup.
- K. Cables jackets that are chaffed or burned exposing internal conductor insulation or have any bare copper ("shiners") shall be replaced.
- L. Test, label and document as called for in contract documents.
- M. Firestop all openings where cable is installed through a fire barrier.

3.4 HORIZONTAL CROSS CONNECT INSTALLATION:

- A. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-B standard, manufacturer's recommendations and best industry practices.
- B. Pair untwist at the termination shall not exceed 13 mm (0.5 inch).
- C. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.
- D. Cables shall be neatly bundled and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.
- E. The cable jacket shall be maintained as close as possible to the termination point.
- F. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

3.5 OPTICAL FIBER TERMINATION HARDWARE:

- A. Fiber slack shall be neatly coiled within the fiber splice tray or enclosure. No slack loops shall be allowed external to the fiber panel.
- B. Each cable shall be individually attached to the respective splice enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.

- C. Each fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.
- D. Each cable shall be clearly labeled at the entrance to the splice enclosure. Cables labeled within the bundle shall not be acceptable.
- E. A maximum of 12 strands of fiber shall be spliced in each tray
- F. All spare strands shall be installed into spare splice trays.

3.6 BACKBONE CABLE INSTALLATION:

- A. Raceways:
 - 1. All backbone cables shall be installed inside innerducts (see specification above) within conduits meeting specification requirements unless specifically noted otherwise.
 - 2. Backbone cables shall be installed separately (in separate innerducts/conduits) from horizontal distribution cables.
 - 3. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.
 - 4. Where backbone cables and distribution cables are specifically specified to be installed in a cable tray or wireway, backbone cables shall be installed first, within innerducts meeting specifications above, bundled separately from the horizontal distribution cables.
- B. Support:
 - 1. Within Telecommunications Rooms or at Telecommunications Backboards, all backbone cables shall be securely fastened to the backboards on the walls.
 - 2. Backbone cables spanning more than three floors shall be securely attached at the top of the cable run with a wire mesh grip and on alternating floors or as required by local codes.
 - 3. Vertical runs of cable shall be supported to messenger strand, cable ladder, or other method to provide proper support for the weight of the cable.
 - 4. Large bundles of cables and/or heavy cables shall be attached using metal clamps and/or metal banding to support the cables.

3.7 COPPER TERMINATION HARDWARE:

- A. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-A/B standard, manufacturer's recommendations and best industry practice.
- B. Pair untwist at the termination shall not exceed 12 mm (one-half inch).
- C. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.
- D. Cables shall be neatly bundled and dressed to their respective panels or blocks. Each

panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

- E. The cable jacket shall be maintained to within 25 mm (one inch) of the termination point.
- F. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

3.8 RACKS:

- A. Floor-mount racks shall be used unless specifically shown otherwise.
- B. Floor-mount racks shall be securely attached to the concrete floor using a minimum 3/8" hardware or as required by local codes.
- C. Racks shall be placed with a minimum of 36 inches clearance from the walls on all sides of the rack. When mounted in a row, maintain a minimum of 36 inches from the wall behind and in front of the row of racks and from the wall at each end of the row.
- D. All racks shall be grounded to the telecommunications ground bus bar in accordance with Section 3.11 of this document.
- E. Rack mount screws not used for installing patch panels and other hardware shall be bagged and left with the rack upon completion of the installation.
- F. Wall mounted termination block fields shall be mounted on 4' x 8' x .75" void free plywood. The plywood shall be mounted vertically 12" above the finished floor. The plywood shall be painted with two coats of grey fire retardant paint.
- G. Wall mounted termination block fields shall be installed with the lowest edge of the mounting frame 18" from the finished floor.
- H. Rack-mounted patch panels (and the associated horizontal cable management sections) furnished within the contract shall occupy no more than 40% of the available space within the associated racks (also furnished within the contract) unless specifically shown or specified otherwise. A minimum of 60% of available rack space shall be reserved for owner-furnished equipment. Where the number of patch panels and horizontal cable management sections would exceed 40% of the available rack space, an additional rack shall be installed.

3.9 EQUIPMENT TRAY FOR TELECOMMUNICATION ROOMS:

- A. All equipment trays shall be 18" in width.
- B. Furnish and install 18" equipment tray from each floor mount rack/server cabinet to wall. Furnish 18" equipment tray around wall as required to support cables. A minimum of two (2) walls shall be completely covered by equipment tray.

- C. Furnish and install cable retaining posts on each side of tray every 4 feet as required to supports cables.

3.10 FIRESTOP SYSTEM:

- A. All firestop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for inspection by the local inspection authorities prior to cable system acceptance.

3.11 GROUNDING SYSTEM:

- A. The TMGB in the MDF shall be connected to the building electrical entrance grounding facility with a #6 AWG ground. Each TBB in each IDF shall be connected to a ground bus in the MDF with #4/0 AWG minimum ground. The intent of this system is to provide a grounding system that is equal in potential to the building electrical ground system. Therefore, ground loop current potential is minimized between telecommunications equipment and the electrical system to which it is attached.
- B. All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, etc. entering or residing in the TR or ER shall be grounded to the respective TGB or TMGB using a minimum #6 AWG stranded copper bonding conductor and compression connectors.
- C. The TBB shall adhere to the recommendations of the ANSI/TIA/EIA-607 standard, and shall be installed in accordance with best industry practice.
- D. Installation and termination of the main bonding conductor to the building service entrance ground shall be performed by the electrical contractor.

3.12 IDENTIFICATION AND LABELING:

- A. The contractor shall develop and submit for approval a labeling system for the cable installation. The Owner will negotiate an appropriate labeling scheme with the successful structured cabling contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels and outlets. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme. Labeling shall follow the guidelines of ANSI/TIA/EIA-606-A.
- B. All label printing will be machine generated by Panduit software (or other) using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.

3.13 TESTING AND ACCEPTANCE:

A. General

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-B. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.
2. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards, the Panduit Certification Program Information Manual and best industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

B. Copper Channel Testing

1. All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance. Horizontal cabling shall be tested using a Level III test unit for category 6 performance compliance, respectively.
2. Continuity - Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.
3. Length - Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the ANSI/TIA/EIA-568-B.1 Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.
4. Category 6 Performance:
 - a. Follow the Standards requirements established in:
 - 1) ANSI/TIA/EIA-568-B .1, B.2 and B.2-1
 - b. A Level III test unit is required to verify category 6 performance. The basic tests required are:
 - 1) Wire Map
 - 2) Length
 - 3) Attenuation
 - 4) NEXT (Near end crosstalk)
 - 5) Return Loss
 - 6) ELFEXT Loss
 - 7) Propagation Delay
 - 8) Delay skew

- 9) PSNEXT (Power sum near-end crosstalk loss)
- 10) PSELFEXT (Power sum equal level far-end crosstalk loss)

C. Fiber Testing

- 1. All fiber testing shall be performed on all fibers in the completed end to end system. There shall be no splices unless clearly defined in an RFP. Testing shall consist of an end to end power meter test performed per EIA/TIA-455-53A. The system loss measurements shall be provided at 850 and/or 1300 nanometers for multimode fibers and 1310 and/or 1550 nanometers for single mode fibers. These tests also include continuity checking of each fiber.
- 2. Backbone multimode fiber cabling shall be tested at both 850 nm and 1300 nm (or 1310 and 1550 nm for singlemode) in both directions.
- 3. Test set-up and performance shall be conducted in accordance with ANSI/EIA/TIA-526-14 Standard, Method B.
- 4. Where links are combined to complete a circuit between devices, the structured cabling contractor shall test each link from end to end to ensure the performance of the system. ONLY LINK TEST IS REQUIRED. The structured cabling contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test method shall be the same used for the test described above. The values for calculating loss shall be those defined in the ANSI/TIA/EIA Standard.
- 5. Attenuation testing shall be performed with an approved hand held tester from an industry recognized test equipment manufacturer.

3.14 SYSTEM DOCUMENTATION:

- A. Upon completion of the installation, the structured cabling contractor shall provide three (3) full documentation sets to the owners for approval. Documentation shall include the items detailed in the sub-sections below.
- B. Documentation shall be submitted within ten (10) working days of the completion of each testing phase (e.g. subsystem, cable type, area, floor, etc.). This is inclusive of all test result and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase. At the request of the Engineer, the structured cabling contractor shall provide copies of the original test results.
- C. The Engineer may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the structured cabling contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

3.15 TEST RESULTS:

- A. Test documentation shall be provided on disk within three weeks after the completion of the project. The disk shall be clearly marked on the outside front cover with the

words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.

- B. The field test equipment shall meet the requirements of ANSI/TIA/EIA-568-A/B including applicable TSB's and amendments. The appropriate Level III tester shall be used to verify Category 6 cabling systems.
- C. Test results generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. The structured cabling contractor must furnish this information in electronic form (CD-ROM).
- D. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

3.16 AS-BUILT DRAWINGS:

- A. The drawings are to include cable routes and outlet locations. Outlet locations shall be identified by their sequential number as defined elsewhere in this document. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The Owner will provide floor plans in paper and electronic (DWG, AutoCAD rel. 2002) formats on which as-built construction information can be added. These documents will be modified accordingly by the structured cabling contractor to denote as-built information as defined above and returned to the Owner.
- B. The Contractors shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (AutoCAD DWG) form.

3.17 WARRANTY:

- A. The manufacturer shall provide a 25 year extended product warranty with a 25 year applications assurance warranty. Manufacturer shall provide the warranty directly to the end user.
- B. An Extended Product Warranty shall be provided which warrants functionality of all components used in the system for 25 years from the date of registration. The Extended Product Warranty shall warrant the installed horizontal copper and the backbone optical fiber portions of the cabling system.
- C. The Application Assurance Warranty shall cover the failure of the wiring system to

support current or future applications that are designed for the link/channel specifications of ANSI/TIA/EIA-568-B.1. These applications include, but are not limited to, 10BASE-T, 100BASE-T, 1000BASE-T, and 155 Mb/s ATM.

- D. The contractor shall provide a warranty on the physical installation.

3.18 FINAL ACCEPTANCE & SYSTEM CERTIFICATION:

- A. Completion of the installation, in-progress and final inspections, receipt of the test and as-built documentation, and successful performance of the cabling system for a two week period will constitute acceptance of the system. Upon successful completion of the installation and subsequent inspection, the end user shall be provided with a numbered certificate, from the manufacturer, registering the installation.

END OF SECTION 27 10 00

SECTION 28 31 00

FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall extend the existing automatic and manual fire alarm system as specified herein and indicated on the drawings.
- B. The system shall include a central control panel, power supply, signal initiating devices, audible and visual alarm devices, a conduit and wiring system and all necessary accessories required to provide a complete operating system.
- C. The system shall be completely addressable.
- D. The system shall comply with the applicable provisions of the National Fire Protection Association Standard Number 72 (National Fire Alarm Code) for fire alarm systems; N.E.C. Article 760; and meet all requirements of the local authorities having jurisdiction.
- E. The system shall be provided by a local service organization located within 50 miles of the job site.

1.2 DESCRIPTION OF SYSTEM

- A. Conduit, outlet boxes, cabinets, devices and wiring installation for complete fire detection and alarm system.
- B. Each and every item of the Fire Alarm System shall be listed as a product of a SINGLE fire alarm system manufacturer under the appropriate category by Underwriter's Laboratories, Inc. (UL), and shall bear the "UL" label. All control equipment shall be listed under UL category UOBZ as a single control unit. Partial listing shall not be acceptable. System controls shall be UL listed for Power Limited Applications per N.E.C. Article 760. All circuits shall be marked in accordance with N.E.C. 760-23.
- C. Wiring shown is diagrammatic to define system and is not intended to show every wire. Review drawings prior to bidding and inform Contractor of any additional wiring necessary for installation of systems. Wiring shall comply with pathway survivability requirements defined in NFPA 72. Include cost of all wiring in bid.
- D. After completion of work, submit one set of record mylar sepias with items for Owner described above. Typical type drawings will not be accepted.
- E. Manufacturer's trained technical representative shall supervise installation, connections and tests. The authority having jurisdiction shall be notified prior to installation or alteration of equipment or wiring. Before acceptance, manufacturer's representative will

test and certify in writing that system is installed and functioning properly as intended by drawings and specifications. Test includes operation of all devices in entire system.

- F. Guarantee entire system in writing for one year from date of acceptance by Owner. Guarantee will cover completely all components, equipment, wiring, etc. Repair any defects found in the system within the guarantee period without cost to owner.
- G. Submit with bid a guaranteed price for complete maintenance and service of system for one year beginning at expiration of guarantee period. Price shall be guaranteed for acceptance by Owner until date of substantial completion of system.

1.3 SUBMITTALS

- A. Submit complete shop drawings of system for review per minimum requirements of NFPA 72 and local AHJ including the following:
- B. Product data cutsheets for all propose equipment with complete descriptive information on each item of equipment including UL listing for all system components
- C. Fire alarm NICET designer information and fire alarm contractor permit information
- D. Legend, notes, sheet index, wiring schedule
- E. To-scale floor plans showing all devices and room names
- F. Terminal-to-terminal connection diagrams for system components and associated equipment interfaces. Identify color code and terminal numbers on shop drawings.
- G. System input/output matrix
- H. Unique device identification numbers
- I. Conduit diagrams
- J. Battery calculations and voltage drop calculations
- K. Typical device installation details
- L. Any other information required by Architect to describe system.

1.4 SYSTEM OPERATION

- A. Actuation of any alarm initiating device shall cause all audible alarm signals to sound, all visual indicating appliances to flash, activate an alarm LED and local tone-alert at control panel/annunciator, cause an LCD read-out of point in alarm including type of alarm (smoke detector, manual station, etc.), provide a signal to the mechanical controls to shut down or re-route air handling systems according to established plans. This shall include a suitable addressable relay at each air handling unit to shut down all air handlers in a given

zone when system goes into alarm.

- B. The general alarm devices may be silenced by authorized personnel only, by entering a locked cabinet and operating the proper silencing switch. A subsequent zone alarm shall reactivate the signals. Operation of the silencing switch shall be indicated by a trouble light and audible signal.
- C. Operation of any sprinkler monitoring switch, power failure, opens, grounds, or any disarrangement of the system wiring or components shall be indicated by a visual and audible trouble signal. The audible trouble signal may be silenced; however, the trouble LED shall remain lit until the system has been returned to normal operating condition.
- D. Analog Smoke Sensor Operation
 - 1. The smoke sensor shall be a smoke density measuring device having no self contained alarm set-point. The alarm decision for each sensor shall be determined by the control panel. The control panel shall determine the condition of each sensor by comparing the sensor value to stored values.
 - 2. The control panel shall maintain a moving average of the sensors smoke chamber value. Systems that do not automatically maintain a constant smoke obscuration sensitivity for each sensor by compensating for environmental factors and are deemed unacceptable.
 - 3. The system shall automatically indicate when an individual sensor needs cleaning. When a sensor's average value reaches a predetermined value, a "Dirty Sensor" trouble condition shall be audibly and visually indicated at the control panel for the individual sensor. Additionally, the LED on the sensor base shall glow steady giving a visible indication at the sensor location.
 - 4. If a "Dirty Sensor" is left unattended, and its average value increases to a second predetermined value, an "Excessively Dirty Sensor" trouble condition shall be indicated at the control panel for the individual sensor.
 - 5. The control panel shall automatically perform a daily self-test on each sensor. Checking the electronics in the sensor's base ensures the accuracy of the values being transmitted to the control panel. A sensor which fails the self-test will cause a "Self Test Abnormal" trouble condition at the control panel. A sensor self-test which must be manually initiated by the operator shall not be acceptable.

1.5 SYSTEM FEATURES

- A. The fire alarm system shall include the following features as a minimum:
 - 1. Supervision of all field wiring.
 - 2. Microprocessor based solid state modular construction.
 - 3. Ground fault detection and ground fault isolating & supervising circuitry.
 - 4. 80 character LCD display to indicate alarms, supervisory service conditions and troubles.
 - 5. Simultaneous test of all LED's and LCD's from a central point.

6. "Dead Front" design control panel/annunciator with field programmable LED alarm, status and trouble indicators, and all control switches located behind a locked tempered glass door.
 7. Fully automatic battery charger and lead alkaline batteries. Batteries shall have capacity to maintain system operation for 24 hours in normal supervisory mode and shall have sufficient capacity remaining to operate in alarm mode for 15 minutes at conclusion of supervisory period. Batteries shall be supervised for connection to the system and for low voltage threshold. Ammeter and voltmeter shall be provided to indicate battery voltage and charging current.
 8. Two (2) sets of 2 amp form C auxiliary alarm contacts fused with feedback.
 9. One (1) set of 2 amp form C auxiliary trouble contacts.
 10. System shall be field programmable for offsite monitoring by remote station reverse polarity, local energy master box or shunt master box types.
 11. System shall be field programmable for signal circuit type of operation; march time code, temporal code, selective code, zone code, general alarm, time limit cutout and alarm silence inhibit.
 12. System shall be field programmable for waterflow/sprinkler supervisory operation on distinct zones as required.
 13. Transient suppression protection shall be provided on the system power supply and on the municipal protection circuit to comply with UL 864 requirements. Additionally, surge suppression shall be provided within the control panel on all circuits that extend outside the building (including to roof-mounted HVAC units).
 14. Supervised remote annunciator connection circuit.
 15. System shall incorporate an alarm/trouble walk test.
 16. Resident non-volatile programmable operating system memory for all operating requirements.
- B. Control panel shall be furnished with one-way voice communication and tone generating capabilities.
1. A central audio control shall be provided for the necessary alarm message/tone generation, main and remote microphone connections and mixer/pre-amplifier circuits. Continuous supervision shall be provided. Audio outputs shall have individual gain control.
 2. A hand held, push-to-talk microphone shall be provided recessed within a protective panel mounted enclosure. The microphone shall be a dynamic communication type with a frequency range of 200HZ to 4000Hz and shall be equipped with a self-winding five foot coiled cable. An LED indicator shall be provided to indicate microphone push-to-talk button has been pressed and speaker circuits are ready for transmission. Microphone shall be supervised from disconnection.
 3. An audio control switch module shall be furnished to provide manual switches to the audio functions. Switches and associated LED indicators shall be supervised for disarrangement or failure.
 4. Audio power amplifiers shall be furnished with self-contained filtered 24VDC power supply, transformer and amplifier monitor circuits. Amplifiers shall provide a 25VRMS output with a frequency response of 120 Hz to 12KHz. Provide a sufficient quantity of amplifiers to operate all system speakers simultaneously plus ten (10)

percent space capacity. Amplifiers shall be sized to accommodate all speakers tapped at two watts. Provide one (1) back-up amplifier capable of automatically replacing any failed amplifier.

5. Speaker circuits shall be supplied which are capable of supplying audio signals at 25VRMS supplied by the system amplifiers. Supervision for open, short or ground fault conditions shall be provided. Individual and distinct trouble indications shall be provided for each fault.
6. Digitized tones for alarm or auxiliary requirements shall be provided.
7. A remote microphone/annunciator (LCD type) command location as shown on plans shall be provided to duplicate the manual voice transmission capability of the fire alarm control panel.
8. The system shall be configured to allow selective voice paging. If any manual control switches are activated, the control panel operator shall be able to make announcements via the paging microphone over the pre-selected speakers. Facility for total building evacuation and paging shall be provided to allow for activation of speakers. This shall be accomplished by an "All Call" switch.

PART 2 - PRODUCTS

2.1 FIRE ALARM CONTROL PANELS/ANNUNCIATORS

- A. The control panel for this project is existing. Furnish all material and labor as required to expand or modify existing panel to accommodate new devices. If the existing panel cannot be modified to accommodate the new devices, the existing control panel shall be replaced with a new control panel and all existing circuits shall be reconnected to the new panel as required.

2.2 MANUAL ALARM STATIONS

- A. Manual alarm stations shall be addressable break glass (double-action). The station body shall be so constructed that chips and scratches will not expose metal. All stations shall be master keyed with the control equipment. When actuated, the "Pull Lever" shall remain at right angle to the station body until reset. Furnish stations with institutional covers where so indicated on plans.
- B. Boxes:
 1. Recessed, two-gang outlet boxes with red, semi-flush trim plates shall be used where possible.
 2. Where surface-mount outlet boxes are required, boxes shall be red, cast aluminum .

2.3 PHOTOELECTRIC SMOKE SENSOR

- A. The smoke sensors shall be of the photoelectric addressable type and shall communicate actual smoke chamber values to the system control panel. The smoke sensors shall operate on the light scatter principle. For maximum maintenance free service and low power requirement, light source for detection chamber and visual alarm indication shall be solid state photodiode.

- B. Each sensor base shall be visually and electrically supervised.
- C. The sensors shall be listed to UL Standard 268 and shall be documented compatible with the control equipment to which they are connected. The sensors shall be listed for both ceiling and wall mount applications.
- D. Each sensor base shall contain integral addressable electronics and an LED that will flash each time it is scanned by the control panel (once every 4 seconds). The control panel shall be responsible for drift compensation. When the control panel determines that a sensor is in an alarm or a trouble condition, the control panel shall command the LED on that sensor's base to turn on steady indicating the abnormal condition. Sensors which do not provide a visible indication of an abnormal condition at the sensor location shall not be acceptable. Sensor bases shall be compatible with detachable photoelectric, ionization and heat sensors so that these various sensor types can be easily interchanged to meet specific location requirements. Sensor base shall be addressable type as required.
- E. Where required, sensor bases shall be provided with a relay driver output and supervised relay, which are to be controlled either automatically or manually from the control panel.
- F. Each sensor base shall be scanned by the control panel for its type identification to prevent inadvertent substitution of the wrong sensor type. The control panel shall operate with the installed device but shall initiate a "Wrong Device" trouble condition until the proper type is installed or the programmed sensor type is changed.
- G. Each sensor shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.
- H. The sensor's electronics shall be immune from false alarms caused by EMI and RFI.
- I. Cover all smoke detection devices with plastic bags immediately after installation to maintain cleanliness, if field conditions so require.
- J. Provide a U.L. listed sensor guard for sensors in areas subject to tampering. The guard shall be suitable for ceiling or sidewall mounting and hinged for easy access. The guard shall be securely mounted with tamper-proof screws.

2.4 PHOTOELECTRIC DUCT DETECTOR

- A. The detector shall be an addressable, non-polarized 24VDC type, which is compatible with the Fire Alarm Control Panel and obtains its operating power from the supervisory current in the fire alarm detection loop. It shall be of the same analog type as the ceiling smoke detectors. Detectors shall be of the solid state photoelectric type and shall operate on the light scattering, photodiode principle. To minimize nuisance alarms, detectors shall have an insect screen and be designed to ignore invisible airborne particles or smoke densities that are below the factory set alarm point. No radioactive

material shall be used.

- B. The detector head shall be directly interchangeable with an ionization detector type. The 24VDC detector may be reset by actuating the control panel reset switch.
- C. Detector construction shall have a mounting base with a twist-lock detecting head that is lockable. The locking feature must be field removable when not required. Contract between the base and head shall be of the bifurcated type utilizing spring type, self-wiping contacts. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control panel.
- D. Sampling tubes sized to match duct size as recommended by equipment manufacturer shall be provided with duct detectors as required.
- E. Detector design shall provide compatibility with other normally open fire alarm detection loop devices (heat detectors, pull stations, etc.). It shall be possible to alarm the duct housing by using a test switch. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housings front cover.
- F. To minimize false alarms, voltage and RF transient suppression techniques shall be employed as-well-as smoke signal verification circuit and an insect screen.
- G. Separate auxiliary SPDT relays for fan shutdown shall be provided with each duct detector for fan shutdown, smoke evacuation or other purposes as indicated on plans.
- H. Remote key operated test stations with LED alarm indicators shall be installed in an accessible, inconspicuous location for each duct detector.
- I. Duct detectors shall be installed for the equipment as indicated on plans as follows (locations shown on plans are diagrammatical only):
 - 1. A minimum of six duct widths downstream from bends or inlets to avoid air turbulence.
 - 2. On the downstream side of filters to detect fires in the filters.
 - 3. In return ducts, ahead of mixing areas.
 - 4. Upstream of air humidifier and cooling coil.
 - 5. With accessibility for test and service.
- J. The following duct detector locations shall be avoided:
 - 1. Where dampers closed for comfort control would interfere with airflow.
 - 2. Next to outside air inlets (unless the intent is to monitor smoke entry from that area).
 - 3. In return air damper branch ducts and mixing areas where airflow may be restricted.
- K. Where duct detectors are installed in exterior or wet locations, weatherproof duct housing enclosures shall be provided to protect the detectors. Enclosures shall be located to be in shaded areas rather than direct sunlight. Entire installation shall be as directed by the equipment manufacturer.

2.5 HEAT SENSORS

- A. Heat sensors shall be U.L. listed, addressable type. They shall provide rate-of-rise temperature sensing, fixed temperature sensing (135 degrees F) and utility temperature sensing (32 degrees F to 155 degrees F range).
- B. Each sensor base shall be visually and electrically supervised.
- C. The sensors shall be listed to UL Standard 268 and shall be documented compatible with the control equipment to which they are connected. The sensors shall be listed for both ceiling and wall mount applications.
- D. Each sensor base shall contain integral addressable electronics and an LED that will flash each time it is scanned by the control panel (once every 4 seconds). The control panel shall be responsible for drift compensation. When the control panel determines that a sensor is in an alarm or a trouble condition, the control panel shall command the LED on that sensor's base to turn on steady indicating the abnormal condition. Sensors which do not provide a visible indication of an abnormal condition at the sensor location shall not be acceptable. Sensor bases shall be compatible with detachable photoelectric, ionization and heat sensors so that these various sensor types can be easily interchanged to meet specific location requirements. Sensor base shall be addressable type as required.
- E. Where required, sensor bases shall be provided with a relay driver output and supervised relay, which are to be controlled either automatically or manually from the control panel.
- F. Each sensor base shall be scanned by the control panel for its type identification to prevent inadvertent substitution of the wrong sensor type. The control panel shall operate with the installed device but shall initiate a "Wrong Device" trouble condition until the proper type is installed or the programmed sensor type is changed.
- G. Each sensor shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.
- H. The sensor's electronics shall be immune from false alarms caused by EMI and RFI.
- I. Heat sensor shall be automatically restorable.

2.6 MAGNETIC DOOR HOLDERS

- A. Provide magnetic door holders as required where shown on plans.

2.7 ALARM SIGNALS (AUDIBLE)

- A. Speakers:
 - 1. The speakers shall be polarized and shall be operated by 25VRMS. Each speaker assembly shall include separate wire leads for in/out wiring for each leg of the

associated signal circuit. T-tapping of signal device conductors to signal circuit conductors shall NOT be accepted. Where speakers are shown as a combination audible-visual assembly, they shall be mounted as a combination unit in a single back box. Speakers shall be capable of producing 88dB and shall be tapped for 2 watt connection.

- B. Devices required to be surface mounted shall be furnished with surface mounting box and adaptor plate.
- C. Devices installed in areas subject to mechanical damage (ie. gymnasiums) shall be furnished with suitable wire guards as indicated on plans.

2.8 ALARM SIGNALS (VISUALS)

- A. Visual Flashing Lamps (Xenon Strobe):
 - 1. Furnish and install per plans and specs visible appliance for fire alarm system notification. The appliance shall be 1HZ synchronized (15cd, 30cd, 110cd) with polar distribution or 75 cd illumination as required by the Americans with Disabilities Act (ADA). The appliance shall be U.L. listed to Standard 1971 and have a circumpolar light output allowing mounting in either vertical or horizontal positions or on the ceiling.
 - 2. The light unit shall be of ABS polycarbonate and the lens of high grade, optical quality LEXAN. For optimized light distribution, the xenon flash tube shall be installed perpendicular to the appliance's back plane. A special compound reflector shall be utilized to maximize and best distribute the light pattern in key axis directions.
 - 3. The effect of the illuminated visible appliance shall be observable in a circumpolar pattern. The visible appliance shall be labeled with the word "FIRE" in a contrasting color and the height of each character shall be a minimum of 5/8 inches. In its quiescent state, the word "FIRE" shall be visible.
 - 4. Mounting heights of visual appliances shall in all respects comply with the Americans with Disabilities Act.
 - 5. Visual indicating appliances shall be comprised of a Xenon flashtube and be entirely solid state. These devices shall be U.L. listed and be capable of either ceiling or wall mounting. The LEXAN lens shall be pyramidal in shape to allow better visibility. Visual units shall be of the stand alone type.

2.9 REMOTE MICROPHONE/ANNUNCIATOR

- A. Where shown on the plans, provide and install an LCD annunciator. The annunciator(s) shall have a stainless steel finish and shall provide the same functionality as the main control panel front panel display. The annunciator shall communicate to the control panel over one twisted shielded pair of wire and operating power shall be 24VDC and be fused at the control panel. Point-wired annunciators will not be considered as equal.
- B. The serial annunciator shall provide a common alarm and trouble circuit consisting of:

1. Control push-button switches – for alarm silence, trouble silence, system reset and manual evacuation duplicating the control panel switches. A key “enable” switch shall be provided to activate or deactivate the control switches.
 2. Tone Alert – Duplicates the control panel tone alert during alarm and trouble conditions.
 3. System trouble LED.
 4. Power on LED.
- C. To accommodate and facilitate job site changes the control switches shall have the capability to be programmed on site to provide for manual switch input operation other than their standard purpose.

2.10 SPRINKLER FLOW SWITCHES

- A. Sprinkler flow switches and supervisory switches are provided under another section of these specifications. This contractor shall be responsible for electrical connection of these devices to the fire alarm system.

2.11 SMOKE DAMPERS

- A. Smoke dampers are provided under another section. This contractor shall be responsible for supplying a source of power and connecting them to the fire alarm system to close on alarm.

2.12 SYSTEM RECORD DOCUMENT CABINET

- A. Furnish and install a documentation cabinet at the system control unit or other approved location. All final record documentation shall be stored in the cabinet. Cabinet shall be labeled as “SYSTEM RECORD DOCUMENTS”. Cabinet shall include a 4 gigabyte digital flash drive interface with USB connector loaded with a digital copy of all system documentation including shop drawings and product data.

2.13 OFF SITE MONITORING

- A. Furnish all material and labor to accomplish and coordinate with local company or fire department as necessary for off site monitoring of the Fire Alarm System. Transmission method(s) shall be as required by applicable codes and Authority Having Jurisdiction (AHJ). Off site monitoring shall be in operation prior to final acceptance. Exact type of off site monitoring (basic reporting or advanced reporting as described below) shall be provided by the contractor per the owner’s direction.
- B. Furnish and install serial digital alarm communicating transmitter (DACT), capable of reporting specific alarm points to the central station. DACT shall be universal in that it can be utilized to either provide basic reporting (alarm, trouble, supervisory conditions) or more advanced reporting (point-to-point reporting of specific alarm conditions) DACT shall be mounted integral to or beside fire alarm control panel.

2.14 FIRE ALARM CABLING

1. All fire alarm cabling shall:

- a. Have red outer insulation/jacket with ripcord.
- b. Be listed and labeled for the intended use in Fire Alarm systems.
- c. Where Level 2 or Level 3 pathway survivability is required by NFPA 72, cabling shall be 2-hour fire rated circuit integrity (CI) type.
- d. Be manufactured by West Penn, Allied, Belden or Superior Essex.

2.15 FIRE ALARM SYSTEM MANUFACTURER

- A. All equipment shall be listed by UL. All panels and peripheral devices shall be the standard equipment of a single manufacturer and shall display the manufacturer's name on each component. Manufacturer's numbers specified in this section are those of Simplex Time Recorder Company to denote type, quality, material and desired operating features to be furnished.
- B. All new equipment shall be compatible, listed, and tested for use with the existing system in accordance with NFPA 72. The manufacturer of the existing control panel is Edwards EST3X.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide and install the system in accordance with the plans and specifications, all applicable codes and the manufacturer's recommendations.
- B. The contractor shall provide 120VAC power to all remote booster power supplies, control panels, transponder cabinets or other similar items as required. Where the project is provided with emergency power from an emergency generator, all power supplies shall be connected to an emergency source. Dedicated branch circuit(s) shall be provided to supply primary power to the fire alarm system. The associated branch circuit breakers shall be furnished with lock-on hardware and shall be identified with red marking as a fire alarm circuit. The location of the circuit disconnecting means shall be permanently identified at the fire alarm control unit.
- C. All wiring shall be installed in strict compliance with all the provisions of NEC - Article 760 Parts I and III, Power-Limited Fire Protective Signaling Circuits or if required may be reclassified as non-power limited and wired in accordance with NEC-Article 760 Parts I and II.
- D. All wiring shall be installed in strict compliance with pathway survivability requirements of applicable codes including NFPA 72.
- E. Upon completion, the contractor shall so certify in writing to the owner and general contractor.
- F. Front surface of all junction box covers in concealed areas (such as above lay-in ceilings) or within mechanical/electrical rooms (and other similar areas where appearance of

boxes is not an issue) shall be sprayed red and labeled "Fire Alarm" or "F/A". Covers in exposed areas shall be labeled "F/A" on interior of front cover. Wiring color code shall be maintained throughout the installation.

- G. All fire alarm wiring shall be installed in conduit. Conduit shall be sized per manufacturer's recommendations, but in no case shall conduit be smaller than 3/4".
- H. Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with the appropriate subcontractors.
- I. All raceways shall be concealed unless specifically shown or approved otherwise.
- J. The contractor shall clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of the installation.
- K. Install System Record Document cabinet adjacent to control panel unless alternate location is approved.
- L. The manufacturer's authorized representative shall provide on-site supervision of installation and shall provide all system setup and programming services.
- M. The manufacturer's authorized representative shall have as a minimum, a NICET LEVEL III certification. The fire alarm contractor shall have a technician with a minimum Nicet Level III certification working in a position of responsibility. All technicians working for the certified contractor shall have a minimum Nicet Level II certification. Any fire alarm contractor wishing to bid on the fire alarm work shall show evidence of certifications at the pre-bid conference.
- N. The fire alarm contractor shall be licensed as a certified fire alarm contractor by the state in which the work is to be performed in compliance with all requirements of state fire marshall or other AHJ's as applicable.
- O. The drawing/specifications included herein are to indicate contract intent only. The Fire Alarm contractor shall provide final design documents to include plans specifying exact device types/locations, circuitry, battery calculations, circuit/voltage drop calculations, etc. in accordance with all applicable code requirements. These final design documents shall be prepared under the supervision of an engineer licensed in the state where the work is to be performed, engaged/employed by the Fire Alarm contractor, and must bear the engineer's licensure seal with signature and date.

3.2 TESTING

- A. The completed fire alarm system shall be fully tested in accordance with NFPA-72H by the contractor in the presence of the owner's representative and the Local Fire Marshal. Upon completion of a successful test, the contractor shall so certify in writing to the owner and general contractor, and shall submit final testing results with O&M documentation..

- B. The contractor shall test and demonstrate proper operation of all smoke detection equipment and associated HVAC controls to the satisfaction of the authority-having-jurisdiction and fire marshal.

3.3 WARRANTY

- A. The contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of one (1) year from the date of the completed and certified test or from the date of first beneficial use.
- B. The equipment manufacturer shall make available to the owner a maintenance contract proposal to provide a minimum of two (2) inspections and tests per year in compliance with NFPA-72H guidelines.

3.4 CERTIFICATION & ACCEPTANCE

- A. A factory trained representative of the manufacturer shall supervise final testing of the system in accordance with N.F.P.A. Standard 72H-1984 in the presence of a representative of the authority having jurisdiction. Manufacturer's representative shall be NICET trained and shall have a level III NICET certificate. It shall be subject to the approval and acceptance of the responsible engineer. On completion of the acceptance tests, the Owner or his representative shall be instructed in the operation and testing of the system.
- B. The fire alarm system shall be free from defects in workmanship and materials, under normal use and service, for a period of one year from the date of acceptance or beneficial occupancy whichever is earlier. Any equipment shown to be defective in workmanship or material shall be repaired, replaced, or adjusted free of charge.
- C. The equipment manufacturer shall be represented by a local service organization, and the name of this organization shall be furnished to the Architect and Owner. The service organization shall be located within 50 miles of the job site. The service organization shall furnish, gratis to the Owner, a one year maintenance warranty contract, effective from the date of final acceptance.

END OF SECTION 28 31 00

SECTION 28 78 00

EMERGENCY RESPONDER COMMUNICATIONS ENHANCEMENT SYSTEM

PART 1 - GENERAL

1.1 INITIAL RADIO SIGNAL SURVEY (INCLUDE IN BASE BID)

- A. Include all costs in base bid for the system vendor to conduct a radio signal survey immediately after building structure is complete, and prior to ceiling installation to determine signal coverage and strength of the municipality's emergency responder radio (public safety) system inside the project facility.
- B. Conduct a survey using a RF Spectrum Analyzer, a calibrated, system-compatible radio or another suitable instrument with traceable certificate of calibration to analyze the RF signal strength. Both inbound and outbound signal strength shall be determined, measured, calculated, and documented as required by code and AHJ. Survey shall be performed by FCC GROL certified technicians. Survey shall include measurements at a minimum of 20 readings per floor or 1,600SF if the floor area exceeds 32,000SF and in all critical areas or as otherwise directed by AHJ.
- C. Survey report and drawing indicating measurements at each frequency band of interest shall be submitted to the AHJ for review. The report shall clearly indicate all areas that do not meet a minimum of -95dBm nominal uplink or downlink signal at 100% or a Delivered Audio Quality (DAQ) of 3.0.
- D. If measured levels determined to be insufficient, a complete Emergency Responder Communications Enhancement System (ERCES) shall be provided in accordance with these specifications below. Cost for the system and installation will be paid through allowance.
- E. Contractor shall be responsible for scheduling survey so that all of the following is completed prior to the installation of ceilings:
 - 1. Conduct initial survey
 - 2. Submit survey results and report to the AHJ for review and determination of system requirements
 - 3. Provide system design and submit shop drawings to architect and AHJ for review

1.2 SCOPE (SEE ALLOWANCES)

- A. The contractor shall design, furnish, install, and warranty a complete Emergency Responder Communications Enhancement System (ERCES). The installed system shall include all hardware, bi-directional amplifiers, band-pass filters, surge suppressors, lightning protection, UPS, transmission lines, power cabling, antennas, and other components necessary for a complete operational system as specified and as acceptable to the local authorities having jurisdiction.

- B. Equipment manufacturer name and model numbers specified are provided to establish quality of equipment and system operational features. Any proposed substitution of equipment from that specified must be approved by the Architect within ten (10) days prior to bid date.
- C. The entire system shall be guaranteed for a period of one (1) year from the date of final acceptance of the installation and the Contractor shall repair or replace defective equipment, during this period, at no cost to the owner.
- D. Entire system shall be verified and approved by local AHJ to comply with all emergency responder radio network requirements including signal strength and frequency range.

1.3 DEFINITIONS

- A. BDA: Bi-Directional Amplifier is a two-way signal booster that is used to amplify band-selective or multi-band RF signals in the uplink, to the base station and in the downlink from the base station to subscriber devices for enhanced signals and improved coverage.
- B. DAS: Distributed Antenna System is a network of separate antenna nodes connected to a common transport medium.
- C. ERCES: Emergency Responder Communications Enhancement System is a complete in-building radio communication system that brings wireless signals into a structure from outside, amplifies those signals with a signal booster (BDA), and then evenly distributes the amplified signals throughout a structure via a Distributed Antenna System (DAS). The system also amplifies signals originating inside the building and transmits them outside.
- D. Donor Antenna: Antenna that receives and transmits signal to radio system outside of facility.

1.4 STANDARDS

- A. The system shall comply with all requirements of the latest edition of each of the following codes and standards. The latest edition of these codes and standards form a part of this specification:
 - 1. U.L. Standard 2524.
 - 2. International Fire Code Section 510
 - 3. NFPA 1225
 - 4. NFPA 72
 - 5. All requirements of local Fire Department, Building Department and all other authorities having jurisdiction (AHJ)

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: For headend and distribution system. Include plans, elevations, sections, details and attachments to other work.
 - 1. Show fabrication and installation details for equipment.
 - 2. Functional Block Diagram: Show single-line interconnections between components for headend and distribution system. Show cable types and sizes.
 - 3. Dimensioned Plan and Elevations of Headend Equipment: Show access and workspace requirements.
 - 4. Wiring Diagrams: For power, signal, and control wiring and transmission cable, include cross connects, taps, and other connections cords.
- C. Design Calculations: Calculate signal attenuation budget and show calculated line and equipment losses for the system based on the functional block diagram, to show that proposed system layout can be expected to perform up to specification. Calculate signal strength from sources to endpoints. Allowable losses between components and user interface shall be used to determine size and type of cable.
- D. Coordination Drawings: Include dimensioned plan and elevation views of components and enclosures. Show access and workspace requirements.
- E. Equipment List: Include each piece of equipment and include model number, manufacturer, serial number, location, and date of original installation. Insert testing record of each piece of adjustable equipment, listing name of person testing, date of test, and description of as-left set points.
- F. Field quality-control reports.
- G. Operation and Maintenance Data: For headend and distribution system to include in emergency, operation, and maintenance manuals.
- H. Contract shall submit set of all drawings and product data to permitting agencies as required. These final design documents shall be prepared under the supervision of an engineer licensed in the state where the work is to be performed, engaged/employed by the system vendor, and must bear the engineer's licensure seal with signature and date.
- I. Any permits necessary for the installation of the work shall be obtained prior to the commencement of the work. All permit costs and inspection fees shall be included.
- J.

PART 2 - PRODUCTS

2.1 RADIO FREQUENCY (RF) BDA-BASED SIGNAL BOOSTER SYSTEMS

- A. In-building signal booster systems shall receive and re-transmit the entire uplink/downlink frequency band utilized by the regional emergency service provider(s). The contractor shall confirm with the regional emergency service provider(s) as to the

specific frequencies used by the various agencies. This system shall be state-of-the-art, operating bi-directionally and in full duplex. The system shall be fully compatible with and function on Locality's Public Safety Radio System.

- B. BDA shall be capable of providing in building coverage for all the cellular networks as identified by the owner.
- C. Signal boosters (BDA)
 - 1. Shall have NEMA Type 4 enclosure
 - 2. Shall be UL2524 listed
 - 3. Shall be FCC certification.
 - 4. Provide standby battery system capable of maintaining the system operational for a minimum of 12 hours or 2 hours if supplied by emergency generator circuit. Batteries system shall be completely enclosed in NEMA Type 4 enclosure.
 - 5. Signal Boosters shall have oscillation suppression circuitry to protect the public safety radio system in case of system malfunction or other causes. The oscillation suppression circuit shall not disable the system operation. Systems that automatically disable the signal booster upon oscillation detection shall not be allowed
 - 6. Signal Boosters shall have uplink noise suppression function to eliminate uplink noise while in standby (i.e. no radio transmission from within a building).
 - 7. Include relays as required for monitoring system with fire alarm system.
- D. DAS Antennas shall be architectural, dome or flush type where located in public areas. Stick type antennas are acceptable where located in back-of-house spaces. Finish shall be white unless directed otherwise by architect in submittal review.
- E. A dedicated annunciator panel shall be provided next to the fire alarm panel / annunciator or other location as designated by AHJ to annunciate the status of all signal booster locations. The annunciator panel shall provide visual and labeled indication of the following for each signal booster:
 - 1. Normal AC power
 - 2. Loss of normal AC power
 - 3. Battery charger failure
 - 4. Low-battery capacity (i.e., to 70 percent depletion)
 - 5. Signal source malfunction
 - 6. Active RF-emitting device malfunction
 - 7. Active system component malfunction
- F. The communications link between the dedicated annunciator and the Emergency Responder Communications Enhancement System (ERCES) system shall be monitored for integrity.
- G. Completed installations (including cabling) shall comply with all applicable codes and standards, including County Building and Electrical Codes, NFPA, ANSI, NEC, OSHA, EIA,

IEEE, R-56, etc., as well as the FCC Rules and Regulations, as applicable. Equipment provided shall be UL listed and FCC type accepted for this specific application. Compliance to codes and standards shall extend to include proper grounding, bonding and surge.

- H. All cabling shall be plenum rated.

2.2 DESIGN REQUIREMENTS:

- A. The system shall provide digital signal strength coverage over 95% area on each floor/level of the equipped building, or in specific areas defined by Locality in a Scope of Work document for a particular building or site. Critical areas shall have 99% floor area coverage.
- B. Systems shall provide a minimum digital and analog coverage of Circuit Merit (CM) 3 and Delivered Audio Quality (DAQ) 3.0, with a reliability factor of 95%.
- C. Antenna isolation shall be maintained between the donor antenna and all inside antennas (D.A.S.) to a minimum of 20dB under all operating conditions
- D. A Coverage Acceptance Test shall be executed prior to final acceptance of an installed system. Coverage acceptance testing shall be based on audio quality performance in evenly spaced test grids in the defined service areas. A minimum of 20 tests will be taken per floor/level. Total number of test grids will be determined by the Owner, based on the size of the space per floor/level.
- E. Design and appearance will be of "finished" construction, i.e. shall be concealed and/or unobtrusive in finished areas. DAS antennas shall be located in back-of-house areas where possible. If required to be located in visible public areas, antennas shall be architectural, low-profile type and located in corridors where possible. Unless indicated otherwise, wire mold and surface conduit installations will not be acceptable unless approved in writing by the Architect in advance.

2.3 MANUFACTURER

- A. Equipment shall be as manufactured by Simplex, Notifier or EST or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Wiring shall be in strict accordance with the National Electrical Code and all state and local regulations. Wiring shall be installed in accordance with manufacturer's wiring diagrams and shall test free from ground, opens and short circuits.
- B. All connections shall be made under the direct supervision of a qualified technician.

- C. Contractor shall provide dedicated power circuits as required for system operation. Where an emergency distribution system is provided, radio coverage system power shall be connected to the emergency branch.
- D. All vertical riser cabling shall be installed in conduit within a 2-hour fire rated enclosure.
- E. All copper circuits routed between or outside of buildings shall be provided with a surge protection device at each end.
- F. Securely mount donor antenna on roof and aim towards direction of public safety city repeater antenna. All mounting and penetrations shall be coordinated with roofing contractor.
- G. Contractor shall provide all devices and cabling as required to monitor system with building Fire Alarm System in accordance with NFPA 1225 and all other applicable code requirements. At a minimum the fire alarm system shall monitor the following:
 - 1. Signal source malfunction.
 - 2. Active RF-emitting device failure.
 - 3. Low-battery capacity indication when 70 percent of the 12-hour operating capacity has been depleted.
 - 4. Active system component failure.
 - 5. Loss of normal AC power.
 - 6. Failure of battery charger.
 - 7. The communications link between the fire alarm system and Emergency Responder Communications Enhancement System (ERCES) system shall be monitored for integrity.
 - 8. Oscillation of active RF-emitting devices.
- H. Refer to Specification Section 27 05 00 or 270500 (Auxiliary System Cables, 0-50V) for additional installation requirements.
- I. During initial installation, each system shall be optimized to perform in accordance with the specifications set forth in the system design, manufacturer's specifications, and FCC regulations. The contractor shall ensure that uplink and downlink levels are properly set and consistent with design expectations. The contractor shall further ensure that noise and spurious products are held within limits set forth in the system design, manufacturer's specifications, and FCC regulations. Prior to system acceptance, for each active BDA, booster amplifier, etc., the contractor shall submit a Proof of Performance certification, that lists the design expectations, actual measurements, and if applicable, FCC specifications for the following parameters:
 - 1. Worst case BDA uplink input level, in dBm.
 - 2. Worst case BDA uplink output level, in dBm.
 - 3. BDA downlink input level, in dBm.
 - 4. BDA downlink output level, in dBm.
 - 5. Noise and spurious products, BDA uplink output, in dBc.

6. Noise and spurious products, BDA downlink output, in dBc.

- J. The original Proof of Performance report shall be submitted to Owner's project manager, and a copy of the Proof of Performance report shall be affixed to its associated equipment.

3.2 WARRANTY

- A. The contractor shall provide a full one-year warranty to cover installation and all equipment, software, and components; the warranty shall commence upon the Owner's final acceptance of the facility. Under warranty coverage, the successful contractor shall provide same business day response time for system malfunctions.
- B. The contractor shall perform optimization of each system during the initial warranty period, sixty (60) to ninety (90) days prior to warranty expiration. This optimization task is separate from the initial optimization performed during system installation. The contractor shall include pricing for annual system optimization to be included as part of post-warranty maintenance. Actual scope of work for annual optimization and maintenance will vary on a case-by-case basis, but typically will consist of the following:
1. Optimize the system to perform in accordance with the specifications set forth in the system design, manufacturer's specifications, and FCC regulations.
 2. Ensure that uplink and downlink levels are properly set and are consistent with design specifications.
 3. Ensure that noise and spurious products are held within limits set forth in the system design, manufacturer's specifications, and FCC regulations.
- C. Update the Proof of Performance records for the system, listing the design expectations, actual measurements, and if applicable, FCC specifications for the following parameters:
1. Worst case BDA uplink input level, in dBm.
 2. Worst case BDA uplink output level, in dBm.
 3. BDA downlink input level, in dBm.
 4. BDA downlink output level, in dBm.
 5. Noise and spurious products, BDA uplink output, in dBc.
 6. Noise and spurious products, BDA downlink output, in dBc.
- D. The updated Proof of Performance report shall be submitted to the Owner, and a copy of the updated Proof of Performance report shall be affixed to its associated equipment.
- E. Visually inspect outside antenna installation. Correct any issues found with the antenna mounting hardware, grounding system, or outside cabling.
- F. Visually inspect inside BDA or booster amplifier equipment installation. Correct any issues found with RF cabling, electrical connection, or equipment mounting.
- G. Clean equipment fans, filters and other ventilation system components.

- H. Inspect and replace any defective indicator lights.
- I. Test battery system performance for proper fallback to battery power and the duration of battery operation.
- J. Test fault reporting system for proper operation and reporting of system faults.
- K. Submit a written Preventive Maintenance Report to the Owner, listing the results of the optimization and preventive maintenance effort. The report shall include the Proof of Performance report for active RF components, and details of any other discrepancies found and corrective actions taken.
- L. All as-built drawings shall be submitted to the Owner at completion, which shall include antenna system layout and all associated hardware, along with specification sheets. Include RF measurements taken.

END OF SECTION 28 78 00

EXHIBIT A
EQUIPMENT CUT SHEETS

Haas ST-10 CNC Turning Center – Specification Sheet

Machine Type: 2-Axis CNC Lathe / Turning Center
 Spindle: A2-5, 15 hp (11.2 kW), 6,000 rpm
 Chuck Size: 6.5 in (165 mm)
 Bar Capacity: 1.75 in (44 mm)
 Turret: 12-station bolt-on turret

Overall Installed Dimensions

Operating Width: 83 in (2108 mm)
 Operating Depth: 120 in (3048 mm)
 Operating Height: 71 in (1803 mm)
 Recommended Service Clearance: 36 in (914 mm) on all sides

Utility Requirements

Electrical: 220–240 VAC, 3-Phase, 40 A
 Compressed Air: 4 scfm @ 100 psi (minimum 80 psi)

*Specifications based on standard ST-10 configuration; optional equipment may change requirements.
 Source: Haas Automation & published machine specifications.*

LATHE MODEL	
HAAS	ST-10
HAAS AUTOMATION, INC. 2800 STURGIS RD, OXNARD, CA. 93030 www.HAASCNC.com	
SERIAL NUMBER.....	5132468
DATE OF MFG.....	08/2025
VOLTAGE.....	220
PHASE.....	3
HERTZ.....	50/60
FULL LOAD.....	40 AMPS
LARGEST LOAD.....	35 AMPS
SHORT CIRCUIT INTERRUPTING CAPACITY - 10,000 AMPS	
WIRING DIAGRAM.....	96 0284
SHORT CIRCUIT CURRENT - 5,000 AMPS RMS SYMMETRICAL	
ARC FLASH RATING: 208 - 240VAC MODELS HRC-1, 360-480VAC MODELS HRC-2	
NEMA TYPE 2 ENCLOSURE - FOR INDOOR USE ONLY. OVER CURRENT PROTECTION PROVIDED AT MACHINE SUPPLY TERMINALS.	
Export Control Notice - This Machine Is an Export Restricted Product - Diversion Contrary to Law Is Prohibited	
The export, re-export and in-country transfer of this machine are subject to United States Export Administration Regulations and may be subject to other export regulations as applicable, including but not limited to European Union export regulations.	

CNC Machining Equipment Relocation Specifications Sheet

- **Two (2) Haas VF-2 Vertical Machining Centers**
- **Two (2) Haas ST-10 CNC Turning Centers**

Relocation Scope

The Contractor shall disconnect, rig, transport, and reinstall all equipment from:

Current Location:

351 N. Broad Street, Mobile, AL (CAM Tech Facility)

New Location:

**925 Dauphin Island Parkway, Mobile, AL
(Building 100)**

Haas VF-2 Vertical Machining Center – Specification Sheet

Machine Type: 3-Axis Vertical Machining Center
 Spindle: 40-Taper, 30 hp (22.4 kW), 8,100 rpm direct-drive
 Travels (X/Y/Z): 30 x 16 x 20 in (762 x 406 x 508 mm)
 Table Size: 36 x 14 in (914 x 356 mm)
 Tool Changer: 20-station carousel

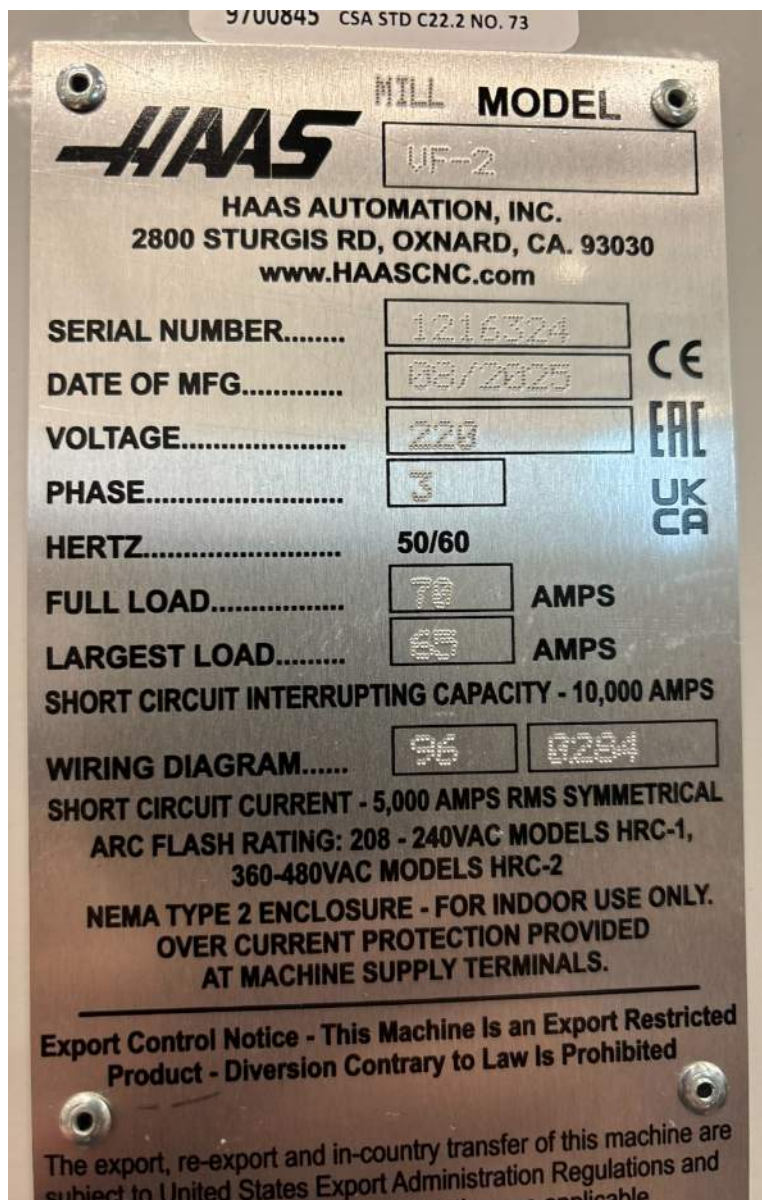
Overall Installed Dimensions

Operating Width: 123.9 in (3147 mm)
 Operating Depth: 88.6 in (2249 mm)
 Operating Height: 107.2 in (2724 mm)
 Recommended Service Clearance: 36 in (914 mm) on all sides

Utility Requirements

Electrical: 220 VAC, 3-Phase, 70 A (optional 440 VAC, 35 A)
 Compressed Air: 4 scfm @ 100 psi (minimum 80 psi)

*Specifications based on standard configuration; optional equipment may change requirements.
 Source: Haas Automation official layout drawings and machine specifications.*



CNC Machining Equipment Relocation Specifications Sheet

- **Two (2) Haas VF-2 Vertical Machining Centers**
- **Two (2) Haas ST-10 CNC Turning Centers**

Relocation Scope

The Contractor shall disconnect, rig, transport, and reinstall all equipment from:

Current Location:

351 N. Broad Street, Mobile, AL (CAM Tech Facility)

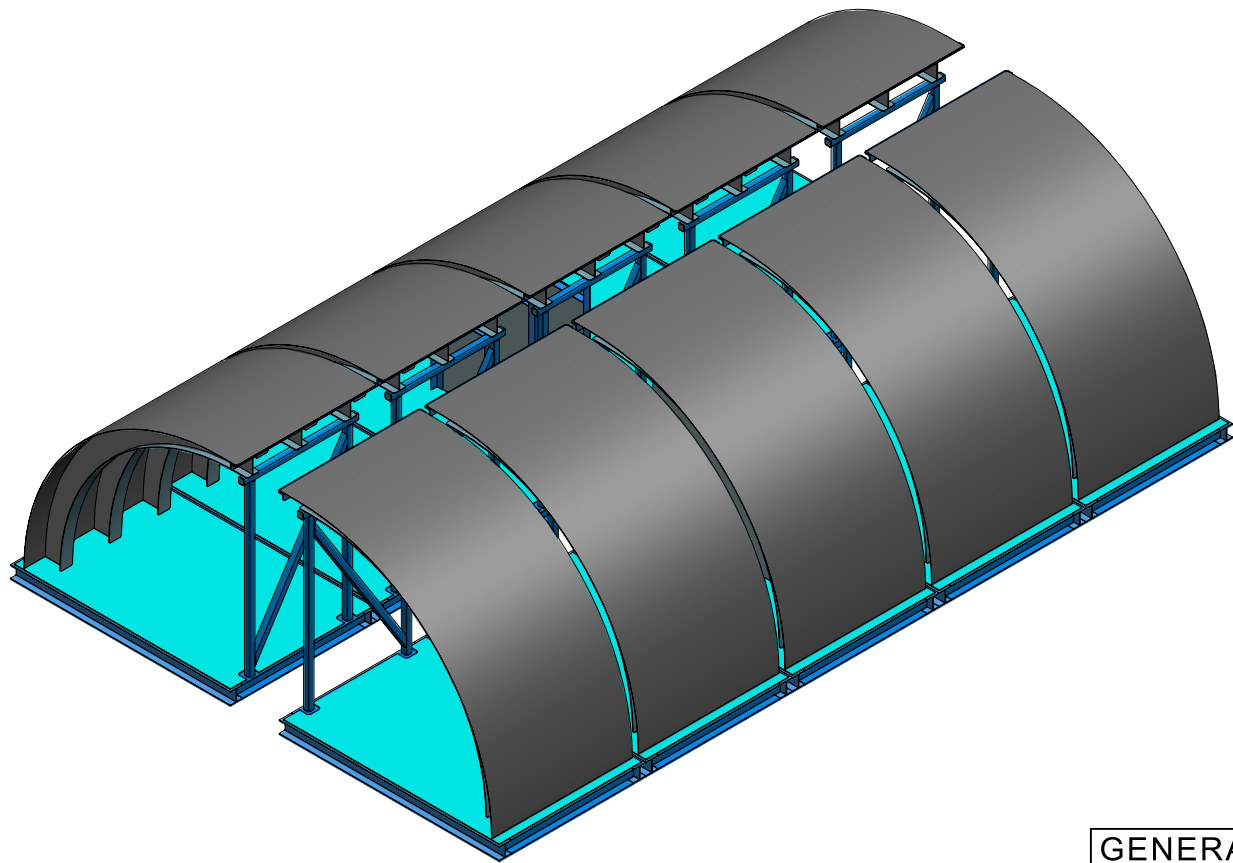
New Location:

**925 Dauphin Island Parkway, Mobile, AL
(Building 100)**

SHEET INDEX	SHT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	REVISIONS			
	REV	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	REV.	DESCRIPTION	DATE	SIGN
	A																A	INITIAL ISSUE		

THE PURPOSE OF THIS PLAN IS TO PROVIDE EB TRAINING WITH
MOCK HULL SECTIONS.

NOTE: THIS DRAWING REPLACES DRAWING "TRNG678910" IN IT'S ENTIRETY.



ISOMETRIC LAYOUT
ITEMS A1 & A2

NO.	TITLE	REV.	DWG. NO.

REFERENCES

GENERAL TOLERANCE UNLESS OTHERWISE SPECIFIED (IN.)						
STRUCTURAL			MACHINING/GENERAL			
DIM.	1 PL.	2 PL	DIM.	1 PL.	2 PL.	3 PL.
0 TO 36	± .1	±.05	0 TO 18	± .1	± .01	± .005
36 TO 120	± .2	±.10	18 TO 36	± .1	± .02	± .010
120 & OVER	± .3	±.20	36 & OVER	± .1	± .03	± .015
MACHINE SURFACES						
125						
SPR NO. N/A			DATE			
CTRL NO. MDLPRT003576636			7/11/16			

OPERATIONS
APPROVED
TECH. CHECK
DESIGNER R. McNIEL / A. BOURCIER
ENGINEER G. MARCHETTI

VIRGINIA

ELECTRIC BOAT CORPORATION

A General Dynamics Company

E

MANUFACTURING
ENGINEERING

QUONSET POINT FACILITY 931

TITLE

MOCK HULL SECTIONS

DWG. NO.

TRNG-1

SCALE

NONE

SHEET

1 OF 15

REV.

A

BILL OF MATERIALS						
ITEM	QTY	NOUN NAME SIZE OR WEIGHT	TYPE	MODIFIER MATERIAL	E.B.P.N.	FILE QTY.
A 1	1	HULL PLATE & FRAMING			–	10 ASSY'S
1	1	SHEET 0.125 THK		A36 MIN. STL	211028511	763 SF
2	3	PLATE 0.250 THK		A36 MIN. STL	218001123	309.5 SF
3	3	PLATE 0.250 THK		A36 MIN. STL	218001123	176 SF
4	1	PLATE 0.250 THK		A36 MIN. STL	218001123	515.5 SF
5	2	TUBE 3.00 x 3.00 x 0.375	SQUARE	A36 MIN. STL	218002191	138 FT
6	1	ANGLE 3.00 X 3.00 X .375		A36 MIN. STL	218021863	58.5 FT
7	2	BEAM W6 X 15#	I-SECT	A36 MIN. STL	218014614	180 FT
8	5	BEAM W6 X 15#	I-SECT	A36 MIN. STL	218014614	274.5 FT
9	1	TUBE 3.00 x 3.00 x 0.375	SQUARE	A36 MIN. STL	218002191	74 FT
10	1	TUBE 3.00 x 3.00 x 0.375	SQUARE	A36 MIN. STL	218002191	47 FT
11	2	PLATE 0.187 THK		A36 MIN. STL	EB218002119	1 SF
A2	2	BHD ASSEMBLY			-	2 ASSY'S
12	1	ANGLE 3.00 X 3.00 X .250		A36 MIN. STL	EB211028923	14.5 FT
13	1	ANGLE 3.00 X 3.00 X .250		A36 MIN. STL	EB211028923	14 FT
14	1	ANGLE 3.00 X 3.00 X .250		A36 MIN. STL	EB211028923	12.5 FT
15	1	ANGLE 3.00 X 3.00 X .250		A36 MIN. STL	EB211028923	8.5 FT
16	1	ANGLE 3.00 X 3.00 X .250		A36 MIN. STL	EB211028923	4.5 FT
17	2	ANGLE 3.00 X 3.00 X .250		A36 MIN. STL	EB211028923	7.5 FT
18	2	ANGLE 3.00 X 3.00 X .250		A36 MIN. STL	EB211028923	9 FT
19	1	SHEET 0.125 THK		A36 MIN. STL	211028511	63.5 SF

GENERAL NOTES

1. DIMENSIONS AND TOLERANCES SHOWN ON THIS DRAWING ARE FOR ASSEMBLY OF TOOLS AND (OR) FIXTURES. FOR SHIPS STRUCTURE AND TOLERANCES SEE REFERENCE DRAWINGS.
2. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.
3. PAINT EXTERIOR OF ASSEMBLY WITH FLAT BLACK ENAMEL.
4. WELD JOINT DESIGNS ARE TYPICAL WHERE MEMBER CONFIGURATIONS, MATERIAL AND MATERIAL SIZES ARE SIMILAR.
5. SIMILAR MATERIAL OF EQUAL OR GREATER STRENGTH MAY BE SUBSTITUTED PROVIDED DIMENSIONS ARE NOT CHANGED.
6. ENSURE THAT ALL BURRS AND SHARP EDGES ARE REMOVED.
7. IN AREA SHOWN, PAINT IN LARGE WHITE LETTERING "DWG NO TRNG-1".
8. TO FACILITATE HANDLING, FABRICATOR OR END-USER MAY INSTALL INTEGRAL LIFT ATTACHMENTS WITH THE APPROVAL OF A PROFESSIONAL ENGINEER.
9. MAXIMUM LOAD ON ONE FRAME W/ LOADS CENTER ON WEB. (FIG. 1)
1500 lb DISTRIBUTED ACROSS ENTIRE FRAME.
500 lb CONCENTRATED AT ANY POINT.

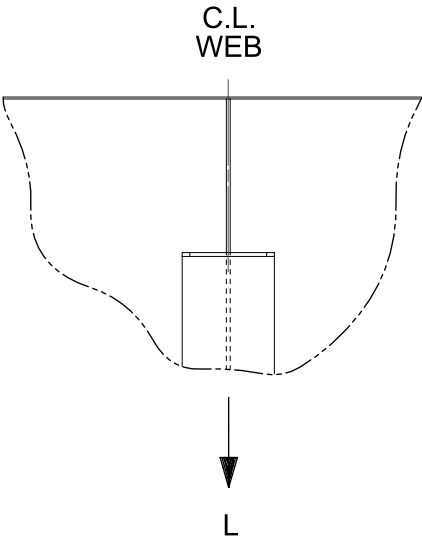
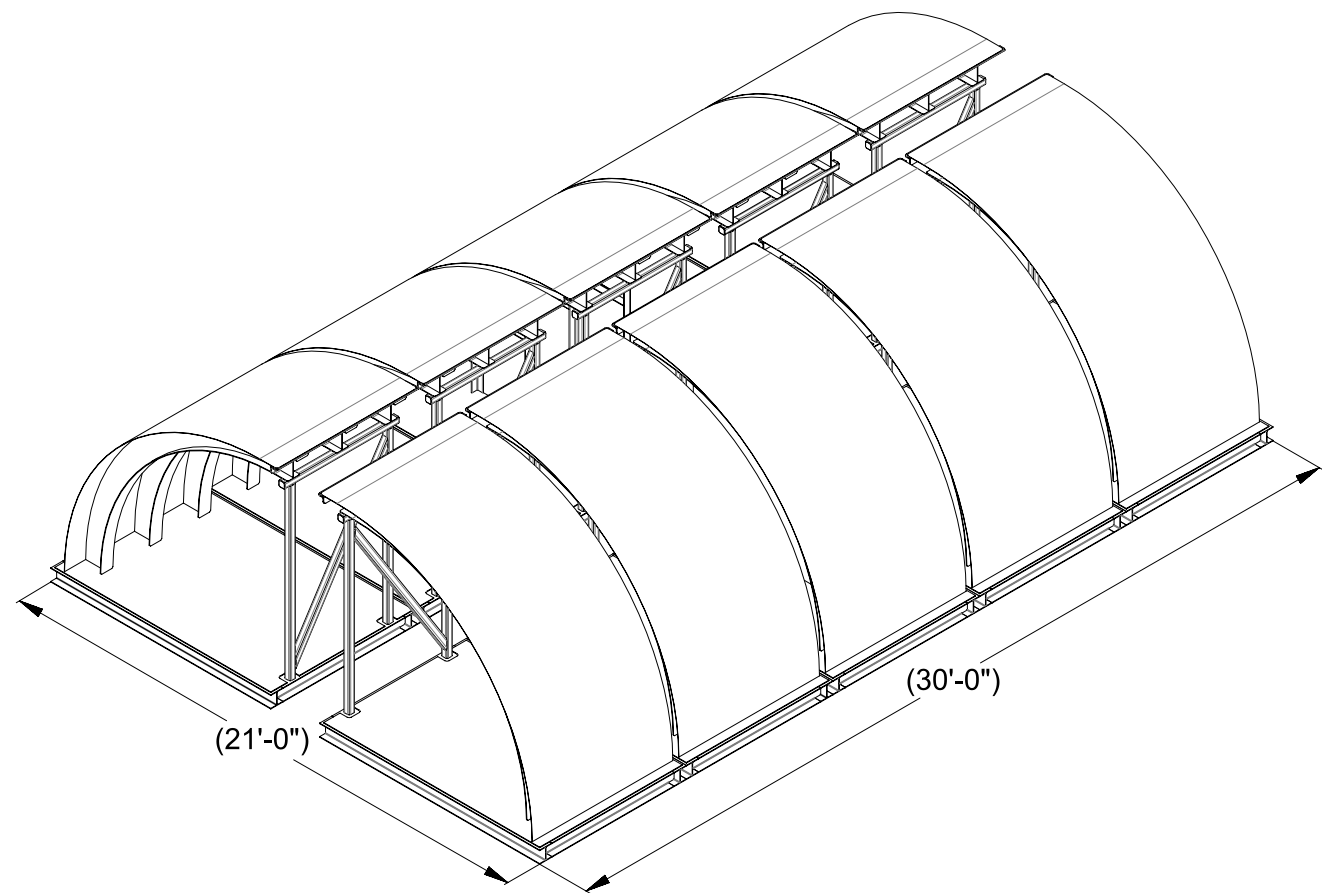
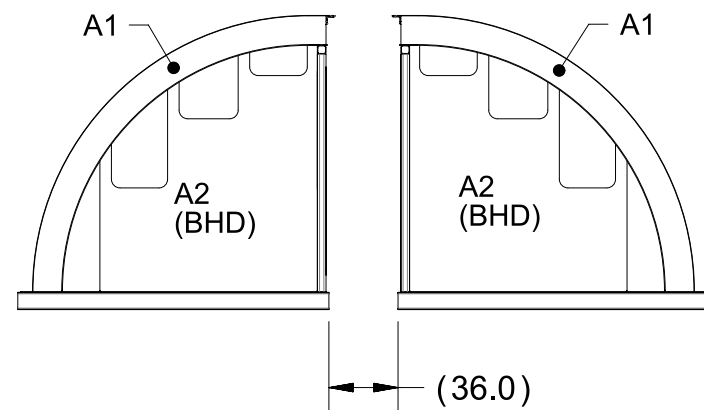


FIG. 1

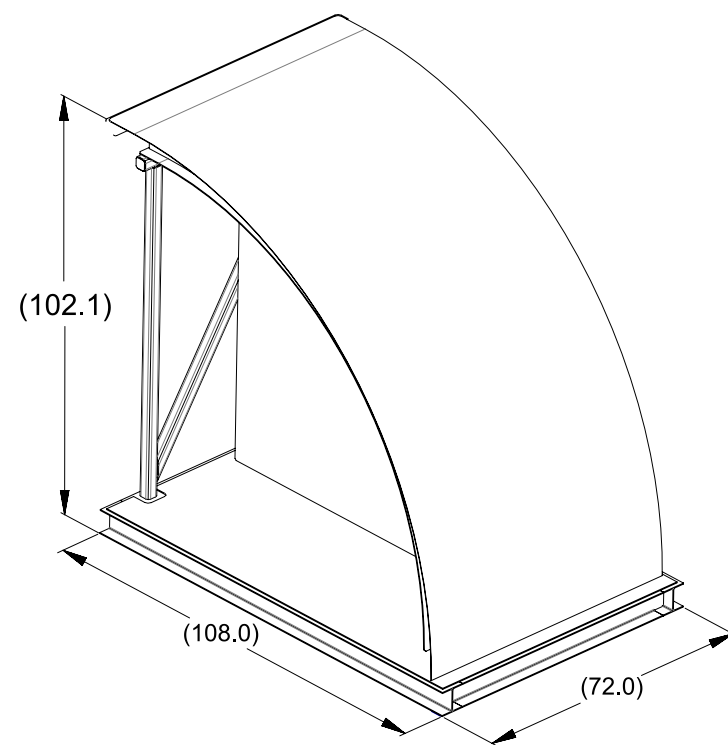
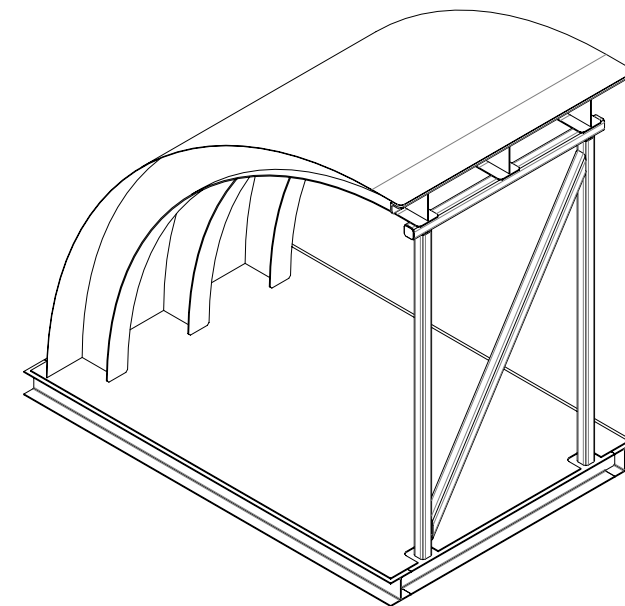
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MOCK HULL SECTIONS			
DWG. NO.	SCALE	SHEET	REV.
TRNG-1	NONE	2	A



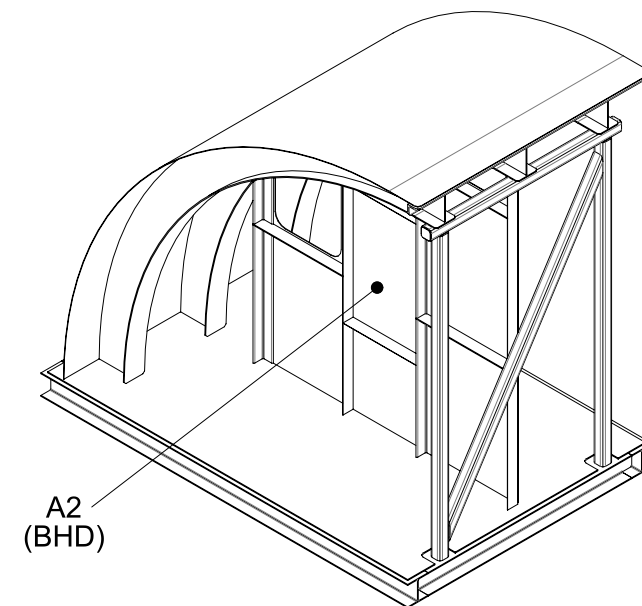
**ISOMETRIC LAYOUT
ITEMS A1 & A2**



(1 PC REQUIRED)

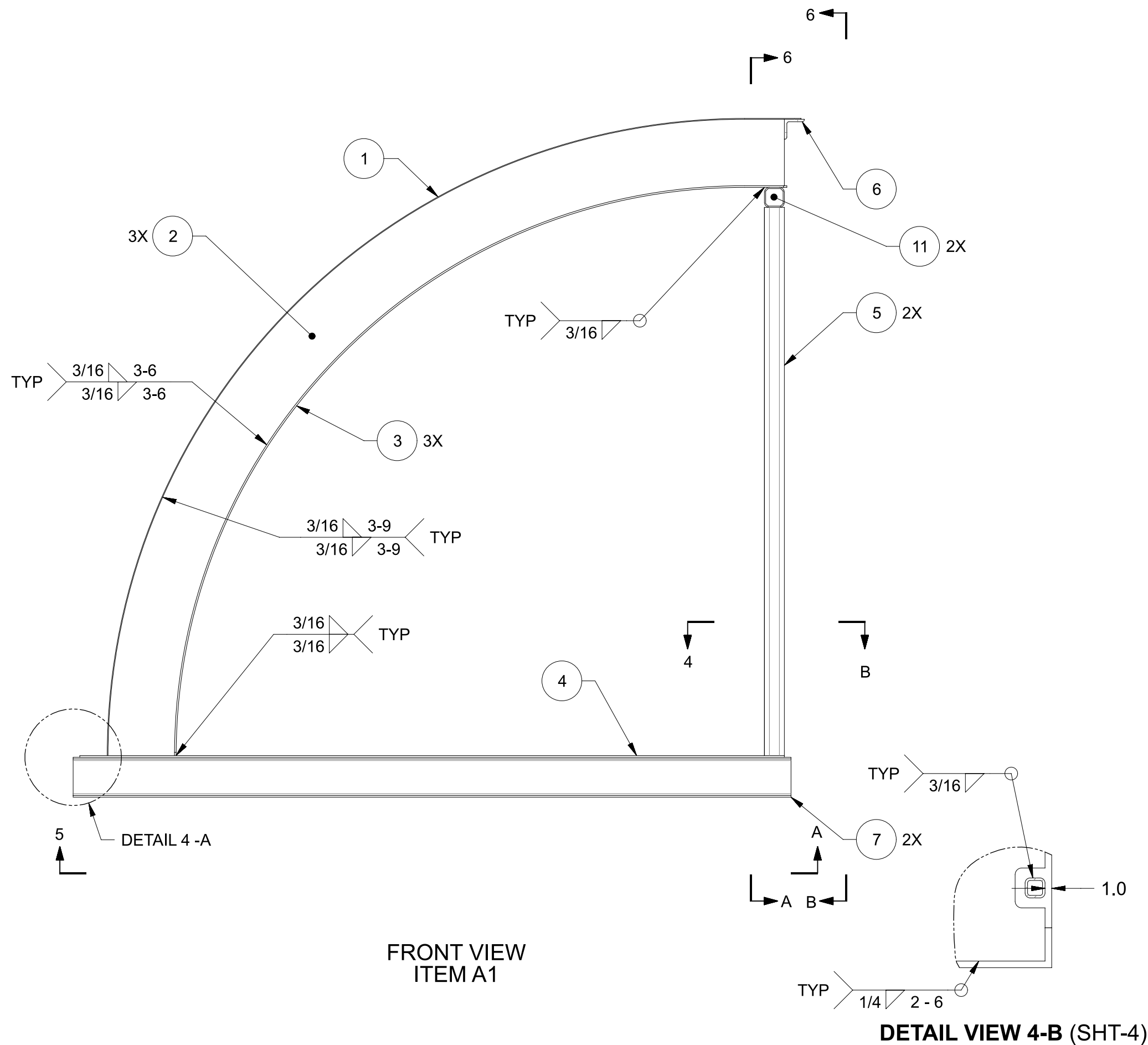
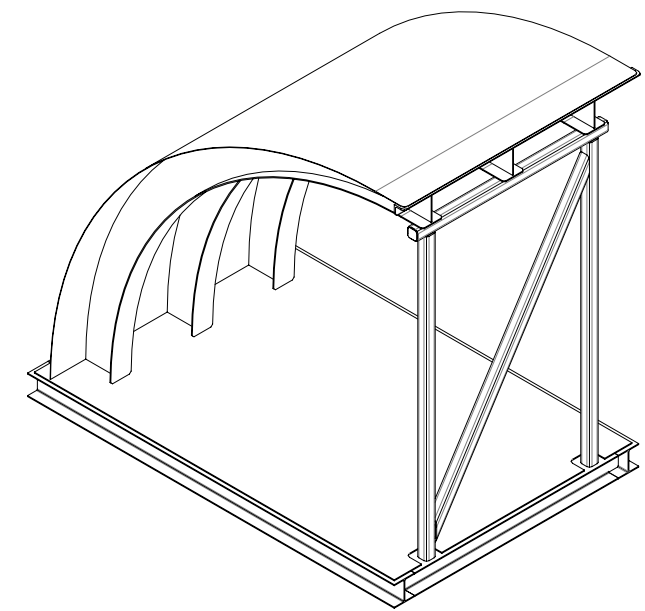


**ISOMETRIC ITEM A1
(10 PCS REQUIRED)**

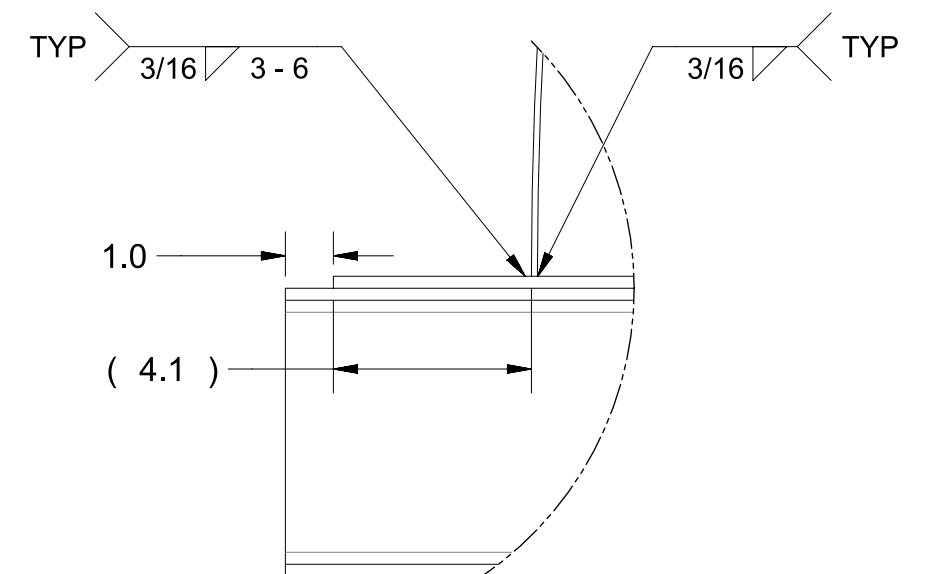


**ISOMETRIC ITEMS A1 & A2
(2 PCS REQUIRED)**

TITLE			
MOCK HULL SECTIONS			
DWG. NO.	SCALE	SHEET	REV.
TRNG-1	NONE	3	A

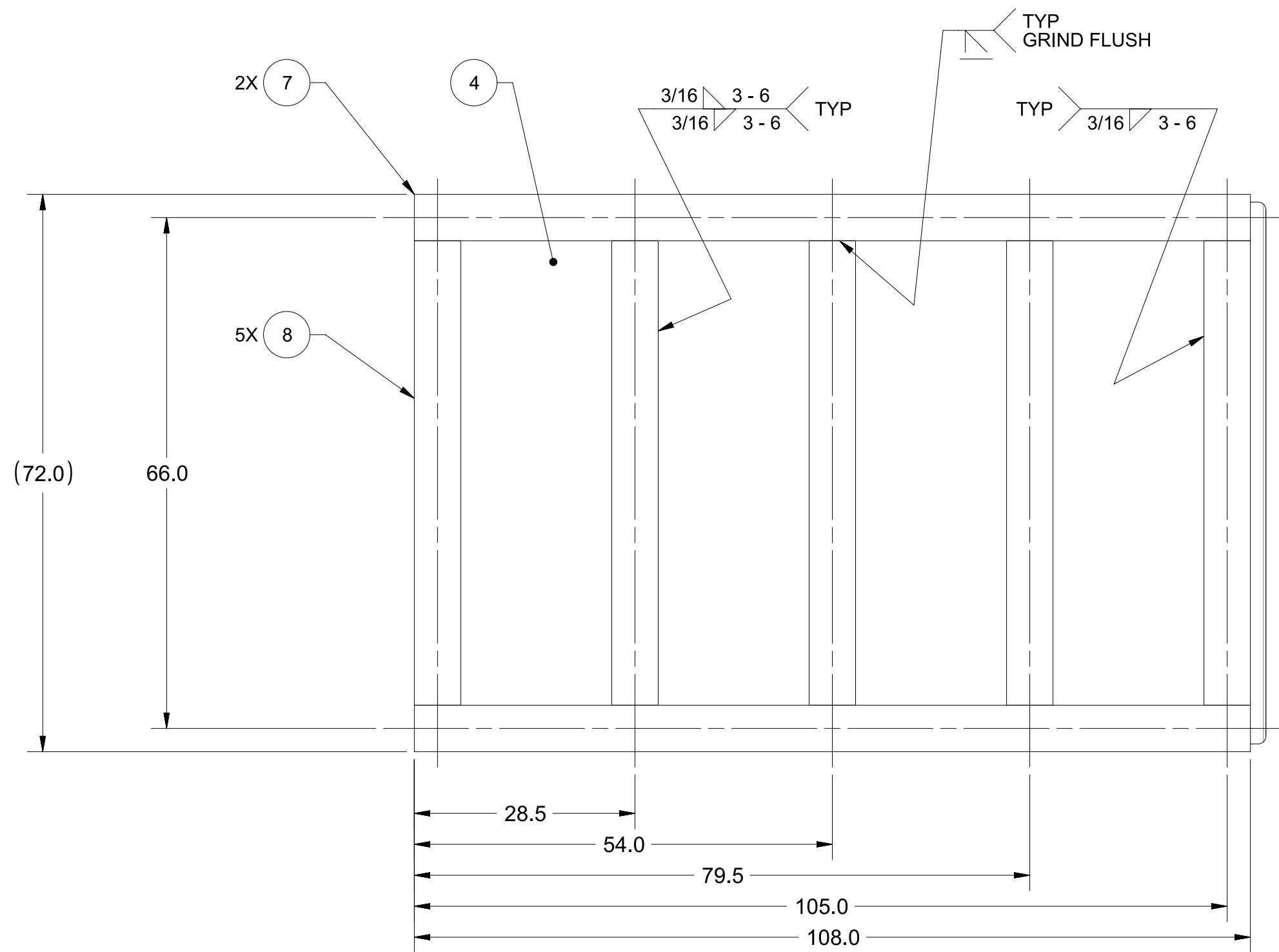


ISOMETRIC VIEW
ITEM A1



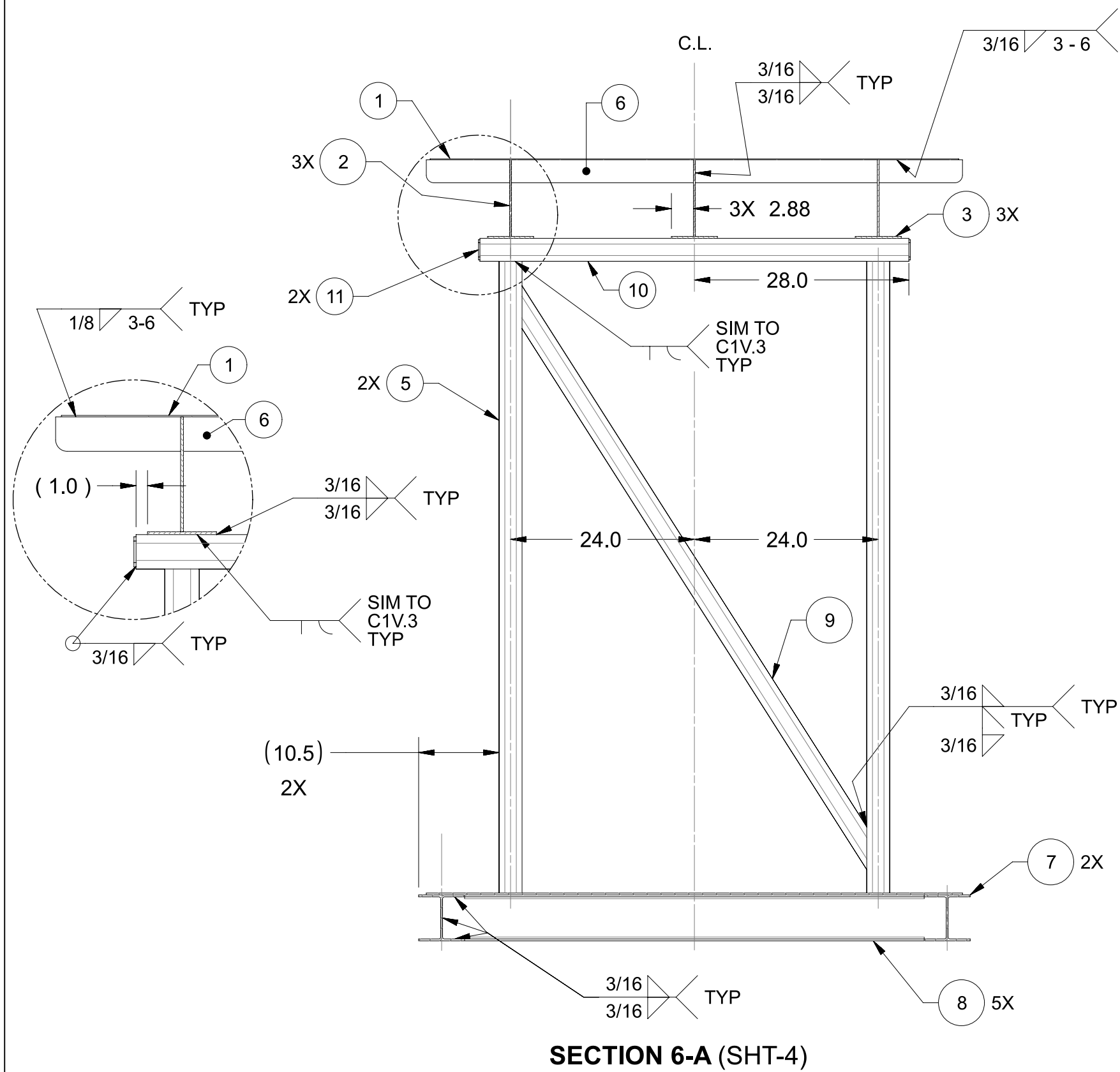
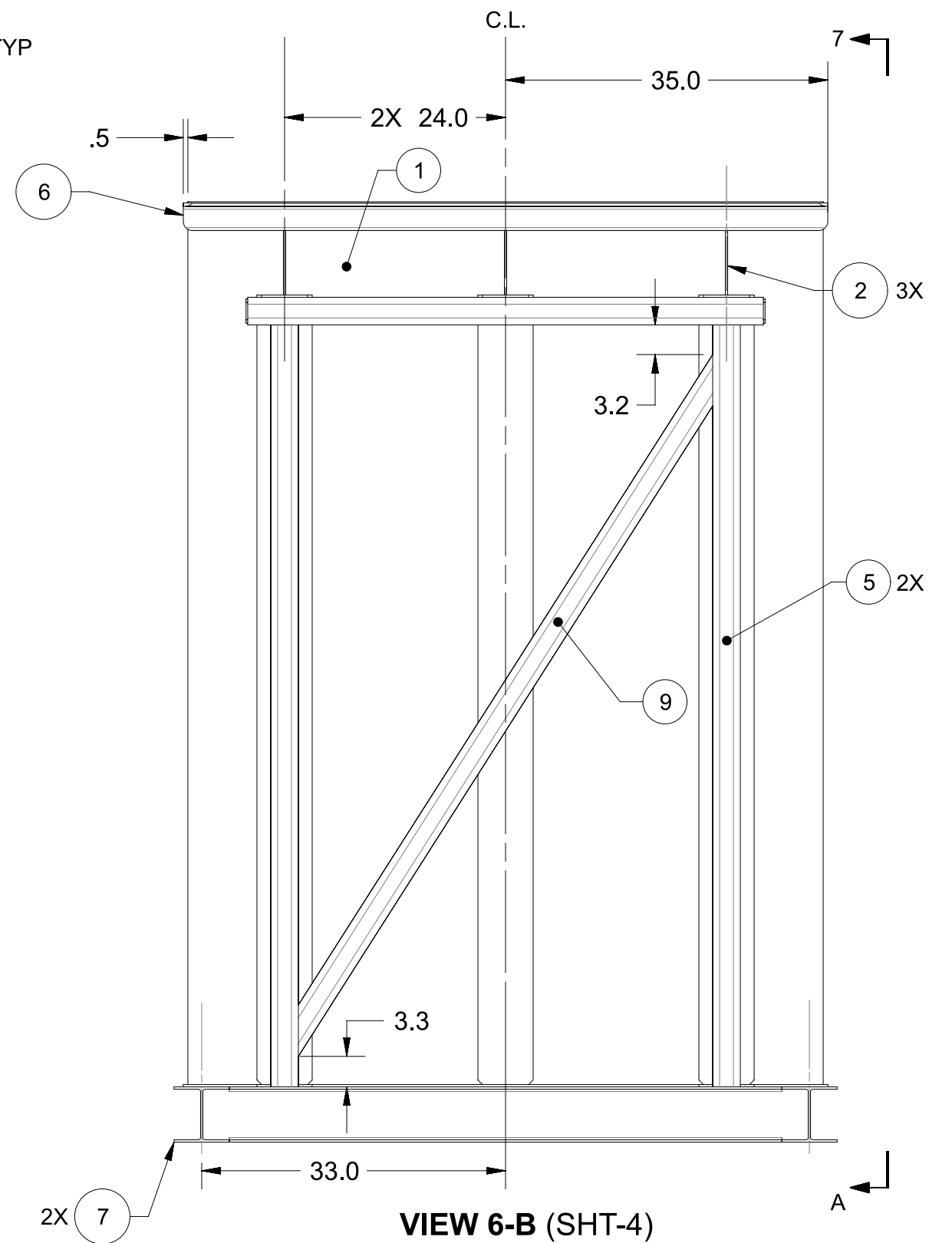
DETAIL VIEW 4-A (SHT-4)

TITLE			
MOCK HULL SECTIONS			
DWG. NO.	SCALE	SHEET	REV.
TRNG-1	NONE	4	A

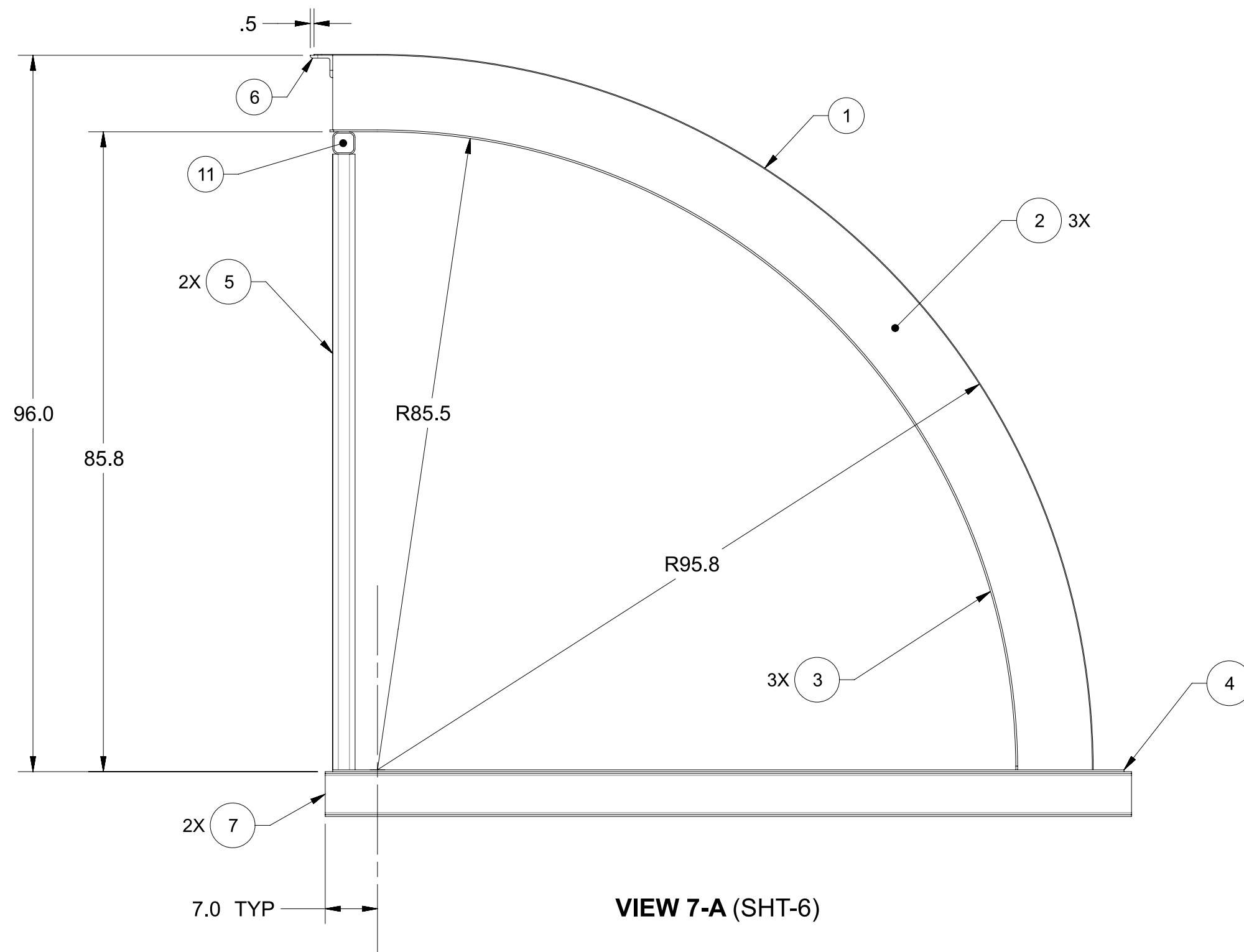


VIEW 5-A (SHT-4)

TITLE			
MOCK HULL SECTIONS			
DWG. NO.	SCALE	SHEET	REV.
TRNG-1	NONE	5	A

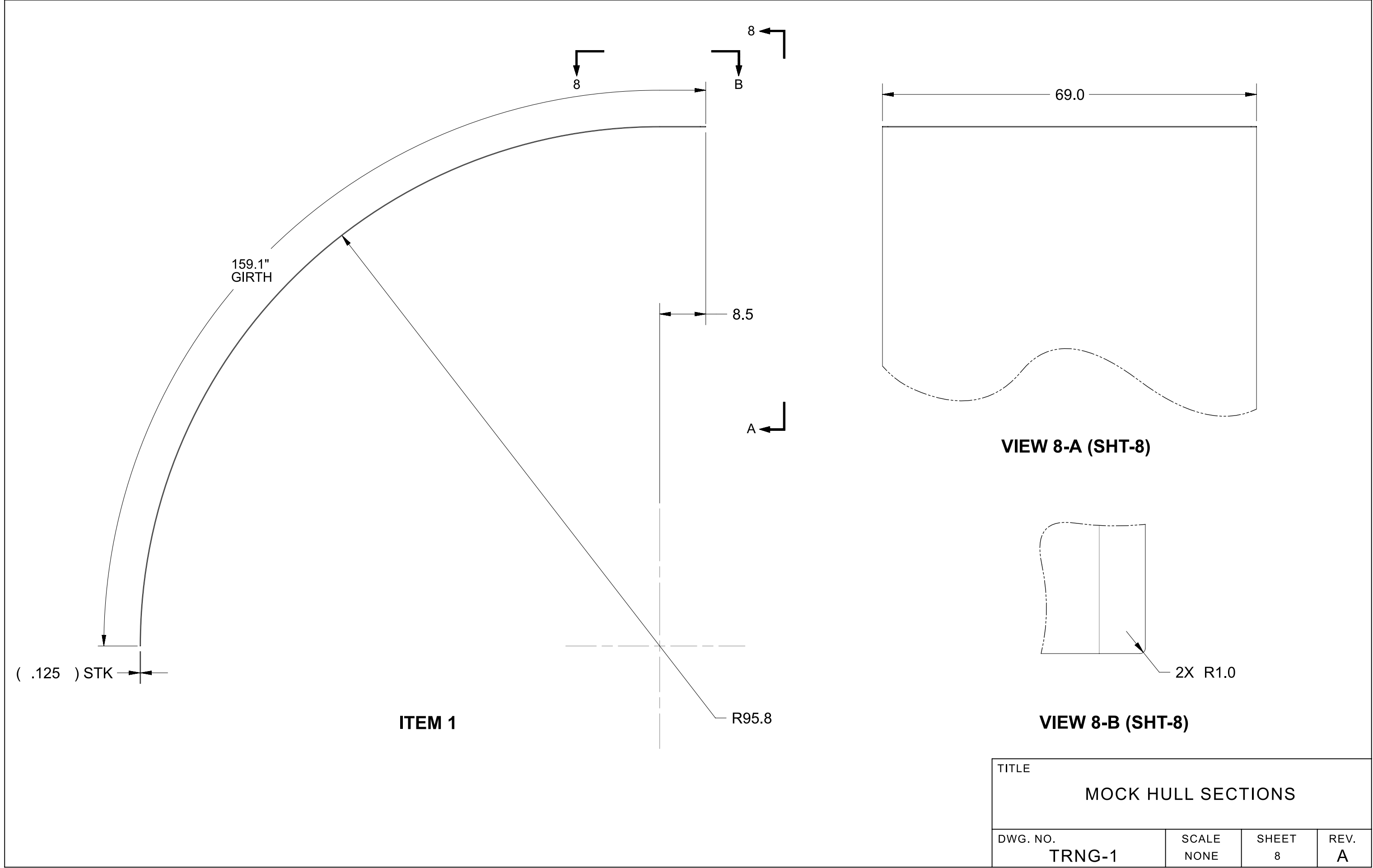


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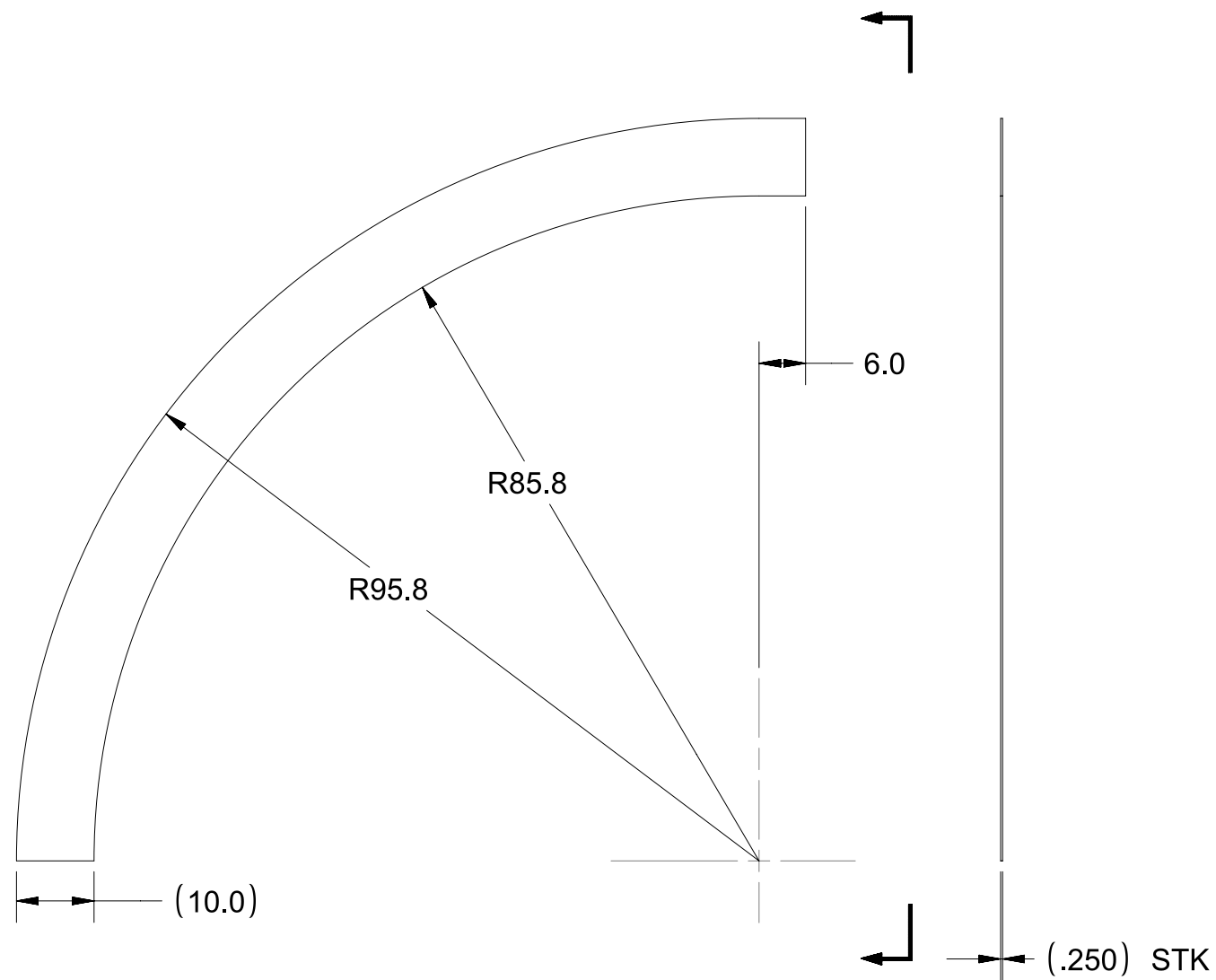
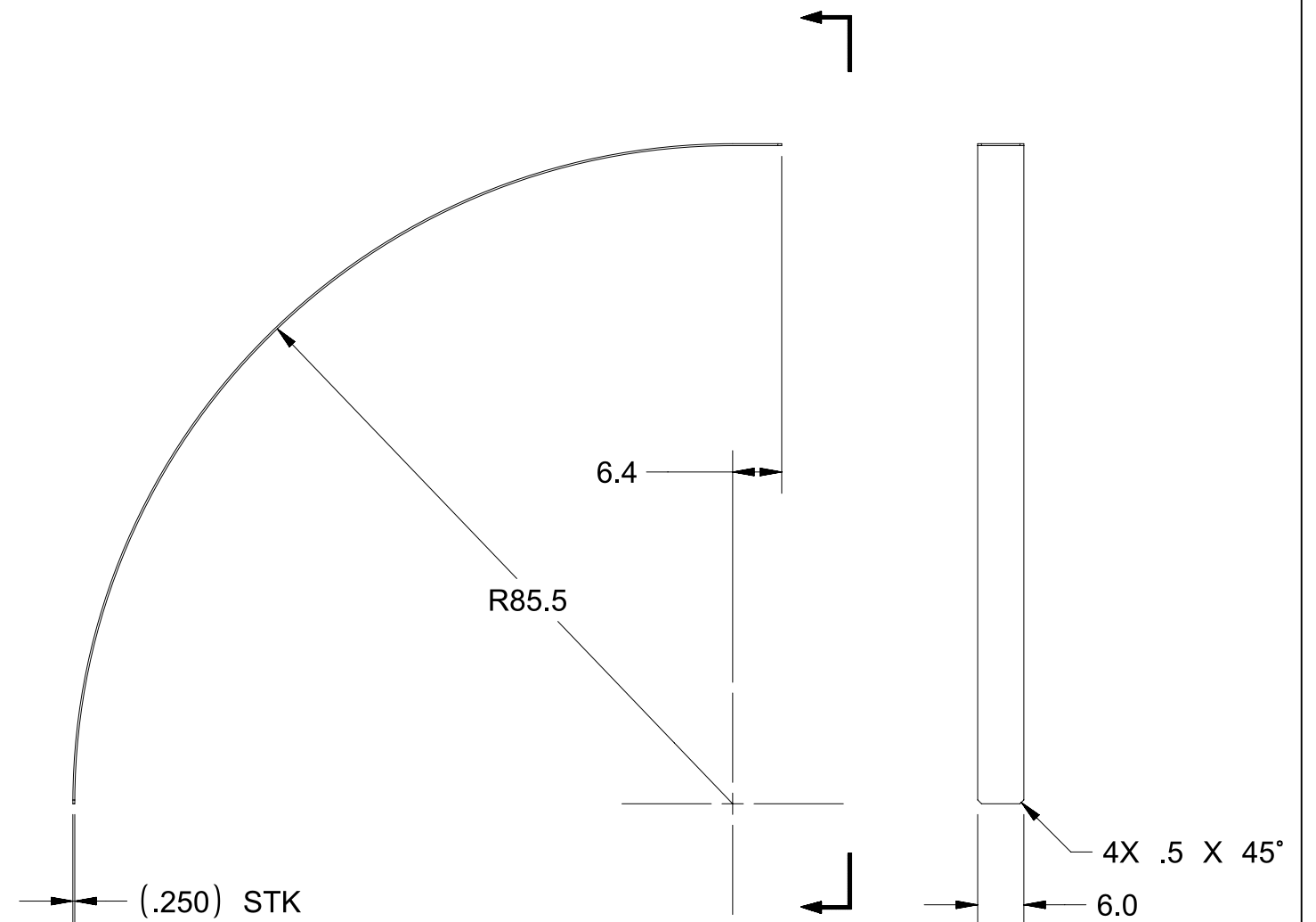
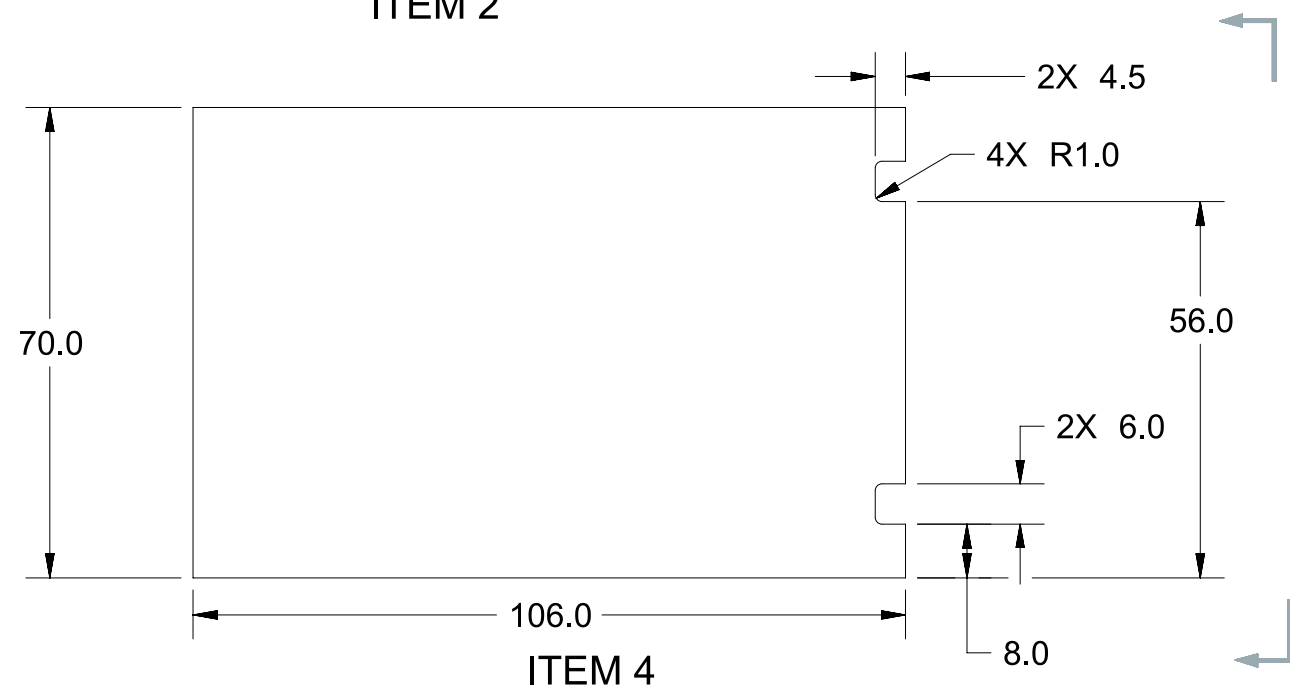
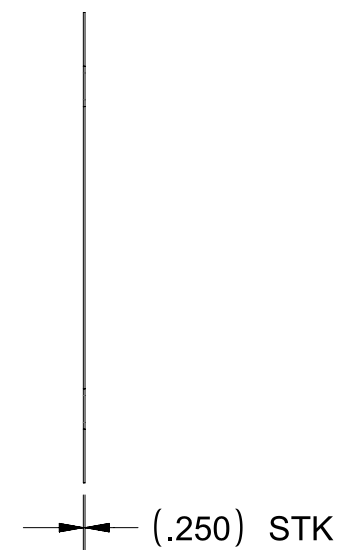


VIEW 7-A (SHT-6)

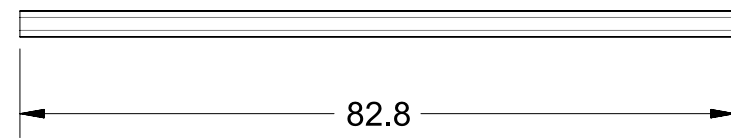
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MOCK HULL SECTIONS			
DWG. NO.	SCALE	SHEET	REV.
TRNG-1	NONE	7	A



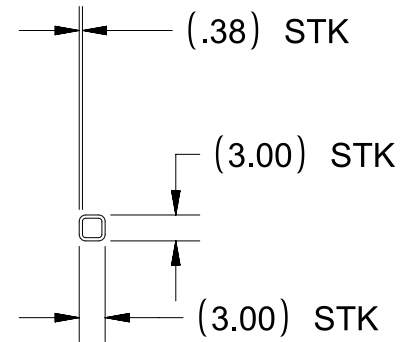
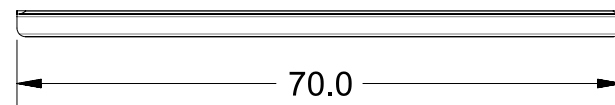
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MOCK HULL SECTIONS			
DWG. NO.	SCALE	SHEET	REV.
TRNG-1	NONE	8	A



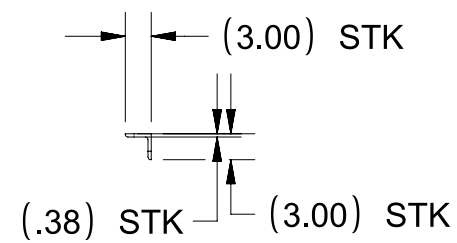
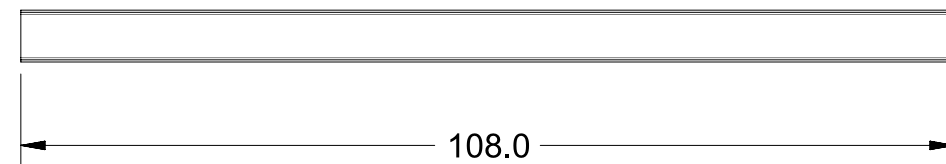
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MOCK HULL SECTIONS			
DWG. NO.	SCALE	SHEET	REV.
TRNG-1	NONE	9	A



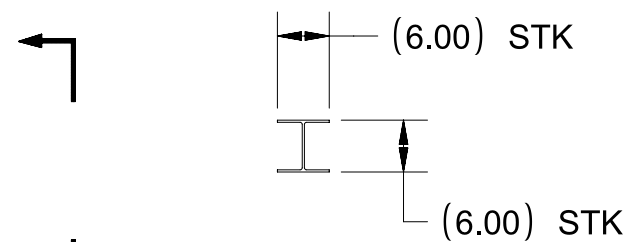
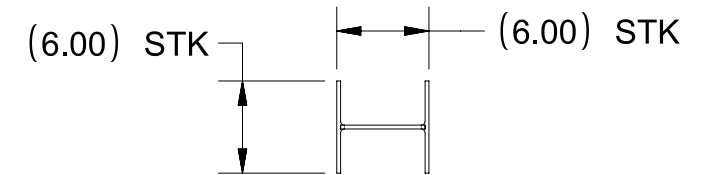
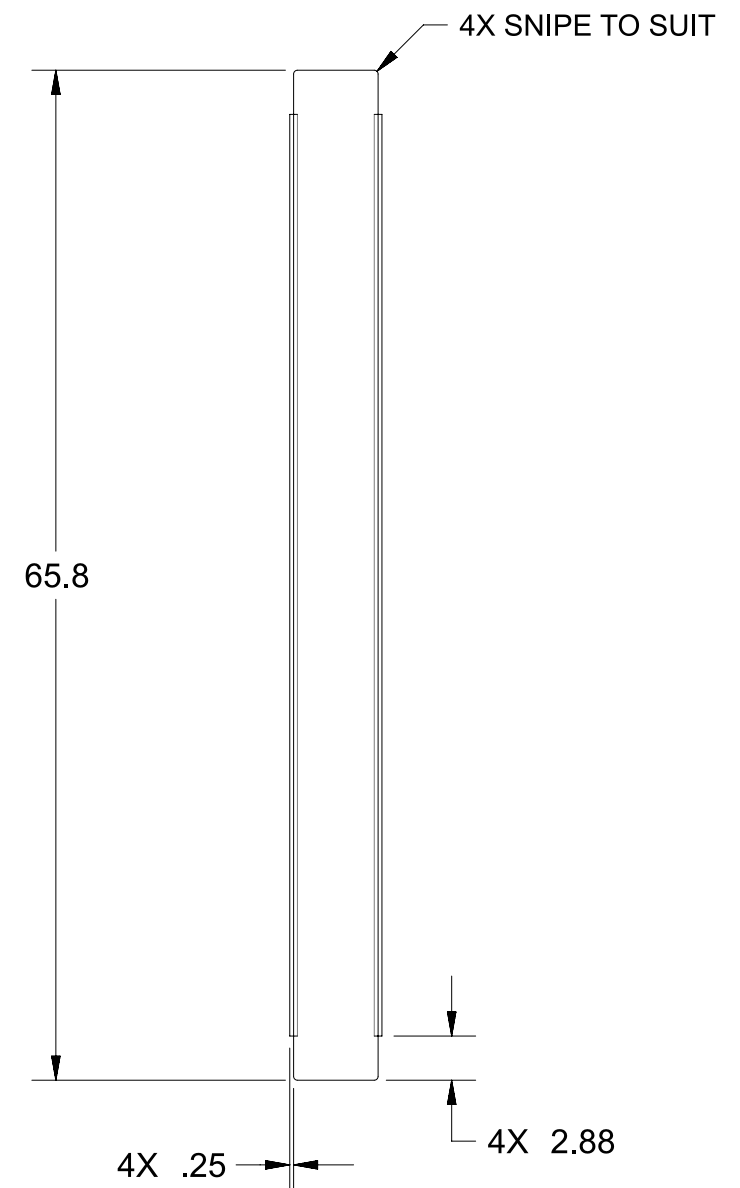
ITEM 5



ITEM 6

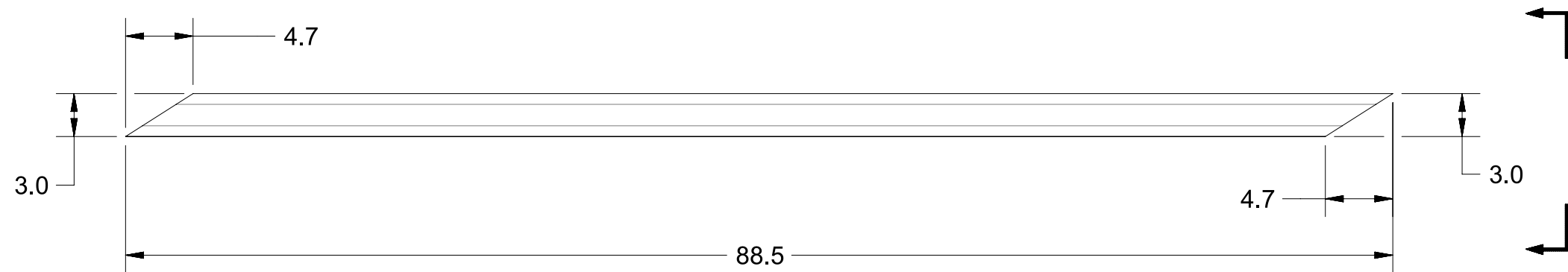


ITEM 7

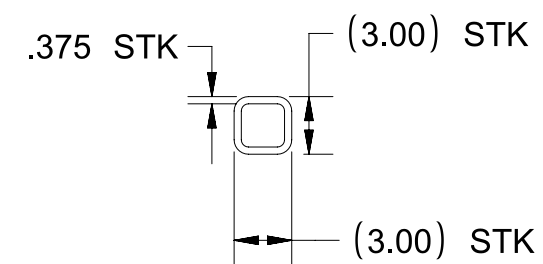
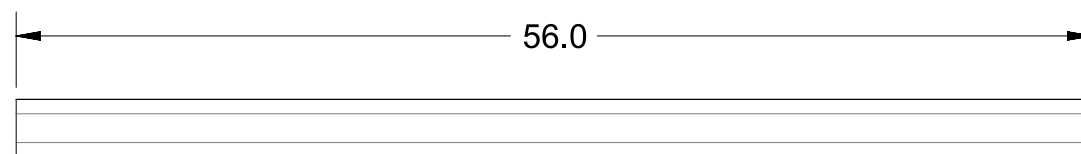


ITEM 8

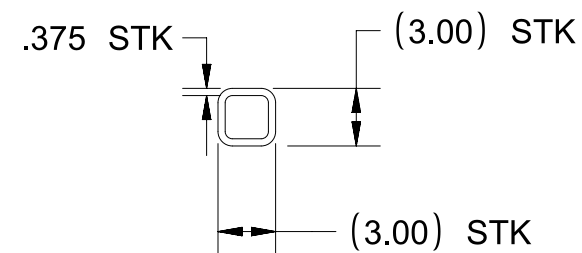
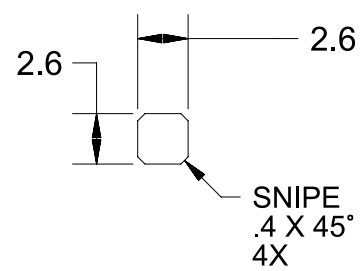
TITLE			
MOCK HULL SECTIONS			
DWG. NO.	SCALE	SHEET	REV.
TRNG-1	NONE	10	A



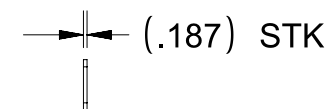
ITEM 9



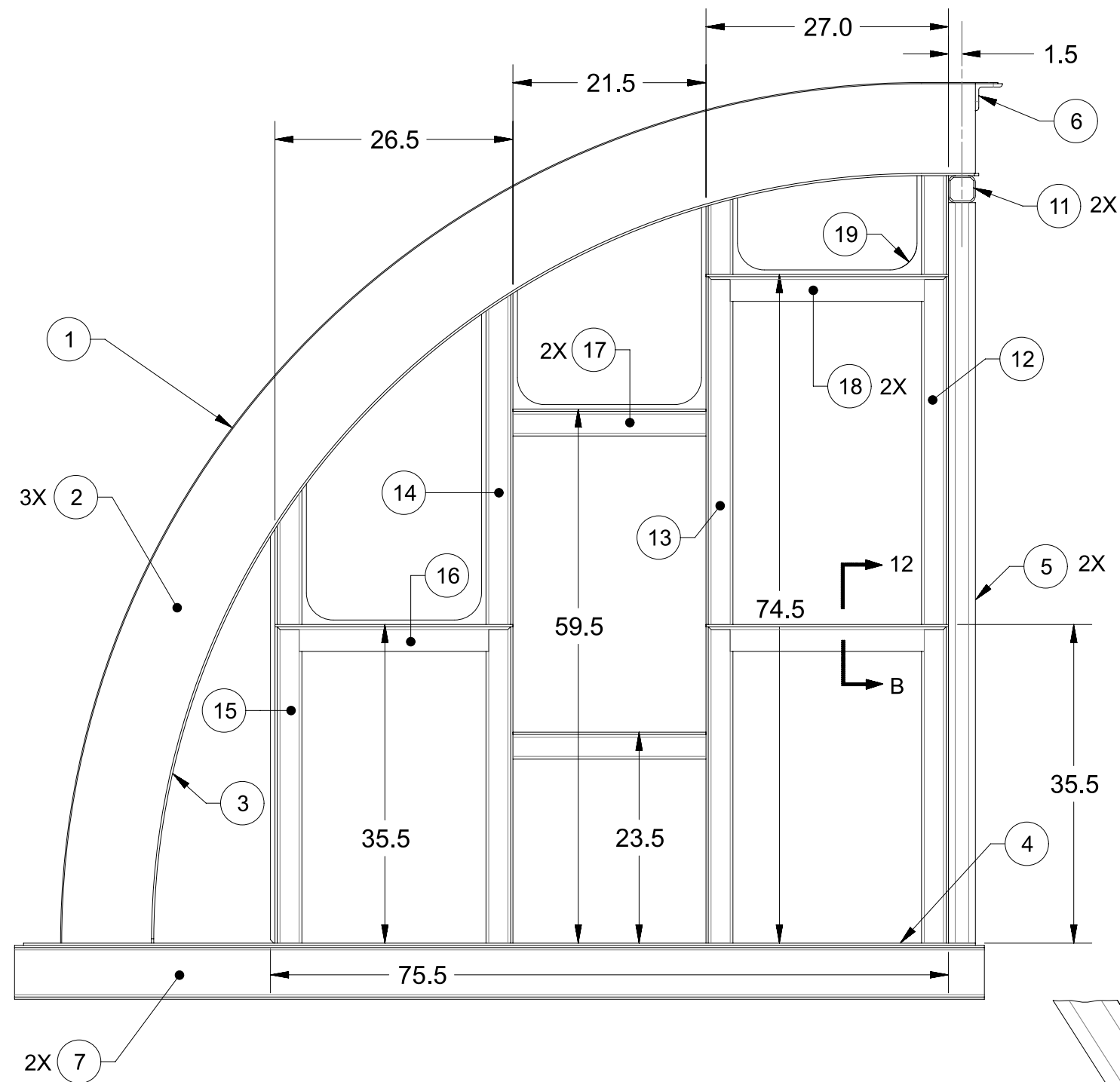
ITEM 10



ITEM 11

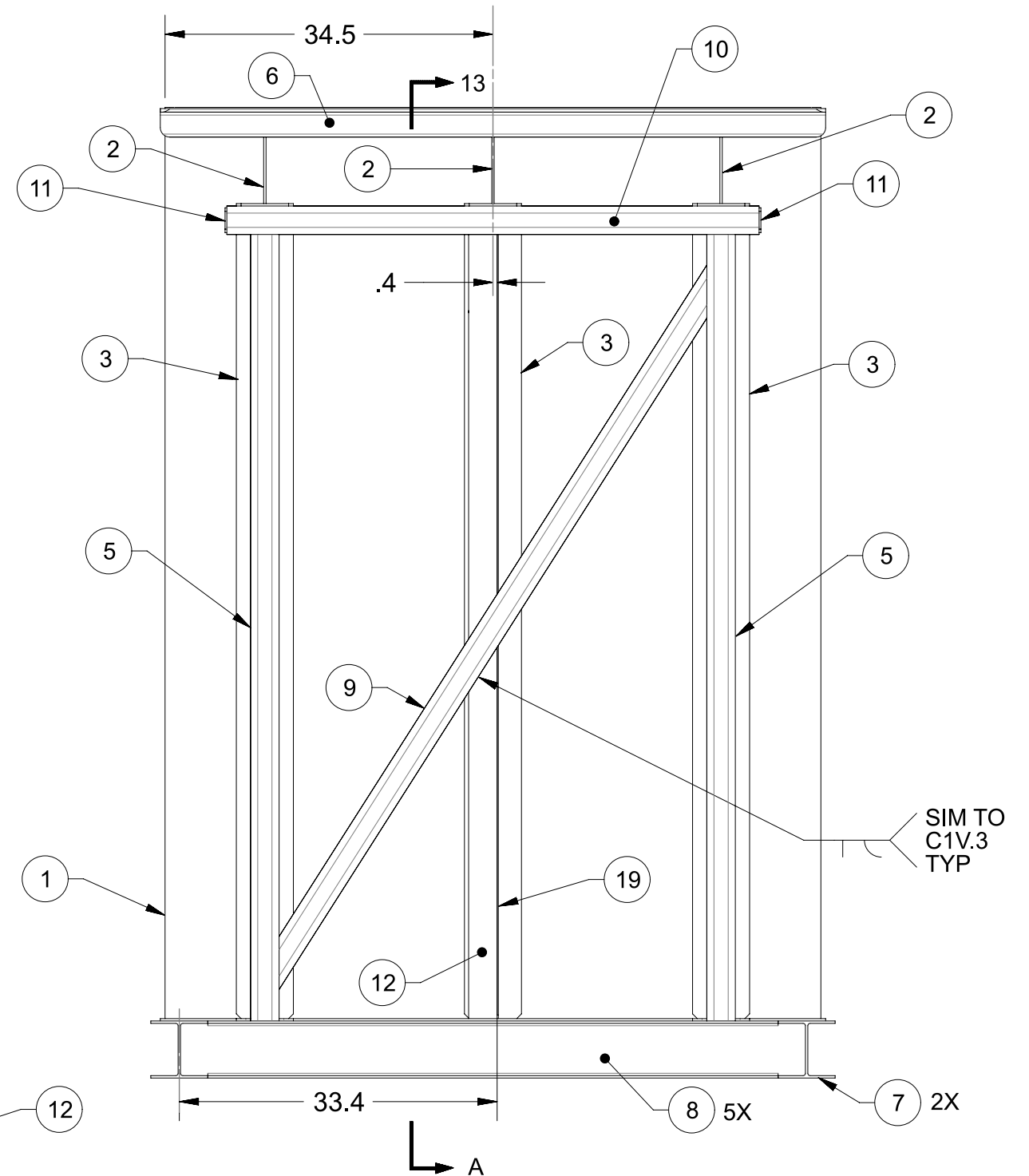


TITLE			
MOCK HULL SECTIONS			
DWG. NO.	SCALE	SHEET	REV.
TRNG-1	NONE	11	A

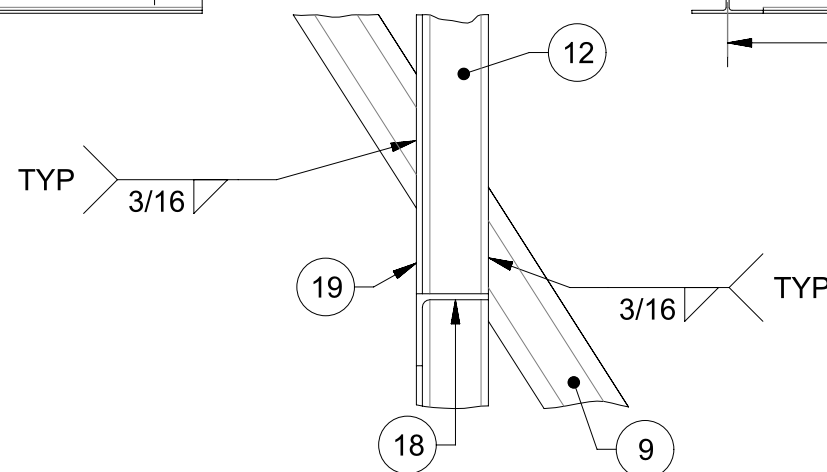


**FRONT VIEW
ITEM A3**

ITEMS 1 THRU 11 DETAILED ON
SHEETS 4 THRU 11
ITEMS 12 THRU 19 DETAILED ON
SHEETS 12 THRU 15

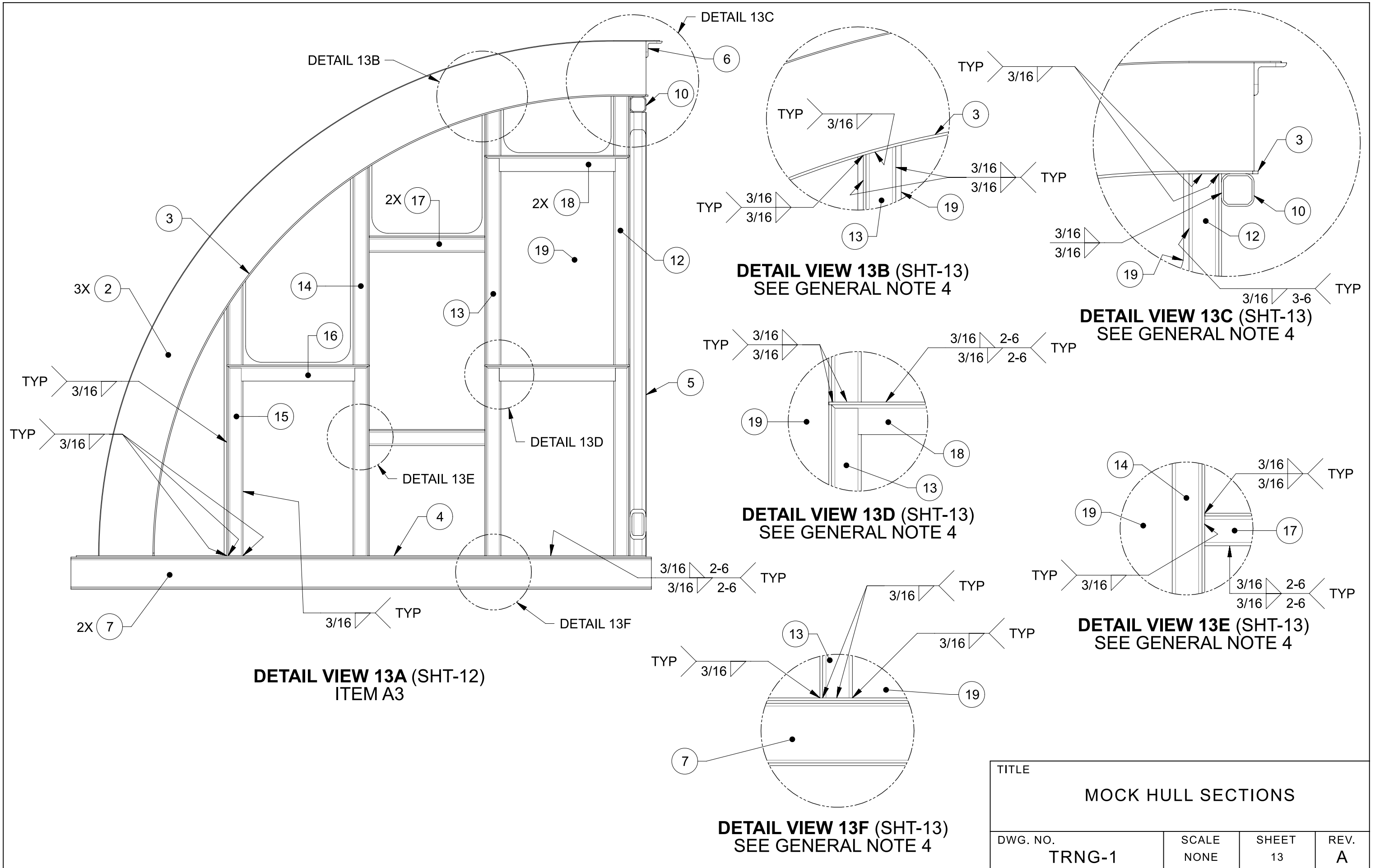


DETAIL VIEW 12-A (SHT-12)

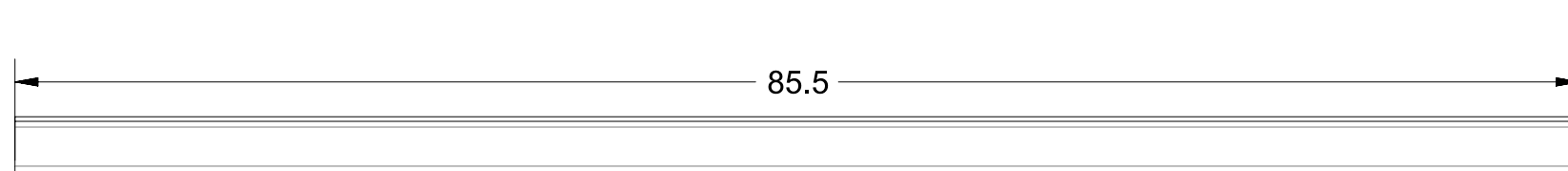


DETAIL VIEW 12-B (SHT-12)

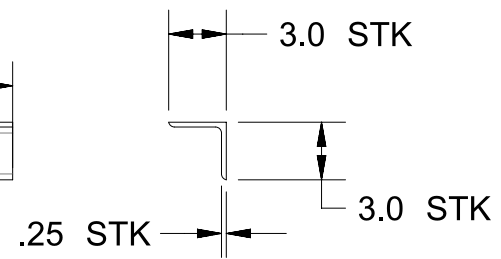
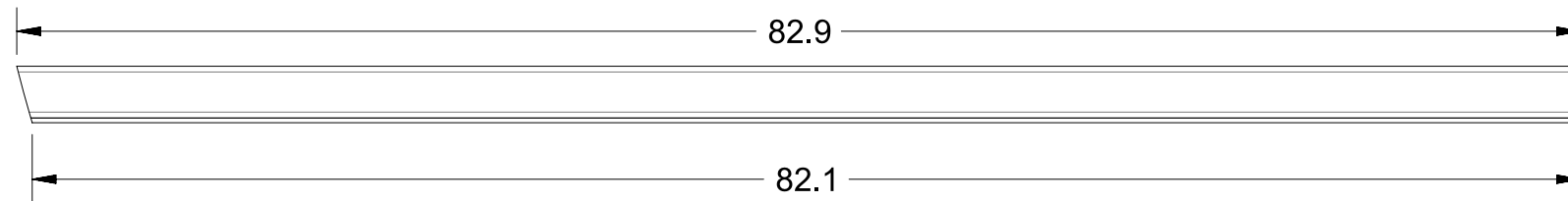
TITLE			
MOCK HULL SECTIONS			
DWG. NO.	SCALE	SHEET	REV.
TRNG-1	NONE	12	A



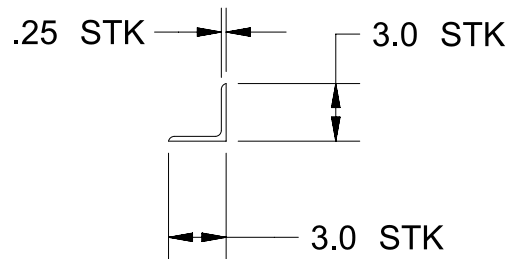
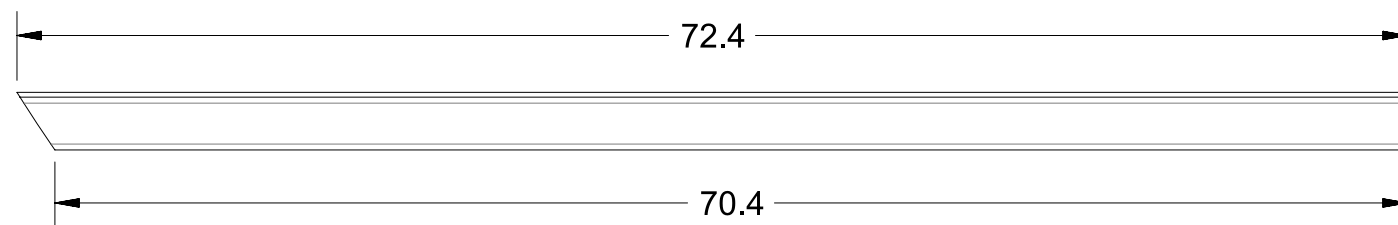
TITLE			
MOCK HULL SECTIONS			
DWG. NO.	SCALE	SHEET	REV.
TRNG-1	NONE	13	A



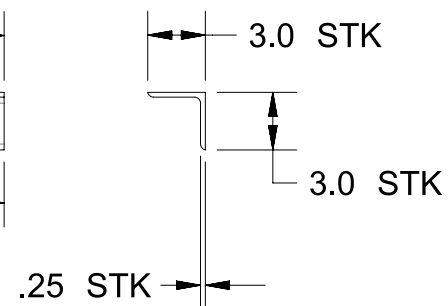
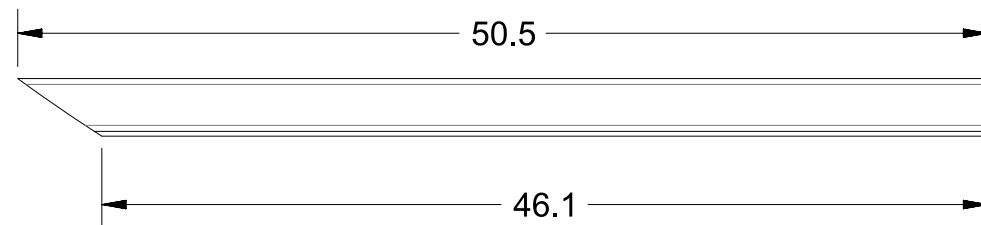
ITEM 12



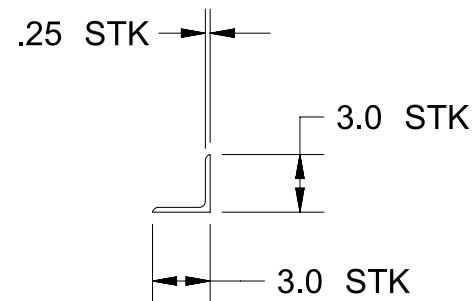
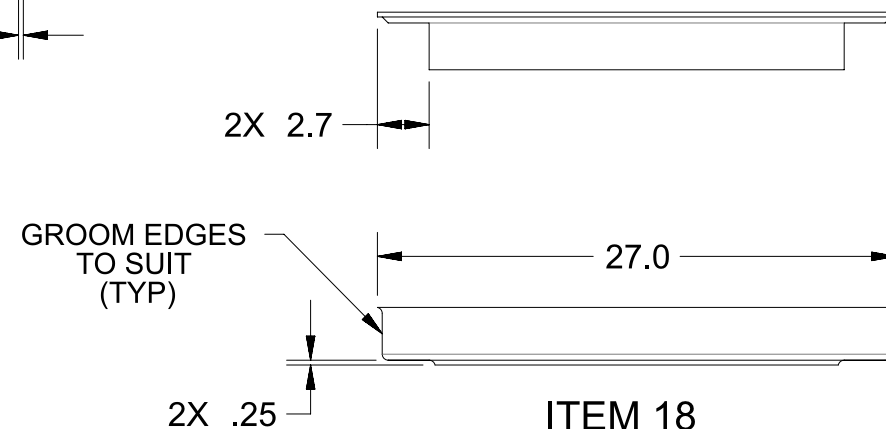
ITEM 13



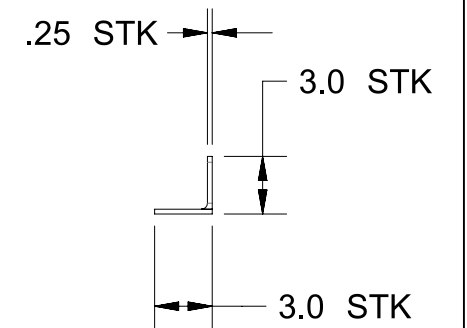
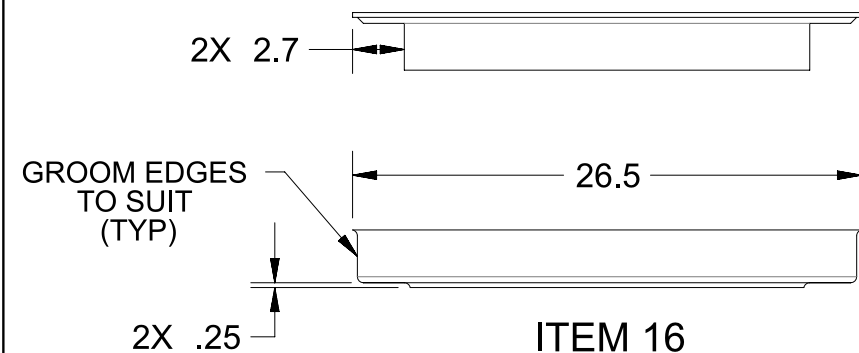
ITEM 14



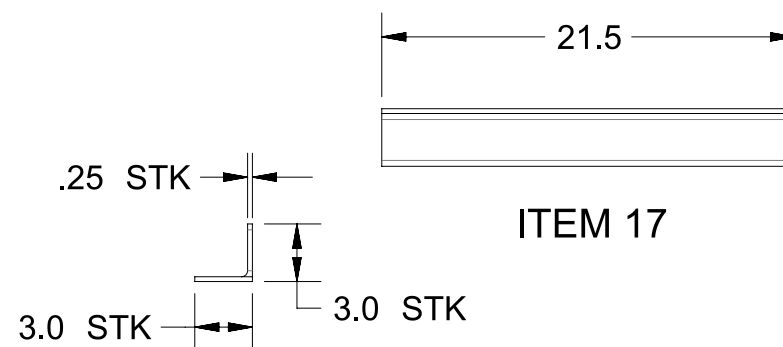
ITEM 15



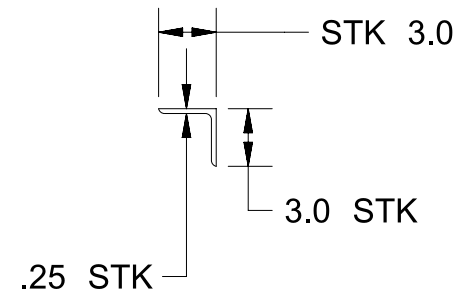
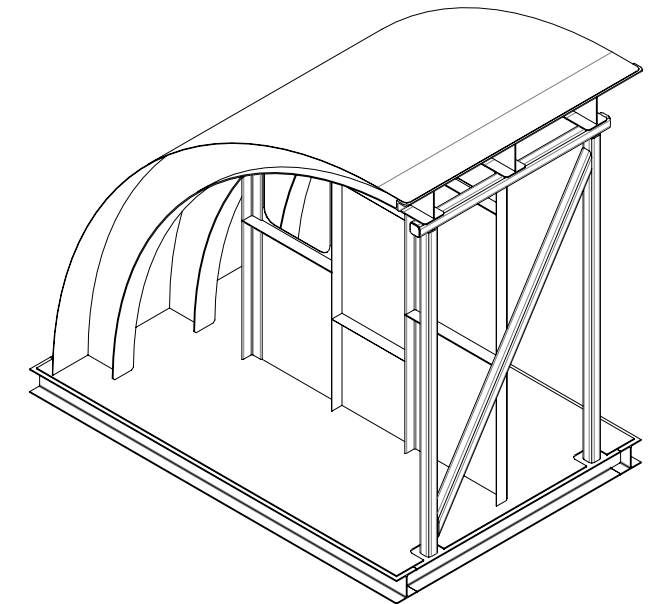
ITEM 18



ITEM 16

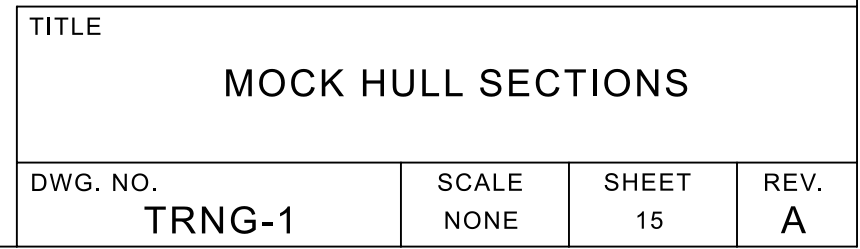


ITEM 17



ISOMETRIC VIEW
(2 PCS REQUIRED)

TITLE			
MOCK HULL SECTIONS			
DWG. NO.	SCALE	SHEET	REV.
TRNG-1	NONE	14	A



Date August 5 2025

Salesperson Bobby Conrad
 EDU Sales Partner Akareem Spears
 Education Institute Bishop State Technical College
 Education Location Mobile, AL
 Project Name Navy Program

Proposal Number AL-8525-BC



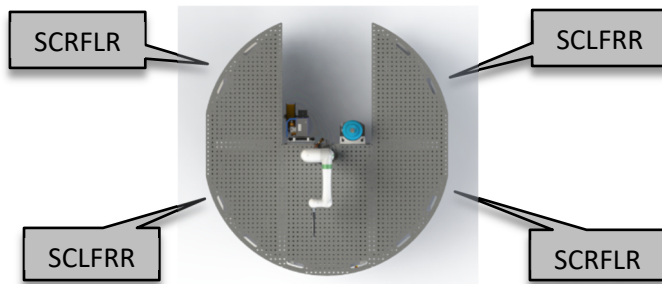
Part #	Description	# of Units	Academic	Total
CART10S-350	FANUC CRX10iA on base modular cart. The Cobot has a reach of 1,249mm (49.1 in) and a payload of 10kg. System features the Miller Auto-continuum 350 with Miller Wire Feeder.	2	\$98,650.00	\$197,300.00
SCLFRR	Side Cart Left Front or Right Rear, work surface 34" W x 54" Deep with 16mm Holes	0	\$6,975.00	
SCRFLR	Side Cart Right Front or Left Rear, work surface 34" W x 54" Deep with 16mm Holes	0	\$6,975.00	

Robot Cart Standard Features:

- Mobile Cart welded construction powder coat finish
- Miller Auto-Continuum 350 with torch and wire feed
- FANUC CRx Collaborative Robot with Miller Library and APT Clever Torch teach button software package ready to teach and weld
- Lockable teach tablet holder
- APT Clever Torch for ease of movement and teaching the robot. Additional button feature built in for tack welding
- Top plate 40" x 58-1/2" with 16mm 2" center holes for clamping and fixture hold down
- 6" Casters for ease of movement
- Ready to accept side cart and accessories

Side Cart Features:

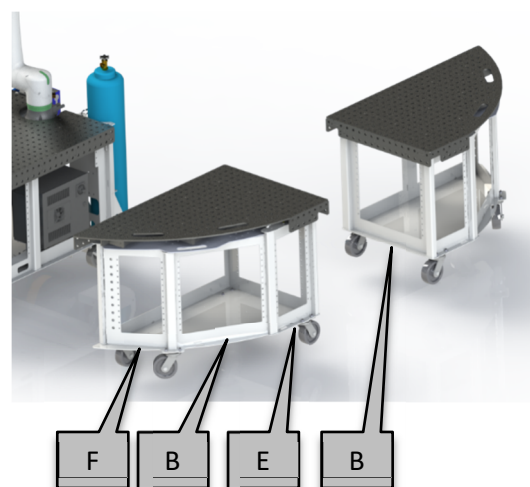
- Mobile Cart welded construction powder coat finish
- Top plate 34" x 54" with 16mm 2" center holes for clamping and fixture hold down
- 6" Casters for ease of movement
- Locates to robot cart
- Ready to accept accessories



Options

Part #	Description	# of Units	Academic	Total
TORCH	15' Bernard Manual weld torch kit with ground clamp <i>Torch Kit adds a 15' long semiautomatic Bernard gun .035/.045 torch and a 2/0 ground cable with clamp. This option used with the Miller Auto-Continuum 350 power supply for hand welding. Hand torch connects to the wire feed at the rear of the weld CERT cart.</i>	0	\$992.00	
WELDPPE	Personal Protective Equipment Kit (per student) <i>Includes: 1 - welding helmet 1 - pair of weld gloves 1 - pair of safety glasses</i>	0	\$476.00	
88001197	Magnetic work holding kit <i>Includes: 1 – 6" X 1-1/2" X 6" adjustable angle magnet 1 – Mini Multi Angle 45° / 90° magnet 1 – Mini Multi Angle 45° / 75° magnet Note: The CRX cart does not include any work holding devices</i>	0	\$628.00	
CRAW10KIT	Certification material kit to perform (10) AWS CRAW tests <i>Includes: (10) 1/4" X 4" X 8" long, CRS bottom plate (10) 1/4" X 4" X 5" long, CRS vertical plate (10) 2" Ø X 2" long, CRS solid round</i>	0	\$1,056.00	
200402000	APTARC50 CERT Instructor Guide Curriculum	0	\$65.00	
200403000	APTARC50 CERT Student Guide Curriculum	0	\$65.00	

Accessory location diagram



Accessories

Part #	Description	# of Units	Academic	Total
DW1025	Shallow drawer, 2-1/2" deep, narrow location E	0	\$249.00	
DW1040	Medium drawer, 4" deep, narrow locations E	0	\$267.00	
DW2025	Shallow drawer, 2-1/2" deep, wide locations B, D	0	\$279.00	
DW2040	Medium drawer, 4" deep, wide locations B, D	0	\$309.00	
PB1006	Pegboard panel, 6" tall, narrow locations E, F	0	\$90.00	
PB2006	Pegboard panel, 6" tall, wide locations A, B	0	\$114.00	
SH1025	Storage shelf, narrow location E	0	\$96.00	
SH2025	Storage shelf, wide locations B, D	0	\$105.00	
CR1007	Clamp hanger rail, 7 notches, narrow locations E, F	0	\$63.00	
CR2013	Clamp hanger rail, 13 notches, wide locations A, B, C	0	\$75.00	
PR1021	Fixture setup pin rail, 21 places, narrow locations E, F	0	\$87.00	
PR2045	Fixture setup pin rail, 45 places, wide locations A, B, C, D	0	\$123.00	
SCSH10	Spray can shallow shelf, narrow locations E, F	0	\$75.00	
SCSH20	Spray can shallow shelf, wide locations A, B, C, D	0	\$90.00	
BINP10	Bin box panel, 2 bins (4-1/8" x 5-3/8" x 3"), narrow locations E, F	0	\$78.00	
BINP20	Bin box panel, 4 bins (4-1/8" x 5-3/8" x 3"), wide locations A, B, C, D	0	\$99.00	
WS1826	Tabletop temporary weld screen, 18" x 26", magnet mount	0	\$435.00	
BP1045	Blanking close out plate, 4-1/2" tall, narrow locations E, F	0	\$51.00	
BP2045	Blanking close out plate, 4-1/2" tall, wide locations A, B, C, D	0	\$60.00	
DIVS10	Drawer divider set for narrow drawers, no pin tray	0	\$57.00	
DIVS20	Drawer divider set for wide drawers, with pin tray	0	\$123.00	
AGHG45	4-1/2" Angle grinder hanger with cord wrap, fits any location	0	\$99.00	

- Narrow locations accessories only fit on side carts
- Wide location accessories fit main robot cart and side carts
- Reference location diagram for accessory fitment locations

Additional

Installation	Initial start-up & support <i>Note: The equipment must be unloaded and uncrated with air and power ran prior to technician arrival or school will be charged at a rate of \$160.00 per hour for additional time.</i>	0	\$1,725.00	
Installation travel and per diem	This additional charge includes travel, hotel and food. <i>Due to the price fluctuation, we cannot estimate this cost, it will be billed out at time of install.</i>		\$0.00	
Training	On-Site (Priced per day) <i>This training does not include how to program a FANUC Robot. Program training will need to be scheduled at FANUC through the FANUC Education Sales Partner. This training only includes the function of the machine.</i>	0	\$1,725.00	
Training travel and per diem	This additional charge includes travel, hotel and food. <i>Due to the price fluctuation, we cannot estimate this cost, it will be billed out at time of training.</i>		\$0.00	
Freight	Call for estimate only. <i>Due to rising freight cost the actual cost will be added to final invoice or billed separately.</i>	0	\$3,250.00	

Total **\$ 197,300.00**

Product Extended Description

The MAC Series Cobot Mod-Weld is a collaboration between FANUC, Miller, and APT to provide the best robotic welding solution specifically for the fabrication shop. The modular design allows easy expansion of the working area for larger parts, or multiple weldments all at the same time.

The robot station and optional side carts expansion tables come standard with the 16mm jig holes on 2" center to center spacing. Jig holes allow for easy work holding and locator tooling turning the tabletop into the part fixture.

The robot is a FANUC CRX 10iA with a reach of 49" giving the end user a large work envelope. Our Clever Torch comes standard for ease of teaching, moving, and programming without the programmer needing to learn complicated robot language. The FANUC CRX has a touch screen tablet interface for ease of programming and a spatter free storage location during welding.

We designed this system with the fabrication shop in mind. We offer a full line up of accessories to maximize the usage and shop space. Common items, consumables, etc. can be safely and neatly stored right where they are needed most.

Note: Additional information, Certifications and student learning can be found at <https://aptmfg.com/products/weld-cert-cart/>

CLEAN AIR
INDUSTRIES



WELDSTATION

The WeldStation™ is a ductless fume extraction solution trusted by hundreds of trade schools and welding labs across North America.

Engineered for adaptability, the WeldStation is available in single or dual booth configurations, giving you the flexibility to meet your workspace needs. Its ductless design and powerful 4,000 CFM of airflow ensure seamless, heavy-duty performance without the hassle of additional accessories or fume capture arms.

Crafted with pride in the USA, the WeldStation features rugged 12-gauge, powder-coated steel construction for unmatched durability. Its self-contained, plug-and-play design streamlines installation, cutting costs and saving valuable time. Simply position the WeldStation, connect power, and you're ready to weld.

No ducts. No delays. Just a smarter, cost-effective solution built for demanding training environments.



Product Benefits

- **No Ducting Required:** Save on expensive start-up costs and valuable space associated with the installation of ducting. The WeldStation is a self-contained system.
- **Capture Airborne Contaminants At Source:** Contains and eliminates harmful weld fumes before they can spread within your facility.
- **Flexibility:** Ducted systems are a fixed solution, making layout changes or facility expansions a costly challenge. The WeldStation offers unmatched flexibility. Its modular design allows you to adapt quickly by repositioning booths or seamlessly adding more as your needs grow. Booths can be installed side-by-side and/or back-to-back.

Product Features

- Single and dual booth configurations available to address your needs
- Built-in tool board
- Integrated weld curtain locks in with a button pin
- Simple filter replacement featuring our new cam lock design
- Knock out holes for electrical needs
- VFD Standard for increased energy savings, noise reduction, and motor speed control
- Two 1" pulsing valves – auto or manual
- 1" NPT compressed air connection – 70-90 PSI required
- [ADA compliant](#)

Optional Features

- Bar-grated table
- Small and large part bins
- Welder shelf
- Hooks
- Customizable logo

Filter Information

- **Two-Stage Spark Arrestors:** Two 24" x 24" x 2" Metal Spark Baffle Filters and two 24" x 24" x 2" Metal Mesh Filters
- **Filter Cartridges:** Four Fire Retardant filters with 226 ft² of media (904 ft² total) – also available in High Efficiency Nanofiber





ADA COMPLIANT



Key Applications

- Manual Welding
- Grinding
- Deburring

Health & Safety

Exposure to weld fumes and weld smoke can pose various health risks. The specific health effects depend on the composition of the fumes, the duration and intensity of exposure, and individual susceptibility. Here are some potential health risks associated with exposure to weld fumes and weld smoke:

- Respiratory Issues
- Lung Damage
- Metal Fume Fever
- Neurological Effects

Regulatory Compliance

Health and safety issues are being taken very seriously by a growing number of companies as OSHA, International, and industry standards increase. Many large us manufacturers are planning and adopting European exposure limits as a global standard for their entire company and are exceeding OSHA Standards.

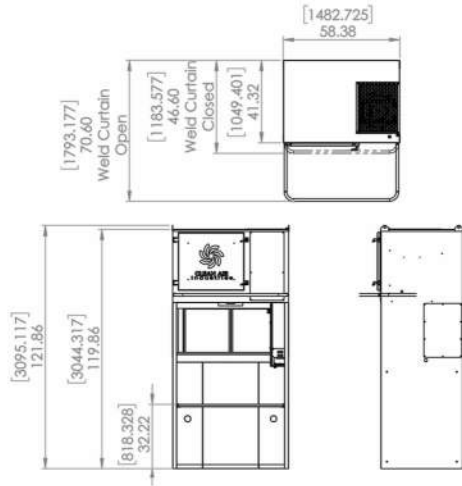
To meet these standards companies must implement a highly efficient dust and fume filtration system to filter out the harmful particulate. The exposure limits these companies are targeting range from .02 - 1 mg/m³ depending on company policy, well below the 5 mg/m³ standard set by OSHA.

Warranty Information

All Clean Air Industries units are backed by a standard 10-year manufacturer's warranty*

We guarantee that the major structural components of the goods will be free from defects in material and workmanship for ten (10) years from the date of shipment.

*This warranty does not cover consumable parts, fuses, filters, or other non-structural components. For warranty details, visit our website: <https://clean-air.com/warranty>

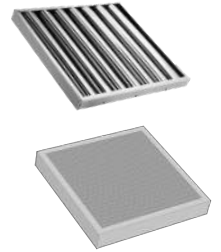


PRE-FILTERS

Two-Stage Spark Arrestors

2x Metal Baffle Filter: 24" x 24" x 2"
(Part #: FIL-WS-BAFFLE)

2x Metal Mesh Filter: 24" x 24" x 2"
(Part #: FIL-WS-METALMESH)



MAIN FILTER CARTRIDGES

4x 80/20 FR – MERV 11

(Part #: FIL-WS-1834)

- Length: 26"
- Outside Diameter: 12.75"
- Inside Diameter: 8.37"

Nanofiber upgrade available
(Part #: FIL-WS-NANO)



USER & MAINTENANCE MANUAL

To learn how to properly operate and maintain this unit, scan the QR code to instantly access your user and maintenance manual.

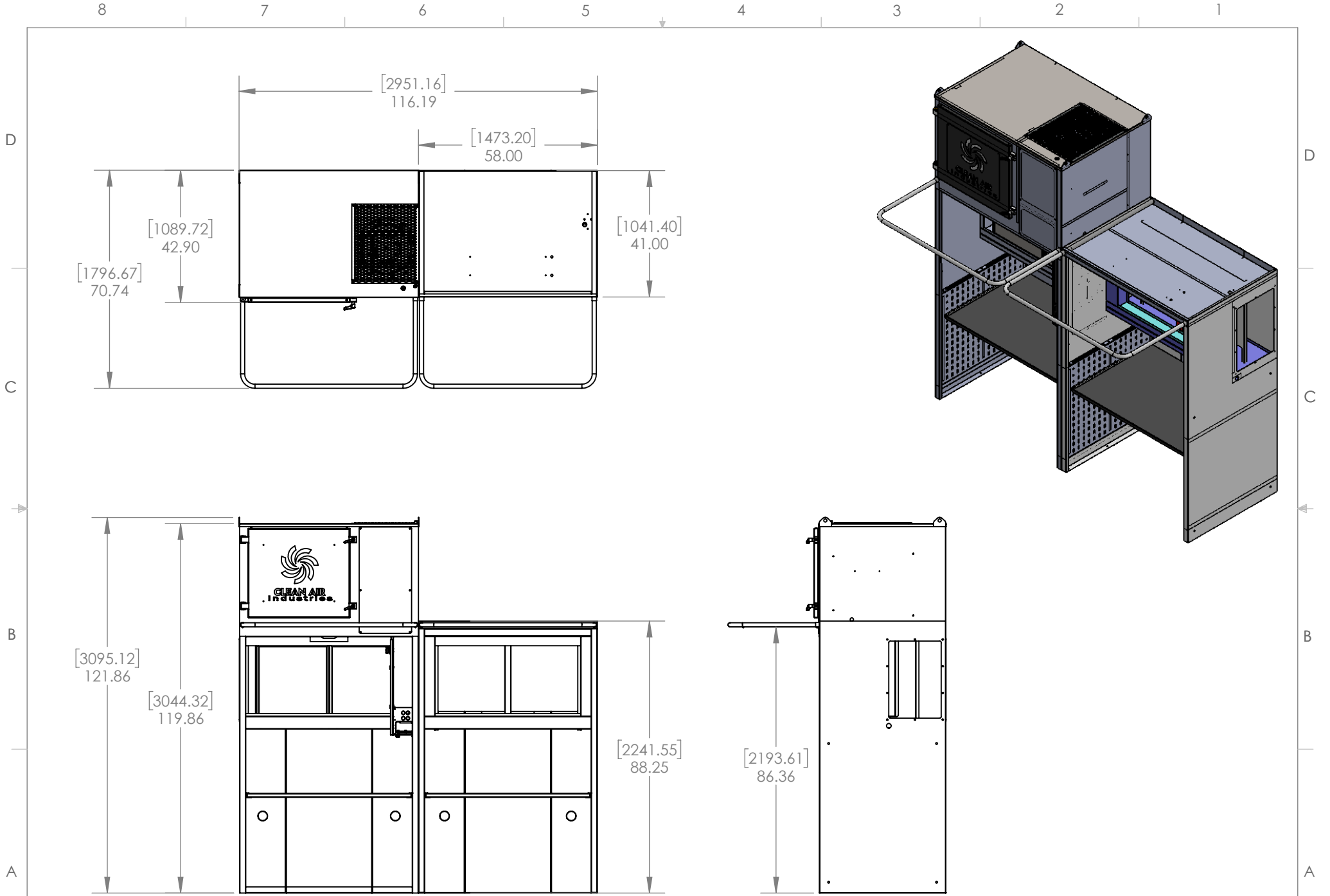
Contact us for replacement filters and parts, or service.



MODEL	CFM	MOTOR	VOLTAGE	MAX NOISE	DIMENSIONS	WEIGHT
WeldStation Single 5'	4000	5HP@3400 RPM	208, 240, 460v/3/60Hz	74 dBA	59" W x 122" H x 71" D	1600 lbs.
WeldStation Single 6'	4000	5HP@3400 RPM	208, 240, 460v/3/60Hz	74 dBA	71" W x 122" H x 71" D	1650 lbs.
WeldStation Dual 5x5	4000	5HP@3400 RPM	208, 240, 460v/3/60Hz	74 dBA	118" W x 122" H x 71" D	2100 lbs.
WeldStation Dual 6x5	4000	5HP@3400 RPM	208, 240, 460v/3/60Hz	74 dBA	142" W x 122" H x 71" D	2200 lbs.

* Please note that the dimensions provided are based on our base models and may vary depending on selected features. To ensure accurate shipping quotes, kindly contact us for personalized information that considers your chosen product features and customizations. Feel free to reach out with any questions or to request a personalized shipping quote. We are committed to your satisfaction and look forward to helping you!





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UNLESS OTHERWISE SPECIFIED:
ALL BENDS ARE 90°
DIMENSIONS ARE IN:
MILLIMETERS AND INCHES
TOLERANCES ARE:
FRACTIONS ±1/32 DECIMALS .XX ±.03 ANGLES .X ±1°
XXX ±.015

ITEM NO. **43837**
STATION 1 Weld
STATION 2
STATION 3
STATION 4

MATERIAL -- Gage
PART SIZE --X--

CAD FILE: 43837 WS-5, Gen2, Dual Top Assembly
WEIGHT lbs

DRAWN BY BrookeH Friday, July 12, 2024 11:30:23 AM

REVISED BY BrookeH Friday, July 12, 2024 11:39:55 AM

SHEET A SCALE 1:40
REV. PRE SHEET: 1 OF 1

QTY per BUILD 1



Material Safety Data Sheet: Curtains and Screens

Revision Date: 06/09/2021

1. Identification

1.1. Product identifier

Product Identity

Transparent Vinyl Curtains. PN 601, 602, 603, 604, 605, 606, 623

1.2. Relevant identified uses of the substance or mixture and uses advised against

Intended Use / Application Method

See Technical Data Sheet.

1.3. Details of the supplier of the safety data sheet

Company Name

John Tillman Co.
1300 W Artesia Blvd
Compton, CA 90220

Emergency

800-255-5480

1.4

The Environmental Protection Agency prohibits processing and distribution of this chemical/product for any use other than: (1) In hydraulic fluids either for the aviation industry or to meet military specifications for safety and performance where no alternative chemical is available that meets U.S. Department of Defense specification requirements, (2) lubricants and greases, (3) new or replacement parts for motor and aerospace vehicles, (4) as an intermediate in the manufacture of cyanoacrylate glue, (5) in specialized engine air filters for locomotive and marine applications, and (6) in adhesives and sealants before January 6, 2025, after which use in adhesives and sealants is prohibited. In addition, all persons are prohibited from releasing PIP (3:1) to water during manufacturing, processing and distribution in commerce, and must follow all existing regulations and best practices to prevent the release of PIP (3:1) to water during the commercial use of PIP (3:1).

2. Hazard(s) identification

2.1. Classification of the substance or mixture

The PVC product contains PIP 3:1 which is classified as hazardous. All other components are not classified.



Material Safety Data Sheet: Curtains and Screens

Revision Date: 06/09/2021

The EPA in Section 40 CFR 751 has classified Phenol Isopropylated Phosphate 3:1 (PIP 3:1), a component in PVC film, as a bioaccumulative and toxic chemical under TSCA Part 751 section 6 (h) and to adhere to the said rulings.

2.2. Label elements

PIP 3:1 is labeled H361D, H361F Reproductive Toxicity H401, H410 Toxic to Aquatic Life

[Prevention]:

No GHS prevention statements f

[Response]:

No GHS response statements

[Storage]:

No GHS storage statements

[Disposal]:

Avoid release to environment

3. Composition/information on ingredients

This product contains the following substances that present a hazard within the meaning of the relevant State and Federal Hazardous Substances regulations.

Ingredient/Chemical Designations	Weight %	GHS Classification	Notes
PVC (Chloroethylene, polymer) CAS Number: 0009002-86-2	50 – 75	Not Classified	
DOTP CAS Number: 0006422-86-2	20-35	Not Classified	
PIP 3:1 CAS Number: 68937-41-7	15 - 25	H361D/F, H401, H410	

In accordance with paragraph (i) of §1910.1200, the specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

4. First aid measures

4.1. Description of first aid measures



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General	In all cases of doubt, or when symptoms persist, seek medical attention. Never give anything by mouth to an unconscious person.
Inhalation	Remove to fresh air, keep patient warm and at rest. If breathing is irregular or stopped, give artificial respiration. If unconscious place in the recovery position and obtain immediate medical attention. Give nothing by mouth.
Eyes	Irrigate copiously with clean water for at least 15 minutes, holding the eyelids apart and seek medical attention.
Skin	Remove contaminated clothing. Wash skin thoroughly with soap and water or use a recognized skin cleanser.
Ingestion	If swallowed obtain immediate medical attention. Keep at rest. Do NOT induce vomiting.
4.2. Most important symptoms and effects, both acute and delayed	
Overview	See section 2 for further details.

5. Fire-fighting measures

5.1. Extinguishing media

Water, dry chemical.

5.2. Special hazards arising from the substance or mixture

Hazardous decomposition: Under fire conditions, the product will decompose and give off hydrogen chloride fumes.

5.3. Advice for fire-fighters

Thermal decomposition of fiber coating may produce an Irritating mixture of smoke and fumes. Fire fighters should wear full protective gear including NIOSH approved self-contained breathing apparatus.

ERG Guide No. ----

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Put on appropriate personal protective equipment (see section 8).

6.2. Environmental precautions

Use good personal hygiene practices. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse.

6.3. Methods and material for containment and cleaning up

Ventilate the area and avoid breathing vapors. Take the personal protective measures listed in section 8.

Contain and absorb spillage with non-combustible materials e.g., sand, earth, and vermiculite. Place in closed containers outside buildings and dispose of according to the Waste Regulations. (See section 13).

Clean, preferably with a detergent. Do not use solvents.

Do not allow spills to enter drains or watercourses.



Material Safety Data Sheet: Curtains and Screens

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If drains, sewers, streams or lakes are contaminated, inform the local water company immediately. In the case of contamination of rivers, streams or lakes the Environmental Protection Agency should also be informed.

7. Handling and storage

7.1. Precautions for safe handling

See section 2 for further details. - [Prevention]:

7.2. Conditions for safe storage, including any incompatibilities

Handle containers carefully to prevent damage and spillage.

Store away from heat.

Incompatible materials: No data available.

See section 2 for further details. - [Storage]:

7.3. Specific end use(s)

No data available.



Material Safety Data Sheet: Curtains and Screens

Revision Date: 06/09/2021

8. Exposure controls and personal protection

8.1. Control parameters

Exposure

CAS No.	Ingredient	Source	Value
0009002-86-2 0006422-86-2	PVC (Chloroethylene, polymer) DOTP	OSHA	No Established Limit
		ACGIH	TWA: 1 mg/m3
		NIOSH	No Established Limit
0068937-41-7	PIP 3:1	OSHA	Not Determined
		ACGIH	Not Determined

Carcinogen Data

CAS No.	Ingredient	Source	Value
0009002-86-2 0006422-86-2 0068937-41-7	PVC (Chloroethylene, polymer) DOTP PIP 3:1	OSHA	Select Carcinogen: Not classified
		NTP	Not included
		IARC	Not classified

8.2. Exposure controls

Respiratory

If workers are exposed to concentrations above the exposure limit they must use the appropriate, certified respirators.

Eyes

Eye protection is recommended for all industrial workplaces.

Skin

Use when material is heated.

Engineering Controls

General ventilation should be sufficient to control odors. Good mechanical ventilation is needed when material is heated.

Other Work Practices

Use good personal hygiene practices. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse.

See section 2 for further details. - [Prevention]:

9. Physical and chemical properties

Appearance

Clear, Tinted, and Opaque Solid

Odor

Mild

Odor threshold

Not determined

pH

Not Measured

Melting point / freezing point

Not Measured

Initial boiling point and boiling range

Not Measured

Flash Point

Not Measured

Evaporation rate (Ether = 1)

Not Measured



Material Safety Data Sheet: Curtains and Screens

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Flammability (solid, gas)	Not Applicable
Upper/lower flammability or explosive limits	Lower Explosive Limit: Not Measured Upper Explosive Limit: Not Measured
Vapor pressure (Pa)	Not Measured
Vapor Density	Not Measured
Specific Gravity	1.15 to 1.6
Solubility in Water	None
Partition coefficient n-octanol/water (Log Kow)	Not Measured
Auto-ignition temperature	Not Measured
Decomposition temperature	Not Measured
Viscosity (cSt)	Not Measured

9.2. Other information

No other relevant information.

10. Stability and reactivity

10.1. Reactivity

Hazardous Polymerization will not occur.

10.2. Chemical stability

Stable under normal circumstances.

10.3. Possibility of hazardous reactions

No data available.

10.4. Conditions to avoid

No data available.

10.5. Incompatible materials

No data available.

10.6. Hazardous decomposition products

Under fire condition, the product will decompose and give off hydrogen chloride fumes.



Material Safety Data Sheet: Curtains and Screens

Revision Date: 06/09/2021

11. Toxicological information

Acute toxicity

Ingredient	Oral LD50, mg/kg	Skin LD50, mg/kg	Inhalation Vapor LC50, mg/L/4hr	Inhalation Dust/Mist LC50, mg/L/4hr	Inhalation Gas LC50, ppm
PVC (Chloroethylene, polymer) - (9002-86-2) DOTP – (6422-86-2)	No data available	No data available	No data available	No data available	No data available
PIP 3:1 Cas No: 68937-41-7	No data available	Mild Irritant	No data available	No data available	No data available

Note: When no route specific LD50 data is available for an acute toxin, the converted acute toxicity point estimate was used in the calculation of the product's ATE (Acute Toxicity Estimate).

12. Ecological information

12.1. Toxicity

PIP 3:1 Toxic to Aquatic life

Aquatic Ecotoxicity

Ingredient	96 hr LC50 fish, mg/l	48 hr EC50 crustacea, mg/l	ErC50 algae, mg/l
PVC (Chloroethylene, polymer) - (9002-86-2) DOTP – (6422-86-2)	Not Available	Not Available	Not Available
PIP 3:1 - (68937-41-7)	0.36mg/l rainbow trout & >1.3mg/l steelhead minnows	>1mg/l Shrimp	Not Available



Material Safety Data Sheet: Curtains and Screens

Revision Date: 06/09/2021

12.2. Persistence and degradability

There is no data available on the preparation itself.

12.3. Bioaccumulative potential – (PIP 3:1), a component of the PVC film, is bioaccumulative

12.4. Mobility in soil

No data available.

12.5. Results of PBT and vPvB assessment

This product contains no PBT/vPvB chemicals.

12.6. Other adverse effects

No data available.

13. Disposal considerations

13.1. Waste treatment methods

Observe all federal, state and local regulations when disposing of this substance.

14. Transport information

	DOT (Domestic Surface Transportation)	IMO / IMDG (Ocean Transportation)	ICAO/IATA
14.1. UN number	Not Applicable	Not Regulated	Not Regulated
14.2. UN proper shipping name	Not Regulated	Not Regulated	Not Regulated
14.3. Transport hazard class(es)	DOT Hazard Class: Not Applicable	IMDG: Not Applicable Sub Class: Not Applicable	Air Class: Not Applicable
14.4. Packing group	Not Applicable	Not Applicable	Not Applicable
14.5. Environmental hazards			
IMDG	Marine Pollutant: Toxic to aquatic life		
14.6. Special precautions for user	No further information		

15. Regulatory information

Regulatory Overview	The regulatory data in Section 15 is not intended to be all-inclusive, only selected regulations are represented.		
Toxic Substance Control Act (TSCA)	The component (PIP 3:1) in the PVC film/product is listed under TSCA 40 CFR Part 751 Section 6(h).		
WHMIS Classification	PIP3:1 D2A very toxic chemical		
US EPA Tier II Hazards	Fire: No		



Material Safety Data Sheet: Curtains and Screens

Revision Date: 06/09/2021

Sudden Release of Pressure: No

Reactive: No

Immediate (Acute): No

Delayed (Chronic): No

EPCRA 311/312 Chemicals and RQs: Report

The PVC film containing (PIP 3:1) must follow the EPA ruling under TSCA 40 CFR Part 751 Section 6(h).

EPCRA 313 Toxic Chemicals:

Follow rulings for (PIP 3:1) under EPA (TSCA 40 CFR Part 751 Section 6 (h), effective 2/5/2021.

California Proposition 65 Listing does not include PIP3:1. Pending EPA TSCA ruling.

The Environmental Protection Agency prohibits processing and distribution of this chemical/product for any use other than: (1) In hydraulic fluids either for the aviation industry or to meet military specifications for safety and performance where no alternative chemical is available that meets U.S. Department of Defense specification requirements, (2) lubricants and greases, (3) new or replacement parts for motor and aerospace vehicles, (4) as an intermediate in the manufacture of cyanoacrylate glue, (5) in specialized engine air filters for locomotive and marine applications, and (6) in adhesives and sealants before January 6, 2025, after which use in adhesives and sealants is prohibited. In addition, all persons are prohibited from releasing PIP (3:1) to water during manufacturing, processing and distribution in commerce, and must follow all existing regulations and best practices to prevent the release of PIP (3:1) to water during the commercial use of PIP (3:1).

16. Other information

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to the information contained herein. We accept no responsibility and disclaim all liability for any harmful effects which may be caused by exposure to our products. Customers/users of this product must comply with all applicable health and safety laws, regulations, and orders.

The full text of the phrases appearing in section 3 is:

End of Document



Certificate of Compliance

This certificate is issued for the following:

Model 593-593B, Model 595-595B, Model 596-596B, Model 615-615B, Model Transparent Vinyl 600 Series

Prepared for:

John Tillman Co
1300 W Artesia Blvd
Compton, CA 90220
United States

FM Approvals Class: 4950

Approval Identification: PR456063/RR223458

Approval Granted: 4/22/2020

To verify the availability of the Approved product, please refer to www.approvalguide.com or www.roofnav.com

Said Approval is subject to satisfactory field performance, continuing Surveillance Audits, and strict conformity to the constructions as shown in the Approval Guide, an online resource of FM Approvals.

A handwritten signature in dark ink, reading 'Phillip J. Smith'.

Phillip J. Smith
VP - Manager of Materials
FM Approvals
1151 Boston-Providence Turnpike
Norwood, MA 02062



Member of the FM Global Group



Customer information packet

VEM3613T

5HP, 3470RPM, 3PH, 60HZ, 184TC, 3630M, TEFC, F1

Class - None

Division - Not Applicable

Specifications

Enclosure	TEFC
Frame	184TC
Frame Material	Steel
Frequency	60.00 Hz
Motor Letter Type	Three Phase
Output @ Frequency	5.000 HP @ 60 HZ
Phase	3
Synchronous Speed @ Frequency	3600 RPM @ 60 HZ
Voltage @ Frequency	230.0 V @ 60 HZ 460.0 V @ 60 HZ
XP Class and Group	None
XP Division	Not Applicable
Agency Approvals	CSA CSA EEV NEMA PREMIUM UR
Ambient Temperature	40 °C
Auxiliary Box	No Auxillary Box
Auxillary Box Lead Termination	None
Base Indicator	No Mounting
Bearing Grease Type	Polyrex EM (-20F +300F)
Blower	None
Current @ Voltage	5.800 A @ 460.0 V 12.800 A @ 208.0 V 11.600 A @ 230.0 V
Design Code	A
Drip Cover	No Drip Cover
Duty Rating	CONT
Efficiency @ 100% Load	88.5 %
Electrically Isolated Bearing	Not Electrically Isolated
Feedback Device	NO FEEDBACK
Front Shaft Indicator	None

Part detail

Revision	B
Type	AC
Mech. spec.	36A003
Base	
Status	PRD/A
Elec. spec.	36WGGQ043
Layout	36LYA003
Eff. date	06-16-2021
CD Diagram	CD0005
Poles	02
Leads	9#16
Proprietary	False
Created date	12-15-2020

Heater Indicator	No Heater
High Voltage Full Load Amps	5.8 a
Insulation Class	F
Inverter Code	Inverter Ready
KVA Code	L
Lifting Lugs	No Lifting Lugs
Locked Bearing Indicator	Locked Bearing
Motor Lead Quantity/Wire Size	9 @ 16 AWG
Motor Lead Termination	Flying Leads
Motor Standards	NEMA
Motor Type	3630M
Mounting Arrangement	F1
Number of Poles	2
Overall Length	16.55 IN
Power Factor	91
Product Family	General Purpose
Pulley End Bearing Type	Ball
Pulley Face Code	C-Face
Pulley Shaft Indicator	Standard
Rodent Screen	None
RoHS Status	ROHS COMPLIANT
Service Factor	1.15
Shaft Diameter	1.125 IN
Shaft Ground Indicator	No Shaft Grounding
Shaft Rotation	Reversible
Shaft Slinger Indicator	No Slinger
Speed	3470 rpm
Speed Code	Single Speed
Starting Method	Direct on line
Thermal Device - Bearing	None
Thermal Device - Winding	None
Vibration Sensor Indicator	No Vibration Sensor
Winding Thermal 1	None
Winding Thermal 2	None

Nameplate

NP3441LUA									
CAT.NO.	VEM3613T								
SPEC	36A003Q043G1								
HP	5								
VOLTS	230/460								
AMPS	11.6/5.8								
RPM	3470								
FRAME	184TC	HZ		60	PH		3		
SF	1.15	CODE		L	DES	A	CLASS		F
NEMA NOM. EFF	88.5	PF		91					
RATING	40C AMB-CONT								
CC	010A	USABLE AT 208V				12.8			
ENCL	TEFC	SER							
DE	6206	ODE		6205					
VPWM INVERTER READY									
CT6-60H(10:1)VT3-60H(20:1									
				50HZ 5HP 190/380V 14.2/7.1A				SF1.0	

AC Induction Motor Performance Data

Record # 85858

Preliminary Data Sheet

Winding: 36WGQ043-RXXX		Type: 3630M	Enclosure: TEFC
Nameplate Data			
Rated Output (HP)	5	460 V, 60 Hz: High Voltage Connection	
Volts	230/460	Full Load Torque	7.57 LB-FT
Full Load Amps	11.6/5.8	Start Configuration	direct on line
R.P.M.	3470	Breakdown Torque	35.2 LB-FT
Hz	60 Phase	Pull-up Torque	25.1 LB-FT
NEMA Design Code	A KVA Code	Locked-rotor Torque	28.6 LB-FT
Service Factor (S.F.)	1.15	Starting Current	58.9 A
NEMA Nom. Eff.	88.5 Power Factor	No-load Current	1.75 A
Rating - Duty	40C AMB-CONT	Line-line Res. @ 25°C	2.57 Ω
S.F. Amps	13.4/6.7	Temp. Rise @ Rated Load	76°C
		Temp. Rise @ S.F. Load	102°C
		Locked-rotor Power Factor	65.7
		Rotor inertia	0.134 lb-ft²

Load Characteristics 460 V, 60 Hz, 5 HP

	25	50	75	100	125	150	S.F.
% of Rated Load							
Power Factor	62	81	88	92	93	94	93
Efficiency	85.6	89.6	89.7	88.7	87.1	85.1	87.8
Speed	3570	3540	3505	3469	3430	3385	3436
Line amperes	2.26	3.25	4.48	5.81	7.28	8.92	6.68

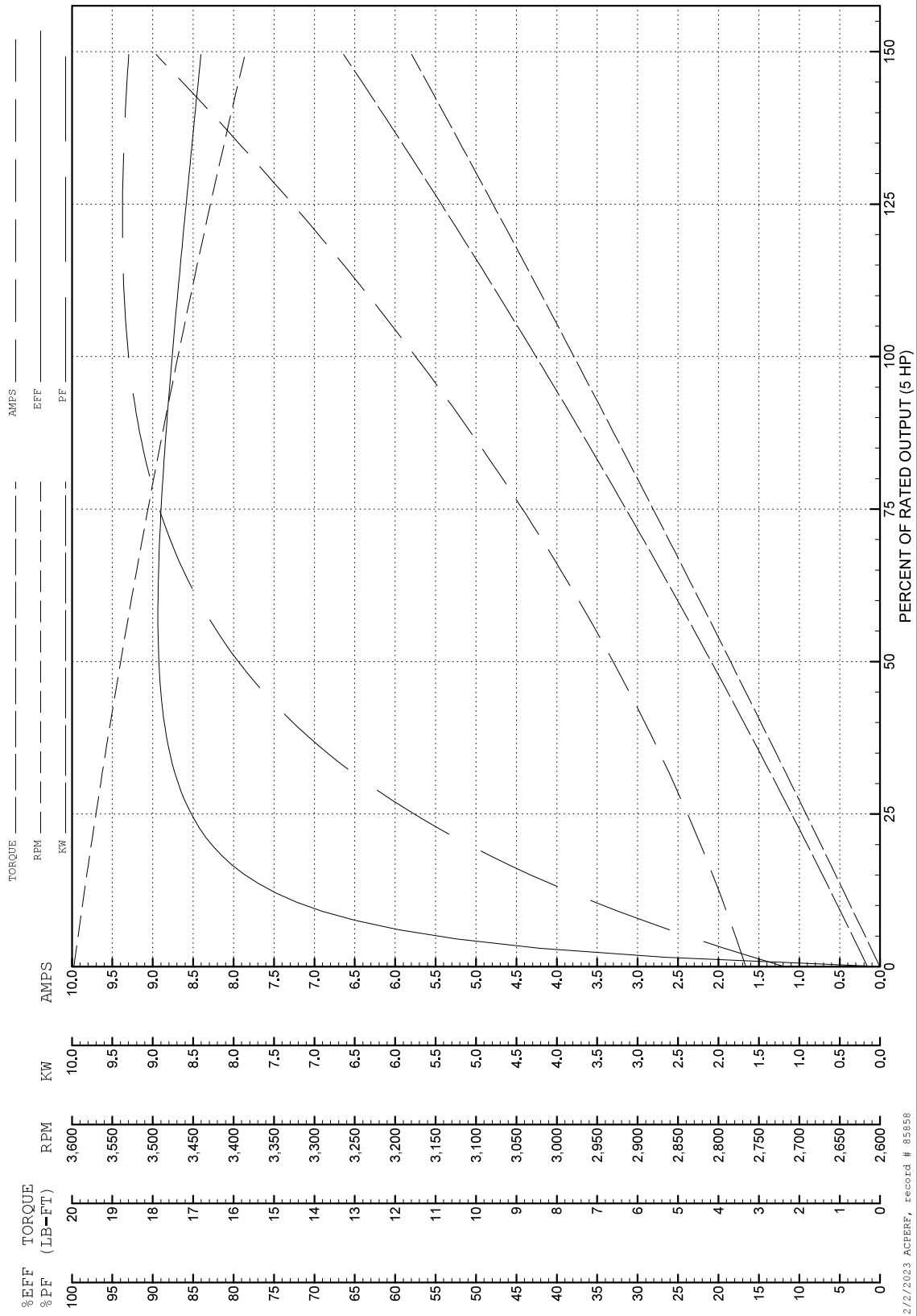
ABB Motors and Mechanical Inc.

WINDING # 36WGQ043

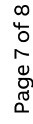
5 HP 3 PH 60 HZ 3470 RPM 460 V 3630M

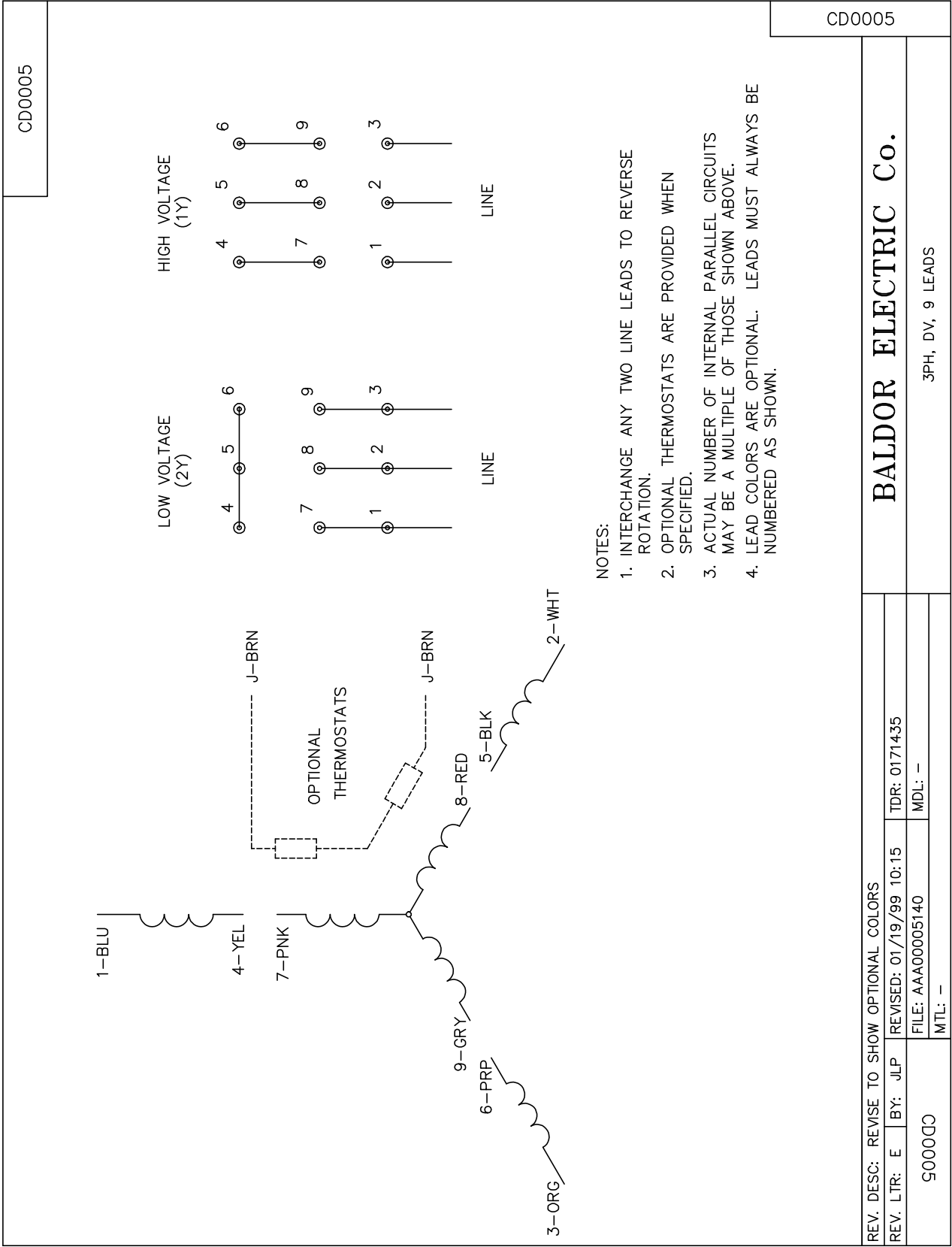
TORQUES (LB-FT) : PO=35.2 PU=25.1 LR=28.6 LRA=58.9

Typical performance - not guaranteed values.



2/2/2023 ACPPER, record # 85858





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912, 25th Street SE

Hickory NC 28602

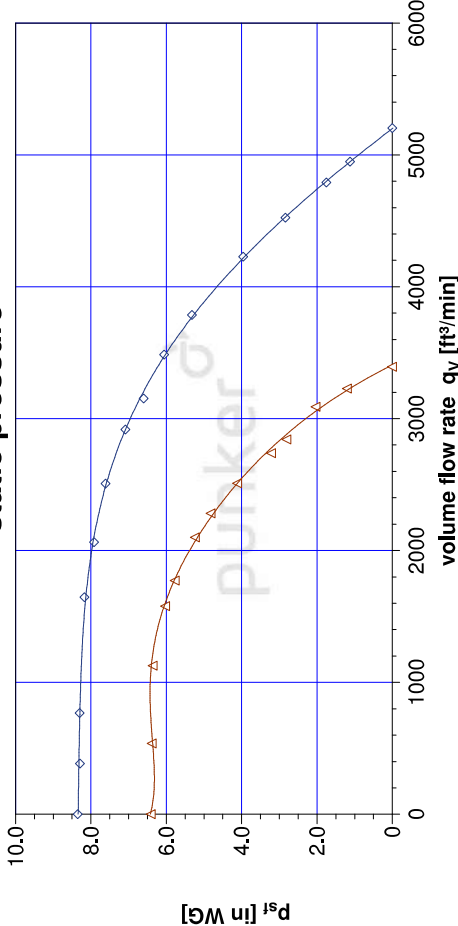
Fon: +1.828.322.1951

Fax: +1.828.328.1336

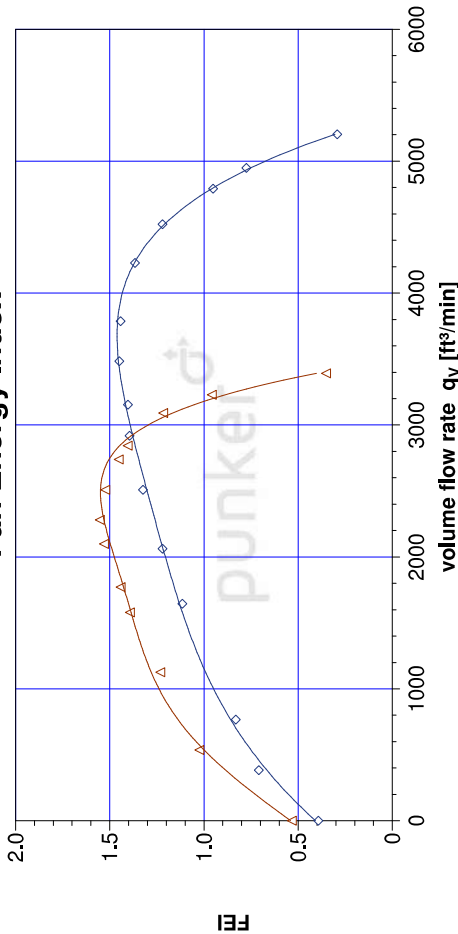
info@punker.com



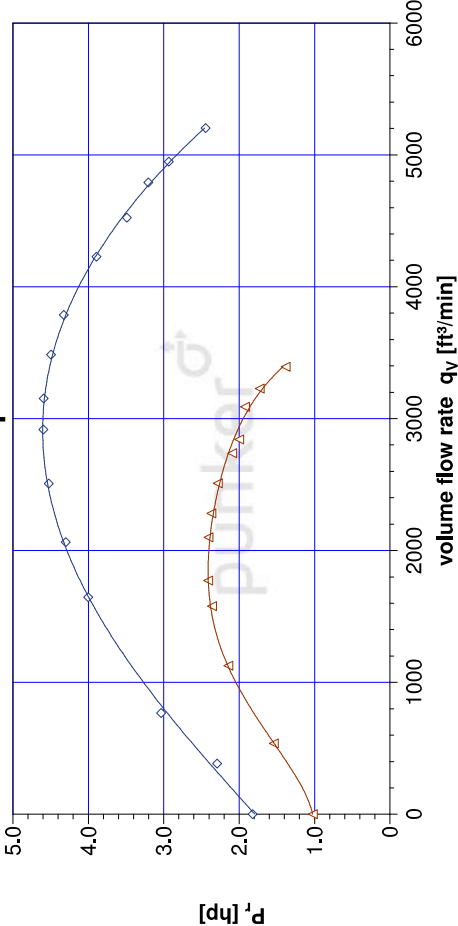
static pressure



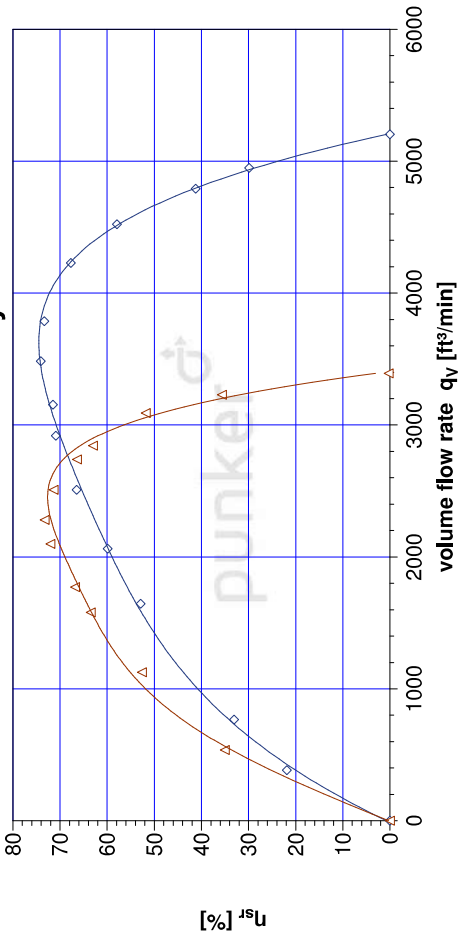
Fan Energy Index



shaft power



mechanical efficiency static



reference fan wheel

◇ 12823 Dclassic SWL 355 x 100-E

△ 12846 Dclassic SWL 315 x 90-E

04.03.2020

reference	fan wheel	n [rpm]	p [lb/ft³]	inlet cone	A [in]	u [in]	ErP since	ErP meas. category	η-motor [%]
◇ 12823	Dclassic SWL 355 x 100-E	3450	0.0752	ED11/355	8.3 (w)	-0.14	2015	A/C (fan wheel)	NEWA: 88.5
△ 12846	Dclassic SWL 315 x 90-E	3450	0.0752	ED11/315	7.3 (w)	-0.13	2015	A/C (fan wheel)	NEWA: 88.5

desired duty point: 0 ft³/min, 0.00 in WG. Technical information is available at: www.punker.com/downloads

The characteristic curves shown are valid for measurements on a testing setup built in accordance with ISO 5801 (DIN 24163) and may vary depending on the mounting situation. In principle, it has to be taken into account that these characteristic values were recorded under laboratory conditions. The real data are to be evaluated in consideration of further marginal conditions.

A = unit length, u = axle gap

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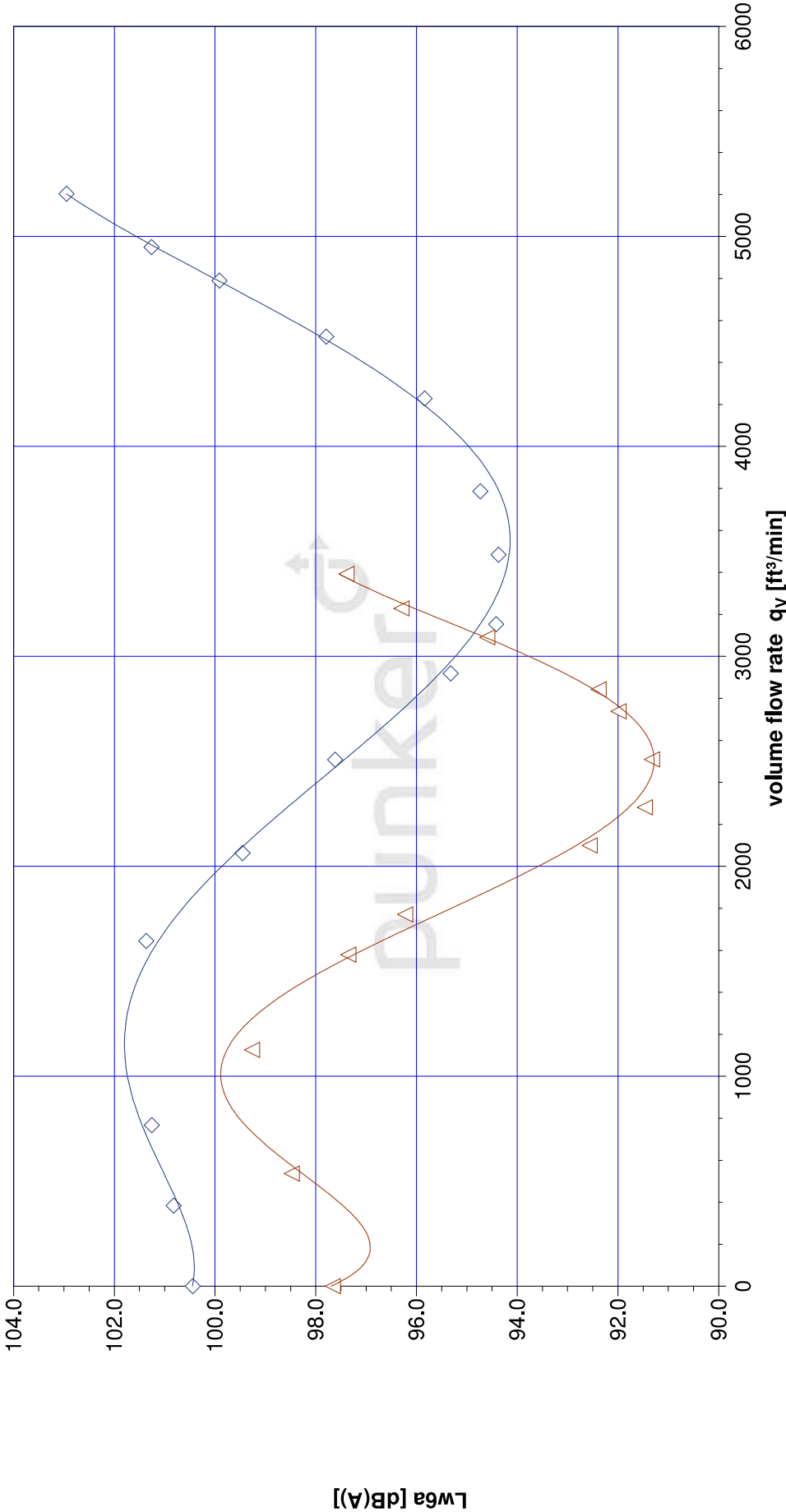
Fon: +1.828.322.1951

Fax: +1.828.328.1336

info@punker.com



sound power level A-weighted



04.03.2020

reference	fan wheel
◇ 12823	Dclassic SWL 355 x 100-E
△ 12846	Dclassic SWL 315 x 90-E

n [rpm]	p [lb/ft³]	inlet cone	A [in]	u [in]	ErP since	ErP meas. category	n-motor [%]
3450	0.0752	ED11/355	8.3 (w)	-0.14	2015	A,C (fan wheel)	NEMA: 88.5
3450	0.0752	ED11/315	7.3 (w)	-0.13	2015	A,C (fan wheel)	NEMA: 88.5

desired duty point: 0 ft³/min, 0.00 in WG. Technical information is available at: www.punker.com/downloads

The characteristic curves shown are valid for measurements on a testing setup built in accordance with ISO 5801 (DIN 24163) and may vary depending on the mounting situation. In principle, it has to be taken into account that these characteristic values were recorded under laboratory conditions. The real data are to be evaluated in consideration of further marginal conditions.

A = unit length, u = axle gap

NOTE:

- The wire diagram shows the wiring set up for a high voltage (460VAC) three phase system. To wire the system as a low voltage (230VAC or 208VAC) three phase system, see the transformer diagram in Detail F and motor wiring in Details D & E.
- Fork Terminals are used to connect to the transformer. The green contacts are grounding terminal blocks and must connect to bare, unpainted DIN rail.
- The transformer uses IP 2X finger safe protection guards. The electrical box has a keyed cam latch and lift off hinge to secure the door. The transformer is a class 2 transformer and the disconnect / emergency shut off is rated as a motor breaking switch.
- Primary branch circuit protection consisting of an inverse time fixed trip circuit breaker rated at 30kA IC trip must be provided by the end user. A WS-5 must be attached to a breaker properly sized for the equipment. A single weld station unit must not be attached to a breaker greater than 250% of the FLA of the motor according to NEC Code. The breaker should be rated at 125% of the unit FLA rounded up to the next standard breaker size.
- Clear flexible tubing is run from the pressure sensor to the air fittings. All air lines must be run free of kinks.
- The disconnect / emergency shut off device is rated at 20 Amps. Additional disconnecting means must be rated at least 20A.
- The DIN connectors on the valves must seal with the SOOW cord using the grommet provided with the connector.
- The light on the Start / Stop double push button must illuminate when the motor actuator is activated. The push button is wired so that the normally closed contact (NC) is 'STOP' and the normally open contact (NO) is 'START' and activates the motor.
- See Details D and E for motor wiring. Clean Air America has standardized on 'Wye' or 'Star' voltage wiring method. Wiring connections in the motor's pecker head must be made using the screw terminals of the distribution block. The distribution block must be screwed to the inside of the pecker head.
- All wires and air tubing leaving the electrical box should be bound together and prevented from laying loose on the cabinet floor. The wires must be routed out of the electrical box and attached to the floor of the cabinet using the wire routing tracks. The cables should then turn up the first valve and route under the reservoir to the second valve. The motor cable is attached to the conduit and then through the 3/4" strain relief. Wires should be tight, but not stressed.
- Once attached, the door must open fully at least 90 degrees with out interference. The door is also removable for eased maintenance.
- Main power for the lights is drawn from the electrical box to a main junction box in the valve compartment. The lights for the main unit are connected directly to the terminal strip inside this junction box. A similar junction box is located on the top of secondary booths. Power for the lights in the secondary booth is run from the junction boxes back through the conduit and wire tracks to the main distribution box and connected to the terminal strip. Electrical connection for the secondary booth to the main booth is done using the quick connects shown in Detail C. These connectors are located inside the wire track beneath the intake.
- WKA and Dwyer sensors are wired and operate identically. If a Kavlico sensor is used, a voltage regulator is used to drop the 24VDC down to 5VDC. If a Dwyer sensor is used see Detail J, no voltage regulator is needed. If Dwyer sensor is used, an additional mounting hole must be drilled. See Detail M for wiring of the Kavlico sensor.
- The following labels must be applied: (2) "Ground Symbol" labels applied to the box next to the grounding terminal blocks, (1) "Danger High Voltage, Disconnect power before servicing" label applied to the outside of the electrical door next to the disconnect, (1) "Laminated Electrical Diagram" applied to the inside of the electrical door, (1) "NEMA 12" label applied to the inside of the electrical box.
- When adding an economizer, a hole must be drilled in the bottom of the electrical box for each economizer lead. Next, 18-2 SOOW cable is run as shown in Detail G. There is no polarity on the economizer.
- When adding a Remote Start / Stop button, a hole must be drilled in the bottom of the electrical box. Next, 16-3 SOOW cable is run as shown in Details H and L. The jumper from 20 to 34 must be removed.
- SOOW cable and THHN wires are rated for 600V. All 460V wires are isolated from other wires by 30mm. Wires for the pressure sensor are isolated from all wires carrying voltage higher than 24VDC by at least 30mm; additionally, the sensor circuit is protected using a 3A breaker.
- Breakers are active when showing red and tripped or deactivated when showing green.
- Use the following chart to determine breaker type:

Breaker	Location	QTY	Type	Size	Voltage
B1	Terminal Strip, Trans Primary	2	UL489	3A	600VAC
B2	Terminal Strip, Trans Secondary	1	UL489	3A	600VAC
B3	Terminal Strip, Lighting Circuit	1	UL489	3A	600VAC
B4	Terminal Strip, Pressure Sensor	1	UL489	3A	600VAC

21) All wires are 16ga THHN stranded wire EXCEPT:

- Motor cables is 12-4 SOOW cable.
- Valve leads are 16-3 SOOW cable.
- Wires between the disconnect and contactor are 12ga wires from SOOW cable or THHN.
- Light cables are 18-2 SOOW.
- Kavlico Sensor and the voltage regulator wires.
- Incoming power wiring is run by customer and must be rated at 600V.

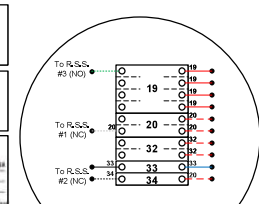
22) Use the following chart to identify the overload and contactor and the overload setting:

Incoming Power	Contactor	Overload	Overload Setting
5HP, 460VAC, 3 Phase:	XTCE018C10A	XTOE020CCS, ZEB12-20	7.5A
3HP, 460VAC, 3 Phase:	XTCE018C10A	XTOE020CCS, ZEB12-20	4.7A
5HP, 230VAC, 3 Phase:	XTCE018C10A	XTOE020CCS, ZEB12-20	15.6A
3HP, 230VAC, 3 Phase:	XTCE018C10A	XTOE020CCS, ZEB12-20	9.4A
5HP, 208VAC, 3 Phase:	XTCE018C10A	XTOE020CCS, ZEB12-20	16.9A
3HP, 208VAC, 3 Phase:	XTCE018C10A	XTOE020CCS, ZEB12-20	10.1A

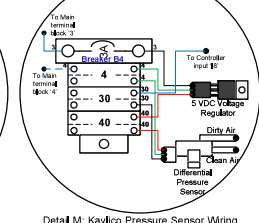
23) Customer must provide incoming power disconnect with fast acting Class J Fuses.

Wire Number Index:	Wire Number Index:
0: Ground	24: N/A
1: +110VAC Supply	25: N/A
2: +110VAC Supply	26: N/A
3: +24VDC Supply	27: 460VAC, Phase 1, Incoming
4: 24VDC Supply	28: 460VAC, Phase 2, Incoming
5: 460VAC, Phase 1, Switched	29: 460VAC, Phase 3, Incoming
6: 460VAC, Phase 2, Switched	30: Pressure Sensor Signal
7: 460VAC, Phase 3, Switched	31: Motor Start Signal
8: N/A	32: Pushbutton Light Signal
9: N/A	33: Light Power Wire
10: N/A	34: Remote Stop Jumper
11: Valve #1 Signal +110VAC	35: Stop Signal to Controller
12: Valve #2 Signal +110VAC	36: +5VDC Supply
13: N/A	43: Overload Signal
14: N/A	52: Trans, Secondary O.C.P.
15: N/A	53: Economizer Signal
16: N/A	54: Restart Latching Relay Sig.
17: N/A	55: Restart Path Interlock Contact
18: Start Signal	
19: Stop Signal	
20: Motor #1 Power, Ph1	
21: Motor #1 Power, Ph2	
22: Motor #1 Power, Ph3	

Color Sample List	PHASE 1	PHASE 2	PHASE 3
Black	●	●	●
White	●	●	●
Gray	●	●	●
Yellow	●	●	●
Orange	●	●	●
Red	●	●	●
Pink	●	●	●
Blue	●	●	●
Green	●	●	●



Detail L: Remote Start / Stop Terminal Strip Wiring



Detail M: Kavlico Pressure Sensor Wiring

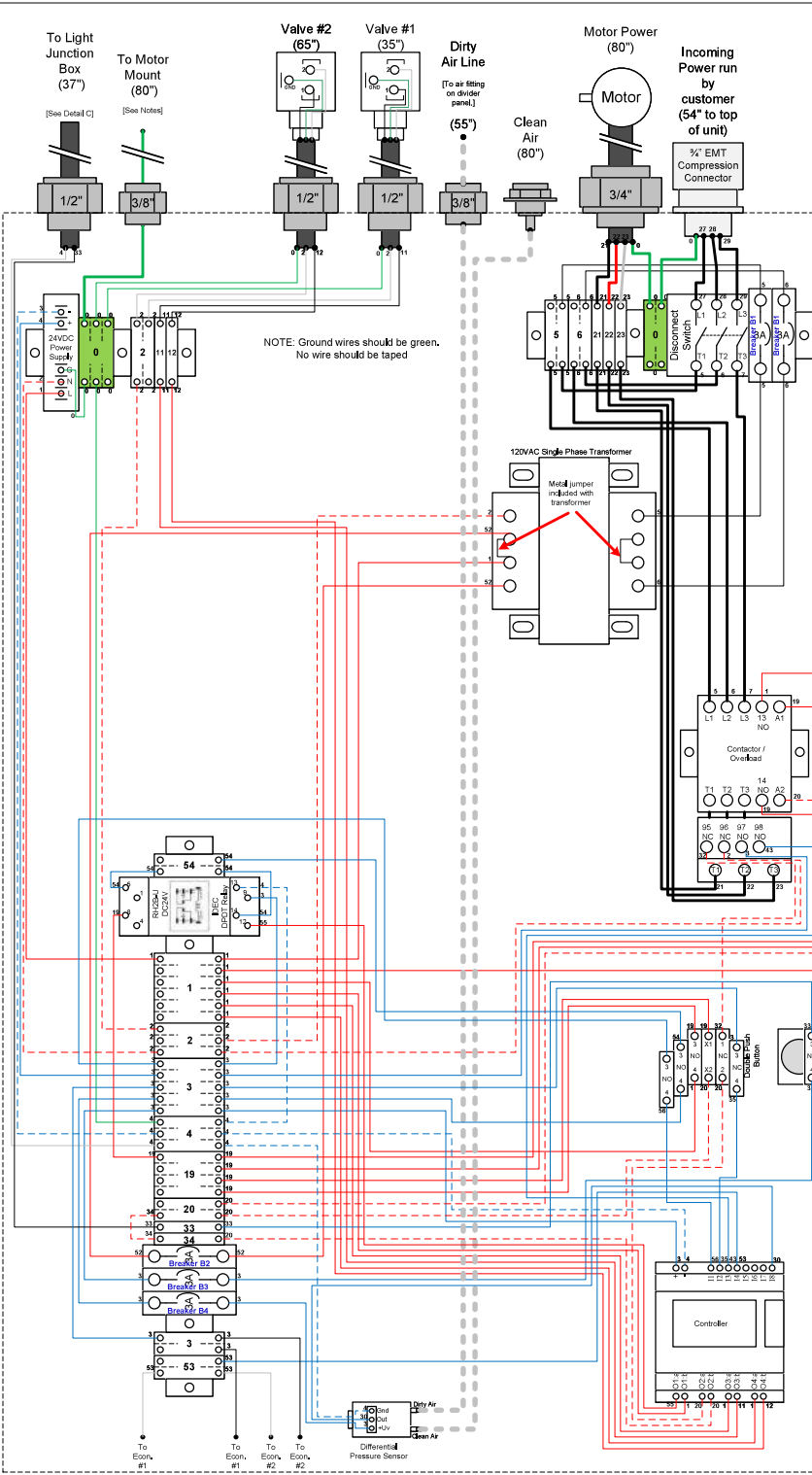
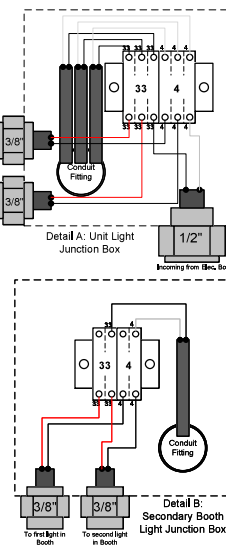
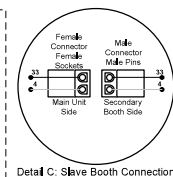
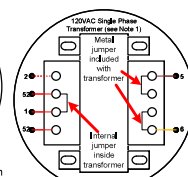
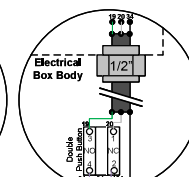
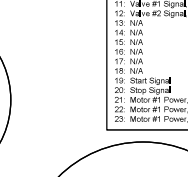
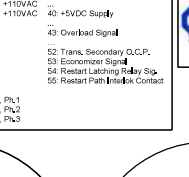
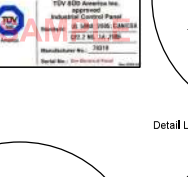
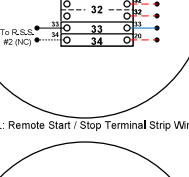
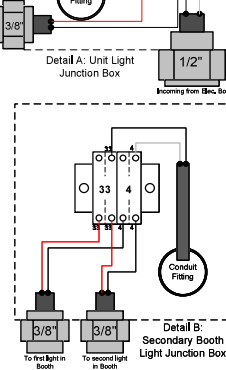
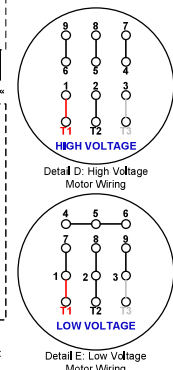
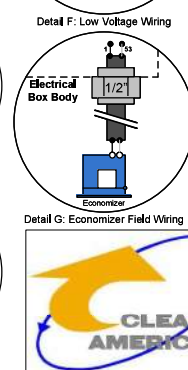
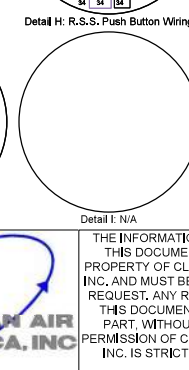
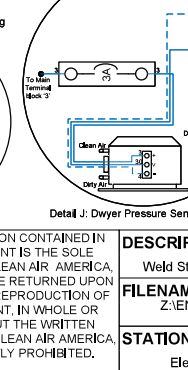
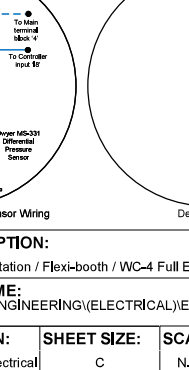
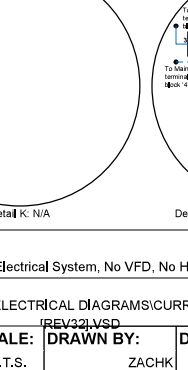
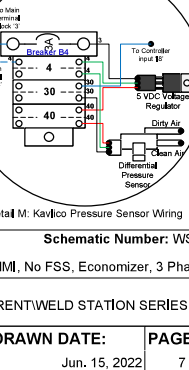
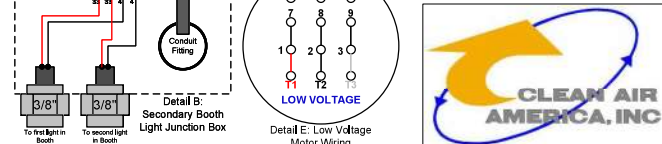
DESCRIPTION:

Weld Station / Flex-booth / WC-4 Full Electrical System, No VFD, No HMI, No FSS, Economizer, 3 Phase

FILENAME:

Z:\ENGINEERING\ELECTRICAL\ELECTRICAL DIAGRAMS\CURRENT WELD STATION SERIES

STATION:	SHEET SIZE:	SCALE:	DRAWN BY:	DRAWN DATE:	PAGE:
Electrical	C	N.T.S.	ZACHK	Jun. 15, 2022	7 OF 18



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STATION:	SHEET SIZE:	SCALE:	DRAWN BY:	DRAWN DATE:	PAGE:
Electrical	C	N.T.S.	ZACHK	Jun. 15, 2022	7 OF 18

Weldstation Dual, Triple 5hp Electrical Cutout

	Voltage	Motor [hp]	Motor FLC [A]	Unit FLA [A]	AC Contactor Part #	24VDC Contactor Part #	Electronic Overload Part #	Electronic Overload Part # [DEFENDER ONLY]	Bimetallic Overload Part #	Overload Setting	MMP Part #	MMP Enclosure Part #
208V, 1-Ph, 1-Motor	208	1	9	14	XTCE_018C10A	XTCE_018C10TD	XTOE020CCS	XTOE020CCSS	LRD14	8.8	XTPR010BC1	XTPAXENCSS55RY
	208	1.5	11	17	XTCE_018C10A	XTCE_018C10TD	XTOE020CCS	XTOE020CCSS	LRD313	11	XTPR012BC1	XTPAXENCSS55RY
	208	2	13	20	XTCE_018C10A	XTCE_018C10TD	XTOE020CCS	XTOE020CCSS	LRD318	13.2	XTPR016BC1	XTPAXENCSS55RY
	208	3	19	26	XTCE_040D00A	XTCE_040D00TD	XTOE020CCS	XTOE020CCSS	LRD325	18.7	XTPR020BC1	XTPAXENCSS55RY
	208	5	31	42	XTCE_040D00A	XTCE_040D00TD	XTOE045DCS	XTOE045CCSS	LRD332	30.8	XTPR032BC1	XTPAXENCSS55RY
230V, 1-Ph, 1-Motor	230	1	8	13	XTCE_018C10A	XTCE_018C10TD	XTOE020CCS	XTOE020CCSS	LRD12	8	XTPR010BC1	XTPAXENCSS55RY
	230	1.5	10	16	XTCE_018C10A	XTCE_018C10TD	XTOE020CCS	XTOE020CCSS	LRD14	10	XTPR010BC1	XTPAXENCSS55RY
	230	2	12	18	XTCE_018C10A	XTCE_018C10TD	XTOE020CCS	XTOE020CCSS	LRD313	12	XTPR012BC1	XTPAXENCSS55RY
	230	3	17	24	XTCE_040D00A	XTCE_040D00TD	XTOE020CCS	XTOE020CCSS	LRD318	17	XTPR020BC1	XTPAXENCSS55RY
	230	5	28	38	XTCE_040D00A	XTCE_040D00TD	XTOE045DCS	XTOE045CCSS	LRD332	28	XTPR032BC1	XTPAXENCSS55RY
	230	7.5	40	53	XTCE_072D00A	XTCE_072D00TD	XTOE045DCS	XTOE045CCSS	LRD340	40	XTPR040DC1	XTPAXENCSD65RY
	230	10	50	66	XTCE_072D00A	XTCE_072D00TD	XTOE100DCS	XTOE100GCSS	LRD350	50	XTPR050DC1	XTPAXENCSD65RY
230V, 3-Ph, 1-Motor	230	1	4	8	XTCE_018C10A	XTCE_018C10TD	XTOE005CCS	XTOE005CCSS	LRD10	4.2	XTPR06P3BC1	XTPAXENCSS55RY
	230	1.5	6	11	XTCE_018C10A	XTCE_018C10TD	XTOE020CCS	XTOE020CCSS	LRD10	6	XTPR06P3BC1	XTPAXENCSS55RY
	230	2	7	12	XTCE_018C10A	XTCE_018C10TD	XTOE020CCS	XTOE020CCSS	LRD12	6.8	XTPR010BC1	XTPAXENCSS55RY
	230	3	10	15	XTCE_018C10A	XTCE_018C10TD	XTOE020CCS	XTOE020CCSS	LRD14	9.6	XTPR010BC1	XTPAXENCSS55RY
	230	5	15	22	XTCE_040D00A	XTCE_040D00TD	XTOE020CCS	XTOE020CCSS	LRD318	15.2	XTPR016BC1	XTPAXENCSS55RY
	230	7.5	22	31	XTCE_040D00A	XTCE_040D00TD	XTOE045DCS	XTOE045CCSS	LRD325	22	XTPR025BC1	XTPAXENCSS55RY
	230	10	28	38	XTCE_040D00A	XTCE_040D00TD	XTOE045DCS	XTOE045CCSS	LRD332	28	XTPR032BC1	XTPAXENCSS55RY
460V, 3-Ph, 1-Motor	460	1	2	6	XTCE_018C10A	XTCE_018C10TD	XTOE005CCS	XTOE005CCSS	LRD07	2.1	XTPR02P5BC1	XTPAXENCSS55RY
	460	1.5	3	7	XTCE_018C10A	XTCE_018C10TD	XTOE005CCS	XTOE005CCSS	LRD08	3	XTPR004BC1	XTPAXENCSS55RY
	460	2	3	7	XTCE_018C10A	XTCE_018C10TD	XTOE005CCS	XTOE005CCSS	LRD08	3.4	XTPR004BC1	XTPAXENCSS55RY
	460	3	5	9	XTCE_018C10A	XTCE_018C10TD	XTOE005CCS	XTOE005CCSS	LRD10	4.8	XTPR006P3BC1	XTPAXENCSS55RY
	460	5	8	13	XTCE_018C10A	XTCE_018C10TD	XTOE020CCS	XTOE020CCSS	LRD12	7.6	XTPR010BC1	XTPAXENCSS55RY
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	460	10	14	21	XTCE_018C10A	XTCE_018C10TD	XTOE020CCS	XTOE020CCSS	LRD318	14	XTPR016BC1	XTPAXENCSS55RY
	460	15	21	29	XTCE_040D00A	XTCE_040D00TD	XTOE045DCS	XTOE045CCSS	LRD325	21	XTPR025BC1	XTPAXENCSS55RY
	460	20	27	37	XTCE_040D00A	XTCE_040D00TD	XTOE045DCS	XTOE045CCSS	LRD332	27	XTPR032BC1	XTPAXENCSS55RY
	460	25	34	46	XTCE_072D00A	XTCE_072D00TD	XTOE045DCS	XTOE045CCSS	LRD340	34	XTPR040DC1	XTPAXENCSD65RY
	460	30	40	53	XTCE_072D00A	XTCE_072D00TD	XTOE045DCS	XTOE045CCSS	LRD340	40	XTPR040DC1	XTPAXENCSD65RY
	460	40	52	68	XTCE_072D00A	XTCE_072D00TD	XTOE100DCS	XTOE100GCSS	LRD365	52	XTPR058DC1	XTPAXENCSD65RY

POWER WAVE® 300C

ADVANCED PROCESS WELDER



THE ULTIMATE ALL-IN-ONE MACHINE

From technical training to industrial fabrication, the Power Wave 300C delivers the ultimate 300 amp- “Do-Everything” welder. Packed with all the arc performance and technology you expect from a Power Wave system, this compact machine takes the industrial “all-in-one” class of welders to the next level.

Processes »

SMAW, GTAW, GMAW, GMAW-P, FCAW
SMAW-AC*, GTAW-AC*, GTAW-HF*, STT MIG*

Applications »

General Fabrication, Education

Output »



Input »



Product Numbers »

POWER WAVE 300C STANDARD

K4487-1

POWER WAVE 300C ADVANCED

K4488-1

POWER WAVE 300C ADVANCED, EDUCATIONAL ONE-PAK

K4934-1

POWER WAVE 300C ADVANCED (CE)

K4490-5

*Available on Power Wave 300C Advanced Model

For full waveform list please visit
www.PowerWaveSoftware.com

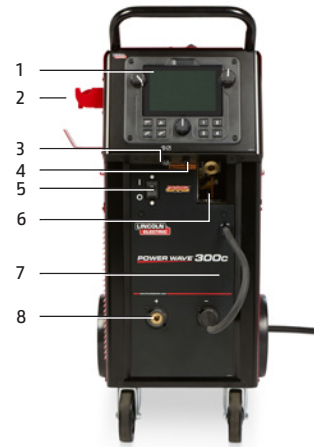
KEY FEATURES

- **Best-in-Class Performance** Industry's only true 300Amp, 100% Duty Cycle, All-Process Machine.
- **All-Process Versatility** Stick, TIG, MIG, Flux-Cored, Arc Gouging processes, with advanced weld modes and integrated High Frequency and AC/DC capabilities*.
- **Intelligent Connectivity** Intelligent, operator-focused interface and powerful Industry 4.0 capabilities including CheckPoint® Production Monitoring.
- **Flexible Input Power** PowerConnect® Technology allows for 200V-600V input power while maintaining consistent and reliable arc performance.
- **Ready-to-Run™ Design** Standard features for simple and straightforward operation, including cable management hooks, integrated cart with tilting bottle rack, and TIG solenoid.

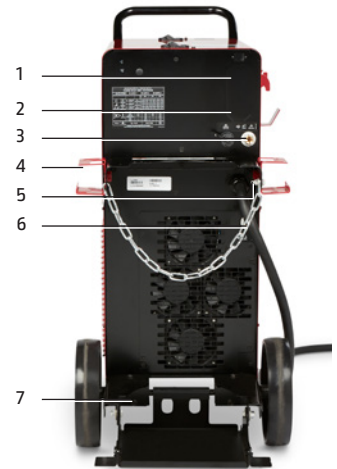
* Available on Power Wave 300C Advanced Model

KEY CONTROLS - POWER SOURCE

1. User Interface / Controls w/USB Port
2. Cable / Torch Hanger
3. Remote Connection, 12 pin
4. Gun Trigger Connection, 4 pin
5. Power Source ON/OFF
6. MIG/FCAW Gun Connection
7. Sense Lead Connection (if required)
8. Twist Mate™ Connections w/ integrated TIG gas solenoid



1. Auxiliary 115V Outlet (optional K2829-1)
2. Ethernet Connection
3. MIG/FCAW Shielding Gas Input
4. Tool Holder
5. Power Cable Input
6. TIG Shielding Gas Input
7. Tilting Bottle Rack



KEY CONTROLS - USER INTERFACE



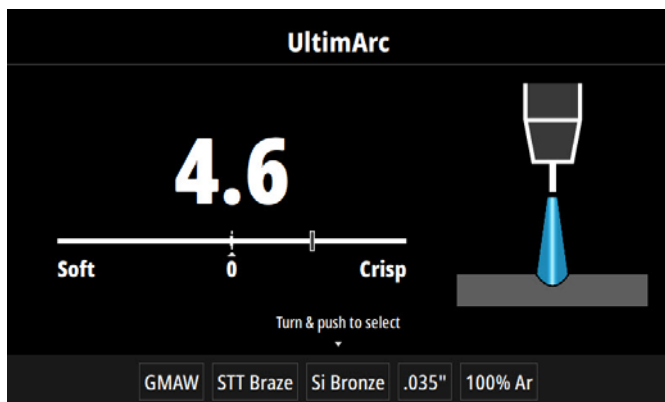
NEXT GENERATION OF SIMPLICITY & CONTROL

The Power Wave 300C user interface helps maximize arc time and allow operators of all skill levels to focus more on making great welds.

- One-button process changes
- Straightforward, easy-to-understand navigation
- Memory buttons for preferred settings
- ArcFX® Technology for visual arc settings feedback
- Single point of use – all controls in one location on the feeder
- Multilingual options for true global compatibility



Power Wave 300C - Home Screen



Power Wave 300C - process configuration screen with ArcFX® Technology



Power Wave 300C - language option screen

FINE-TUNED ARC PERFORMANCE

The Power Wave 300C comes loaded with an expansive list of weld modes optimized for maximum performance with the industry's most common filler metals, wire diameters, and gas mixtures offered by Lincoln Electric's Waveform Control Technology®.

- Stick modes optimized for cellulosic and low hydrogen electrodes
- MIG modes optimized for 0.035-0.052 in. for steel, 0.035-0.045 in. for stainless, 0.045-0.052 in. for metal cored, and 0.035, 3/64, and 1/16 in. for aluminum
- MIG modes optimized for simplicity (Smart Pulse™) and fume management (Low Fume Pulse™)*
- Flux-cored modes optimized for 0.045 in., 0.052 in., 1/16 in
- High-Frequency and AC/DC TIG Modes*

* Available on the Power Wave 300C Advanced Model



Power Wave 300C Standard

- DC Output
- Multi-Process Capabilities

What's Included

- Magnum® PRO Curve™ 300 Gun Ready-Pak (K2951-2-6-45)
- Harris Flowmeter/Regulator and Hose Kit (310021)
- 10 ft. (3 m) Work Lead
- 0.035/0.045 in. (0.9/1.2 mm) Combination V-Groove Drive Rolls (Included in Wire Drive Assembly) (KP1696-1)

Order

K4487-1 Standard



Power Wave 300C Advanced

- AC/DC Output
- Multi-Process Capabilities, with Advanced Waveforms:
 - Smart Pulse™, Low Fume Pulse™, and STT®
 - HF TIG including AC Aluminum Modes

What's Included

- Magnum PRO Curve 300 Gun Ready-Pak (K2951-2-6-45)
- Harris Flowmeter/Regulator and Hose Kit (310021)
- 10 ft. (3 m) Work Lead
- 0.035/0.045 in. (0.9/1.2 mm) Combination V-Groove Drive Rolls (Included in Wire Drive Assembly) (KP1696-1)

Order

K4488-1 Advanced

K4490-5 Advanced CE



Power Wave 300C Advanced Educational One-Pak

What's Included

- Power Wave 300C Advanced (K4488-1)
- Magnum PRO Curve 300 Gun Ready-Pak (K2951-2-6-45)
- Harris Flowmeter/Regulator and Hose Kit (310021)
- 10 ft. (3 m) Work Lead
- PTA-17F TIG Torch Ready-Pak (12.5 ft, 1 pc.) (K1782-14)
- Foot Amptrol™ - 25 ft (7.6 m), 12-pin (K870-2)
- Stick Electrode Holder, Cable (w/ Twist Mate) (K2374-1)
- 0.035/0.045 in. (0.9/1.2 mm) Combination V-Groove Drive Rolls (Included in Wire Drive Assembly) (KP1696-1)

Order

K4934-1

ADDITIONAL POWER WAVE 300C ACCESSORIES



K4866-1 Power Wave 300C Dual Gas Bottle Upgrade Kit

Allows for the use of multiple gas bottles or a combination of a gas bottle and water cooler on the rear of a Power Wave 300C



K4898-1 Power Wave 300C Water Cooler Adapter Kit

Allows Cool Arc® 40 Water Cooler to be installed in place of a gas bottle on the 300C single or dual bottle rack. Kit Includes: (1) 300C Cool Arc 40 Mounting Assembly and Hardware Kit, (1) Cool Arc 40 CGA to QD Water Hose Extension Kit, and (2) Quick Disconnect Adapters (KP4642-1).



K1813-1 Cool Arc 40 Water Cooler

Industrial water cooler that can function in both horizontal and vertical orientation for minimized footprint

* For use of Lincoln Electric Magnum PRO semi-automatic water cooled guns, order Fast-Mate gun and K489-8 adapter.

RECOMMENDED ACCESSORIES

GENERAL OPTIONS



Power Wave 300C 115V Auxiliary Kit
Adds a duplex 115v outlet to the rear of the machine. Includes harness and PC board.
Order K2829-1

Screen Protector
Order KP4735-1



Remote Output Control with 12-pin Universal Connector
Consists of a control box with choice of two cable lengths. Permits remote adjustment of output.
Order K857-2 (25 ft, 7.6 m)
Order K857-3 (100 ft, 30.5 m)

WIRE FEEDER OPTIONS



Magnum PRO Welding Guns
See publications E12.05 and E12.08.



Gun Connector Kit
Power Wave 300C / POWER MIG
Configures Lincoln Electric Magnum PRO guns to connect to Power Wave 300C and POWER MIG® power sources. For use with KP42 & KP44 series liners
Order K466-6



Magnum PRO Dual Procedure Adapter
Required to use Magnum PRO Dual Procedure or Dual Schedule guns with the Power Wave 300C
Order K3159-1



Magnum Curve 300 AL Push Gun
10 ft. *The Magnum PRO AL Push Gun is a cost effective solution for welding 3/64-1/16 in. aluminum wire over distances up to 10 ft. This welding gun solution was designed with the soft wire in mind, and includes the proper expendables to ensure premium performance for the recommended applications
Order K4700-1-6-116A



Fast-Mate™ Adapter
Allows guns with a Fast-Mate™ style back end to connect into Power Wave 300C and POWER MIG power sources
Order K489-8



Spindle Adapter for Small Spools
Permits 8 in. (200 mm) O.D. spools to be mounted on 2 in. (51 mm) O.D. spindles
Order K468



Spindle Adapter for 14lb Coils
Permits 14 lb. (6 kg) Innershield® coils to be mounted on 2 in (51mm) O.D. spindles
Order K435



Readi-Reel™ Adapter
Adapts 22-30 lb. (10-14 kg) Lincoln Read-Reels® of electrode to 2 in (51mm) spindle
Order K363P



Magnum PRO AL Fixed Conduit Push-Pull Guns
The new, improved Magnum PRO AL Fixed Conduit Push-Pull Guns feature a new rigid liner which provides a smooth, premium aluminum welding solution. The enhanced feeding capabilities will reduce downtime and increase arc on time.
Order K4797-2 (Air Cooled) or K4798-2 (Water Cooled)
E12.14



Magnum Pro 250LX GT Spool Gun
With longer-lasting Magnum PRO Expendables and direct connect functionality
The Magnum PRO 250LX GT spool gun results in less downtime and hassle-free setup.
*Will need Lincoln 7-pin to 12-pin Adapter (K2910-1)
Order K3569-2 and K2910-1
E12.28

TIG OPTIONS



PTA-17 Air Cooled TIG Ready-Pak®
Flexible head and Ultra-Flex™ cables provide ultimate comfort and maneuverability. Pre-configured package with K1622-1 Twist-Mate™ adapter, cable cover. Includes: #7 nozzle, 1/16 in. (1.6 mm) and 3/32 in. (2.4 mm) collets, collet bodies and E3® Tungsten
Order: K1782-14 (12.5 ft, 3.8 m)
Order K1782-18 (25 ft, 7.6 m)
Additional TIG torch options in E12.150



Arc Start Switch (00001862)
Attaches to TIG torch for convenient finger control. Comes equipped with 12-pin connector
Order K814-2



Hand Amptrol Rotary Track Style, 12-pin
Amphenol (25 ft) Remote current control for TIG welding
Order K963-4



Foot Amptrol (00002440)
Provides 25 ft. (7.6 m) of remote output control for TIG welding. (12-pin plug connection).
Order K870-2



TIG-Mate 20 Water-Cooled TIG Torch Starter Pack
Get everything you need for TIG welding in one complete easy to-order kit packaged in its own portable carrying case. Includes: PTW-20 torch, parts kit, Harris flowmeter/regulator, Twist-Mate adapter, 10 ft. (3.0 m) gas hose, water hose coupler and water hoses, work clamp and cable.
Order K2267-1

CONSUMABLES

CONTACT TIPS AND LINERS

Wire Diameter - in. (mm)	Description	Order No.
FOR STEEL / STAINLESS STEEL / SILICON BRONZE		
0.045 [1.2]	350A Contact Tips (10)	KP2744-045
0.035 [0.9]	350A Contact Tips (10)	KP2744-035
0.030 [0.8]	350A Contact Tips (10)	KP2744-030
0.025 [0.6]	350A Contact Tips (10)	KP2744-025
0.035 - 0.045 [0.9 - 1.2]	Magnum PRO Curve 15 ft (4.5 m) Liner Solid Wire (1)	KP44-3545-15



Shown:
KP2744-045, Contact Tip

NOZZLES AND DIFFUSERS

Nozzle Diameter - in. (mm)	Description	Order No.
350A		
0.375 [9.5]	Thread-on Flush Nozzle	KP2742-1-38F
0.5 [12.7]	Thread-on Flush Nozzle	KP2742-1-50F
0.375 [9.5]	Thread-on Recessed Nozzle	KP2742-1-38R
0.5 [12.7]	Thread-on Recessed Nozzle	KP2742-1-50R
—	Steel Thread-on Nozzle	KP2746-1
550A		
0.625 [15.9]	Thread-on Flush Nozzle	KP2743-1-62F
0.75 [19.0]	Thread-on Flush Nozzle	KP2743-1-75F
0.625 [15.9]	AL Thread-on Recessed Nozzle	KP2743-1-62RA
0.75 [19.0]	Thread-on Recessed Nozzle	KP2743-1-75R
—	Steel Thread-on Diffuser	KP2747-1



Shown:
KP2742-1-38F, Thread-on Nozzle



Shown:
KP2746-1, Steel Thread-on Diffuser



Shown:
KP2747-1, Steel Thread-on Diffuser

For more options, please refer to the Magnum PRO Instruction Manual.

DRIVE ROLL KITS

Wire Type	Wire Diameter - in. (mm)	Order No.
Solid	0.023-0.030 [0.6-0.8]	KP1696-030S
	0.035 [0.9]	KP1696-035S
	0.035/0.045 Combination	KP1696-1
	0.040 [1.0]	KP1696-2
	0.045 [1.2]	KP1696-045S
Cored	0.035 [0.9]	KP1697-035C
	0.045 [1.2]	KP1697-045C
Aluminum	0.035 [0.9]	KP1695-035A
	3/64 [1.2]	KP1695-3/64A
	1/16 [1.6]	KP1695-1/16A



Shown:
KP1697-035C, Cored Drive Roll Kit

PRODUCT SPECIFICATIONS

Product Name	Product Number	Input Voltage / Phase / Hertz	Output Range	Rated Output / Voltage / Duty Cycle	Input Current @ Rated Output (Single Phase Values)	Dimensions H x W x D in (mm)	Net Weight lb (kg)
Power Wave 300C Standard	K4487-1	208/230/400/460/575/1/3/50/60	5-350A	GMAW: 350A/31.5V/40% GMAW: 300A/29V/100%	39/35/22/18/14.5 [57/52/NA/32/NA]	39.7 x 20.5 x 39.4 [1008 x 521 x 1001]	194 [88]
Power Wave 300C Advanced	K4488-1			SMAW: 325A/33V/40% SMAW: 280A/31.2V/100%	44/40/25/20/16.5 [61/58/NA/34/NA]		214 [97]
Power Wave 300C Advanced, Educational One-Pak	K4934-1			FCAW: 350A/31.5V/40% FCAW: 300A/29V/100% GTAW: 350A/24V/40% GTAW 300A/22V/100%			259 [118]
Power Wave 300C Advanced (CE)	K4490-5	208/230/400/3/50/60		GMAW: 325A/30.3V/40% GMAW: 300A/29V/100% SMAW: 325A/33V/40% SMAW: 280A/31.2V/100% FCAW: 325A/31.5V/40% FCAW: 300A/29V/100% GTAW: 350A/24V/40% GTAW 300A/22V/100%	44/40/25		214 [97]

For best welding results with Lincoln Electric® equipment, always use Lincoln Electric consumables. Visit www.lincolnelectric.com for more details.

CUSTOMER ASSISTANCE POLICY

The business of Lincoln Electric is manufacturing and selling high quality welding equipment, automated welding systems, consumables, cutting equipment and EV charging systems. Our challenge is to meet the needs of our customers, who are experts in their fields, and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric for information or technical information about their use of our products. Our employees respond to inquiries to the best of their ability based on information and specifications provided to them by the customers and the knowledge they may have concerning the application. Our employees, however, are not in a position to verify the information provided or to evaluate the engineering requirements for the particular weldment, or to provide engineering advice in relation to a specific situation or application. Accordingly, Lincoln Electric does not warrant or guarantee or assume any liability with respect to such information or communications. Moreover, the provision of such information or technical information does not create, expand, or alter any warranty on our products. Any express or implied warranty that might arise from the information or technical information, including any implied warranty of merchantability or any warranty of fitness for any customers' particular purpose or any other equivalent or similar warranty is specifically disclaimed.

Lincoln Electric is a responsive manufacturer, but the definition of specifications, and the selection and use of specific products sold by Lincoln Electric is solely within the control of, and remains the sole responsibility of the customer. Many variables beyond the control of Lincoln Electric affect the results obtained in applying these types of fabrication methods and service requirements.

Skid Steer Training Simulator System

Classroom 213

- **One (1) Vortex Advantage Skid Steer Training Simulator**
- **Three (3) Computer Workstations required for simulator operation and instructional use**
- **Three (3) Electrical Power Drops**
- **110-Volt Electrical Service to support all simulator and workstation equipment**



ONE SCREEN

- **Four (4) Interactive Touchscreen Displays**
- **Four (4) Hubware Kits for Touchscreen T7 Displays, each including: Intel® i7 OPS PC**
 - **Windows 11 Pro Operating System**
 - **Windows 11 Pro License (Single Computer)**
 - **SnapCam**
 - **Keyboard**
- **Four (4) Universal Tilt Wall Mounts compatible with displays ranging from 39" to 75".**

Installation Locations

- 1. Conference Room 210**
- 2. Classroom 213**
- 3. Classroom 214**
- 4. Classroom 216**

Digital Display

- **(2) 65" Commercial Digital Displays**
- **Samsung, Sony, or LG professional-grade 65" displays suitable for continuous commercial operation.**
- **(2) Professional 4K Media Players**
- **Enterprise-grade 4K media players featuring dynamic memory allocation, optimized motion graphics performance, 4K content playback, PoE+ capability, Live TV support, OpenGL ES compatibility, dynamic mosaic mode, and standard I/O connections.**
- **(2) Carousel Media Player Licenses**
- **Software licenses for digital signage content management and playback.**
- **(2) Annual Carousel Cloud Pro Subscription Licenses**
- **Additional Carousel Cloud Pro media player subscriptions, extending through the current agreement term ending October 2028.**
- **(2) 64GB Micro SD Memory Cards**
- **SanDisk SDHC-64C10-1(M) Class 10 Micro SD cards or approved equivalent.**
- **(2) Universal Tilt Wall Mounts**
- **Commercial-grade wall mounts compatible with 39" to 75" displays.**

Display Locations

- 1. Corridor Near Tool Room**
- 2. Lobby**



Audio | Video | Theatrical Lighting

The ESB Group, Inc
5855 U.S. Highway 11
Springville, AL 35146
O: 205-533-9396
M: 251-533-2422
www.esbgroup.net

Bishop State Community College

QTE12-26-119

Carver Ship Building

Contract Number :: ACCSITJPA-2019-0042

April 14, 2026

Scope of Work :: Purchase and Installation of Onescreen Displays, & Digital Signage Displays

:: Interactive Displays ::			
QTY	MAKE	MODEL NUMBER	DESCRIPTION
4	OneScreen	T7-75	75 inch 4K UHD Touchscreen with Octa-core processor, 8 GB RAM, 128 GB Storage, Android 15 w/EDLA, Built-in Mic, NFC, Subwoofer, Software & Apps Bundle*, 3 Year Warranty
4	OneScreen	Hubware-Kit-T7	Hubware kit for Touchscreen T7 (i7 OPS PC with Windows 11 Pro, SnapCam, Keyboard)
4	OneScreen	Win11Pro	Windows 11 Pro license-single computer
4	Samsung / Sony / LG	65" DISPLAY	65-inch Commercial 4K UHD Display, 350 NIT, 24/7
4	VTI	VTI Mobile Stand	Mobile Stand which supports 55" to 86" Screens
4	Samsung / Sony / LG	65" DISPLAY	65-inch Commercial 4K UHD Display, 350 NIT, 24/7
4	Chief / Peerless	MOUNT	Universal Tilt Wall Mount for 39" to 75" Displays
4	Brightsign	XD236	Professional 4K player with dynamic memory allocation, optimized motion graphics, 4k content, PoE+ & Live TV, full open GL ES, and dynamic mosaic mode for enterprise+ experiences with standard I/O
4	Carousel	Media Player License	Annual Subscription for an additional Carousel Cloud Pro media player license (Continues through end of current agreement - October 2028)
4	SanDisk	SDHC-64C10-1(M)	64GB Class 10 Micro SD Memory Card
TOTAL			\$39,753.00

:: Installation ::			
QTY	MAKE	MODEL NUMBER	DESCRIPTION
1	ESB	ESB-MISC	Hardware (Miscellaneous items: GAS, Nuts, Bolts, Screws, Tools, Chains, Shackles, Eye Bolts, Suspension Rods, Gripples, etc...)
1	ESB	ESB-TECH	Documentation, Installation of all above mentioned equipment. All Installations come with a 1 year warranty
Installation TOTAL			\$10,240.00

Visit us at www.ESBgroup.net			
		Sub-Total ::	\$49,993.00
		Tax :: (\$	-)
		Total ::	\$49,993.00

Based on manufacturer specifications all pricing is good for 30 days

NOTE: THIS QUOTE DOES NOT INCLUDE ANY ELECTRICAL CONDUIT, BOXES, POWER OR LABOR REQUIRED BY THE AUDIO, VIDEO, OR THEATRICAL LIGHTING SYSTEMS - UNLESS NOTED IN THE ABOVE EQUIPMENT LIST.

Robotic Welder

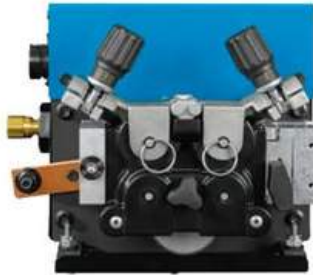
Welding lab

Auto-Continuum™ System Features

Tru-Feed™ technology provides precise feeding operation for stable arc performance.

- **Low-inertia motor** provides faster response for the best arc starts with the least amount of spatter.
- **Balanced-pressure drive-roll design and tensioners** feed wire in its truest and straightest form for consistent feedability.

Spring-loaded Accu-Mate™ connection prevents the gun from being pulled loose.



Quick-change dual-bearing drive rolls give you more consistent wire feeding.

Drive rolls and guides are common with other Miller industrial feeders (use existing, not new parts).

Inlet guide installation is toolless.

Wind Tunnel Technology™. Internal air flow that protects electrical components and PC boards from dirt, dust, debris — greatly improving reliability.

Fan-On-Demand™ operates only when needed reducing noise, power consumption, and the amount of airborne contaminants pulled through the machine.



AUTO-LINE™ TECHNOLOGY Allows for any input voltage hookup (230–575 V) with no manual linking. Provides convenience in any job setting and eliminates weld defects caused by dirty or unreliable power.

Control display for easy reference of weld parameters.

Parameter flexibility allows the system to be set for voltage and wire feed speed control, or for voltage and amperage control.

Auto-Continuum™ System Processes

Each weld program is designed for specific wire and gas combinations — for optimized performance.

Low spatter levels at high travel speeds is a requirement in automated welding. The Versa-Pulse process precisely controls the welding arc, significantly reducing spatter size and quantity over traditional processes.



Better weld quality

The adaptive arcs of Versa-Pulse™ and Accu-Pulse® instantly make adjustments to handle weld tacks, large gaps and inconsistent parts. The result is higher quality welds and fewer weld defects.

Versa-Pulse™

- Fast, low-heat, low-spatter process — for high-speed automation on materials 1/4 inch (6.35 mm) and thinner
- Great for gap filling
- Shortest arc length/lowest pulse voltage for lower heat and lower spatter at higher speeds

Accu-Pulse®

- The most popular process for majority of industrial welding applications
- Most adaptive arc on 16 gauge (1.6 mm) and thicker
- Designed for all weld positions

RMD®

- Lowest heat process, best for gap handling
- Limited travel speed

High-deposition MIG

- Higher deposition rates than standard spray transfer on thicker materials
- Designed for welding applications in which spray transfer is preferred

MIG

- Lower spatter than traditional MIG welders
- Better arc performance with silicon bronze and coated materials

Best for	Standard Spray	High-Deposition MIG	Accu-Pulse	Versa-Pulse	MIG Short Circuit	RMD
Deposition	A	A	A	B	D	D
Gap Filing	D	D	B	B	A	A
Low Heat Input	D	C	B	A	A	A
Out-of-Position Welds			A	B	B	B
Low Spatter	A	A	A	A	C	B
Thick Metals	A	A	A	C	D	D
Thin Metals			B	A	A	A
Increased Travel Speed	A	A	A	A	B	C
<div style="display: flex; align-items: center; justify-content: space-between;"> HOT COLD </div>						

Ratings A, B, C, and D are relative values. An "A" rating indicates a best fit between your performance needs and process. A "blank" rating indicates that the process is not recommended for that application.

Flexibility



Fleet standardization. Auto-Continuum™ can be used for both automation and hand-held applications.

Note: To convert Auto-Continuum for manual weld applications, order feeder base (301431) and wire feeder drive (301216).

Adaptable to a variety of fixed and flexible automation configurations and requirements.

Welding Intelligence™ Improve your welding operations by increasing productivity, improving quality and managing costs with Insight Core™ (standard) and Insight Centerpoint™ (optional) welding information management systems.

Easily add new processes and custom programs via the USB interface.

Parameter flexibility allows the system to be set for voltage and wire feed speed control, or for voltage and amperage control.



Automation applications



Hand-held applications

Insight Welding Intelligence™

Insight Welding Intelligence is a portfolio of solutions that manage weld data to help our customers get more done, produce higher-quality welds and control costs. Learn more at MillerWelds.com/insight



Insight Core™ (Standard)

Insight Core reports welding productivity from a web-based application to measure and improve your operation.

- **Measure welding productivity.** See each welder's arc-on time to set baselines, plan improvements and measure goals.
- **View easy-to-understand reports.** Dashboards show trends and develop reports. Compare welders, cells and plants.
- **Identify welding costs.** Make improvements to reduce expenses.
- **Easily install and use.** Just connect it to the internet. View secure data on any web-connected device anywhere.



Insight Centerpoint™ (Optional)

Insight Centerpoint is the real-time welder feedback solution that provides arc data monitoring, guidance and control within the weld cell.

- **Reduce training time.** Guide welders through the weld sequence in real time.
- **Ensure quality welds.** Contain weld defects early and control your weld operation by monitoring every parameter of every weld.
- **Reduce costs.** Alert welders if a weld is missed or is outside of acceptable parameters, allowing it to be corrected cost-effectively.

Insight Centerpoint ordering information



Ethernet Cable
See page 10 for available lengths



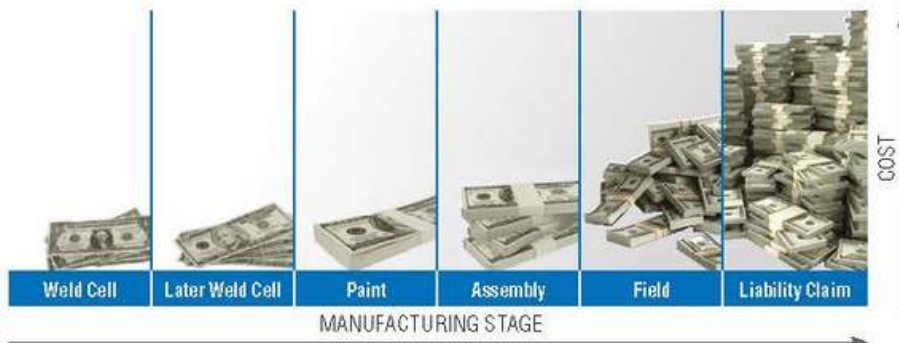
Centerpoint 10 License and Activation 951809

Gas Flow Sensor 301478

Continuum wire drive sensor kit with gas sensor for boom-mounted wire drive motors (works with Insight Core and Centerpoint).

Cost of a missed weld or defect

Insight Centerpoint provides real-time guidance in the weld cell so welders can correctly complete even complex weld sequences. It also delivers control of weld operations by monitoring every weld and immediately alerting welders to missed/out-of-parameter welds — so weld operations can contain weld errors and minimize the cost of rework.

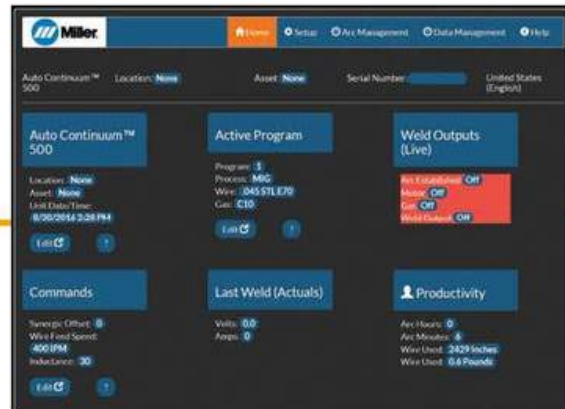


- Guide new inexperienced welders through the manufacturing process by presenting them with visual work instructions, reducing training time and out-of-date work instructions
- Centerpoint can prevent the next weld from occurring if missing or out-of-spec welds are detected, to alert and direct the operator to which weld(s) are out of parameter, reducing inspection time

- Repair can be done at the weld cell before paint, final assembly, or finished product delivery, which significantly reduces the cost of rework and improves overall parts quality

Webpages

Webpages are an easy way to initialize and configure your automation welding system.



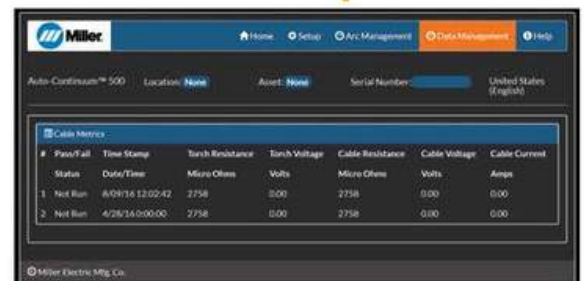
To use the webpage interface connect to the Auto-Continuum™ power source one of three ways:

-  Connect to factory network via Wi-Fi
-  Connect to factory network via Ethernet cable
-  Direct connect to PC via Ethernet cable (see page 11 for recommended Ethernet cable)



Configure your robot settings to establish communication. Options include:

- EtherNet/IP™
- DeviceNet
- Analog



System status / event logs

- Access system logs to help identify weld cell issues (Example: can identify weld cable degradation)

Ordering Information

Equipment and Options	Stock No.	Description	Qty.	Price
1 Power Sources				
Auto-Continuum™ 350	907656	Power source only		
	907658	Power source with auxiliary power		
Auto-Continuum™ 500	907657	Power source only		
	907659	Power source with auxiliary power		
For EtherNet/IP,™ DeviceNet or Analog Robot Controller				
Robot Controller Connection				
2a Ethernet Cables	300734	9.8 ft. (3 m)		
	300736	32.8 ft. (10 m)		
2b DeviceNet Communication Cable	300021	20 ft. (6.1 m)		
2c DeviceNet to Analog Adapter	301547	Field-installed option. Adapts DeviceNet to analog communication. Includes 9 ft. (2.7 m) DeviceNet communication cable.		
Analog Receptacle Kit (one required per machine)	194793	ABB® analog communication		
	194791	FANUC® analog communication		
	194790	Motoman® analog communication		
	195002	Universal analog communication		
Wire Drive Motor Assemblies and Accessories				
3 Auto-Continuum Wire Drive Motor Assembly	301207	Left-hand drive		
	301208	Right-hand drive		
4 Auto-Continuum Robotic MIG Kit	301455	Includes all cables, hoses and hardware for outfitting a robot arm. See page 11 for complete list.		
5 Wire Drive Motor Mounting Brackets	300013	Universal — fits FANUC®/KUKA®/Motoman®		
	300483	FANUC® 100 and 120 IC		
6 Tregaskiss® Robotic MIG Guns, Peripherals and Consumables		Order separately. Visit Tregaskiss.com for models and information on TOUGH GUN® robotic MIG guns, TOUGH GUN® reamers, QUICK LOAD® liners and TOUGH LOCK® consumables.		
Welding Intelligence™ Software				
Insight Centerpoint™	951809	Centerpoint 10 license and activation		
Gas Flow Sensors	301478	Adds gas flow sensing capability for Insight Core and Insight Centerpoint to Auto-Continuum wire drives.		
Accessories				
Continuum™ Cooler	301214	Integrated 2-gallon capacity cooler for water-cooled MIG guns		
Low-Conductivity Coolant	043810	1-gallon plastic bottle (must be ordered in quantities of 4)		
Continuum Feeder Base and Spool Support	301431			
Wire Feeder Drive (Left)	301216	For use with feeder base and spool support when converting to a manual weld system		

Date:

Total Quoted Price:

Distributed by:



Auto-Continuum™ System

More power. Better reliability.

For demanding industrial applications.



Power source design

Smart and powerful digital design has the fast response needed to deliver the most stable welding performance for better welding results.

Developed as a platform to meet current and future needs with integrated expansion capabilities.

Produces more power at higher duty cycles and temperature ratings than competitive models.

- More power maximizes reliability in demanding automation applications by keeping all internal components operating cooler regardless of the jobs to be done.
- More power ensures better welding results regardless of application or weld process.



More power, better reliability

Auto-Continuum 350: up to 26% more weld power

11,000 watts versus 8,700 watts = 2,300 watts more!

(Continuum: 350 A x 31.5 V at 100% duty cycle = 11,000 watts)

(Competitor: 300 A x 29 V at 100% duty cycle = 8,700 watts)

Auto-Continuum 500: up to 18% more weld power

19,500 watts versus 16,425 watts = 3,075 watts more!

(Continuum: 500 A x 39 V at 100% duty cycle = 19,500 watts)

(Competitor: 450 A x 36.5 V at 100% duty cycle = 16,425 watts)

Wire drive motor assembly

Low-inertia motor provides faster response for the best arc starts with the least amount of spatter.

Reduced-weight design allows for quicker point-to-point arm movement and provides improved servo motor life.

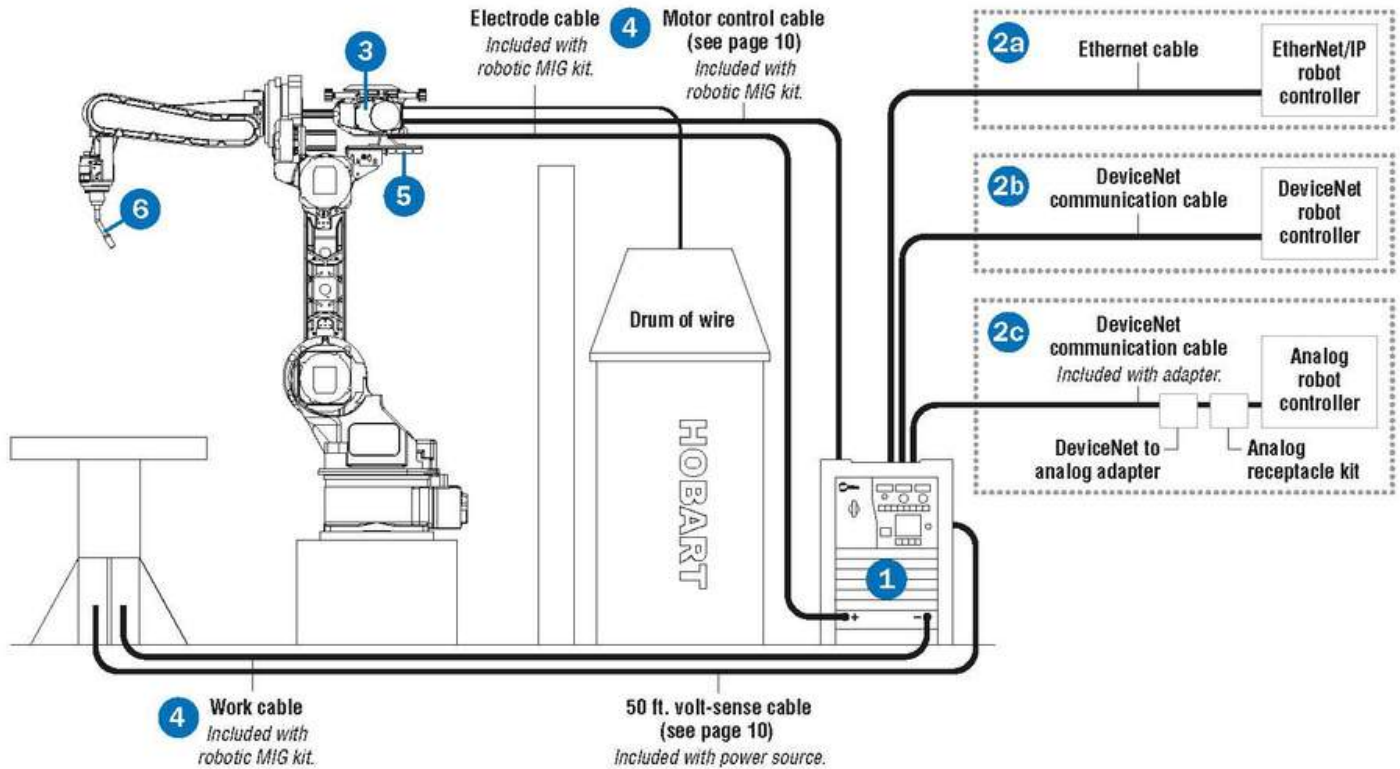


Easy to set up and install

- **Easy communication** from robot and power source
- **Wire drive motor assembly design** utilizes common Miller mounting configurations
- **Designed for easy integration** with fixed and flexible automation systems
- **Integrates** with major industrial robot brands
- **Simple retrofit** to existing automation systems



Typical Installations (Robotic/automation pulsed MIG or conventional MIG.)



1 Power Source

See page 12 for available models. All power sources are equipped with both EtherNet/IP™ and DeviceNet communication and include a 50-foot (15.2 m) volt-sense cable.

2 Robot Controller Connection (choose one)

- a EtherNet/IP™** — Requires Ethernet cable. 9.8-foot (3 m) cable included with Auto-Continuum robotic MIG kit. See page 10 for individual cables.
- b DeviceNet** — Requires DeviceNet communication cable (300021). See page 10.
- c Analog** — Requires DeviceNet to analog adapter (301427) and analog receptacle kit (see page 10).

3 Wire Drive Motor Assembly

See page 9 for available drive motor options.

4 Auto-Continuum™ Robotic MIG Kit

Includes all cables, hoses and hardware for outfitting a robot arm. See description at right for details.

5 Motor Mounting Bracket

See page 10 for available brackets. Motor mounting brackets from other brands must be supplied by robot manufacturer or system integrator.

6 Tregaskiss® Robotic MIG Gun

Must be ordered separately. Visit Tregaskiss.com for additional torch information.

Auto-Continuum Robotic MIG Kit 301455

Kit includes the following:

- 25-foot (7.6 m) motor control cable
- 15-foot (4.6 m) 90-degree motor control extension cable
- One 15-foot (4.6 m) weld cable
- Flowmeter regulator
- 30-foot (9.1 m) gas hose
- 9.8-foot (3 m) Ethernet cable
- .035/.045-inch V-groove drive roll kit with guides
- 30-foot (9 m) weld wire conduit assembly
- 10-foot (3 m) conduit and clamps for mounting motor control cable, weld cable and gas hose

Genuine Miller® Accessories

Auto-Continuum™ with DeviceNet

DeviceNet Communication Cable
300021 20 ft. (6.1 m)

Auto-Continuum Digital Peripheral Cable
301104 20 ft. (6.1 m)

Auto-Continuum Analog

Analog Receptacle Kits

194793 ABB®

194791 FANUC®

194790 Motoman®

195002 Universal

One required per machine. 12-inch (305 mm) length. For analog communication with robot controls via 72-pin Harting connector on Auto-Continuum.

DeviceNet to Analog Adapter 301547

Adapts DeviceNet to analog communication. Includes 9-foot (2.7 m) DeviceNet communication cable.

Analog Robot Simulator 195030

Device simulates the analog commands of typical robots. It can be used as a diagnostic tool to determine power source functionality and isolate robot, power source or cable issues.

For All Auto-Continuum Models



ADAM DI/O Module
(Use model ADAM-6050-D available from advantech.com)

Provides a digital I/O interface for communication between a robot /PLC and Auto-Continuum power supply. The interface allows for the interaction of a

robot or PLC and the Insight Centerpoint™ application. This module is **required** for all DeviceNet and analog Auto-Continuum models to run Insight Centerpoint.

Wire Drive Motor Mounting Brackets

300013 Universal – FANUC®/KUKA®/Motoman®
300483 FANUC® 100 and 120 IC

Welding Guns

Manual — see BernardWelds.com

Automation — see Tregaskiss.com

Motor Control Cables

263368025 25 ft. (7.6 m)

263368050 50 ft. (15.2 m)

263368080 80 ft. (24.4 m)

263368100 100 ft. (30.5 m)

90-degree Motor Control Extension Cables

281554015 15 ft. (4.6 m), 90 degree

281554025 25 ft. (7.6 m), 90 degree

Includes overmolded connections on high-flex cables for optimal service life.

Volt-Sense Cable 242212050

Replacement 50 ft. (15.2 m) cable. One cable supplied with Auto-Continuum power source.

Ethernet Cables

300734 9.8 ft. (3 m)

300736 32.8 ft. (10 m)

Industrial-grade 360-degree-shielded Cat 5 Ethernet cable with conventional RJ45 overmolded four-pole connector on one end to connect to factory network, and industrial M12 overmolded connector on the other end to attach to Auto-Continuum power source. Cable supports 10/100 Mbps-per-second transmission rate.

Continuum Feeder Base and Spool Support 301431

Sheet metal construction. Allows mounting of Auto-Continuum wire drive motor for manual welding operations.

Wire Feeder Drive (Left) 301216

Use with feeder base and spool support when converting to a manual weld system.

Hub and Spindle Assembly 072094



Spool Cover
057607



Wire Reel Assembly
108008

Reel Cover 195412

For 60-pound (27 kg) coil. Helps to protect the welding wire from dust and other contaminants.



Wire Straightener

141580 For .035–.045 in. (0.9–1.1 mm) wire.

141581 For 1/16–1/8 in. (1.6–3.2 mm) wire.

Helps reduce the cast in wire to improve wire feeding performance and increase the service life of the gun liner and contact tip.

Coolant Systems



Continuum™ Cooler 301214

For use with water-cooled torches rated up to 500 amps. Integrated coolant flow switch ensures coolant is flowing in the system. The Continuum cooler mounts to the bottom of the Continuum power source. Power is supplied via an internal connection with the power source.

Low-Conductivity Coolant 043810

Sold in cases of four one-gallon recyclable plastic bottles. Miller coolants contain a base of ethylene glycol and deionized water to protect against freezing to -37 degrees Fahrenheit (-38°C) or boiling to 227 degrees Fahrenheit (108°C). Also contains a compound that resists algae growth.

Wire Drive Motor Assembly Specifications (Subject to change without notice.)



Auto-Continuum™ Wire Drive Motor Assembly
 301207 Left-hand drive
 301208 Right-hand drive

Input Power	Welding Power Source	Input Welding Circuit Rating	Wire Feed Speed	Wire Diameter Capacity	Dimensions	Net Weight
50 VDC	Auto-Continuum 350 or 500	500 A at 100% duty cycle	Standard 50–1,000 ipm (1.27–25.4 m/min.)	.035–5/64 in. (0.9–2.0 mm)	H: 8.75 in. (222 mm) W: 10 in. (254 mm) D: 10 in. (254 mm)	16.5 lb. (7.5 kg)



Certified by Canadian Standards Association to both the Canadian and U.S. Standards.

Drive Roll Kits and Guides

Select drive roll kits from chart below according to type and wire size being used. Drive roll kits include four drive rolls, necessary guides and feature an anti-wear sleeve for inlet guide.

Wire Size	V-groove for hard wire 	U-groove for soft wire or soft-shelled cored wires 	V-knurled for hard-shelled cored wires 	U-cogged for extremely soft wire or soft-shelled cored wires (i.e., hard facing types) 	U-groove for aluminum wires contains nylon guides 
.035 in. (0.9 mm)	151026	—	151052	—	265255
.035 and .045 in. (0.9 and 1.2 mm)	235336*	—	151052	—	265255
.040 in. (1.0 mm)	161190	—	—	—	—
.045 in. (1.1/1.2 mm)	151027	151037**	151053	151070	265256**
.052 in. (1.3/1.4 mm)	151028	—	151054	—	—
1/16 in. (1.6 mm)	151029	151039	151055	151072	265257
.068/.072 in. (1.8 mm)	—	—	151056	—	—
5/64 in. (2.0 mm)	—	—	151057	—	—
3/32 in. (2.4 mm)	—	151041	151058	—	—

*Drive roll is dual-size reversible with one .035-inch and one .045-inch groove.

**Accommodates .045- and .047-inch (3/64-inch) wire.

Nylon Wire Guides for Feeding Aluminum Wire

Wire Size	Inlet Guide	Intermediate Guide
.035 in. (0.9 mm)	221912	242417
.047 in. (1.2 mm)	221912	205936
1/16 in. (1.6 mm)	221912	205937

Note: U-groove drive rolls are recommended when feeding aluminum wire.

Wire Guides

Wire Size	Inlet Guide	Intermediate Guide
.023–.040 in. (0.6–1.0 mm)	221030	149518
.045–.052 in. (1.1–1.4 mm)	221030	149519
1/16–5/64 in. (1.6–2.0 mm)	221030	149520
3/32–7/64 in. (2.4–2.8 mm)	229919	149521

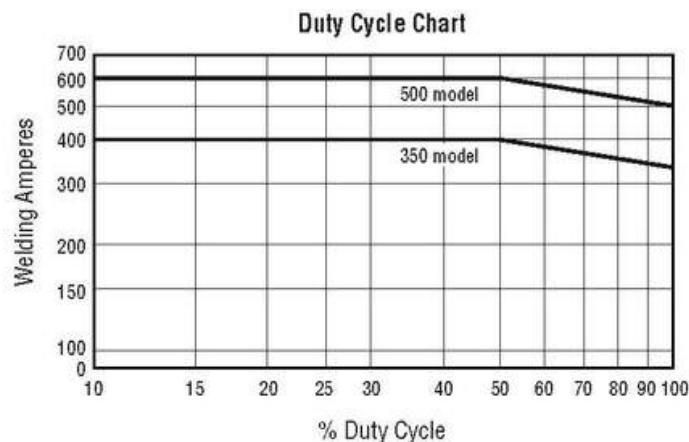
Model	Amp/Volt Ranges	Rated Output	Amps Input at Rated Output, 50/60 Hz, 3-Phase							Max. Open-Circuit Voltage	Dimensions	Net Weight
			230 V	380 V	400 V	460 V	575 V	KVA	KW			
Auto-Continuum 350	20–400 A 10–44 V	350 A at 31.5 VDC, 100% duty cycle	36.7 0–1*	21.8 0–1*	20.8 0–1*	18.8 0–1*	14.6 0–1*	14.4 0.8*	13.8 0.17*	72 VDC	H: 27.19 in. (691 mm) (including lift eye) W: 17.5 in. (444 mm) D: 28.22 in. (717 mm)	130 lb. (59.4 kg)
Auto-Continuum 500	20–600 A 10–44 V	500 A at 39 VDC, 100% duty cycle	57.6 0–1*	34.7 0–1*	33.2 0–1*	28.9 0–1*	23.3 0–1*	23.1 0.8*	21.9 0.17*	72 VDC		150 lb. (69 kg)

*While idling.



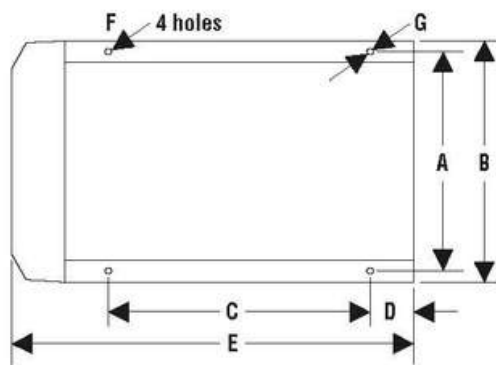
Certified by Canadian Standards Association to both the Canadian and U.S. Standards.

Performance Data



Mounting Specifications

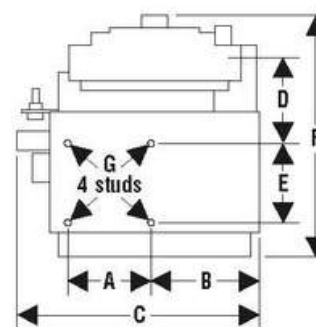
Bottom View Power Source



- A. 16.093 in. (409 mm)
- B. 17.5 in. (444 mm)
- C. 17.375 in. (441 mm)
- D. 2.281 in. (58 mm)
- E. 26.172 in. (665 mm)
- F. .468 in. (12 mm) dia.
- G. .468 in. x 1 in. (12 x 25 mm)

Height: 27.187 in. (691 mm)
Width: 17.5 in. (444 mm)
Depth: 28.125 in. (714 mm)

Bottom View Wire Drive Motor



- A. 3.5 in. (89 mm)
- B. 4.36 in. (111 mm)
- C. 10 in. (254 mm)
- D. 3.56 in. (101 mm) (distance from mounting studs to power pin hole)
- E. 3.25 in. (83 mm)
- F. 10 in. (254 mm)
- G. 1/4 in.-20 mounting studs

Height: 8.75 in. (222 mm)
Width: 10 in. (254 mm)
Depth: 10 in. (254 mm)

EQUIPMENT LIST																												
							POWER REQUIREMENTS						IT		UTILITY SERVICES													
TAG	EQUIP. NAME	MODEL #	EQUIP. TYPE	MANUF.	WEIGHT	SIZE	VOLTS	AMPS	HERTZ	HORSE POWER	PHASE	EMERG. POWER	UPS	DATA	COLD WATER	HOT WATER	AIR	VAC	DRAIN	EXHAUST	SPECIALTY GAS	QTY.	EX/ NEW	RESPONSIBILITY (OFOI, OFCI, CFCI, CFOI)	NOTES	CUT SHEET		
EQ1	CNC Machine	#ST-10	2- Axis CNC Lathe/ Turning Center	Haas	7,900LBS	10'-0"D x83"W x71"H	110 Volts & 220 Volts	35 Amps (largest load), 35 Amps (full load)	50/60 Hertz	15hp	Phase 3											2	EX	OFCI - Contractor must contact Phillips Corporation (contact will be provided) to disconnect, load, move, from CAM Tech Facility on Main Campus to SW Campus, unload, and reconnect.	36" CLR on all sides, 11.2kW, 220-240VAC, 6000rpm, 4scfm @100psi (min 80psi)	x		
EQ2	Electric Training Tables					2'-6""D x8"W x4'H																10	NEW		w/outlets on table, 1 quad electric overhead reel per pair of tables, 1 compressed air overhead reel per pair of tables.			
EQ3	CNC Machine	#VF-2	3- Axis CNC Lathe/ Turning Center		7,800LBS	88.6"D x123"W x107.2"H	110 Volts & 220 Volts	65 Amps (largest load), 70 Amps (full load)	50/60 Hertz	30hp	Phase 3											2	EX	OFCI - Contractor must contact Phillips Corporation (contact will be provided) to disconnect, load, move, from CAM Tech Facility on Main Campus to SW Campus, unload, and reconnect.	36" CLR on all sides, 220VAC, 8100rpm, 22.4kW, (optimal 440VAC, 35A), 4scfm @100 (min 80psi)	x		
EQ4	Star Tables					7'D x7'-2"W x46"H	110 Volts on Reels above															4	NEW	OFCI	Vices at each table			
EQ5	Mock Hull Booths	#TRNG1		Virginia Electric Boat Corp.		9'D x6"W x8'-6"H																10	NEW		1 overhead compressed reel and 1 overhead electric quad reel on either end of the hull area	x		
EQ6	Pipe Fitting Tables					2'-6"D x5"W x48"H																18	NEW	OFCI				
EQ7	Pipe Fitting Tables w/ vices					2'-6"D x5'-0"W x3'-0"H																4	NEW	OFCI	1 overhead electric quad reel per a table pair, Vices at each table, dimensions pulled from plan			
EQ8	Welding Certification Cart	CART105-350	Certified Robotic Welding Training	APT Manuf. Solutions/ Miller Fanuc		Expanded 63"D x80"W x78"H Closed 33"W x80"L x78"H	208, 240				phase 3											4	NEW	OFCI - Contractor to disconnect, load, move, from Carver Campus to SW Campus, unload, and reconnect	weld torch kit, modular design, touch screen tablet, long arm	x		
EQ9	Dual Welding Station	5x5BOOTH, 6X5BOOTH		Clean Air Industries	2,100lbs	66.07"D x58.38"W (116.19" W for 2) x121.86"H	208, 240, 460V		60Hz	5Hp @3400 RPM	Phase 3						1" NPT Compressed air connection 70-90psi					14 (dual stations) + 1 single = 29	NEW	OFOI	Ductless Fume extration, Filters, 74dBA, Disconnect/Emergency Shut-off	x		
EQ10	Welder	Power Wave 300C	Advanced Process Welder	Lincoln Electric	259Lbs	39.7"H x20.5"W x39.4"D	208/ 230/ 400/ 460/ 575 Volts	5-350A	60/60Hz		Phase 1 & 3												NEW	OFCI		x		
EQ11	Skid Steer Training Simulator			Vortex Advantage	maybe 50 lbs	estimate 48"Wx 60"Dx 72"H	110 Volts															1	NEW	OFCI - Contractor must disconnect, load, move, from CAM Tech Facility on Main Campus to SW Campus, unload, and reconnect.	Software, 4 Displays, 4 hubs for Displays, 4 Mounting kits, 30" Clr on one side.	x		
EQ12	Robotic Welder		Auto-Continum System	Miller									ETHE RNET/ IP									1	NEW		Ethernet/IP	x		
EQ13	Fiber Laser	HL 50E XT		Haas	800lbs	55"x55"x80 "	110 VAC	50Watts														1		OFCI				
EQ14	High Voltage Mock-up Unit																					1	EX	CFCI				
EQ15	Robot	Haas 10kg Cobot Package		Haas	1460lbs	102"x75"x38 "	100-240 VAC		50-60hz		Phase 1											1		OFCI				
EQ16	Manual Mill	Haas HKM 1 Knee Mill		Haas	2240lbs	55.5"x64.5 "x73"	220	15 AMP			Phase 3						85psi					2		OFCI				
EQ17	Miter Saw	Haas HMS 3121		Haas	1102lbs	63"x43."3x74"	220	12 AMP			Phase 3											1		OFCI				
EQ18	Flammable Cabinets																					2	EX	CFCI				
EQ19	COPIER	Taskalfa		Kyrocera	200lbs	26.65"Wx21.65D	120 Volts															1	EX	OFCI - Contractor must disconnect, load, move, from CAM Tech Facility on Main Campus to SW Campus, unload, and reconnect.				
EQ20	Manual Lathe	HML 1V Manual lathe		Haas	3000lbs	89.4"x44.1 X74.8"	240	24 AMP			Phase 3											2		OFCI				

EXHIBIT B
ELECTRICAL COMCHECK



Interior Lighting Compliance Certificate

Project Information

Energy Code: 2015 IECC
Project Title: BISHOP STATE COMMUNITY COLLEGE MARITIME TRAINING CENTER
RENOVATION

Project Type: Alteration

Construction Site:
925 DAUPHIN ISLAND PKWY
Mobile, Alabama 36605

Owner/Agent:
Bishop State Community College
925 DAUPHIN ISLAND PKWY
Mobile, Alabama 36605

Designer/Contractor:
Kevin Ruggiero
Jackson, Renfro & Associates
31 Inverness Center Parkway Suite
300
Birmingham, Alabama 35242
205-995-1078
kevin@jraee.com

Allowed Interior Lighting Power

A Area Category	B Floor Area (ft ²)	C Allowed Watts / ft ²	D Allowed Watts
1-School/University	18540	0.87	16130
Total Allowed Watts =			16130

Proposed Interior Lighting Power

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixture	D Fixture Watt.	E (C X D)
<u>School/University (18540 sq.ft.)</u>				
LED: A4: Other:	1	24	39	936
LED: A4E: Other:	1	16	39	624
LED: A6: Other:	1	56	48	2688
LED: A6E: Other:	1	9	48	432
LED: B: Other:	1	6	30	180
LED: BE: Other:	1	5	30	150
LED: C: Other:	1	55	71	3905
LED: CE: Other:	1	22	71	1562
LED: E: Other:	1	10	37	370
LED: EE: Other:	1	2	37	74
LED: H: Other:	1	1	34	34
Total Proposed Watts =			10955	

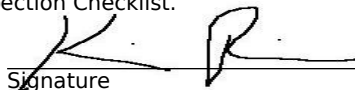
Interior Lighting Compliance Statement

Compliance Statement: The proposed interior lighting alteration project represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed interior lighting systems have been designed to meet the 2015 IECC requirements in COMcheck Version COMcheckWeb and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Kevin Ruggiero - Engineer

Name - Title

Signature



10/19/2026

Date



Exterior Lighting Compliance Certificate

Project Information

Energy Code: 2015 IECC
Project Title: BISHOP STATE COMMUNITY COLLEGE MARITIME TRAINING CENTER RENOVATION
Project Type: Alteration
Exterior Lighting Zone: 2 (Neighborhood business district (LZ2))

Construction Site:
925 DAUPHIN ISLAND PKWY
Mobile, Alabama 36605

Owner/Agent:
Bishop State Community College
925 DAUPHIN ISLAND PKWY
Mobile, Alabama 36605

Designer/Contractor:
Kevin Ruggiero
Jackson, Renfro & Associates
31 Inverness Center Parkway Suite 300
Birmingham, Alabama 35242
205-995-1078
kevin@jraee.com

Allowed Exterior Lighting Power

A Area/Surface Category	B Quantity	C Allowed Watts /	D Tradable Wattage	E Allowed Watts (B X C)
Other door (not main entry)	30 ft of	20	Yes	600
Total Tradable Watts (a) =				600
Total Allowed Watts =				600
Total Allowed Supplemental Watts (b) =				600

(a) Wattage tradeoffs are only allowed between tradable areas/surfaces.

(b) A supplemental allowance equal to 600 watts may be applied toward compliance of both non-tradable and tradable areas/surfaces.

Proposed Exterior Lighting Power

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixture	D Fixture Watt.	E (C X D)
<u>Other door (not main entry) (30 ft of door width): Tradable Wattage</u>				
LED: D: Other:	1	19	15	285
LED: DE: Other:	1	7	15	105
LED: FE: Other:	1	5	25	125
LED: G: Other:	1	4	78	312
Total Tradable Proposed Watts =				827

Exterior Lighting PASSES

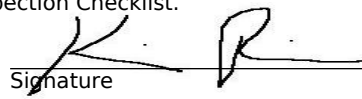
Exterior Lighting Compliance Statement

Compliance Statement: The proposed exterior lighting alteration project represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed exterior lighting systems have been designed to meet the 2015 IECC requirements in COMcheck Version COMcheckWeb and to comply with any

applicable mandatory requirements listed in the Inspection Checklist.

Kevin Ruggiero - Engineer

Name - Title


Signature

10/19/2026

Date



Inspection Checklist

Energy Code: 2015 IECC

Requirements: 100.0% were addressed directly in the COMcheck software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
C103.2 [PR4] ¹	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the interior lighting and electrical systems and equipment and document where exceptions to the standard are claimed. Information provided should include interior lighting power calculations, wattage of bulbs and ballasts, transformers and control devices.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C103.2 [PR8] ¹	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the exterior lighting and electrical systems and equipment and document where exceptions to the standard are claimed. Information provided should include exterior lighting power calculations, wattage of bulbs and ballasts, transformers and control devices.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)
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Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
C405.2.1 [EL15] ¹	Lighting controls installed to uniformly reduce the lighting load by at least 50%.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.2.1 [EL18] ¹	Occupancy sensors installed in required spaces.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.2.1, C405.2.2, 3 [EL23] ²	Independent lighting controls installed per approved lighting plans and all manual controls readily accessible and visible to occupants.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.2.2.1 [EL22] ²	Automatic controls to shut off all building lighting installed in all buildings.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.2.3 [EL16] ²	Daylight zones provided with individual controls that control the lights independent of general area lighting.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.2.3, C405.2.3.1, C405.2.3.2 [EL20] ¹	Primary sidelighted areas are equipped with required lighting controls.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.2.3, C405.2.3.1, C405.2.3.3 [EL21] ¹	Enclosed spaces with daylight area under skylights and rooftop monitors are equipped with required lighting controls.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.2.4 [EL4] ¹	Separate lighting control devices for specific uses installed per approved lighting plans.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.2.4 [EL8] ¹	Additional interior lighting power allowed for special functions per the approved lighting plans and is automatically controlled and separated from general lighting.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.2.5 [EL25] ^{null}	Automatic lighting controls for exterior lighting installed. Controls will be daylight controlled, set based on business operation time-of-day, or reduce connected lighting > 30%.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.3 [EL6] ¹	Exit signs do not exceed 5 watts per face.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)
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Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C303.3, C408.2.5.2 [FI17] ³	Furnished O&M instructions for systems and equipment to the building owner or designated representative.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.4.1 [FI18] ¹	Interior installed lamp and fixture lighting power is consistent with what is shown on the approved lighting plans, demonstrating proposed watts are less than or equal to allowed watts.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	See the Interior Lighting fixture schedule for values.
C405.5.1 [FI19] ¹	Exterior lighting power is consistent with what is shown on the approved lighting plans, demonstrating proposed watts are less than or equal to allowed watts.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	See the Exterior Lighting fixture schedule for values.
C408.2.5.1 [FI16] ³	Furnished as-built drawings for electric power systems within 90 days of system acceptance.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C408.3 [FI33] ¹	Lighting systems have been tested to ensure proper calibration, adjustment, programming, and operation.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

EXHIBIT C
MECHANICAL COMCHECK



Mechanical Compliance Certificate

Project Information

Energy Code: 2015 IECC
Project Title: Bishop MIB Renovation
Location: Mobile, Alabama
Climate Zone: 2a
Project Type: Alteration

Construction Site:

Owner/Agent:

Designer/Contractor:

Mechanical Systems List

Quantity	Component	Description
HVAC Systems		
1	AC-1 (Multiple-Zone):	Heating: 1 each - Hydronic or Steam Coil (Heating Equip), Hot Water, Capacity = 2653300 kBtu/h No minimum efficiency requirement applies Cooling: 1 each - Hydronic Coil (CW), Capacity = 240640 kBtu/h, Air Economizer No minimum efficiency requirement applies Fan System: AC-1 2 -- Compliance (Motor nameplate HP and fan efficiency method) : Passes Fans: AC-1 Supply, Constant Volume, 7103 CFM, 5.0 motor nameplate hp, 80.0 fan efficiency grade, 80.0 total fan efficiency, 80.0 design fan efficiency
1	AC-2 (Multiple-Zone):	Heating: 1 each - Hydronic or Steam Coil (AC-2), Unknown, Capacity = 126360 kBtu/h No minimum efficiency requirement applies Cooling: 1 each - Hydronic Coil (Cooling Equip), Capacity = 120380 kBtu/h, Air Economizer No minimum efficiency requirement applies Fan System: AC-2 BUILDING -- Compliance (Motor nameplate HP and fan efficiency method) : Passes Fans: AC-2 Supply, Multi-Zone VAV, 3700 CFM, 5.5 motor nameplate hp, 80.0 fan efficiency grade, 80.0 total fan efficiency, 80.0 design fan efficiency
1	VRF AC-1/HP-1 (Single Zone):	Packaged Terminal Heat Pump Heating Mode: Capacity = 42000 kBtu/h, Proposed Efficiency = 3.66 COP, Required Efficiency = 2.81 COP Cooling Mode: Capacity = 36000 kBtu/h, , Air Economizer Proposed Efficiency = 10.50 EER, Required Efficiency = 9.50 EER Proposed Part Load Efficiency = 0.00 , Required Part Load Efficiency = 0.00 Fan System: Unspecified

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2015 IECC requirements in COMcheckWeb and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Name - Title

Signature

Date

EXHIBIT D
RESIDENTIAL APPLIANCES DATA SHEETS

GCST20S1W

GE® Series 2.0 Cu. Ft. Countertop Microwave Oven

DIMENSIONS AND INSTALLATION INFORMATION (IN INCHES)

EXTERIOR DIMENSIONS* (IN INCHES)	
W x H x D	24-3/32 x 13-3/4 x 19-2/5

*Height includes feet. Depth does not include handle.

THIS UNIT DESIGNED TO BE PLACED ON COUNTERTOP.



For answers to your Monogram,® GE Profile™ or GE® appliance questions, visit our website at geappliances.com or call GE Answer Center® service, 800.626.2000.



Specification Revised 5/24

GCST20S1W

GE® Series 2.0 Cu. Ft. Countertop Microwave Oven

FEATURES AND BENEFITS

2.0 Cu. Ft. Capacity – 1200 Watts (IEC-705 test procedure)

Sensor cooking controls – Automatically adjusts time and power for delicious cooking results

Child Lock On/Off – Provides an added layer of peace of mind for modern households. (See product literature for instructions on how to turn Child Lock off)

Auto & time defrost – Simply enter the weight of the food, and the oven automatically sets the optimal defrosting time and power level or set your desired time for defrosting

Turntable – Rotates food throughout the cooking cycle for even cooking results

Instant on controls – Cooking and reheating happens instantly at the touch of a button

Control lockout – Provides peace of mind by locking the oven and preventing accidental activation

Electronic touch controls – Electronic pads on the control panel are easy to operate with just a touch

Add 30 seconds – Each touch allows you to add 30 seconds of microwave cooking time at any point in the cooking process without reprogramming

Kitchen timer – Oven timer can be set to countdown a specific amount of minutes to help watch the time for you

Model GCST20S1WW – White

Model GCST20S1WBB – Black

Model GCST20S1WSS – Stainless steel



For answers to your Monogram, GE Café™ Series, GE Profile™ Series or GE Appliances product questions, visit our website at geappliances.com or call GE Answer Center® Service, 800.626.2000.



Quote

09/17/2026

Project:
Bishop State Ice Machine

From:
Mobile Fixture & Equip. Co, Inc
Floyd Hyke
1155 Montlimar Drive
Mobile, AL 36609-
251-342-0455

Please refer to the end of this document for information regarding Mobile Fixture's Standard Terms & Conditions. If you would like a copy of those, please visit our website at <https://mobilefixture.com/pages/terms-conditions> or contact your Mobile Fixture representative.

Prices indicated by Mobile Fixture are based upon the prices in effect as of the date of this document. Due to unprecedented pricing, transportation, and lead time volatilities, Mobile Fixture will not be responsible for unscheduled manufacturer price increases, surcharges, free freight level deviations, or extended lead times causing potential delays or increased costs to the project. Unless otherwise agreed to in a writing, signed, and delivered by Mobile Fixture's authorized representative, prices quoted by Mobile Fixture are subject to change without notice at any time, including (without limitation) between the date of Buyer's order and the date of shipment. Buyer shall be liable for the prices in effect on the date of shipment. In the event of a change in the quoted price prior to the date of shipment, Mobile Fixture will notify Buyer of the price change prior to shipment.

Minimum 25% restocking fee on all special-order returns plus any applicable return freight. NOTE: Some special-order items are NON-RETURNABLE.

All prices are subject to change without notice based on applicable tariff regulations and import duties.

Item	Qty	Description	Sell	Sell Total
1	1 ea	ICE MAKER, CUBE-STYLE Manitowoc Model No. IDP0420A Indigo NXT™ Series Ice Maker, cube-style, air-cooled, self-contained condenser, 22"W x 24.5"D x 21.5"H, production capacity up to 463 lb./24 hours at 70°/50° (358 lb. AHRI certified at 90°/70°), easyTouch display with 13 different language options, date/time stamp display, automatic reminder/alert icon, one touch asset information, automatic detection of accessories, continuous operating status, programmable production options (time, weight, day or night), one touch cleaning with displayed instructions, Alpha-San anti-microbial protection, acoustical ice sensing probe, self-diagnostic technology, DuraTech™ exterior, dice size cubes, R290 refrigerant, NSF, cULus, CE	\$3,800.46	\$3,800.46
	1 ea	WARRANTY-ICE-SC 3 year parts & labor (Machine), 5 year parts & labor (Evaporator), 5 year parts & 3 years labor (Compressor), standard [Refer to Ice Machine Warranty Bond for complete details]		
	1 ea	(-161) 115v/60/1-ph, 11.3 amps		
	1 ea	AR-10000-P Arctic Pure® Plus Primary Water Filter Assembly, includes head, shroud, hardware, mounting assembly, & (1) filter	\$254.05	\$254.05

Item	Qty	Description	Sell	Sell Total
		cartridge, 15,000 gallon capacity, 0-600 lbs./ice per day		
1 ea		WARRANTY-ARCPURE 3 year parts & labor warranty on cap, housing, hardware, & mounting assembly (does not refer to filter cartridge), standard [Refer to Arctic Ice Pure™ Accessories Warranty Bond]		
1 ea		SPA162 Vending Ice Dispenser, touchless lever, floor model, 22"W x 31-3/16"D x 54"H, AHRI certified 120-lb capacity, designed for dice or half-dice ice type, bucket filling, stainless steel exterior with vinyl trim, accepts 22" dice or half-dice machines, cULus, CE, NSF, ADA compliant	\$3,961.75	\$3,961.75
1 ea		WARRANTY-BIN/DISP 3 year parts & labor warranty, standard [Refer to Ice Storage Bin & Dispensers Warranty Bond for complete details]		
1 ea		(-161) 115v/60/1-ph, 1.6 amps, NEMA 5-15P, standard		
ITEM TOTAL:				\$8,016.26
Total				\$8,016.26

This Document shall be subject to Mobile Fixture & Equipment Co., Inc. Terms of Sale <https://mobilefixture.com/pages/terms-conditions> which are incorporated herein by reference and shall govern. The parties specifically agree that no signature shall be required in order for this Document or its applicable terms and conditions to be deemed legally binding and enforceable on Customer where the intent to be so bound can be inferred (including by acceptance or retention of products or services), notwithstanding contrary requirements under any law.

Acceptance: _____ Date: _____
 Printed Name: _____

INDIGO[®] NXT



Get the App!



Indigo NXT Series iP0420 ice machine
on D420 bin.
Ice machine and bin sold separately.

iP0420

Manitowoc Ice Cube Machine

IDP0420A | IYP0420A | IDP0420W | IYP0420W

ICE SHAPES



▶ **Half-Dice:** 3/8" x 1 1/8" x 7/8"
(0.95 x 2.86 x 2.22 cm)



▶ **Dice:** 7/8" x 7/8" x 7/8"
(2.22 x 2.22 x 2.22 cm)

SIZE

- ▶ Up to 466 lbs (211 kgs) of daily ice production
- ▶ 22" (55.88 cm) wide, 34" (86.36 cm) deep, and 71.5" (181.61 cm) high including 6" (15.24 cm) legs
- ▶ 383 lb (172 kgs) ice bin storage capacity*

*Application capacity based on 90% volume x 33 lbs./ft³ average density of ice

SPECIFICATIONS

Refrigerant: R290

- Air-cooled: 6 oz (170 g)
- Water-cooled: 5.3 oz (150 g)

BTU Per Hour

- ▶ 8,800 (average)
- ▶ 10,570 (peak)

Operating Limits

- ▶ Ambient temperature range: 40° to 110°F (4.4° to 43.3°C)
- ▶ Water temperature range: 40° to 90°F (4.4° to 32.2°C)
- ▶ Water pressure ice maker (water in)
 - Min. 20 psi (137.9 kPa)
 - Max. 80 psi (551.1 kPa)
- ▶ Condenser inlet water in (water-cooled only)
 - Min. 20 psi (137.9 kPa)
 - Max. 276 psi (1,902.95 kPa)

Power: 115/60/1

- ▶ Air-cooled-115V
 - Minimum circuit ampacity: 12 amps
 - Maximum fuse size: 20 amps
- ▶ Water-cooled-115V
 - Minimum circuit ampacity: 11.3 amps
 - Maximum fuse size: 15 amps

FEATURES

- ▶ Sanitation
 - Hinged front door and removable components (water trough, tube, curtain, probe, pump) allow easy interior access and cleaning.
 - Select parts feature AlphaSan[®] antimicrobial protection.
 - DuraTech[™] exterior provides superior corrosion resistance compared to stainless steel. Innovative clear coat resists finger prints and dirt.
 - Optional LuminIce[®] Growth Inhibitor helps control bacteria and yeast, with status indicator on display.
 - ▶ Sustainability & Value
 - R290 offers low global warming potential and zero ozone depletion.
 - Icon-based easyTouch[®] display simplifies operation.
 - Acoustical probe and Active Sense help ensure consistent ice production.
 - 24-hour diagnostics support preventative maintenance.
 - Designed with programmable ice production to take advantage of off-peak rates and/or shut off over night to lower lifetime costs.*
 - Connect via Bluetooth for quick setup and instant machine information.
- *Based on manufacturer assumptions without independent testing. Results may vary by settings and conditions.

ACCESSORIES

- ▶ LuminIce[®] II virus and bacteria inhibitor helps control viruses and bacteria in the ice machine.
 - ▶ iAuCS[®] schedules and performs routine ice machine descaling or sanitizing automatically.
 - ▶ Arctic Pure[®] Pro water filters reduce sediments and chlorine contaminants down to 0.5 microns.
- For optimal performance, use the Arctic Pure prefilter in combination with the Arctic Pure primary filter.



LuminIce II



iAuCS



Arctic Pure Water Filters

INDIGO NXT iP0420

Manitowoc Ice Cube Machine

IDP0420A | IYP0420A | IDP0420W | IYP0420W

INSTALLATION

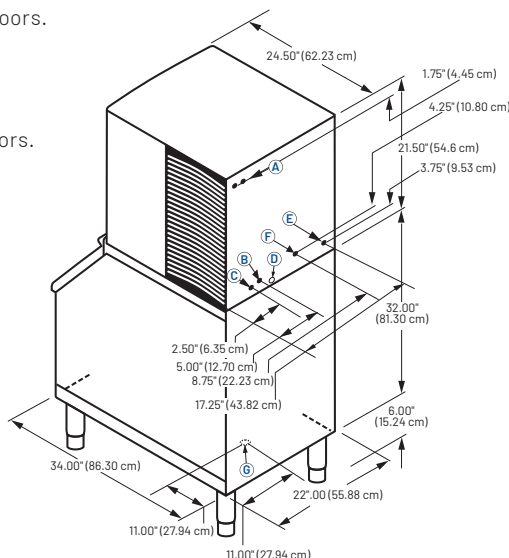
Ice machine must be installed indoors.

Minimum installation clearance:

- Top/side: 12" (30.5 cm)
- Back: 5" (12.7 cm)

Installation location must be indoors.

- A** Electrical Entrance (2) Options
- B** 3/8" (0.95 cm) F.P.T.
Ice Making Water Inlet
- C** 1/2" (1.27 cm) F.P.T.
Ice Making Water Outlet
- D** 1/2" (1.27 cm)
Auxiliary Base Drain Socket
- E** 3/8" (0.95 cm) F.P.T.
Water Condenser Inlet
(water-cooled units)
- F** 1/2" (1.27 cm) F.P.T.
Water Condenser Outlet
(water-cooled units)
- G** 3/4" (1.91 cm)
Bin Drain



iP0420 on D320 Bin

SPACE-SAVING DESIGN



	iP0420 D320	iP0420 D420
Height	59.50" 151.13 cm	71.5" 181.61 cm
Width	22.0" 55.9 cm	22.0" 55.9 cm
Depth	34.0" 86.36 cm	34.0" 86.36 cm
Bin Storage	264 lbs 120 kgs	383 lbs 174 kgs

Height includes adjustable bin legs
6.00" to 8.00", (15.24 to 20.32 cm)
set at 6.00" (15.24 cm).

Bin capacity is based on 90% of the
volume x 33 lbs/ft³ average density of ice.
Ice machine and bin sold separately.

SPECIFICATIONS

	Model	Ice Shape	Shipping Weight	Ice Production 24 Hours		Power Usage kWh per 100 lbs of ice	Ice Machine Potable water usage per 100 lbs ice	Condenser water usage per 100 lbs ice
				70° Air/50°F Water 21° Air/10°C Water	90° Air/70°F Water 32° Air/21°C Water			
Air Cooled	IDP0420A	Dice	131 lbs (59.42 kgs)	463 lbs (210 kgs)	358 lbs (162 kgs)	5.94	14.44 gal (55.7 L)	N/A
	IYP0420A	Half-Dice	134 lbs (60.78 kgs)	437 lbs (198 kgs)	336 lbs (152 kgs)	5.9	14.76 gal (55.9 L)	N/A
Water Cooled	IDP0420W	Dice	132 lbs (59.87 kgs)	442 lbs (205 kgs)	369 lbs (167 kgs)	5.06	13.9 gal (52.6 L)	141.3 (534.9 L)
	IYP0420W	Half-Dice	132 lbs (59.87 kgs)	466 lbs (211 kgs)	416 lbs (189 kgs)	4.81	14 gal (53 L)	114.7 (434 L)

R290 is a refrigerant grade propane which is naturally occurring with no ozone depletion potential and extremely low global warming potential.

Limited Commercial Warranty

Ice Maker Three (3) years parts and labor

Evaporator Five (5) years parts and labor

Compressor Five (5) years parts, three (3) years labor



2110 South 26th Street | Manitowoc, WI 54220 | United States
+1.920.682.0161 | 920.683.7589 Fax | manitowocice.com

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ICE MACHINE WARRANTY

Manitowoc Ice, Inc. (hereinafter referred to as the "COMPANY") warrants for a period of thirty-six months from the installation date (except as limited below) that new ice machines manufactured by the COMPANY shall be free of defects in material or workmanship under normal and proper use and maintenance as specified by the COMPANY and upon proper installation and start-up in accordance with the instruction manual supplied with the ice machine. The COMPANY'S warranty hereunder with respect to the compressor shall apply for an additional twenty-four months, excluding all labor charges, and with respect to the evaporator for an additional twenty-four months, including labor charges.

The obligation of the COMPANY under this warranty is limited to the repair or replacement of parts, components, or assemblies that in the opinion of the COMPANY are defective. This warranty is further limited to the cost of parts, components or assemblies and standard straight time labor charges at the servicing location.

Time and hourly rate schedules, as published from time to time by the COMPANY, apply to all service procedures. Additional expenses including without limitation, travel time, overtime premium, material cost, accessing or removal of the ice machine, or shipping are the responsibility of the owner, along with all maintenance, adjustments, cleaning, and ice purchases. Labor covered under this warranty must be performed by a COMPANY Contracted Service Representative or a refrigeration service agency as qualified and authorized by the COMPANY'S local Distributor. The COMPANY'S liability under this warranty shall in no event be greater than the actual purchase price paid by customer for the ice machine.

The foregoing warranty shall not apply to (1) any part or assembly that has been altered, modified, or changed; (2) any part or assembly that has been subjected to misuse, abuse, neglect, or accidents; (3) any ice machine that has been installed and/or maintained inconsistent with the technical instructions provided by the COMPANY; or (4) any ice machine initially installed more than five years from the serial number production date. This warranty shall not apply if the Ice Machine's refrigeration system is modified with a condenser, heat reclaim device, or parts and assemblies other than those manufactured by the COMPANY, unless the COMPANY approves these modifications for specific locations in writing.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES OR GUARANTEES OF ANY KIND, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

In no event shall the COMPANY be liable for any special, indirect, incidental or consequential damages. Upon the expiration of the warranty period, the COMPANY'S liability under this warranty shall terminate. The foregoing warranty shall constitute the sole liability of the COMPANY and the exclusive remedy of the customer or user. To secure prompt and continuing warranty service, the warranty registration card or register on line within five (5) days from the installation date.

MANITOWOC ICE, INC.
2110 South 26th St., Manitowoc, WI 54220
Telephone: 920-682-0161
Web Site -www.manitowocice.com
Rev. 08/22



SM, QM SERIES ICE MACHINE WARRANTY

Manitowoc Ice, Inc. (hereinafter referred to as the "COMPANY") warrants for a period of thirty-six months from the installation date (except as limited below) that new SM & QM Series ice machines manufactured by the COMPANY shall be free of defects in material or workmanship under normal and proper use and maintenance as specified by the COMPANY and upon proper installation and start-up in accordance with the instruction manual supplied with the ice machine.

The obligation of the COMPANY under this warranty is limited to the repair or replacement of parts, components, or assemblies that in the opinion of the COMPANY are defective. This warranty is further limited to the cost of parts, components or assemblies and standard straight time labor charges at the servicing location.

Time and hourly rate schedules, as published from time to time by the COMPANY, apply to all service procedures. Additional expenses including without limitation, travel time, overtime premium, material cost, accessing or removal of the ice machine, or shipping are the responsibility of the owner, along with all maintenance, adjustments, cleaning, and ice purchases. Labor covered under this warranty must be performed by a COMPANY Contracted Service Representative or a refrigeration service agency as qualified and authorized by the COMPANY'S local Distributor. The COMPANY'S liability under this warranty shall in no event be greater than the actual purchase price paid by customer for the ice machine.

The foregoing warranty shall not apply to (1) any part or assembly that has been altered, modified, or changed; (2) any part or assembly that has been subjected to misuse, abuse, neglect, or accidents; (3) any ice machine that has been installed and/or maintained inconsistent with the technical instructions provided by the COMPANY; or (4) any ice machine initially installed more than five years from the serial number production date. This warranty shall not apply if the Ice Machine's refrigeration system is modified with a condenser, heat reclaim device, or parts and assemblies other than those manufactured by the COMPANY, unless the COMPANY approves these modifications for specific locations in writing.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES OR GUARANTEES OF ANY KIND, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

In no event shall the COMPANY be liable for any special, indirect, incidental or consequential damages. Upon the expiration of the warranty period, the COMPANY'S liability under this warranty shall terminate. The foregoing warranty shall constitute the sole liability of the COMPANY and the exclusive remedy of the customer or user. To secure prompt and continuing warranty service, the warranty registration card or register on line within five (5) days from the installation date.

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Rev. 08/22



FLAKE/CHIPLET/NUGGET COMMERCIAL ICE MACHINE WARRANTY

Manitowoc Ice, Inc. (hereinafter referred to as the "COMPANY") warrants for a period of twenty-four months from the installation date (except as limited below) that new Flake/Chiplet ice machines manufactured by the COMPANY shall be free of defects in material or workmanship under normal and proper use and maintenance as specified by the COMPANY and upon proper installation and start-up in accordance with the instruction manual supplied with the ice machine. The COMPANY's warranty hereunder with respect to the compressor shall apply for an additional thirty-six months, excluding all labor charges.

The obligation of the COMPANY under this warranty is limited to the repair or replacement of parts, components, or assemblies that in the opinion of the COMPANY are defective. This warranty is further limited to the cost of parts, components or assemblies and standard straight time labor charges at the servicing location.

Time and hourly rate schedules, as published from time to time by the COMPANY, apply to all service procedures. Additional expenses including without limitation, travel time, overtime premium, material cost, accessing or removal of the ice machine, or shipping are the responsibility of the owner, along with all maintenance, adjustments, cleaning, and ice purchases. Labor covered under this warranty must be performed by a COMPANY Contracted Service Representative or a refrigeration service agency as qualified and authorized by the COMPANY's local Distributor. The COMPANY's liability under this warranty shall in no event be greater than the actual purchase price paid by customer for the ice machine.

The foregoing warranty shall not apply to (1) any part or assembly that has been altered, modified, or changed; (2) any part or assembly that has been subjected to misuse, abuse, neglect, or accidents; (3) any ice machine that has been installed and/or maintained inconsistent with the technical instructions provided by the COMPANY; or (4) any ice machine initially installed more than five years from the serial number production date. This warranty shall not apply if the Ice Machine's refrigeration system is modified with a condenser, heat reclaim device, or parts and assemblies other than those manufactured by the COMPANY, unless the COMPANY approves these modifications for specific locations in writing.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES OR GUARANTEES OF ANY KIND, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

In no event shall the COMPANY be liable for any special, indirect, incidental or consequential damages. Upon the expiration of the warranty period, the COMPANY's liability under this warranty shall terminate. The foregoing warranty shall constitute the sole liability of the COMPANY and the exclusive remedy of the customer or user. To secure prompt and continuing warranty service, the warranty registration card must be completed and sent to the COMPANY within five (5) days from the installation date.

MANITOWOC ICE, INC.
2110 South 26th St., Manitowoc, WI 54220
Telephone: 920-682-0161
Web Site -www.manitowocice.com
Rev. 08/22



LIMITED WARRANTY FOR RF, RN, UF, and UN SERIES FLAKE & NUGGET ICE MACHINES

LIMITED WARRANTY

Manitowoc Ice, Inc. (hereinafter referred to as the "COMPANY") warrants that new RF, RFS, RNS, RNF, UNF, UFF, UNP, and UFP Flake and Nugget Ice Machines (regardless of refrigerant type) sold by Company shall be free of defects in material or workmanship under normal and proper use and maintenance as specified by the Company and upon proper installation and start-up in accordance with the instruction manual supplied.

WHAT IS COVERED

- Parts for a period of three (3) years.
- Labor for a period of three (3) years.
- Compressor parts for five (5) years and labor for three (3) years.

The RF, RFS, RNS, RNF, UNF, UFF, UNP, and UFP Flake and Nugget Ice Machine warranty begins on the date of the original installation. This warranty shall not apply to any ice machine initially installed more than five (5) years from the serial number production date.

The obligation of the Company under this warranty is limited to the repair or replacement of parts, components, or assemblies that in the sole opinion of the Company are defective. This warranty is further limited to the cost of parts, components or assemblies and standard straight time labor charges (excluding the compressor warranty) at the servicing location.

Time and hourly rate schedules, as published from time to time by the Company, apply to all service procedures. Additional expenses including without limitation, travel time, overtime premium, material cost, accessing or removal of the RF, RFS, RNS, RNF, UNF, UFF, UNP, and UFP Flake and Nugget Ice Machine, or shipping are the responsibility of the purchaser, along with all maintenance, adjustments, cleaning, and ice purchases. Labor covered under this warranty must be performed by an approved Company contracted Service Representative or a refrigeration service agency as qualified and authorized by the Company's local Distributor. The Company's liability under this warranty shall in no event be greater than the actual purchase price paid by purchaser for the RRF, RFS, RNS, RNF, UNF, UFF, UNP, and UFP Flake and Nugget Ice Machine.

EXCLUSIONS FROM COVERAGE

- Repair or replacement of parts required because of misuse, improper care or storage, negligence, alteration, use of incompatible supplies or lack of specified maintenance shall be excluded.
- Normal maintenance items.
- Failures caused by improper or erratic voltages, adverse environmental or water conditions, improper drainage, interruption in electrical or water supply.
- Improper or unauthorized repair.
- Any RF, RFS, RNS, RNF, UNF, UFF, UNP, and UFP Flake and Nugget Ice Machine that has been installed and/or maintained inconsistent with the instructions provided by the Company.
- Parts subject to damage beyond the control of Company, or to RF, RFS, RNS, RNF, UNF, UFF, UNP, and UFP Flake and Nugget Ice Machine's which have been subject to accidents, damage in shipment, fire, floods, other hazards or acts of God that are beyond the control of the Company.
- This Limited Warranty shall not apply if the RF, RFS, RNS, RNF, UNF, UFF, UNP, and UFP Flake and Nugget Ice Machine's refrigeration system is modified with a condenser, heat reclaim device, or parts and assemblies other than those manufactured by the Company, unless the Company approves these modifications for specific locations in writing prior to the commencement of such modification.

LIMITATIONS OF LIABILITY

The preceding paragraphs set forth the exclusive remedy for all claims based on failure of, or defect in, RF, RFS, RNS, RNF, UNF, UFF, UNP, and UFP Flake and Nugget Ice Machines sold hereunder, whether the failure or defect arises before or during the warranty period, and whether a claim, however instituted, is based on contract, indemnity, warranty, tort (including negligence), strict liability, implied by statute, common-law or otherwise, and Company and agents shall not be liable for any claims for personal injuries or consequential damages or loss, howsoever caused. Upon the expiration of the warranty period, all such liability shall terminate. THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, IMPLIED OR STATUTORY NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE SHALL APPLY, COMPANY DOES NOT WARRANT ANY PRODUCTS OR SERVICES OF OTHERS.

REMEDIES

The liability of Company for breach of any warranty obligation hereunder is limited to: (i) the repair or replacement of the RF, RFS, RNS, RNF, UNF, UFF, UNP, and UFP Flake and Nugget Ice Machine on which the liability is based, or with respect to services, re-performance of the services; or (ii) at Company's option, the refund of the amount paid for said equipment or services. Any breach by Company with respect to any item or unit of equipment or services shall be deemed a breach with respect to that item or unit or service only.

WARRANTY CLAIM PROCEDURE

Customer shall be responsible to:

- Complete and return warranty registration card or register on line within five (5) days from the installation date. Complete the following and retain for your records: Distributor/Dealer Model Number and Serial Number Installation Date.
- All warranty service must be performed by an approved Manitowoc contracted or authorized Service Representative. To schedule a service appointment contact your local Manitowoc Service Representative or visit us at www.manitowocice.com to find a Service Representative near you.

GOVERNING LAW

This Limited Warranty shall be governed by the laws of the state of Wisconsin, USA, excluding their conflicts of law principles. The United Nations Convention on Contracts for the International Sale of Goods is hereby excluded in its entirety from application to this Limited Warranty.

COMPLETE AND RETAIN FOR YOUR RECORD:

Distributor/Dealer _____
 Model Number _____
 Serial Number _____
 Installation Date _____

Manitowoc Ice

2110 South 26th Street
 P.O. Box 1720
 Manitowoc, WI 54221-1720
 Web site: www.manitowocice.com



RN MODEL NUGGET ICE MACHINE COMMERCIAL WARRANTY

Manitowoc Ice, Inc. (hereinafter referred to as the "COMPANY") warrants for a period of twenty-four months from the installation date (except as limited below) that new RN Nugget Ice Machines manufactured by the COMPANY shall be free of defects in material or workmanship under normal and proper use and maintenance as specified by the COMPANY and upon proper installation and start-up in accordance with the instruction manual supplied with the ice machine.

Limited Warranty

Parts for a period of three (3) years.

Labor for a period of two (2) years.

Compressor parts for five (5) years and labor for two (2) years.

The obligation of the COMPANY under this warranty is limited to the repair or replacement of parts, components, or assemblies that in the opinion of the COMPANY are defective. This warranty is further limited to the cost of parts, components or assemblies and standard straight time labor charges at the servicing location.

Time and hourly rate schedules, as published from time to time by the COMPANY, apply to all service procedures. Additional expenses including without limitation, travel time, overtime premium, material cost, accessing or removal of the ice machine, or shipping are the responsibility of the owner, along with all maintenance, adjustments, cleaning, and ice purchases. Labor covered under this warranty must be performed by a COMPANY Contracted Service Representative or a refrigeration service agency as qualified and authorized by the COMPANY's local Distributor. The COMPANY's liability under this warranty shall in no event be greater than the actual purchase price paid by customer for the ice machine.

The foregoing warranty shall not apply to (1) any part or assembly that has been altered, modified, or changed; (2) any part or assembly that has been subjected to misuse, abuse, neglect, or accidents; (3) any ice machine that has been installed and/or maintained inconsistent with the technical instructions provided by the COMPANY; or (4) any ice machine initially installed more than five years from the serial number production date. This warranty shall not apply if the Ice Machine's refrigeration system is modified with a condenser, heat reclaim device, or parts and assemblies other than those manufactured by the COMPANY, unless the COMPANY approves these modifications for specific locations in writing.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES OR GUARANTEES OF ANY KIND, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

In no event shall the COMPANY be liable for any special, indirect, incidental or consequential damages. Upon the expiration of the warranty period, the COMPANY's liability under this warranty shall terminate. The foregoing warranty shall constitute the sole liability of the COMPANY and the exclusive remedy of the customer or user. To secure prompt and continuing warranty service, the warranty registration card must be completed and sent to the COMPANY within five (5) days from the installation date.

MANITOWOC ICE, INC.

2110 South 26th St., Manitowoc, WI 54220

Telephone: 920-682-0161

Web Site -www.manitowocice.com

Rev. 08/22



LIMITED WARRANTY FOR US CRYSTALCRAFT™ ICE MACHINE

LIMITED WARRANTY

Manitowoc Ice, Inc. (hereinafter referred to as the "COMPANY") warrants that new US CrystalCraft™ sold by Company shall be free of defects in material or workmanship under normal and proper use and maintenance as specified by the Company and upon proper installation and start-up in accordance with the instruction manual supplied.

WHAT IS COVERED

- Parts for a period of three (3) years.
- Labor for a period of three (3) years.
- Compressor parts for five (5) years and labor for three (3) years.

The US CrystalCraft™ warranty begins on the date of the original installation. This warranty shall not apply to any ice machine initially installed more than five (5) years from the serial number production date.

The obligation of the Company under this warranty is limited to the repair or replacement of parts, components, or assemblies that in the sole opinion of the Company are defective. This warranty is further limited to the cost of parts, components or assemblies and standard straight time labor charges (excluding the compressor warranty) at the servicing location.

Time and hourly rate schedules, as published from time to time by the Company, apply to all service procedures. Additional expenses including without limitation, travel time, overtime premium, material cost, accessing or removal of the US CrystalCraft™, or shipping are the responsibility of the purchaser, along with all maintenance, adjustments, cleaning, and ice purchases. Labor covered under this warranty must be performed by an approved Company contracted Service Representative or a refrigeration service agency as qualified and authorized by the Company's local Distributor. The Company's liability under this warranty shall in no event be greater than the actual purchase price paid by purchaser for the US CrystalCraft™.

EXCLUSIONS FROM COVERAGE

- Repair or replacement of parts required because of misuse, improper care or storage, negligence, alteration, use of incompatible supplies or lack of specified maintenance shall be excluded.
- Normal maintenance items.
- Failures caused by improper or erratic voltages, adverse environmental or water conditions, improper drainage, interruption in electrical or water supply.
- Improper or unauthorized repair.
- Any US CrystalCraft™ that has been installed and/or maintained inconsistent with the instructions provided by the Company.
- Parts subject to damage beyond the control of Company, or to US CrystalCraft™'s which have been subject to accidents, damage in shipment, fire, floods, other hazards or acts of God that are beyond the control of the Company.
- This Limited Warranty shall not apply if the US CrystalCraft™'s refrigeration system is modified with a condenser, heat reclaim device, or parts and assemblies other than those manufactured by the Company, unless the Company approves these modifications for specific locations in writing prior to the commencement of such modification.

LIMITATIONS OF LIABILITY

The preceding paragraphs set forth the exclusive remedy for all claims based on failure of, or defect in, US CrystalCraft™ sold hereunder, whether the failure or defect arises before or during the warranty period, and whether a claim, however instituted, is based on contract, indemnity, warranty, tort (including negligence), strict liability, implied by statute, common-law or otherwise, and Company and agents shall not be liable for any claims for personal injuries or consequential damages or loss, howsoever caused. Upon the expiration of the warranty period, all such liability shall terminate. THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, IMPLIED OR STATUTORY NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE SHALL APPLY, COMPANY DOES NOT WARRANT ANY PRODUCTS OR SERVICES OF OTHERS.

REMEDIES

The liability of Company for breach of any warranty obligation hereunder is limited to: (i) the repair or replacement of the US CrystalCraft™ on which the liability is based, or with respect to services, re-performance of the services; or (ii) at Company's option, the refund of the amount paid for said equipment or services. Any breach by Company with respect to any item or unit of equipment or services shall be deemed a breach with respect to that item or unit or service only.

WARRANTY CLAIM PROCEDURE

Customer shall be responsible to:

- Complete and return warranty registration card or register on line within five (5) days from the installation date. Complete the following and retain for your records: Distributor/Dealer Model Number and Serial Number Installation Date.
- All warranty service must be preformed by an approved Manitowoc contracted or authorized Service Representative. To schedule a service appointment contact your local Manitowoc Service Representative or visit us at www.manitowocice.com to find a Service Representative near you.

GOVERNING LAW

This Limited Warranty shall be governed by the laws of the state of Wisconsin, USA, excluding their conflicts of law principles. The United Nations Convention on Contracts for the International Sale of Goods is hereby excluded in its entirety from application to this Limited Warranty.

COMPLETE AND RETAIN FOR YOUR RECORD:

Distributor/Dealer _____
 Model Number _____
 Serial Number _____
 Installation Date _____

Manitowoc Ice

2110 South 26th Street
 P.O. Box 1720
 Manitowoc, WI 54221-1720
 Web site: www.manitowocice.com



LIMITED WARRANTY FOR ICE STORAGE D-BIN & S-DISPENSERS

LIMITED WARRANTY

Manitowoc Ice, Inc. (hereinafter referred to as the "COMPANY") warrants that new Ice Storage Bins or Dispensers sold by Company shall be free of defects in material or workmanship under normal and proper use and maintenance as specified by the Company and upon proper installation and start-up in accordance with the instruction manual supplied.

WHAT IS COVERED

- Parts for a period of three (3) years.
- Labor for a period of three (3) years.
- Accessory Ice Transport Carts for two (2) years parts and labor. The Ice Storage Bin / Dispenser warranty begins on the date of the original installation. This warranty shall not apply to any Ice Storage Bin or Dispenser initially installed more than five (5) years from the serial number production date.

The obligation of the Company under this warranty is limited to the repair or replacement of parts, components, or assemblies that in the sole opinion of the Company are defective. This warranty is further limited to the cost of parts, components or assemblies and standard straight time labor charges at the servicing location.

Time and hourly rate schedules, as published from time to time by the Company, apply to all service procedures. Additional expenses including without limitation, travel time, overtime premium, material cost, accessing or removal of the Ice Storage Bin / Dispenser, or shipping are the responsibility of the purchaser, along with all maintenance, adjustments, cleaning, and ice purchases. Labor covered under this warranty must be performed by an approved Company contracted Service Representative or a refrigeration service agency as qualified and authorized by the Company's local Distributor. The Company's liability under this warranty shall in no event be greater than the actual purchase price paid by purchaser for the Ice Storage Bin or Dispenser.

EXCLUSIONS FROM COVERAGE

- Repair or replacement of parts required because of misuse, improper care or storage, negligence, alteration, use of incompatible supplies or lack of specified maintenance shall be excluded.
- Normal maintenance items.
- Failures caused by improper or erratic voltages, adverse environmental or water conditions, improper drainage, interruption in electrical or water supply.
- Improper or unauthorized repair.
- Any Ice Storage Bin / Dispenser that has been installed and/or maintained inconsistent with the instructions provided by the Company.
- Parts subject to damage beyond the control of Company, or to Ice Storage Bin's / Dispenser's which have been subject to accidents, damage in shipment, fire, floods, other hazards or acts of God that are beyond the control of the Company.

LIMITATIONS OF LIABILITY

The preceding paragraphs set forth the exclusive remedy for all claims based on failure of, or defect in, Ice Storage Bin's / Dispenser sold hereunder, whether the failure or defect arises before or during the warranty period, and whether a claim, however instituted, is based on contract, indemnity, warranty, tort (including negligence), strict liability, implied

by statute, common-law or otherwise, and Company and agents shall not be liable for any claims for personal injuries or consequential damages or loss, howsoever caused. Upon the expiration of the warranty period, all such liability shall terminate. THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, IMPLIED OR STATUTORY NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE SHALL APPLY, COMPANY DOES NOT WARRANT ANY PRODUCTS OR SERVICES OF OTHERS.

REMEDIES

The liability of Company for breach of any warranty obligation hereunder is limited to: (i) the repair or replacement of the Ice Storage Bin's / Dispenser on which the liability is based, or with respect to services, re-performance of the services; or (ii) at Company's option, the refund of the amount paid for said equipment or services. Any breach by Company with respect to any item or unit of equipment or services shall be deemed a breach with respect to that item or unit or service only.

WARRANTY CLAIM PROCEDURE

Customer shall be responsible to:

- Complete and return warranty registration card or register on line within five (5) days from the installation date. Complete the following and retain for your records: Distributor/Dealer Model Number and Serial Number Installation Date.
- All warranty service must be preformed by an approved Manitowoc contracted or authorized Service Representative. To schedule a service appointment contact your local Manitowoc Service Representative or visit us at www.manitowocice.com to find a Service Representative near you.

GOVERNING LAW

This Limited Warranty shall be governed by the laws of the state of Wisconsin, USA, excluding their conflicts of law principles. The United Nations Convention on Contracts for the International Sale of Goods is hereby excluded in its entirety from application to this Limited Warranty.

COMPLETE AND RETAIN FOR YOUR RECORD:

Distributor/Dealer _____
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Manitowoc Ice

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 Manitowoc, WI 54221-1720
 Web site: www.manitowocice.com



LIMITED WARRANTY FOR F-STYLE ICE STORAGE BINS

LIMITED WARRANTY

Manitowoc Ice, Inc. (Hereinafter referred to as the "COMPANY") warrants that new Ice Storage Bins or Dispensers sold by Company shall be free of defects in material or workmanship under normal and proper use and maintenance as specified by the Company and upon proper installation and start-up in accordance with the instruction manual supplied.

WHAT IS COVERED

- Parts for a period of five (5) years.
- Labor for a period of five (5) years.
- Limited lifetime warranty for corrosion.
- Accessory Ice Transport Carts for two (2) years parts and (1) year labor.

The Ice Storage Bin warranty begins on the date of the original installation. This warranty shall not apply to any Ice Storage Bin or Dispenser initially installed more than five (5) years from the serial number production date.

The obligation of the Company under this warranty is limited to the repair or replacement of parts, components, or assemblies that in the sole opinion of the Company are defective. This warranty is further limited to the cost of parts, components or assemblies and standard straight time labor charges at the servicing location.

Time and hourly rate schedules, as published from time to time by the Company, apply to all service procedures. Additional expenses including without limitation, travel time, overtime premium, material cost, accessing or removal of the Ice Storage Bin / Dispenser, or shipping are the responsibility of the purchaser, along with all maintenance, adjustments, cleaning, and ice purchases. Labor covered under this warranty must be performed by an approved Company contracted Service Representative or a refrigeration service agency as qualified and authorized by the Company's local Distributor. The Company's liability under this warranty shall in no event be greater than the actual purchase price paid by purchaser for the Ice Storage Bin or Dispenser.

EXCLUSIONS FROM COVERAGE

- Repair or replacement of parts required because of misuse, improper care or storage, negligence, alteration, use of incompatible supplies or lack of specified maintenance shall be excluded.
- Normal maintenance items.
- Failures caused by improper or erratic voltages, adverse environmental or water conditions, improper drainage, interruption in electrical or water supply.
- Improper or unauthorized repair.
- Any Ice Storage Bin / Dispenser that has been installed and/or maintained inconsistent with the instructions provided by the Company.
- Parts subject to damage beyond the control of Company, or to Ice Storage Bin's / Dispenser's which have been subject to accidents, damage in shipment, fire, floods, other hazards or acts of God that are beyond the control of the Company.

LIMITATIONS OF LIABILITY

The preceding paragraphs set forth the exclusive remedy for all claims based on failure of, or defect in, Ice Storage Bin's / Dispenser sold hereunder, whether the failure or defect arises before or during the warranty

period, and whether a claim, however instituted, is based on contract, indemnity, warranty, tort (including negligence), strict liability, implied by statute, common-law or otherwise, and Company and agents shall not be liable for any claims for personal injuries or consequential damages or loss, howsoever caused. Upon the expiration of the warranty period, all such liability shall terminate. THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, IMPLIED OR STATUTORY NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE SHALL APPLY, COMPANY DOES NOT WARRANT ANY PRODUCTS OR SERVICES OF OTHERS.

REMEDIES

The liability of Company for breach of any warranty obligation hereunder is limited to: (i) the repair or replacement of the Ice Storage Bin's / Dispenser on which the liability is based, or with respect to services, re-performance of the services; or (ii) at Company's option, the refund of the amount paid for said equipment or services. Any breach by Company with respect to any item or unit of equipment or services shall be deemed a breach with respect to that item or unit or service only.

WARRANTY CLAIM PROCEDURE

Customer shall be responsible to:

- Complete and return warranty registration card or register on line within five (5) days from the installation date. Complete the following and retain for your records: Distributor/Dealer Model Number and Serial Number Installation Date.
- All warranty service must be preformed by an approved Manitowoc contracted or authorized Service Representative. To schedule a service appointment contact your local Manitowoc Service Representative or visit us at www.manitowocice.com to find a Service Representative near you.

GOVERNING LAW

This Limited Warranty shall be governed by the laws of the state of Wisconsin, USA, excluding their conflicts of law principles. The United Nations Convention on Contracts for the International Sale of Goods is hereby excluded in its entirety from application to this Limited Warranty.

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Manitowoc Ice

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P.O. Box 1720
Manitowoc, WI 54221-1720
Web site: www.manitowocice.com



Manitowoc®

AuCS® Accessory Warranty

(Automatic Cleaning System)

Manitowoc Ice, Inc. (hereinafter referred to as the "COMPANY") warrants for a period of thirty-six months from the installation date (except as limited below) that new AuCS® Accessory sold by the COMPANY shall be free of defects in material or workmanship under normal and proper use and maintenance as specified by the COMPANY and upon proper installation and start-up in accordance with the instruction manual supplied with the AuCS® Accessory.

The obligation of the COMPANY under this warranty is limited to the repair or replacement of parts, components, or assemblies that in the opinion of the COMPANY are defective. This warranty is further limited to the cost of parts, components or assemblies and standard straight time labor charges at the servicing location.

Time and hourly rate schedules, as published from time to time by the COMPANY, apply to all service procedures. Additional expenses including without limitation, travel time, overtime premium, material cost, accessing or removal of the AuCS® Accessory, or shipping are the responsibility of the owner, along with all maintenance, adjustments, and cleaning costs. Labor covered under this warranty must be performed by a COMPANY Contracted Service Representative or a refrigeration service agency as qualified and authorized by the COMPANY'S local Distributor. The COMPANY'S liability under this warranty shall in no event be greater than the actual purchase price paid by the customer for the AuCS® Accessory.

The foregoing warranty shall not apply to (1) any part or assembly that has been altered, modified, or changed; (2) any part or assembly that has been subjected to misuse, abuse, neglect, or accidents; (3) ice machine cleaner or sanitizer solution; (4) any AuCS® Accessory that has been installed and/or maintained inconsistent with the technical instructions provided by the COMPANY; or (5) any AuCS® Accessory initially installed more than five years from the serial number production date.

The AuCS® Accessory is designed to operate only with COMPANY'S approved cleaner and sanitizer on the COMPANY'S ice machines.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES OR GUARANTEES OF ANY KIND, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. In no event shall the COMPANY be liable for any special, indirect, incidental or consequential damages. Upon the expiration of the warranty period, the COMPANY'S liability under this warranty shall terminate. The foregoing warranty shall constitute the sole liability of the COMPANY and the exclusive remedy of the customer or user.

To secure prompt and continuing warranty service, the warranty registration card must be completed and sent to the COMPANY within five (5) days from the installation date. Complete the following and retain for your record:

Distributor/Dealer _____
Model Number _____ Serial Number _____
Installation Date _____

MANITOWOC ICE, INC.
2110 South 26th St., Manitowoc, WI 54220
Telephone: 920-682-0161
Web Site -www.manitowocice.com
Rev. 08/22



Luminice® Accessory Warranty

Manitowoc Ice, Inc. (hereinafter referred to as the "COMPANY") warrants for a period of thirty-six months from the installation date (except as limited below) that new Luminice® Accessory sold by the COMPANY shall be free of defects in material or workmanship under normal and proper use and maintenance as specified by the COMPANY and upon proper installation and start-up in accordance with the instruction manual supplied with the Luminice® Accessory.

The obligation of the COMPANY under this warranty is limited to the repair or replacement of parts, components, or assemblies that in the opinion of the COMPANY are defective. This warranty is further limited to the cost of parts, components or assemblies and standard straight time labor charges at the servicing location.

Time and hourly rate schedules, as published from time to time by the COMPANY, apply to all service procedures. Additional expenses including without limitation, travel time, overtime premium, material cost, accessing or removal of the Luminice® Accessory, or shipping are the responsibility of the owner, along with all maintenance, adjustments, and cleaning costs. Labor covered under this warranty must be performed by a COMPANY Contracted Service Representative or a refrigeration service agency as qualified and authorized by the COMPANY'S local Distributor. The COMPANY'S liability under this warranty shall in no event be greater than the actual purchase price paid by the customer for the Luminice® Accessory.

The foregoing warranty shall not apply to (1) any part or assembly that has been altered, modified, or changed; (2) any part or assembly that has been subjected to misuse, abuse, neglect, or accidents; (3) wear items such as cartridges or o-rings; (4) any Luminice® Accessory that has been installed and/or maintained inconsistent with the technical instructions provided by the COMPANY; or (5) any Luminice® Accessory initially installed more than five years from the serial number production date.

The Luminice® Accessory is designed to operate only with COMPANY'S ice machines.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES OR GUARANTEES OF ANY KIND, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. In no event shall the COMPANY be liable for any special, indirect, incidental or consequential damages. Upon the expiration of the warranty period, the COMPANY'S liability under this warranty shall terminate. The foregoing warranty shall constitute the sole liability of the COMPANY and the exclusive remedy of the customer or user.

To secure prompt and continuing warranty service, the warranty registration card must be completed and sent to the COMPANY within five (5) days from the installation date. Complete the following and retain for your record:

Distributor/Dealer _____
Model Number _____ Serial Number _____
Installation Date _____

MANITOWOC ICE, INC.
2110 South 26th St., Manitowoc, WI 54220
Telephone: 920-682-0161
Web Site -www.manitowocice.com
Rev. 08/22



ArcticPure® Accessory Warranty

Manitowoc Ice, Inc. (hereinafter referred to as the "COMPANY") warrants for a period of thirty-six months from the installation date (except as limited below) that new ArcticPure® Accessory sold by the COMPANY shall be free of defects in material or workmanship under normal and proper use and maintenance as specified by the COMPANY and upon proper installation and start-up in accordance with the instruction manual supplied with the ArcticPure® Accessory.

The obligation of the COMPANY under this warranty is limited to the repair or replacement of parts, components, or assemblies that in the opinion of the COMPANY are defective. This warranty is further limited to the cost of parts, components or assemblies and standard straight time labor charges at the servicing location.

Time and hourly rate schedules, as published from time to time by the COMPANY, apply to all service procedures. Additional expenses including without limitation, travel time, overtime premium, material cost, accessing or removal of the ArcticPure® Accessory, or shipping are the responsibility of the owner, along with all maintenance, adjustments, and cleaning costs. Labor covered under this warranty must be performed by a COMPANY Contracted Service Representative or a refrigeration service agency as qualified and authorized by the COMPANY'S local Distributor. The COMPANY'S liability under this warranty shall in no event be greater than the actual purchase price paid by the customer for the ArcticPure® Accessory.

The foregoing warranty shall not apply to (1) any part or assembly that has been altered, modified, or changed; (2) any part or assembly that has been subjected to misuse, abuse, neglect, or accidents; (3) wear items such as cartridges or o-rings; (4) any ArcticPure® Accessory that has been installed and/or maintained inconsistent with the technical instructions provided by the COMPANY; or (5) any ArcticPure® Accessory initially installed more than five years from the serial number production date.

The ArcticPure® Accessory is designed to operate only with COMPANY'S ice machines.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES OR GUARANTEES OF ANY KIND, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. In no event shall the COMPANY be liable for any special, indirect, incidental or consequential damages. Upon the expiration of the warranty period, the COMPANY'S liability under this warranty shall terminate. The foregoing warranty shall constitute the sole liability of the COMPANY and the exclusive remedy of the customer or user.

To secure prompt and continuing warranty service, the warranty registration card must be completed and sent to the COMPANY within five (5) days from the installation date. Complete the following and retain for your record:

Distributor/Dealer _____
Model Number _____ Serial Number _____
Installation Date _____

MANITOWOC ICE, INC.
2110 South 26th St., Manitowoc, WI 54220
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Rev. 08/22



Arctic Pure Plus

Premium Water Filters for Ice Machines



Arctic Pure Plus
Premium Water Filters for Ice Machines

Models ☐ AR-PRE-P ☐ AR-10000-P ☐ AR-20000-P ☐ AR-40000-P



AR-PRE-P



AR-10000-P



AR-20000-P



AR-40000-P

- | | | | |
|--|---|--|---|
| <ul style="list-style-type: none"> • Pre-filter, removes hard sediments, sand, dirt and rust from water, and protects solenoids, valves and inlets to the ice maker • Compatible with all models | <ul style="list-style-type: none"> • Chlorine Reduction • SLOW PHOS scale inhibitor • 0.5 Microns filtration • 15,000 gallon capacity • Models 0-600 lbs/day | <ul style="list-style-type: none"> • Chlorine Reduction • SLOW PHOS scale inhibitor • 0.5 Microns filtration • 20,000 gallon capacity • Models 601-1000 lbs/day | <ul style="list-style-type: none"> • Chlorine Reduction • SLOW PHOS scale inhibitor • 0.5 Microns filtration • 40,000 gallon capacity • Models 1001-2500 lbs/day |
|--|---|--|---|

Standard Features and Benefits

- 95% average reduction of chlorine from incoming water supply assures the ice tastes and smells fresher, clearer and more enjoyable
- Silver impregnated carbon block provides antimicrobial protection against potential bacteria microorganisms, algae, mold and slime on ice machine surfaces
- Engineered with SLOW PHOS (slowly soluble polyphosphate) to inhibit scale formation and corrosion
- Reduces dirt, submicron particles (down to 0.5 microns) and eliminates contaminants such as cryptosporidium and giardia cysts.
- Ultra-fine filtration (0.5 Microns) with silver impregnated carbon block and slowly soluble polyphosphates provides triple protection from harmful contaminants that can affect your ice machine's performance
- Reduces ice machine cost and maintenance frequency by reducing scale, impurities, and contaminants that can enter the machine.
- Extends the life of the ice machine, when the filters are changed every 6 months or when water pressure is below 20 psi.
- Optimizes the daily performance of the machine, allowing it run at full capacity producing the freshest and purist ice possible
- Cartridges are easy to install, safe, sanitary and can be changed out rapidly, "on the fly" without turning off the water supply
- **Certified to NSF/ANSI Standard 42, 53, 372, and CSA B483.1** by IAPMO and meets CUPC requirements.

IAPMO R&T Certifications

System Model #	Replace. Cartridge	Std. 42 Claims	Std. 53 Claims	Chlorine Red. Cap
AR-PRE-P	K00496	Part. Class 3	None	None
AR-10000-P	K00493	Chlorine & Part. Class 1	Cyst	15,000 gal
AR-20000-P	K00494	Chlorine & Part. Class 1	Cyst	20,000 gal
AR-40000-P	K00495	Chlorine & Part. Class 1	Cyst	40,000 gal

- CSAB483.1: For Canadian water standards
- *NSF/ANSI 53 cyst claim only valid at or below rated flow rate
- Warning : Do not use with water that is microbiologically unsafe or of unknown quality without adequate disinfections before or after the unit. For cold water use only. Not for residential use.

Note on Pre-filter: A pre-filter is recommended for all applications to achieve maximum filtration efficiency and cartridge life.

Warranty

3-Year parts and labor warranty on head, shroud, hardware, and mounting assembly.
(water filter cartridge not included).
Residential Warranty - 1 Year



ArcticPure™ Accessory Warranty

Manitowoc Ice, Inc. (hereinafter referred to as the "COMPANY") warrants for a period of thirty-six months from the installation date (except as limited below) that new ArcticPure™ Accessory sold by the COMPANY shall be free of defects in material or workmanship under normal and proper use and maintenance as specified by the COMPANY and upon proper installation and start-up in accordance with the instruction manual supplied with the ArcticPure™ Accessory.

The obligation of the COMPANY under this warranty is limited to the repair or replacement of parts, components, or assemblies that in the opinion of the COMPANY are defective. This warranty is further limited to the cost of parts, components or assemblies and standard straight time labor charges at the servicing location.

Time and hourly rate schedules, as published from time to time by the COMPANY, apply to all service procedures. Additional expenses including without limitation, travel time, overtime premium, material cost, accessing or removal of the ArcticPure™ Accessory, or shipping are the responsibility of the owner, along with all maintenance, adjustments, and cleaning costs. Labor covered under this warranty must be performed by a COMPANY Contracted Service Representative or a refrigeration service agency as qualified and authorized by the COMPANY'S local Distributor. The COMPANY'S liability under this warranty shall in no event be greater than the actual purchase price paid by the customer for the ArcticPure™ Accessory.

The foregoing warranty shall not apply to (1) any part or assembly that has been altered, modified, or changed; (2) any part or assembly that has been subjected to misuse, abuse, neglect, or accidents; (3) wear items such as cartridges or o-rings; (4) any ArcticPure™ Accessory that has been installed and/or maintained inconsistent with the technical instructions provided by the COMPANY; or (5) any ArcticPure™ Accessory initially installed more than five years from the serial number production date.

The ArcticPure™ Accessory is designed to operate only with COMPANY'S ice machines.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES OR GUARANTEES OF ANY KIND, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. In no event shall the COMPANY be liable for any special, indirect, incidental or consequential damages. Upon the expiration of the warranty period, the COMPANY'S liability under this warranty shall terminate. The foregoing warranty shall constitute the sole liability of the COMPANY and the exclusive remedy of the customer or user.

To secure prompt and continuing warranty service, the warranty registration card must be completed and sent to the COMPANY within five (5) days from the installation date.

Complete the following and retain for your record:

Distributor/Dealer _____
Model Number _____ Serial Number _____
Installation Date _____

MANITOWOC ICE, INC.

2110 So. 26th St., P.O. Box 1720, Manitowoc, WI 54221-1720

Telephone: 920-682-0161 · Fax: 920-683-7585

Web Site - www.manitowocice.com

Form 80-1464-3 06/03



SPA-162 • SFA-192 Touchless Ice Dispensers

Model



SPA-162



SFA-192

ADA Compliant



ONLY 22" WIDE

SPA Model

Designed for filling both ice buckets and glasses. The touch-less lever activated ice chute means the ice bucket or glass is used to dispense ice, not a hand. Clearance from the grate to the bottom of the chute 9.5" (24.13cm).

Coupled with an Indigo NXT ice machine, you can program the ice machine to be off at night so that while the hotel guests are sleeping, the ice machine can be too!



Indigo NXT iT0620 Ice Machine
SPA-162 Ice Dispenser
(Ice Machine and Dispenser sold separately)

SFA Model

Designed for filling both ice buckets and glasses with a built in Water Valve. The touch-less lever activated ice chute means the ice bucket or glass is used to dispense ice, not a hand. Clearance from grate to bottom of chute 9.5" (24.13 cm).



Indigo NXT iT0620 Ice Machine
SFA-192 Ice & Water Dispenser
(Ice Machine and Dispenser sold separately)

Standard Features

- 120 lbs. (54.4 kgs.) ice storage capacity. Accepts 22" (55.88 cm) wide Manitowoc ice machine.
- Only 22" (55.88 cm) wide, 31" (78.7 cm) deep, and 75.5" high (191.77 cm).
- The touch-less lever eliminates the need to touch a hand to the machine to dispense ice.
- Efficient built-in agitator assures 100% dispensing. Oversized drain pan collects larger quantity of ice overflow.
- DuraTech™ exterior provides superior corrosion resistance. Stainless finish with innovative clear-coat resists fingerprints and dirt.

Warranty

- 5-year parts and 5-year labor coverage on ice machine evaporator.
- 5-year parts and 3-year labor coverage on ice machine compressor.
- 3-year parts-and-labor coverage on all other ice machine and dispenser components.

Ice Shape



Half Dice
3/8" x 1 1/8" x 7/8"
(.95 x 2.86 x 2.22 cm)



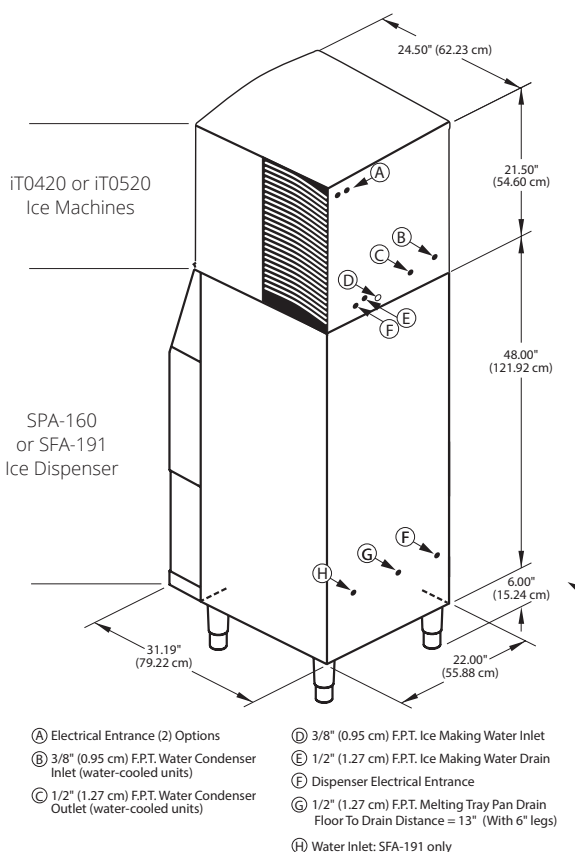
Dice
7/8" x 7/8" x 7/8"
(2.22 x 2.22 x 2.22 cm)



SPA-162 • SFA-192 Touchless Ice Dispensers



SPA-162 • SFA-192 Touchless Ice Dispensers



Installation Note - Dispensers have no minimum clearance, when installing an ice machine/ dispenser combination follow the clearance requirements for the ice machine being installed.

Ice Machine Electric

Note: Dispenser will accept single 22" wide ice machine. Ice machine ordered separately. Choose Dice or Half Dice cube size. Refer to ice machine specification sheet for electrical and complete AHRI standard ratings.

Dispenser Electric:

115/60/1. (208-230/60/1 and 230/50/1 also available.)

Maximum Circuit Fuse Size:

15.0 amps. HACR-type circuit breakers can be used in place of fuses.

Dispenser Electrical Connection:

6' power cord, rated 125 VAC, 16-3 conductors with standard 3-prong, straight-blade, ground-type plug (NEMA configuration 5-15P).

Motor:

1.6 amps maximum. Permanently lubricated.

Service Access:

Dispenser door removes easily to access components.

Model Options:

SPA-162 touch-less activated lever only
SFA-192 touch-less activated lever with water valve

Series iT0420 (115 volt)

Model	Ice Shape	Ice Production 24 Hours			
		70°Air/50°F Water		90°Air/70°F Water	
		lbs.	kgs.	lbs.	kgs.
IDT-0420A	dice	470	213	375	170
IDT-0420W	dice	454	206	400	181
IYT-0420A	half-dice	460	209	375	170
IYT-0420W	half-dice	490	222	425	193

Series iT0620 (115 volt)

Model	Ice Shape	Ice Production 24 Hours			
		70°Air/50°F Water		90°Air/70°F Water	
		lbs.	kgs.	lbs.	kgs.
IDT-0620A	dice	560	254	450	204
IDT-0620W	dice	530	240	450	204
IYT-0620A	half-dice	575	261	465	211
IYT-0620W	half-dice	560	254	485	220

LuminIce® II Virus and Bacteria Inhibitor

controls viruses and bacteria inside the ice machine



Arctic Pure Plus Water Filters

AR-Pre-P

Filters dirt, rust, and hard sediments down to 5 micron.



AR-10000-P

Ultra-fine filtration reduces chlorine & contaminants down to .5 microns. Use of pre-filter recommended.



Manitowoc Ice reserves the right to make changes to the design or specifications without prior notice.

2110 South 26th Street
Manitowoc, WI 54220

Tel: 1.920.682.0161
Fax: 1.920.683.7589

www.manitowocice.com
43580
5/22



LIMITED WARRANTY FOR ICE STORAGE BIN & DISPENSERS

LIMITED WARRANTY

Manitowoc Ice a division of Manitowoc FSG Operations, LLC, ("Company") warrants that new Ice Storage Bins or Dispensers sold by Company shall be free of defects in material or workmanship under normal and proper use and maintenance as specified by the Company and upon proper installation and start-up in accordance with the instruction manual supplied.

WHAT IS COVERED

- Parts and Labor for a period of three (3) years.
 - Accessory Ice Transport Carts for two (2) years parts and labor.
- The Ice Storage Bin / Dispenser warranty begins on the date of the original installation. This warranty shall not apply to any Ice Storage Bin or Dispenser initially installed more than five (5) years from the serial number production date.

The obligation of the Company under this warranty is limited to the repair or replacement of parts, components, or assemblies that in the sole opinion of the Company are defective. This warranty is further limited to the cost of parts, components or assemblies and standard straight time labor charges at the servicing location.

Time and hourly rate schedules, as published from time to time by the Company, apply to all service procedures. Additional expenses including without limitation, travel time, overtime premium, material cost, accessing or removal of the Ice Storage Bin / Dispenser, or shipping are the responsibility of the purchaser, along with all maintenance, adjustments, cleaning, and ice purchases. Labor covered under this warranty must be performed by an approved Company contracted Service Representative or a refrigeration service agency as qualified and authorized by the Company's local Distributor. The Company's liability under this warranty shall in no event be greater than the actual purchase price paid by purchaser for the Ice Storage Bin or Dispenser.

EXCLUSIONS FROM COVERAGE

- Repair or replacement of parts required because of misuse, improper care or storage, negligence, alteration, use of incompatible supplies or lack of specified maintenance shall be excluded.
- Normal maintenance items.
- Failures caused by adverse environmental, water conditions, or improper drainage.
- Improper or unauthorized repair.
- Any Ice Storage Bin / Dispenser that has been installed and/or maintained inconsistent with the instructions provided by the Company.
- Parts subject to damage beyond the control of Company, or to Ice Storage Bin's / Dispenser's which have been subject to accidents, damage in shipment, fire, floods, other hazards or acts of God that are beyond the control of the Company.
- This Limited Warranty shall not apply if the Ice Storage Bin / Dispenser is modified with parts and assemblies other than those manufactured by the Company, unless the Company approves these modifications for specific locations in writing prior to the commencement of such modification.

LIMITATIONS OF LIABILITY

The preceding paragraphs set forth the exclusive remedy for all claims based on failure of, or defect in, Ice Storage Bins or Dispensers sold hereunder, whether the failure or defect arises before or during the warranty period, and whether a claim, however instituted, is based on contract, indemnity, warranty, tort (including negligence), strict liability, implied by statute, common-law or otherwise, and Company and agents shall not be liable for any claims for personal injuries or consequential damages or loss, howsoever caused. Upon the expiration of the warranty period, all such liability shall terminate. THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, IMPLIED OR STATUTORY. NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE SHALL APPLY, COMPANY DOES NOT WARRANT ANY PRODUCTS OR SERVICES OF OTHERS.

REMEDIES

The liability of Company for breach of any warranty obligation hereunder is limited to: (i) the repair or replacement of the Ice Storage Bin or Dispenser on which the liability is based, or with respect to services, re-performance of the services; or (ii) at Company's option, the refund of the amount paid for said equipment or services. Any breach by Company with respect to any item or unit of equipment or services shall be deemed a breach with respect to that item or unit or service only.

WARRANTY CLAIM PROCEDURE

Customer shall be responsible to:

- Complete and return warranty registration card or register on line within five (5) days from the installation date.
- All warranty service must be performed by an approved Manitowoc contracted or authorized Service Representative. To schedule a service appointment contact your local Manitowoc Service Representative or visit us at www.manitowocice.com to find a Service Representative near you.

GOVERNING LAW

This Limited Warranty shall be governed by the laws of the state of Wisconsin, USA, excluding their conflicts of law principles. The United Nations Convention on Contracts for the International Sale of Goods is hereby excluded in its entirety from application to this Limited Warranty.

COMPLETE AND RETAIN FOR YOUR RECORD:

Distributor/Dealer _____

Model Number _____

Serial Number _____

Installation Date _____

Manitowoc Ice
2110 South 26th Street
P.O. Box 1720
Manitowoc, WI 54221-1720
Web site: www.manitowocice.com

VPR w2 EasyPour Decanters (1U/1L Warmer)

20.2" x 15.9" x 8.7"
(51.3cm x 40.4cm x 22.1cm)

- Internal components are constructed from stainless steel
- Just pour cold water in top and coffee brews immediately
- Pourover brewer requires no plumbing – completely portable
- SplashGard® funnel deflects hot liquids away from the hand
- Two individually controlled warmers
- Easy Pour Decanters included



 Servers and airpots sold separately

Agency:



Specifications

Product #: 33200.0002

Water Access: Not Plumbed

Finish: Black

Funnel: Black Plastic

Warmers: One Upper/ One Lower

Additional Features

2 EasyPour Decanters Included

Electrical & Capacity

Volts	Amps	Watts	Cord Attached	Plug Type	8oz cups/hr 236ml cups/hr	Input H ₂ O Temp.	Phase	# Wires plus Ground	Hertz
120	13.1	1575	Yes	NEMA 5-15P	62	60°F (15.5°C)	1	2	60

Plumbing Requirements

PSI	kPa	Fitting Supplied	Water Flow Required (GPM)
-	-	-	-

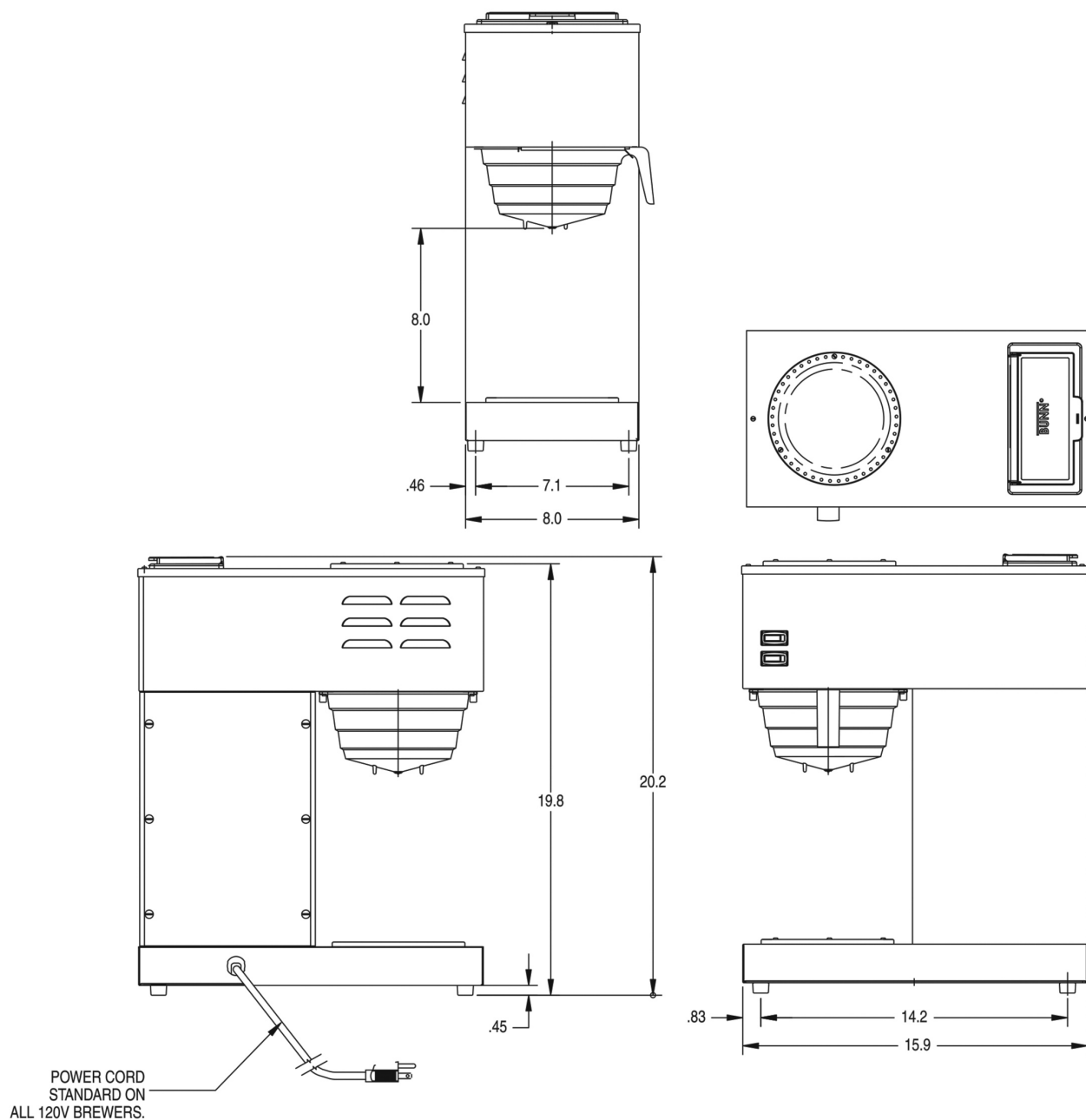
CAD Drawings

2D	Revit	KLC
●		



BUNN® reserves the right to change specifications and product design without notice. Such revisions do not entitle the buyer to corresponding changes, improvements, additions or replacements for previously purchased equipment. For most current specifications and other info visit bunn.com.

Created on:
09/14/2017



Unit				Shipping				
	Width	Height	Depth	Width	Height	Depth	Weight	Volume
English	8.7 in.	20.2 in.	15.9 in.	11.6 in.	34.3 in.	18.9 in.	22.800 lbs	4.259 ft ³
Metric	22.1 cm	51.3 cm	40.4 cm	29.5 cm	87.1 cm	48.0 cm	10.342 kgs	0.121 m ³



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Created on:
09/14/2017

Related Products & Accessories:

VPR w2 EasyPour Decanters (1U/1L Warmer)
(33200.0002)



WX2, 120V

Product #: 06310.0004



PARRILLA

Product #: 06310.0004



WX1, 120V

Product #: 06450.0004



FILTERS,REGULAR1M
500/2 50/CL

Product #: 20115.0000



PAPEL FILTRANTE

Product #: 20115.0000



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Created on:
09/14/2017

Serving & Holding Options: VPR w2 EasyPour Decanters (1U/1L Warmer)(33200.0002)

 <p>EASY POUR,(BLK) 1/CS</p> <p>Product #:06100.0101</p>	 <p>EASY POUR,(BLK) 2/CS</p> <p>Product #:06100.0102</p>	 <p>JARRAS</p> <p>Product #:06100.0102</p>	 <p>EASY POUR,(BLK) 3/CS</p> <p>Product #:06100.0103</p>	 <p>JARRAS</p> <p>Product #:06100.0103</p>
 <p>EASY POUR,(BLK) 6/CS</p> <p>Product #:06100.0106</p>	 <p>JARRAS</p> <p>Product #:06100.0106</p>	 <p>EASY POUR,(BLK) 12/CS</p> <p>Product #:06100.0112</p>	 <p>EASY POUR,(BLK) 24/CS</p> <p>Product #:06100.0124</p>	 <p>EASY POUR,(BLK) 6-1/2 CS</p> <p>Product #:06100.0156</p>
 <p>EASY POUR,(ORN) 1/CS</p> <p>Product #:06101.0101</p>	 <p>EASY POUR,(ORN) 2/CS</p> <p>Product #:06101.0102</p>	 <p>JARRAS</p> <p>Product #:06101.0102</p>	 <p>EASY POUR,(ORN) 3/CS</p> <p>Product #:06101.0103</p>	 <p>EASY POUR,(ORN) 6/CS</p> <p>Product #:06101.0106</p>
 <p>JARRAS</p> <p>Product #:06101.0106</p>	 <p>EASY POUR,(ORN) 12/CS</p> <p>Product #:06101.0112</p>	 <p>EASY POUR,(ORN) 24/CS</p> <p>Product #:06101.0124</p>	 <p>DECANTER,GLASS-BLK 12C 24/CS</p> <p>Product #:42400.0024</p>	 <p>DECANTER,GLASS-BLK 12CUP 1PK</p> <p>Product #:42400.0101</p>



Serving & Holding Options: VPR w2 EasyPour Decanters (1U/1L Warmer)(33200.0002)



DECANTER, GLASS-BLK
12C 3/CS

Product #: 42400.0103



DECANTER, GLASS-ORN
12C 24/CS

Product #: 42401.0024



DECANTER, GLASS-
ORN 12 CUP 1PK

Product #: 42401.0101



DECANTER, GLASS-ORN
12C 3/CS

Product #: 42401.0103



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Created on:
09/14/2017

EXHIBIT E
ART WORK FOR DEDICATION PLAQUE SIGN

**BISHOP STATE COMMUNITY COLLEGE
MARITIME TRAINING CENTER**

MOBILE, ALABAMA

ACCS BOARD OF TRUSTEES

KAY IVEY, GOVERNOR OF ALABAMA

J.E.B. SHELL, CHAIR

RON HOUSTON, VICE-CHAIR

VALERIE GRAY

BRITTON LIGHTSEY

TIM MCCARTNEY

JOHN MITCHELL

LLEVELYN RHONE

DR. YVETTE RICHARDSON

GOODRICH 'DUS' ROGERS

JIMMY H. BAKER, ACCS CHANCELLOR

OLIVIER CHARLES, BSCC PRESIDENT

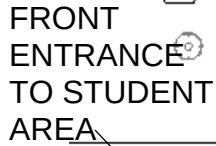
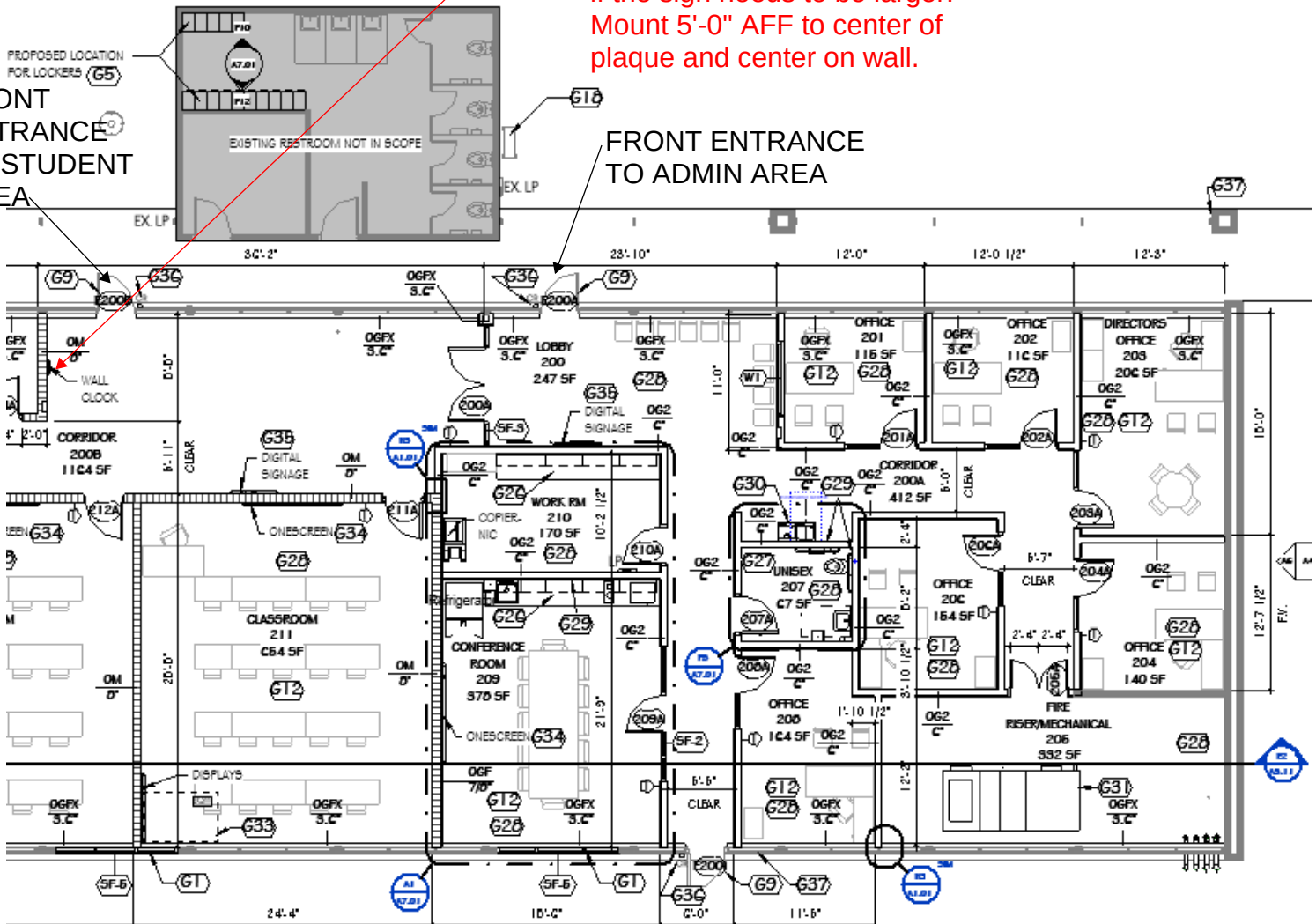
GOODWYN MILLS CAWOOD, LLC ARCHITECT

TBD CONTRACTOR

COMPLETED 2027

PLAQUE LOCATION

26"H x 18"W ACCS plaque-
GC shall provide and install.
Dimensions may change in
submittal of signage artwork
if the sign needs to be larger.
Mount 5'-0" AFF to center of
plaque and center on wall.



KEY NOTES - GENERAL CONSTRUCTION

ACCS INSTRUCTIONS TO ARCHITECTS AND ENGINEERS

C1030: Fittings

- Building Dedication Plaques: All new buildings should receive a building dedication plaque. For renovated buildings, the choice to install a building dedication plaque is at the discretion of the College and is not required. Building dedication plaques can be installed on the exterior of the building near the main entrance or on the interior of the building just inside the main entrance. If building dedication plaque is installed on the exterior, the plaque should be cast bronze. The interior building dedication plaque can be cast bronze or cast aluminum with bronze finish. The building dedication plaques should have an edge border. Plaques should contain pre-drilled holes in the corners for mounting. Mounting of the plaque should be included in the quote. The mounting height should be 60" from the floor to the center of the plaque. Signage proof shall be submitted to ACCS for review and approval.

The size of the building dedication plaque should be in a vertical position between 18" – 22" in width and between 26" – 32" in height. Font size based on the specific text for each sign and the required spacing. The building dedication plaque should contain the following information (see sample below):

NAME OF THE COLLEGE
 NAME OF THE BUILDING
 CITY, STATE
 ACCS BOARD OF TRUSTEES
 NAME GOVERNOR OF ALABAMA
 (listing of each Board Member,
 starting with the Chair and then Vice Chair,
 and the rest of the members alphabetically by last name)
 NAME ACCS CHANCELLOR
 NAME COLLEGE PRESIDENT
 NAME ARCHITECT
 NAME CONTRACTOR
 COMPLETED (YEAR)



ACCS INSTRUCTIONS TO ARCHITECTS AND ENGINEERS



Recognition Plaque: In addition to the main building dedication plaque, sometimes it may be appropriate to have a secondary recognition plaque of those that helped contribute to the building or renovation. These plaques should be of the same material as the building dedication plaque. The recognition plaque size should be between 8” – 10” in height and between 12” – 16” in width. Font size based on specific text for each sign. The mounting of this plaque should be 4” to the right of the building dedication plaque, 60” from the floor to the center of the plaque. Signage proof shall be submitted to ACCS for review and approval.



ACCS INSTRUCTIONS TO ARCHITECTS AND ENGINEERS

