SPECIFICATIONS AND CONTRACT DOCUMENTS

FOR

GULF COAST ELECTRIC COOPERATIVE HURRICANE SAFE ROOM



PREPARED FOR:

Gulf Coast Electric Cooperative

JULY 2026

PROJECT NUMBER 50150343

PREPARED BY:

Dewberry

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All construction activities not covered in the above specifications shall conform to Division II and Division III Specifications of the FDOT Standard Specifications for Road and Bridge Construction, latest edition and any implemented modifications of those specifications.

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GULF COAST ELECTRIC COOPERATIVE **PROJECT #50150343**
HURRICANE SAFE ROOM

NOTICE TO RECEIVE SEALED BIDS

The Gulf Coast Electric Cooperative will receive sealed bids from any qualified person, company or corporation interested in constructing:

GULF COAST ELECTRIC COOPERATIVE – HURRICANE SAFE ROOM

This project includes the construction of one (1) safe room building, parking area, stormwater management system and all associated infrastructure components and utilities in Wewahitchka, FL.

Plans and Specifications can be obtained by contacting Shannon Renfro at srenfro@dewberry.com with Dewberry, 324 Marina Drive, Port St. Joe, Florida 32456. The bid must conform to Section 287.133(3) Florida Statutes, on public entity crimes. There is no charge for electronic copies of the Plans and Specs.

The completion date for this project will be 540 days for Substantial Completion and 570 days for Final Completion from the date of the Notice to Proceed presented to the successful bidder. Liquidated damages for failure to complete the project on the specified date will be set at $500.00 per day.

Please indicate on the envelope that this is a sealed bid, for the "**Gulf Coast Electric Cooperative – Hurricane Safe Room".**

Bids will be received until **3:00 pm Central Time**, on **Monday, August 10, 2026** at **Gulf Coast Electric Cooperative, 722 W. Highway 22, Wewahitchka, FL 32465**, and will be opened and read aloud thereafter at **3:10 pm Central Time**.

The Gulf Coast Electric Cooperative reserves the right to waive informalities in any bid, to accept and/or reject any or all bids, and to accept the bid that in their judgment will be in their best interest. All bids shall remain firm for a period of ninety (90) days after the opening. The awarding by the Cooperative will be held on **August 21, 2026**, however, the Cooperative reserves the right to withhold Notice to Proceed for up to 90 days.

A **mandatory** pre-bid meeting will be held on **Tuesday, July 28, 2026** at **10:00 am Central Time**. at Gulf Coast Electric Cooperative, 722 W. Highway 22, Wewahitchka, FL 32465.

Questions regarding the project must be submitted in writing to Josh Baxley at jbaxley@dewberry.com no later than **3:00 pm Central Time on Friday, July 24, 2026.**

This project will be funded as shown in the breakdown below:

Estimated cost of construction:	$4,238,317
Estimated HMGP award (construction):	$2,935,911
Estimated CDBG-DR award (construction):	$978.637
Estimated owner contribution (construction):	$323,769

All bidders shall comply with all applicable State and local laws concerning licensing registration and regulation of contractors doing business to the State of Florida. The Gulf Coast Electric Cooperative is an Equal Opportunity Employer.

INSTRUCTIONS TO BIDDERS

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ARTICLE 1 – DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. *Issuing Office* – The office from which the Bidding Documents are to be issued.

Dewberry
324 Marina Drive
Port St. Joe, FL 32456

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents may be obtained from the Issuing Office in the number and format stated in the advertisement or invitation to bid.

2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

ARTICLE 3 – QUALIFICATIONS OF BIDDERS

3.01 This item has been intentionally left blank.

3.02 This item has been intentionally left blank.

3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

3.04 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

ARTICLE 4 – SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

4.01 *Site and Other Areas*

A. This item has been intentionally left blank.

4.02 *Existing Site Conditions*

A. Subsurface and Physical Conditions; Hazardous Environmental Conditions

1. The Supplementary Conditions identify:

a. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site.

2. This item has been intentionally left blank.

3. This item has been intentionally left blank.

4. This item has been intentionally left blank.

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B. Underground Facilities: Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site are set forth in the Contract Documents and are based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

C. This item has been intentionally left blank.

4.03 *Site Visit and Testing by Bidders*

A. This item has been intentionally left blank.

4.04 *Owner's Safety Program*

A. This item has been intentionally left blank.

4.05 *Other Work at the Site*

A. This item has been intentionally left blank.

ARTICLE 5 – BIDDER'S REPRESENTATIONS

5.01 It is the responsibility of each Bidder before submitting a Bid to:

A. examine and carefully study the Bidding Documents, and any data and reference items identified in the Bidding Documents;

B. visit the Site, conduct a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfy itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;

C. become familiar with and satisfy itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work;

D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings;

E. consider the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs;

F. agree, based on the information and observations referred to in the preceding paragraph, that at the time of submitting its Bid no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;

G. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;

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H. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder;

I. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work; and

J. agree that the submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 6 – PRE-BID CONFERENCE

6.01 A **mandatory** pre-bid meeting will be held on **TUESDAY, JULY 28, 2026 at 10:00 AM CT** at the Gulf Coast Electric Cooperative, 722 W. Highway 22, Wewahitchka, FL 32465.

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all parties recorded as having received the Bidding Documents. Questions received less than five days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, supplement, or change the Bidding Documents.

ARTICLE 8 – BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5% percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a certified check, bank money order, or a Bid bond (on the form included in the Bidding Documents) issued by a surety meeting the requirements of Paragraphs 6.01 and 6.02 of the General Conditions.

8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract Documents, furnished the required contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults.

8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Contract or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

8.04 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within seven days after the Bid opening.

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ARTICLE 9 – CONTRACT TIMES

9.01 The number of days within which, or the dates by which, the Work is to be substantially completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 – LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages, if any, for failure to timely attain Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 11 – SUBSTITUTE AND "OR-EQUAL" ITEMS

11.01 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those "or-equal" or substitute or materials and equipment subsequently approved by Engineer prior to the submittal of Bids and identified by Addendum. No item of material or equipment will be considered by Engineer as an "or-equal" or substitute unless written request for approval has been submitted by Bidder and has been received by Engineer at least 15 days prior to the date for receipt of Bids. Each such request shall comply with the requirements of Paragraphs 7.04 and 7.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. If Engineer approves any such proposed item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.

11.02 All prices that Bidder sets forth in its Bid shall be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of "or-equal" or substitution requests are made at Bidder's sole risk.

ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS, AND OTHERS

12.01 A Bidder shall be prepared to retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of the Work if required by the Bidding Documents to do so. If a prospective Bidder objects to retaining any such Subcontractor, Supplier, or other individual or entity, and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.

12.02 Subsequent to the submittal of the Bid, Owner may not require the Successful Bidder or Contractor to retain any Subcontractor, Supplier, or other individual or entity against which Contractor has reasonable objection.

12.03 The apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of the Subcontractors or Suppliers proposed for the Work.

If requested by Owner, such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, or other individual or entity. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, without an increase in Bid price.

12.04 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, or other individuals or entities. Declining to make requested substitutions will not constitute

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grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.06 of the General Conditions.

12.05 The Contractor shall not award work to Subcontractor(s) in excess of the limits stated in SC 7.06.

ARTICLE 13 – PREPARATION OF BID

13.01 The Bid Form is included with the Bidding Documents.

A. All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.

B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."

13.02 A Bid by a corporation shall be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown.

13.03 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown.

13.04 A Bid by a limited liability company shall be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.

13.05 A Bid by an individual shall show the Bidder's name and official address.

13.06 A Bid by a joint venture shall be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The official address of the joint venture shall be shown.

13.07 All names shall be printed in ink below the signatures.

13.08 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.

13.09 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.

13.10 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located. Bidder's state contractor license number shall also be shown on the Bid Form.

ARTICLE 14 – BASIS OF BID

14.01 *Unit Price*

A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form.

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B. The "Bid Price" for each unit price Bid item will be the product of the "Estimated Quantity" for the item and the corresponding "Bid Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by Owner for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.

C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

ARTICLE 15 – SUBMITTAL OF BID

15.01 The Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Article 7 of the Bid Form. Bidder shall submit original & 5 copies of the Bid Form & all attachments.

15.02 A Bid shall be received no later than the date and time prescribed and at the place indicated in the advertisement or invitation to bid and shall be enclosed in a plainly marked package with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid shall be addressed to the **Gulf Coast Electric Cooperative, 722 W. Highway 22, Wewahitchka, FL 32465.**

ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID

16.01 A Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.

16.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 16.01 and submit a new Bid prior to the date and time for the opening of Bids.

16.03 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 17 – OPENING OF BIDS

17.01 Bids will be opened at the time and place indicated in the advertisement or invitation to bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

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ARTICLE 19 – EVALUATION OF BIDS AND AWARD OF CONTRACT

19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible. If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, then the Owner will reject the Bid as nonresponsive; provided that Owner also reserves the right to waive all minor informalities not involving price, time, or changes in the Work.

19.02 If Owner awards the contract for the Work, such award will be to the responsible Bidder submitting the lowest responsive Bid.

19.03 In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.

19.04 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.

19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

ARTICLE 20 – BONDS AND INSURANCE

20.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the Agreement (executed by Successful Bidder) to Owner, it shall be accompanied by required bonds and insurance documentation.

ARTICLE 21 – SIGNING OF AGREEMENT

21.01 When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder shall execute and deliver the required number of counterparts of the Agreement (and any bonds and insurance documentation required to be delivered by the Contract Documents) to Owner. Within ten days thereafter, Owner shall deliver one fully executed counterpart of the Agreement to Successful Bidder.

ARTICLE 22 – SALES AND USE TAXES

22.01 Owner is exempt from Florida state sales and use taxes on materials and equipment to be incorporated in the Work. Said taxes shall be included in the Bid. Refer to Paragraph 7.09 of the Supplementary Conditions for additional information.

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BID FORM

GULF COAST ELECTRIC COOPERATIVE HURRICANE SAFE ROOM
PROJECT # 50150343

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ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to: **Gulf Coast Electric Cooperative**
722 W. Highway 22
Wewahitchka, FL 32465

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

Addendum No.	***Addendum, Date***
_____	_____
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site.

E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.

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F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and confirms that the written resolution thereof by Engineer is acceptable to Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.

J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the e execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

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ITEM	DESCRIPTION	EST QTY	UNIT	BID UNIT PRICE	BID PRICE
GENERAL COSTS					
1	MOBILIZATION	1	LS		
2	BONDS AND INSURANCE	1	LS		
3	TESTING AND LAYOUT	1	LS		
4	PROJECT SIGN	1	LS		
5	AS-BUILT SURVEY	1	LS		
6	NPDES PERMITTING	1	LS		
7	TESTING	1	EA		
				GENERAL COSTS TOTAL	
SITE CONSTRUCTION					
8	CLEAR AND GRUB	3	AC		
9	CONSTRUCTION ENTRANCE	1	LS		
10	EROSION CONTROL	1	LS		
11	SOD	3,623	SY		
12	SEED AND MULCH	300	SY		
13	SILT FENCING	1,260	LF		
14	REGULAR EXCAVATION	8,146	CY		
15	EXPORT	3,142	CY		
16	REMOVE AND REPLACE 5' OF EXISTING GROUND (UNSUITABLE SOIL UNDERNEATH BUILDING FOUNDATION)	1,610	CY		
17	CONCRETE SIDEWALK	1,834	SF		
18	ADA CONCRETE RAMPS	2	EA		
19	CONCRETE PARKING BUMPERS	36	EA		
20	2" SP 9.5 ASPHALT PARKING	315	TN		
21	OPTIONAL BASE GROUP 6 (8" LIMEROCK PARKING)	2,866	SY		
22	12" STABILIZED SUBGRADE	2,866	SY		
23	FDOT TYPE 'C' INLET	4	EA		
24	TYPE "C" DISCHARGE STRUCTURE	1	EA		
25	18" HDPE PIPE (ADS HP)	558	LF		
26	18" MES	1	EA		
27	18" FDOT HEADWALL	1	LF		
28	ROOF DRAIN SYSTEM (CONNECTIONS, PIPING AND INLETS)	1	LS		

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29	WATER SERVICE (INCLUDES ALL FITTINGS, PIPING, BORES AND TAP…METER WILL BE PROVIDED BY CITY)	1	LS		
30	SEWER SERVICE (INCLUDES ALL PIPING, FITTINGS, DUPLEX GRINDER STATION, GRINDER ELECTRICAL, GRINDER TRANSFER SWITCH AND BORE AND MANHOLE TIE-IN)	1	LS		
31	SIGNAGE	1	LS		
32	FENCE ALLOWANCE (INCLUDES ALL FENCING AND GATED ACCESS)	1	LS		
33	THERMOPLASTIC STRIPING AND SIGNAGE FOR ADA PARKING	4	EA		
34	PARKING AREA STRIPING (PAINTED)	1	LS		
				SITE CONSTRUCTION TOTAL	
BUILDING CONSTRUCTION					
CONCRETE					
35	FOOTINGS	65	CY		
36	SLAB ON GRADE WITH MESH	98	CY		
37	TIE BEAMS	11.2	CY		
38	CONCRETE DECK TOPPING	85	CY		
				SUBTOTAL	
MASONRY					
39	REGULAR BLOCK 8"	7,513	BLK		
40	VFC 8" BLK @ 8" OC	17	CY		
41	VFC 8" BLK @ 16" OC	43	CY		
42	HFC 8" BLK	11	CY		
43	BRICK VENEER	5,685	SF		
				SUBTOTAL	
METALS					
44	STRUCTURAL STEEL COLUMNS HSS	2.43	TN		
45	STRUCTURAL STEEL BEAMS WF	19.55	TN		

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46	STEEL ROOF DECK 2" 20GA	5,980	SF		
47	MISC. STEEL	1	LS		
48	SHEAR STUDS	424	EA		
49	DECK EDGE ANGLE	0.96	TN		
50	ROOF LADDER	1	EA		
51	WIRE MESH AT MECH YARD	560.00	SF		
52	ALUM CANOPIES	96.00	SF		
53	STRUCTURAL STEEL STUD FRAMING @ PARAPET	1,034.40	SF		
				SUBTOTAL	
WOOD / PLASTIC / COMPOSITES					
54	INTERIOR WOOD BLOCKING	5,250	SF		
55	ROOF 2x BLOCKING	1,016	LF		
56	BASE CABINET	40	LF		
57	WALL CABINET	16	LF		
58	PASS-THRU COUNTERTOP	13	LF		
59	SOLID SURFACE COUNTERTOPS	163	SF		
				SUBTOTAL	
THERMAL & MOISTURE PROTECTION					
60	ROOF DECK INSULATION - XPS RIGID R25	5,980	SF		
61	GYPSUM COVER BD 1/2"	6,038	SF		
62	TAPERED INSILATION BD	1,150	SF		
63	ROOFING - BUILT UP SBS MOD. BITUMINOUS	6,038	SF		
64	ROOF HATCH	1	EA		
65	STAINLESS STEEL PARAPET CAP	341	LF		
66	COLLECTION BOX WITH DS	4	EA		
67	EXTERIOR WALL METAL PANELS	1,043	SF		
68	SEALANTS	5,250	SF		
				SUBTOTAL	
OPENINGS					
69	EXT HM DR/FR/HDW - 3070, IMPACT	3	EA		
70	INT HM FRS - 6070	2	EA		
71	INT HM FRS - 3070	13	EA		
72	INT WD DR/HDW - 6070	2	EA		
73	INT WD DR/HDW - 3070	13	EA		
74	ALUM STOREFRONT FRS/GLASS - IMPACT	258	SF		
75	ALUM STOREFRONT DOORS - 3070	3	EA		

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76	ACCESS PANELS	1	LS		
				SUBTOTAL	
FINISHES					
77	STUCCO ON MASONRY, PAINTED	264	SF		
78	MFUR / INSUL / GYP BD 1S	5,888	SF		
79	MS 3 5/8" / GYP BD 2S	7,245	SF		
80	MS / GYP BD BULKHEADS	288	SF		
81	INSULATION 3 1/2"	1,610	SF		
82	PORCELAIN TILE	822	SF		
83	LUXURY VINYL TILE	2,415	SF		
84	SEALED CONCRETE	604	SF		
85	RASIED FLOORING	1,990	SF		
86	TILE BASE	35	LF		
87	RESILIENT BASE	1,403	LF		
88	CT WALLS	2,112	SF		
89	PAINT BLOCK	528	SF		
90	PAINT GYP BD, STD	16,104	SF		
91	PAINT FRS	15	EA		
92	PAINT DRS	3	EA		
93	STAIN DRS	17	EA		
94	SUSPENDED GYP BD	990	SF		
95	ACT 2X2	4,125	SF		
96	EXPOSED, PAINTED	484	SF		
				SUBTOTAL	
SPECIALTIES					
97	ROOM PANEL SIGNS	13	EA		
98	GRAB BAR STSTL - 1 1/2", 24"	3	EA		
99	GRAB BAR STSTL - 1 1/2", 36"	3	EA		
100	HAND DRYER ELECT	3	EA		
101	MIRRORS W/STSTL FRAME	3	SF		
102	NAPKIN RECEPTACLE	2	EA		
103	ROBE HOOK	4	EA		
104	SOAP DISPENCER, LIQUID	3	EA		
105	TOILET TISSUE DISPENCER	4	EA		
106	TOWEL DISPENSER / RECEPTACLE	4	EA		
107	MOP HOLDER	2	EA		
108	SHOWER ROD / CURTAIN	3	EA		
109	FIRE EXTINGUISHER CABINET - RECESSED	4	EA		

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110	FIRE EXTINGUISHER CABINET - WALL BRKT	1	EA		
				SUBTOTAL	
EQUIPMENT					
111	COM RANGE 36"	1	EA		
112	ANSUL HOOD	1	EA		
113	DISHWASHER	1	EA		
114	MICROWAVE, COUNTERTOP	2	EA		
115	COMMERCIAL REFRIGERATOR	2	EA		
116	UNDERCOUNTER REFRIGERATOR	1	EA		
				SUBTOTAL	
PLUMBING					
117	WC - 1,2	6	EA		
118	LAV - 1,2	4	EA		
119	S - 1,2,3	3	EA		
120	UR - 1	1	EA		
121	FD - 1	4	EA		
122	FS - 1	1	EA		
123	HB - 1	4	EA		
124	SHOWER	3	EA		
125	WH, ELECT, TANK	2	EA		
126	CP - 1 WH	1	EA		
127	EWC	1	EA		
128	MS - 1, MOP BASIN	2	EA		
129	MCO - 1	2	EA		
				SUBTOTAL	
HVAC					
130	SPLIT SYS W/ EL HEAT	13.5	TN		
131	DUCTLESS A/C	1.5	TN		
132	DUCTWORK	5,500	LBS		
133	INSULATION 3 1/2"	4,675	SF		
134	DEVICES	5,250	SF		
135	FANS	1,500	CFM		
136	LOUVERS	4	EA		
137	TEST & BALANCE	5,500	SF		
138	CONTROLS	5,500	SF		
				SUBTOTAL	
ELECTRICAL					
139	SERVICE FEEDERS 400 AMP	150	LF		
140	FEEDERS TO DISTRIBUTION EQUIP	1	LS		

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141	MDP - 400 AMP	1	EA		
142	PANELS 200 AMP	1	EA		
143	PANELS 60 AMP	1	EA		
144	POWER DISTRIBUTION	5,250	SF		
145	INTERIOR LIGHTS LED & CONTROL	5,250	SF		
146	EXTERIOR LIGHTS LED & CONTROL	5,250	SF		
147	LIGHTNING PROTECTION	5,250	SF		
148	HARDENED COMMUNICATION INFRASTRUCTURE	5,250	SF		
149	FIRE STOPPING	5,250	SF		
150	EMERGENCY GENERATOR 50KW (INCLUDES FL RATED ENCLOSURE)	1	EA		
151	ATS - 200 AMP	1	EA		
152	ATS - 60 AMP	1	EA		
153	CCTV SYSTEM	1	LS		
154	SECURITY SYSTEM	1	LS		
155	AV SYSTEM	1	LS		
156	CONDUITS 3 - 4" UNDERGROUND	150	LF		
				SUBTOTAL	
				BUILDING CONSTRUCTION TOTAL	
				TOTAL COST OF CONSTRUCTION	

Bidder acknowledges that (1) each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item and (2) estimated quantities are not guaranteed and are solely for the purpose of comparison of Bids and final payment for all unit price Bid items will be based on actual quantities determined as provided in the Contract Documents.

This project will be funded as shown in the breakdown below:

Estimated cost of construction:	$4,238,317
Estimated HMGP award (construction):	$2,935,911
Estimated CDBG-DR award (construction):	$978.637
Estimated owner contribution (construction):	$323,769

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ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid security;

B. List of Proposed Subcontractors;

C. Evidence of authority to do business in the state or jurisdiction of the Project;

D. Contractor's License No.: _____;

E. Copies of Addenda

F. Appendix C – Drug Free Workplace Programs

G. Appendix D – Public Entity Crimes

H. Appendix E – Conflict of Interest Disclosure Form

I. Appendix F – Certification Regarding Lobbying

J. Appendix G – Contractor E-Verify Affidavit

K. Appendix H – Anti-Collusion Statement

L. Appendix I – Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion. Also required is a screenshot or a printout of the bidder's current registration with sam.gov, showing the bidder is both currently an active registrant and that they are in good standing (not suspended/debarred).

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

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ARTICLE 9 – BID SUBMITTAL

BIDDER: *[Indicate correct name of bidding entity]*

_____

By:
[Signature] _____

[Printed name] _____
(If Bidder is a corporation, a limited liability company, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest:
[Signature] _____

[Printed name] _____

Title: _____

Submittal Date: _____

Address for giving notices:

_____

_____

_____

Telephone Number: _____

Fax Number: _____

Contact Name and e-mail address: _____

_____

Bidder's License No.: _____
(where applicable)

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Bid Bond

Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

BIDDER *(Name and Address)*:

SURETY *(Name, and Address of Principal Place of Business)*:

OWNER *(Name and Address)*:
Gulf Coast Electric Cooperative
722 W. Highway 22
Wewahitchka, FL 32465

BID
Bid Due Date:
Description: **Hurricane Safe Room**

BOND
Bond Number:
Date:
Penal sum _____ $ _____
(Words) (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

BIDDER	**SURETY**
_____ (Seal)	_____ (Seal)
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature	Signature (Attach Power of Attorney)
_____	_____
Print Name	Print Name
_____	_____
Title	Title
Attest: _____	Attest: _____
Signature	Signature
Title	Title

Note: Addresses are to be used for giving any required notice.
Provide execution by any additional parties, such as joint venturers, if necessary.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation shall be null and void if:

3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or

3.2 All Bids are rejected by Owner, or

3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after the Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

NOTICE OF AWARD

Date of Issuance:

Owner:	**Gulf Coast Electric Cooperative**	Owner's Contract No.:	
Engineer:	**Dewberry Engineers Inc.**	Engineer's Project No.:	**50150343**
Project:	**Hurricane Safe Room**	Contract Name:	
Bidder:			
Bidder's Address:			

TO BIDDER:

You are notified that Owner has accepted your Bid dated _____ *2026* for the above Contract, and that you are the Successful Bidder and are awarded a Contract for:

Gulf Coast Electric Cooperative Hurricane Safe Room .

The Contract Price of the awarded Contract is: $_____

3 unexecuted counterparts of the Agreement accompany this Notice of Award.

☒ a set of the Drawings will be delivered separately from the other Contract Documents.

You must comply with the following conditions precedent within 15 days of the date of receipt of this Notice of Award:

1. Deliver to Owner [3]counterparts of the Agreement, fully executed by Bidder.
2. Deliver with the executed Agreement(s) the Contract security *[e.g., performance and payment bonds]* and insurance documentation as specified in the Instructions to Bidders and General Conditions, Articles 2 and 6.
3. Other conditions precedent (if any):

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within ten days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner: **Gulf Coast Electric Cooperative**

_____

Authorized Signature

By: _____

Title:

Copy: Engineer

AGREEMENT
BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

THIS AGREEMENT is by and between **Gulf Coast Electric Cooperative** ("Owner") and

("Contractor").

Owner and Contractor hereby agree as follows:

ARTICLE 1 – WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

This project includes the construction of one (1) safe room building, parking area, stormwater management system and all associated infrastructure components and utilities in Wewahitchka, FL.

ARTICLE 2 – THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows:

Gulf Coast Electric Cooperative Hurricane Safe Room

ARTICLE 3 – ENGINEER

3.01 The Project has been designed by Dewberry Engineers Inc.

3.02 The Owner has retained Dewberry Engineers Inc. ("Engineer") to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Contract Times: Days*

A. The Work will be substantially completed within 540 days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within 570 days after the date when the Contract Times commence to run.

4.03 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the times specified in Paragraph 4.02 above, plus any

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extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. Substantial Completion: Contractor shall pay Owner $ 500.00 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02.A above for Substantial Completion until the Work is substantially complete.

2. Completion of Remaining Work: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner $ 500.00 for each day that expires after such time until the Work is completed and ready for final payment.

ARTICLE 5 – CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents the amounts that follow, subject to adjustment under the Contract:

A. This item has been intentionally left blank.

B. This item has been intentionally left blank.

C. This item has been intentionally left blank.

D. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 25th day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract

a. 95 percent of Work completed (with the balance being retainage). If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long

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as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and

b. 95 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 95 percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions.

6.03 *Final Payment*

A. Upon final completion and acceptance of the Work in accordance with Paragraph 15.06 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 15.06.

ARTICLE 7 – INTEREST

7.01 All amounts not paid by Owner when due shall bear interest at the rate specified by Part VII of Florida Statute Chapter 218 or, if no rate is provided or is applicable, then at 2.5%.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

8.01 In order to induce Owner to enter into this Contract, Contractor makes the following representations:

A. Contractor has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents.

B. Contractor has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Contractor is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Contractor has carefully studied all reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site.

E. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (3) Contractor's safety precautions and programs.

F. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

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H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

J. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 *Contents*

A. The Contract Documents consist of the following:

1. This Agreement
2. Performance bond
3. Payment bond
4. General Conditions
5. Supplementary Conditions
6. Drawings consisting of 65 pages (Appendix A).
7. Addenda (numbers __ to _ , inclusive).
8. Exhibits to this Agreement (enumerated as follows):
    a. Contractor's Bid
    b. Appendices:
        1) Appendix B – Davis Bacon Wage Decision
        2) Appendix C – Drug Free Workplace
        3) Appendix D – Public Entity Crimes
        4) Appendix E – Conflict of Interest Disclosure Form
        5) Appendix F – Certification Regarding Lobbying
        6) Appendix G – Contractor E-Verify Affidavit
        7) Appendix H – Anti-Collusion Statement
        8) Appendix I – Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion
        9) Appendix J – Federal Requirements
        10) Appendix K – ANSI/AWWA C605
        11) Appendix L – PPI-Handbook of PE Pipe – Chapter 2

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9. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:

    a. Notice to Proceed.

    b. Work Change Directives.

    c. Change Orders.

    d. Field Orders.

10. Geotechnical Investigation

B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 9.

D. The Contract Documents may only be amended, modified, or supplemented as provided in the General Conditions.

ARTICLE 10 – MISCELLANEOUS

10.01 *Terms*

A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

10.02 *Assignment of Contract*

A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 *Successors and Assigns*

A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 *Severability*

A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

10.05 *Contractor's Certifications*

A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:

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1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

10.06 *Other Provisions*

A. This section has been intentionally left blank.

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IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on _____ (which is the Effective Date of the Contract).

OWNER:	CONTRACTOR:
Gulf Coast Electric Cooperative	
By:	By:
Title:	Title:
	(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)
Attest:	Attest:
Title:	Title:
Address for giving notices:	Address for giving notices:
722 E. Highway 22	
Wewahitchka, FL 32465	
	License No.: _____ *(where applicable)*

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NOTICE TO PROCEED

Owner:	**Gulf Coast Electric Cooperative**	Owner's Contract No.:	
Contractor:		Contractor's Project No.:	
Engineer:	**Dewberry Engineers Inc.**	Engineer's Project No.:	**50150343**
Project:	**Hurricane Safe Room**	Contract Name:	
		Effective Date of Contract:	

TO CONTRACTOR:

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on _____, 2026.

On or before that date, Contractor shall start performing its obligations under the Contract Documents. In accordance with the Agreement, the date of Substantial Completion is _____(540 days), and the date of readiness for final payment is_____(570 days).

Before starting any Work at the Site, Contractor must comply with the following:

Owner: **Gulf Coast Electric Cooperative**

_____

Authorized Signature

By: _____

Title:

Date Issued: _____

Copy: Engineer

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PERFORMANCE BOND

CONTRACTOR *(name and address)*:

SURETY *(name and address of principal place of business)*:

OWNER *(name and address)*:

Gulf Coast Electric Cooperative
722 W. Highway 22
Wewahitchka, FL 32465

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location)*: **Gulf Coast Electric Cooperative Hurricane Safe Room**

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:

Amount:

Modifications to this Bond Form: ☒ None ☐ See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

_____ *(seal)*
Contractor's Name and Corporate Seal

By: _____
Signature

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

SURETY

_____ *(seal)*
Surety's Name and Corporate Seal

By: _____
Signature *(attach power of attorney)*

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

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1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:

3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

7.2 additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

7.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

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10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

16. Modifications to this Bond are as follows:

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PAYMENT BOND

CONTRACTOR *(name and address)*:

SURETY *(name and address of principal place of business)*:

OWNER *(name and address)*:

Gulf Coast Electric Cooperative
722 W. Highway 22
Wewahitchka, FL 32465

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location)*: **Gulf Coast Electric Cooperative Hurricane Safe Room**

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:

Amount:

Modifications to this Bond Form: ☒ None ☐ See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL	**SURETY**
_____ *(seal)*	_____ *(seal)*
Contractor's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	**By:** _____
Signature	Signature *(attach power of attorney)*
_____	_____
Print Name	Print Name
_____	_____
Title	Title
Attest: _____	**Attest:** _____
Signature	Signature
_____	_____
Title	Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

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1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.

4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.

5. The Surety's obligations to a Claimant under this Bond shall arise after the following:

    5.1 Claimants who do not have a direct contract with the Contractor,

        5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

        5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).

    5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).

6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.

7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

    7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

    7.2 Pay or arrange for payment of any undisputed amounts.

    7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

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12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. **Definitions**

16.1 **Claim:** A written statement by the Claimant including at a minimum:

1. The name of the Claimant;
2. The name of the person for whom the labor was done, or materials or equipment furnished;
3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
4. A brief description of the labor, materials, or equipment furnished;
5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
7. The total amount of previous payments received by the Claimant; and
8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

16.2 **Claimant:** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.3 **Construction Contract:** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4 **Owner Default**: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5 **Contract Documents:** All the documents that comprise the agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

18. Modifications to this Bond are as follows:

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Contractor's Application for Payment No.

	Application Period:	Application Date:
To (Owner): **Gulf Coast Electric Cooperative**	From (Contractor):	Via (Engineer):
Project: **Hurricane Safe Room**	Contract:	
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.: **50150343**

Application For Payment

Change Order Summary

Approved Change Orders		
Number	Additions	Deductions
TOTALS		
NET CHANGE BY CHANGE ORDERS		

1. ORIGINAL CONTRACT PRICE	**$**
2. Net change by Change Orders	**$**
3. Current Contract Price (Line 1 ± 2)	**$**
4. TOTAL COMPLETED AND STORED TO DATE (Column F total on Progress Estimates)	**$**
5. RETAINAGE:	
a. X _____ Work Completed	**$**
b. X _____ Stored Material	**$**
c. Total Retainage (Line 5.a + Line 5.b)	**$**
6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5.c)	**$**
7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application)	**$**
8. AMOUNT DUE THIS APPLICATION	**$**
9. BALANCE TO FINISH, PLUS RETAINAGE (Column G total on Progress Estimates + Line 5.c above)	**$**

Contractor's Certification

The undersigned Contractor certifies, to the best of its knowledge, the following:
(1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment;
(2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all Liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such Liens, security interest, or encumbrances); and
(3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

Contractor Signature

By:	Date:

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is recommended by: _____ _____
(Engineer) (Date)

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is approved by: _____ _____
(Owner) (Date)

Approved by: _____ _____
Funding or Financing Entity (if applicable) (Date)

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Progress Estimate - Lump Sum Work

Contractor's Application

For (Contract): **Hurricane Safe Room**		Application Number:
Application Period:		Application Date:

			Work Completed		E	F		G
A		B	C	D				
Specification Section No.	Description	Scheduled Value ($)	From Previous Application (C+D)	This Period	Materials Presently Stored (not in C or D)	Total Completed and Stored to Date (C + D + E)	% (F / B)	Balance to Finish (B - F)

Progress Estimate - Unit Price Work

Contractor's Application

For (Contract): **Hurricane Safe Room**								Application Number:			
Application Period:								Application Date:			
A					B	C	D	E	F		
Item		Contract Information				Estimated Quantity Installed	Value of Work Installed to Date	Materials Presently Stored (not in C)	Total Completed and Stored to Date (D + E)	% (F / B)	Balance to Finish (B - F)
Bid Item No.	Description	Item Quantity	Units	Unit Price	Total Value of Item ($)						
	Totals										

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Stored Material Summary

Contractor's Application

For (Contract): **Hurricane Safe Room**								Application Number:			
Application Period:								Application Date:			
A		B	C		D		E		F		G
Bid Item No.	Supplier Invoice No.	Submittal No. (with Specification Section No.)	Storage Location	Description of Materials or Equipment Stored	Stored Previously		Amount Stored this Month ($)	Subtotal Amount Completed and Stored to Date (D + E)	Incorporated in Work		Materials Remaining in Storage ($) (D + E - F)
					Date Placed into Storage (Month/Year)	Amount ($)			Date (Month/ Year)	Amount ($)	
				Totals							

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EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner:	**Gulf Coast Electric Cooperative**	Owner's Contract No.:	
Contractor:		Contractor's Project No.:	
Engineer:	**Dewberry Engineers Inc.**	Engineer's Project No.:	**50150343**
Project:	**Hurricane Safe Room**	Contract Name:	

This [preliminary] [final] Certificate of Substantial Completion applies to:

☐ All Work ☐ The following specified portions of the Work:

Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work shall be as provided in the Contract, except as amended as follows:

Amendments to Owner's responsibilities: ☐ None ☐ As follows

Amendments to Contractor's responsibilities: ☐ None ☐ As follows:

The following documents are attached to and made a part of this Certificate:

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract.

EXECUTED BY ENGINEER:	RECEIVED:	RECEIVED:
By: _____ (Authorized signature)	By: _____ Owner (Authorized Signature)	By: _____ Contractor (Authorized Signature)
Title: _____	Title: _____	Title: _____
Date: _____	Date: _____	Date: _____

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. *Bidder*—An individual or entity that submits a Bid to Owner.

6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer

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has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. ("CERCLA"); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5501 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. ("RCRA"); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.

13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.

14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .

15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.

17. *Cost of the Work*—See Paragraph 13.01 for definition.

18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Engineer*—The individual or entity named as such in the Agreement.

21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.

23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

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24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.

26. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.

27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.

28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.

32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or "RPR" includes any assistants or field staff of Resident Project Representative.

33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.

34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals and the performance of related construction activities.

35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

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37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.

38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.

42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.

44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.

45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

46. *Unit Price Work*—Work to be paid for on the basis of unit prices.

47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

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48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 *Terminology*

A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives*:

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. *Day*:

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*:

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents; or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).

E. *Furnish, Install, Perform, Provide*:

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

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3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Contractor’s Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.

C. *Evidence of Owner’s Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;

2. a preliminary Schedule of Submittals; and

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3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.

B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or

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computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

3.02 *Reference Standards*

A. Standards Specifications, Codes, Laws and Regulations

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*:

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict,

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error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*:

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.

B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

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3.05 *Reuse of Documents*

A. Contractor and its Subcontractors and Suppliers shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

4.03 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

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2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

2. abnormal weather conditions;

3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and

4. acts of war or terrorism.

D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.

E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

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G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*:

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part

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by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;

2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and

3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

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5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or

2. is of such a nature as to require a change in the Drawings or Specifications; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Possible Price and Times Adjustments*:

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;

b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

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c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or

b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

c. Contractor failed to give the written notice as required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;

c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and

d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after

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becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

C. *Engineer's Review*: Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Possible Price and Times Adjustments*:

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

    a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;

    b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;

    c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and

    d. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

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5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and

2. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

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F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.

H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.H shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

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ARTICLE 6 – BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.

B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.

D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.

E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 *Insurance—General Provisions*

A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is

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maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.

G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.

H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.

I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.

J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 *Contractor's Insurance*

A. *Workers' Compensation*: Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.

2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).

3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).

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4. Foreign voluntary worker compensation (if applicable).

B. *Commercial General Liability—Claims Covered*: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:

1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.

2. claims for damages insured by reasonably available personal injury liability coverage.

3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

C. *Commercial General Liability—Form and Content*: Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage:

a. Such insurance shall be maintained for three years after final payment.

b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.

2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.

3. Broad form property damage coverage.

4. Severability of interest.

5. Underground, explosion, and collapse coverage.

6. Personal injury coverage.

7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.

8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.

D. *Automobile liability*: Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.

E. *Umbrella or excess liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.

F. *Contractor's pollution liability insurance*: Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result

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of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.

H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.

I. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:

1. include at least the specific coverages provided in this Article.

2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.

3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.

4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.

5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.

J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

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6.04 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 *Property Insurance*

A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."

2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.

3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.

4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).

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5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).

6. extend to cover damage or loss to insured property while in transit.

7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

8. allow for the waiver of the insurer's subrogation rights, as set forth below.

9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.

10. not include a co-insurance clause.

11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.

12. include performance/hot testing and start-up.

13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.

B. *Notice of Cancellation or Change*: All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.

C. *Deductibles*: The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.

D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

E. *Additional Insurance*: If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.

F. *Insurance of Other Property*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

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6.06 *Waiver of Rights*

A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.

D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 *Receipt and Application of Property Insurance Proceeds*

A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the

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policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and

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guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 *"Or Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

3) it has a proven record of performance and availability of responsive service; and

4) it is not objectionable to Owner.

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

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D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

a. shall certify that the proposed substitute item will:

1) perform adequately the functions and achieve the results called for by the general design,

2) be similar in substance to that specified, and

3) be suited to the same use as that specified.

b. will state:

1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,

2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

c. will identify:

1) all variations of the proposed substitute item from that specified, and

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2) available engineering, sales, maintenance, repair, and replacement services.

d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.

B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

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E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.

F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.

J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.

K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.

L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.

N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

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O. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor

2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.08 *Permits*

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

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7.09 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.10 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.12 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. all persons on the Site or who may be affected by the Work;

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2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

7.14 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or

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exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements*:

1. Before submitting a Shop Drawing or Sample, Contractor shall have:

a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings*:

a. Contractor shall submit the number of copies required in the Specifications.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to

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provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.

2. *Samples*:

   a. Contractor shall submit the number of Samples required in the Specifications.

   b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Other Submittals*: Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.

D. *Engineer's Review*:

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.

5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

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8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures*:

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal;

6. the issuance of a notice of acceptability by Engineer;

7. any inspection, test, or approval by others; or

8. any correction of defective Work by Owner.

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D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.

B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop

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Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

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8.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;

2. an itemization of the specific matters to be covered by such authority and responsibility; and

3. the extent of such authority and responsibilities.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.

C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

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D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

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9.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during

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or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 *Rejecting Defective Work*

A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.

B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.

C. Engineer's authority as to Change Orders is set forth in Article 11.

D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.07 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

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B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

1. *Change Orders*:

a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.

b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.

2. *Work Change Directives*: A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an

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adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 *Owner-Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.03 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.

B. An adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on

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the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).

C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.01.C.2.a and 11.01.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.

B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under

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the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures*: Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.

2. *Engineer's Action*: Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

3. *Binding Decision*: Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

B. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;

2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and

4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

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B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12 – CLAIMS

12.01 *Claims*

A. *Claims Process*: The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.

D. *Mediation*:

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim

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submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable

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thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

    a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

    b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

    c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

    d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

    e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

    f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes

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other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*: When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.

E. *Documentation*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

13.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

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B. *Cash Allowances*: Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

13.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.

E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;

2. there is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

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ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

14.02 *Tests, Inspections, and Approvals*

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;

3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to

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cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

A. Engineer has the authority to require special inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

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B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will

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include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *Applications for Payments*:

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*:

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

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a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

a. to supervise, direct, or control the Work, or

b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:

a. the Work is defective, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

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e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*:

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner*:

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:

a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

c. Contractor has failed to provide and maintain required bonds or insurance;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

f. the Work is defective, requiring correction or replacement;

g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

h. the Contract Price has been reduced by Change Orders;

i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;

j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

l. there are other items entitling Owner to a set off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount

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remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

15.03 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

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E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.

2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment*:

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of

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inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

   a. all documentation called for in the Contract Documents;

   b. consent of the surety, if any, to final payment;

   c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

   d. a list of all disputes that Contractor believes are unsettled; and

   e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Application and Acceptance*:

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

D. *Payment Becomes Due*: Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation,

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including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.08 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such other adjacent areas;

2. correct such defective Work;

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

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E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;

3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or

4. Contractor's repeated disregard of the authority of Owner or Engineer.

B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses,

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and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for

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expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this Article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and

2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this Article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or

2. agree with the other party to submit the dispute to another dispute resolution process; or

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18 – MISCELLANEOUS

18.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 *Computation of Times*

A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

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18.04 *Limitation of Damages*

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

18.07 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

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EJCDC® C-800, Supplementary Conditions.
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Supplementary Conditions

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC® C-700 (2013 Edition). All provisions that are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added thereto.

SC-2.02 Copies of Documents

SC-2.02 Delete Paragraph 2.02.A in its entirety and insert the following new paragraph in its place:

A. Owner shall furnish to Contractor one (1) copy of conformed Contract Documents incorporating and integrating all Addenda and any amendments negotiated prior to the Effective Date of the Contract (including one fully executed counterpart of the Agreement). Additional printed copies of the conformed Contract Documents will be furnished upon request at the cost of reproduction.

SC-4.01 Commencement of Contract Times; Notice to Proceed

SC-4.01.A Delete Paragraph 4.01.A in its entirety and insert the following:

A. The Contract Times will commence to run on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the effective date of the Contract.

SC-5.06 Hazardous Environmental Conditions

SC-5.06 Delete Paragraphs 5.06.A and 5.06.B in their entirety and insert the following:

A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.

B. Not Used.

SC-6.03 Contractor's Liability Insurance

SC 6.03 Add the following new paragraph immediately after Paragraph 6.03.J:

K. The limits of liability for the insurance required by Paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

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1. **Workers' Compensation, and related coverages under Paragraphs 6.03.A.1 and A.2 of the General Conditions:**

State:		**Statutory**
Federal, if applicable (e.g., Longshoreman's):		**Statutory**
Employer's Liability:		
Bodily injury, each accident	**$**	**1,000,000**
Bodily injury by disease, each employee	**$**	**1,000,000**
Bodily injury/disease aggregate	**$**	**1,000,000**
Foreign voluntary worker compensation		**Statutory**

2. **Contractor's Commercial General Liability under Paragraphs 6.03.B and 6.03.C of the General Conditions:**

General Aggregate	**$**	**2,000,000**
Products - Completed Operations Aggregate	**$**	**2,000,000**
Personal and Advertising Injury	**$**	**1,000,000**
Each Occurrence (Bodily Injury and Property Damage)	**$**	**1,000,000**

3. **Automobile Liability under Paragraph 6.03.D. of the General Conditions:**

Bodily Injury:		
Each person	**$**	**1,000,000**
Each accident	**$**	**1,000,000**
Property Damage:		
Each accident	**$**	**1,000,000**
Combined Single Limit of	**$**	**1,000,000**

4. **Excess or Umbrella Liability:**

Per Occurrence	**$**	**1,000,000**
General Aggregate	**$**	**2,000,000**

5. **Contractor's Pollution Liability:**

☒ **If box is checked, Contractor is not required to provide Contractor's Pollution Liability insurance under this Contract**

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SC-7.02 Labor; Working Hours

SC-7.02.B. Add the following new subparagraph immediately after Paragraph 7.02.B:

1. Regular working hours are defined as up to nine (9) hours per day, Monday through Friday beginning no earlier than 7:30 a.m. and ending no later than 5:00 p.m. excluding 30 minutes for lunch. Whenever the Contractor is performing any part of the Work with the exception of equipment maintenance and cleanup, Owner's representative and/or inspection may be required. Requests to work other than regular working hours must be submitted to the Owner's designated representative at least 48 hours prior to any proposed weekend work or scheduled extended workweeks to give the Owner ample time to arrange for representation and/or inspection during those periods. Periodic unscheduled overtime on weekdays will be permitted provided that twenty four hours notice is provided to the Owner's designated representative. Maintenance and cleanup may be performed during hours other than regular working hours with no notice. The Contractor shall not work on any Federal holiday unless previously approved by the Owner.

SC-7.02.C. Add the following new paragraph immediately after Paragraph 7.02.B:

Contractor shall be responsible for the cost of any overtime pay or other expense incurred by the Owner for Engineer's services (including those of the Resident Project Representative, if any), Owner's representative, and construction observation services, occasioned by the performance of Work on Saturday, Sunday, any legal holiday, or as overtime on any regular work day. If Contractor is responsible but does not pay, or if the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

SC-7.02.C. Add the following new subparagraph immediately after Paragraph 7.02.C:

1. For purposes of administering the foregoing requirement, additional overtime costs are defined as:

Project Manager	**$150.00/hour**
Project Engineer	**$115.00/hour**
Inspector	**$110.00/hour**

SC-7.06 Concerning Subcontractors, Suppliers, and Others

SC-7.06 Add the following new paragraph immediately after Paragraph 7.06.O:

P. The Contractor shall not award work valued at more than fifty (50%) of the Contract Price to Subcontractor(s) without prior written approval of the Owner.

SC-7.09 Taxes

SC-7.09 Add the following new paragraph immediately after Paragraph 7.09.A:

B. Owner is exempt from payment of sales and compensating taxes of the State of Florida and of cities and counties thereof on all materials to be incorporated into the Work.

1. Owner will furnish the required certificates of tax exemption to Contractor for use in the purchase of supplies and materials to be incorporated into the

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Work. The Sales Tax Exempt Purchasing Agreement is included in the Appendix.

2. Owner's exemption does not apply to construction tools, machinery, equipment, or other property purchased by or leased by Contractor, or to supplies or materials not incorporated into the Work.

SC-7.16 Shop Drawings, Samples, and Other Submittals

SC-7.16 Delete Paragraph 7.16.B.1.a in its entirety and insert the following:

a. Contractor shall submit one (1) copy of all shop drawings for Engineer's review and approval.

SC-10.03 Project Representative

SC-10.03 Add the following new paragraphs immediately after Paragraph 10.03.A:

B. The Resident Project Representative (RPR) will be Engineer's representative at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions.

SC-15.01 Progress Payments

SC-15.01.B Add the following language at the end of Paragraph 15.01.B.3:

3. No Payments will be made that would deplete the retainage, place in escrow any funds that are required for retainage, or invest the retainage for the benefit of the Contractor.

SC-15.01.D Amend by replacing the word "Ten" with "Thirty".

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

SC-17.02 Add the following new paragraph immediately after Paragraph 17.01.

SC-17.02 Final Resolution Method

A. All matters subject to final resolution under this Article will be decided by a non-jury trial in the court system of the County in which the work is located.

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EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

Change Order No. _____

Date of Issuance:	Effective Date:
Owner: **Gulf Coast Electric Cooperative**	Owner's Contract No.:
Contractor:	Contractor's Project No.:
Engineer: **Dewberry Engineers Inc.**	Engineer's Project No.: **50150343**
Project: **Hurricane Safe Room**	Contract Name:

The Contract is modified as follows upon execution of this Change Order:

Description:

Attachments: *[List documents supporting change]*

CHANGE IN CONTRACT PRICE	**CHANGE IN CONTRACT TIMES** *[note changes in Milestones if applicable]*
Original Contract Price: $_____	Original Contract Times: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
[Increase] [Decrease] from previously approved Change Orders No. ___ to No. ___: $_____	[Increase] [Decrease] from previously approved Change Orders No. ___ to No. ___: Substantial Completion: _____ Ready for Final Payment: _____ days
Contract Price prior to this Change Order: $_____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
[Increase] [Decrease] of this Change Order: $_____	[Increase] [Decrease] of this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
Contract Price incorporating this Change Order: $_____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for Final Payment: _____ days or dates

RECOMMENDED:	ACCEPTED:	ACCEPTED:
By: _____	By: _____	By: _____
Engineer (if required)	Owner (Authorized Signature)	Contractor (Authorized Signature)
Title: _____	Title _____	Title _____
Date: _____	Date _____	Date _____

Approved by Funding Agency (if applicable)

By: _____ Date:

Title: _____

TECHNICAL SPECIFICATIONS

GCEC HURRICANE SAFE ROOM

TECHINCAL SPECIFICATIONS

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SECTION 02110 - SITE CLEARING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Extent of site clearing is shown on drawings.

B. Site clearing work includes, but is not limited to:

1. Protection of existing trees.

2. Removal of trees and other vegetation.

3. Topsoil stripping.

4. Clearing and grubbing.

5. Removing above-grade improvements.

6. Removing below-grade improvements.

1.03 JOB CONDITIONS

A. Traffic:

1. Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

2. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

B. Protection of Existing Improvements:

1. Provide protection necessary to prevent damage to existing improvements indicated to remain in place.

2. Protection improvements on adjoining properties and on OWNER’s property.

C. Restore damaged improvements to their original condition, as acceptable to parties having jurisdiction.

1.04 Protection of Existing Trees and Vegetation:

A. Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line.

B. Provide temporary guards to protect trees and vegetation to be left standing.

1.05 Salvable Improvements:

A. Carefully remove items indicated to be salvaged, and store on OWNER's premises where indicated or directed.

PART 2 - PRODUCTS

Not applicable to work of this section.

PART 3 - EXECUTION

3.01 SITE CLEARING

A. General:

1. Remove trees, shrubs, grass and other vegetation, improvements, or obstructions interfering with installation of new construction.

2. Remove such items elsewhere on the site or premises as specifically indicated. Removal includes digging out stumps and roots.

3. Carefully and cleanly cut roots and branches of trees indicated to be left standing, where such roots and branches obstruct new construction.

B. Topsoil:

1. Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4 inches.

2. Satisfactory topsoil is reasonably free of topsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material.

3. Remove heavy growths of grass from areas before stripping.

4. Stop topsoil stripping a sufficient distance, where trees are indicated to be left standing, to prevent damage to main root system.

5. Stockpile topsoil in storage piles in areas shown, or where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent wind-blown dust.

6. Dispose of unsuitable or excess topsoil same as waste material, herein specified.

C. Clearing and Grubbing:

1. Clear site of trees, shrubs and other vegetation, except for those indicated to be left standing.

2. Completely remove stumps, roots, and other debris protruding through the ground surface.

3. Use only hand methods for grubbing inside drip line of trees indicated to be left standing.

4. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

5. Place fill material in horizontal layers not exceeding 6-inch loose depth, and thoroughly compact to a density equal to adjacent original ground.

6. Removal of Improvements:

7. Remove existing above-grade and below-grade improvements necessary to permit construction, and other work as indicated.

3.02 DISPOSAL OF WASTE MATERIALS

A. Burning on OWNER's Property: Burning is not permitted on OWNER's property unless OWNER's approval is obtained and proper authorities are notified.

B. Removal from OWNER's Property: Remove waste materials and unsuitable materials from OWNER's property and dispose of off site in legal manner.

END OF SECTION 02110

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Definition: "Excavation" consists of removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.

1.03 QUALITY ASSURANCE

A. Codes and Standards:

1. Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

B. Testing and Inspection Service:

1. Employ, at CONTRACTOR's expense, a testing laboratory subject to approval by the ENGINEER to perform soil testing and inspection service for quality control during earthwork operations.

1.04 SUBMITTALS

A. Test Reports-Excavating: Submit following reports directly to ENGINEER from the testing services; with copy to CONTRACTOR:

1. Test reports on fill material. (Modified Proctor Tests)

2. Field density test reports. (Modified Proctor Tests)

3. Report of actual unconfined compressive strength and/or results of bearing tests of each stratum tested.

1.05 JOB CONDITIONS

A. Existing Utilities:

1. Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.

2. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with OWNER and utility companies in keeping respective services and facilities in operation. CONTRACTOR shall bear all costs of repairing damaged utilities to the satisfaction of utility owner.

3. Do not interrupt existing utilities serving facilities occupied and used by OWNER or others, during occupied hours, except when permitted in writing by ENGINEER and then only after acceptable temporary utility services have been provided.

4. Provide minimum of 48-hour notice to engineer, and receive notice to proceed before interrupting any utility.

5. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

B. Use of explosives:

1. The use of explosives is not permitted.

C. 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. Protect structures, utilities, sidewalks, pavements, and other facilities from damages caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

4. Perform excavation within drip-line of large trees to remain by hand, and protect the root system from damage or dryout in the manner prescribed in sections under “Sitework.”

PART 2 - PRODUCTS

2.01 SOILS MATERIALS

A. Subbase Material:

1. Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, natural or crushed sand.

B. Backfill and Fill Materials:

1. Satisfactory soil materials free of clay, rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter. The fill material should be sand containing little fines.

2. Prior to placing the fill material, the existing material shall be stripped of all soils containing a significant percentage of organics and all loose soils which cannot be readily compacted.

3. If existing materials do not meet these requirements, it may be necessary to backfill with select materials other than those on the job site.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Excavation:

1. Excavation is Unclassified, and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.

2. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of ENGINEER. Unauthorized excavation, as well as remedial work directed by ENGINEER, shall be at CONTRACTOR's expense.

3. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom of 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 ENGINEER.

4. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classifications, unless otherwise directed by engineer.

B. Additional Excavation:

1. When excavation has reached required subgrade elevations, notify ENGINEER who will make an inspection of conditions.

2. If unsuitable bearing materials are encountered at required subgrade elevations, notify ENGINEER who will make an inspection of conditions.

3. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by the ENGINEER.

4. Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work.

C. Stability of Excavations:

1. Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.

2. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

D. Site Excavation:

1. The Contractor shall excavate and/or dredge within the footprint as necessary to attain the foundation grades described by the Construction Drawings. Beach quality sand and material removed from the footprint shall be evenly graded along the beach to the east of the inlet. The Contractor shall excavate materials below the water surface with methods and management practices that are in keeping with existing inlet maintenance dredging permits. Any and all rock and/or debris materials encountered during excavation or resulting from demolition or construction activities shall be transported offsite, and the Contractor shall take responsibility disposing of these materials.

3.04 SHORING AND BRACING

A. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition.

B. Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction.

C. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

D. Dewatering:

1. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area. The cost of all dewatering operations including well pointing and “sock pipe” shall be the responsibility of the CONTRACTOR. The ENGINEER may direct the CONTRACTOR to provide dewatering if deemed necessary.

2. 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.

3. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

E. Material Storage:

1. Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.

2. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

3. Dispose of excess soil material and waste materials as herein specified.

F. Excavation for Structures:

1. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 feet, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of service, other construction, and for inspection.

2. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is places. Trim bottoms to required lines and grades to leave solid base to receive other work.

G. Excavation for Trenches:

1. Dig trenches to the uniform width required for particular item to be installed, sufficiently wide to provide ample working room. Provide 6-inch to 9-inch clearance on both sides of pipe or conduit and a maximum of 30 inches total width.

2. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations. Beyond building perimeter, keep bottoms of trenches sufficiently below finish grade to avoid freeze-ups.

3. Where rock is encountered, carry excavation 6 inches below required elevation and backfill with a 6-inch layer of crushed stone or gravel prior

to installation of pipe.

4. For pipes or conduit 5 inches or less in nominal size and for flat-bottomed multiple-duct conduit units, do not excavate beyond indicated depths. Hand excavate bottom cuts to accurate elevations and support pipe or conduit on undisturbed soil.

5. For pipes or conduit 6 inches or larger in nominal size, tanks and other mechanical/electrical work indicated to receive subbase, excavate to subbase depth indicated, or, if not otherwise indicated, to 6 inches below bottom of work to be supported.

6. Except as otherwise indicated, excavate for waterbearing piping so top of piping is not less than 3 feet below finished pavement grade, but not less than 2 feet 6 inches below finish grade.

7. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.

8. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and which are carried below bottom of such footings, or which pass under wall footings. Place concrete to level of bottom of adjacent footing.

9. Use care in backfilling to avoid damage or displacement of pipe systems.

3.02 COMPACTION

A. General:

1. Control soil compaction during construction, providing minimum percentage of density specified for each area classification indicated below.

2. All compaction requirements for this section are specified on the construction plans.

B. Moisture Control:

1. Where subgrade of layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during subsequent to compaction operations.

2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

3. Soil material that has been removed because it is too wet to permit

compaction may be stockpiled or spread and allowed to dry. Assist drying by dicing, harrowing or pulverizing, until moisture content is reduced to a satisfactory value.

3.03 BACKFILL AND FILL

A. General: Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below:

1. In excavations, use satisfactory excavated or borrow material.

2. Under grassed areas, use satisfactory excavated or borrow material.

3. Under walks and pavements, use subbase material, or satisfactory excavated or borrow material, or combination of both.

4. Under piping and conduit, use subbase material where subbase is indicated under piping or conduit; shape to fit bottom 90 degrees of cylinder.

B. Backfill excavation as promptly as work permits, but not until completion of the following;

1. Acceptance of construction below finish grade.

2. Inspection, testing, approval, and recording locations of underground utilities.

3. Removal of concrete formwork.

4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. 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.

6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

C. 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.

D. Placement and Compaction:

1. The lower portion of backfill, to a compacted level of one foot above the top of the pipe, shall be hand placed in layers of lifts not to exceed six inches of compacted depth and each layer compacted individually by means of hand tampers. Above that level, place lifts in layers not to exceed twelve inches of compacted depth and machine filling and tamping may be used.

2. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each lift to required percentage of minimum soil density for each area classification as designated herein. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

3. Place backfill and fill materials evenly adjacent to structures, piping or conduit to required elevations. Take care to 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.

3.04 GRADING

A. General:

1. Uniformly grade areas within limits of grading under this section, including adjacent transition areas.

2. Smooth finished surfaces 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:

1. Grade areas adjacent to building lines to drain away from structures and to prevent ponding.

C. Finish surfaces free from irregular surface changes, and as follows:

1. Lawn or Unpaved Ares: Finish areas to receive topsoil to within not more than 0.10 feet 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 feet 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 requires subgrade elevations.

D. Grading Surface of Fill Under Building Slabs:

1. Grade smooth and even, free from voids, compacted as specified, and to required elevation.

2. Provide final grades within a tolerance of 1/2-inch when tested with a 10 feet straightedge.

3. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage for each area classification.

3.05 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction:

1. Provide testing service by a qualified soil testing firm, subject to ENGINEER's approval, to inspect and approve subgrades and fill layers before further construction work is performed.

B. Paved Areas:

1. Make at least one field density test of subgrade for every 2000 square feet of paved area but in no case less than 3 tests, nor less than 1 per driveway or crossing. In each compacted fill layer, make one field density test for every 2,000 square feet of paved area but in no case less than 3 tests, nor less than 1 per driveway or crossing.

C. Non-Paved Areas:

1. Perform at least 1 field density test per 3,000 square feet of fill per every vertical foot of height, and perform at least 1 field density test per 1,000 feet of pipe installed per every 2 feet of vertical trench depth.

D. If in opinion of ENGINEER, based on testing service reports and inspection, subgrade or fills which have been placed below are specified density, provide additional compaction and testing at no additional expense.

3.06 MAINTENANCE

A. Protection of Graded Areas:

1. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and re-establish grades in settled, eroded, and rutted areas to specified

tolerances.

C. Reconditioning Compacted Areas:

1. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

D. Sodded Areas:

1. See Section 02211, “Sodding” for requirements of sodded areas.

3.07 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Disposal of all spoil material resulting from construction shall be the responsibility of the CONTRACTOR.

END OF SECTION 02200

SECTION 02211 - SODDING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Sod Installation

1.02 REFERENCES

A. ASPA - American Sod Producers Association - Guideline Specifications to Sodding.

B. FS O-F-241 - Fertilizers, Mixed, Commercial.

1.03 DEFINITIONS

A. Weeds: Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Hill, Bindweed, Bent Grass, Wild Garlic, Perrenial Sorrel, and Brome Grass.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver sod on pallets. Protect exposed roots from dehydration.

B. Do not deliver more sod that can be laid within 24 hours.

PART 2 - PRODUCTS

2.01 ACCEPTABLE SOD GROWERS

A. Nurseries and Sod Growers in the surrounding area who have a 5-year record are acceptable.

2.02 MATERIALS

A. Sod:

1. ASPA approved, field grown grade; cultivated grass sod; for low maintenance and traffic durability, with strong fibrous root system, free of stone, burned or bare spots; containing no more than 5 weeds per 1000 square feet.

B. Approved Sods:

1. Bermuda, (Cynodon Dactylon).

2.03 HARVESTING SOD

A. Machine cut sod and load on pallets in accordance with ASPA guidelines.

B. Cut sod in area not exceeding one square yard, with minimum 1/2 inch and maximum one inch topsoil base.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that prepared soil base is ready to receive the work of this Section.

B. Beginning of installation means acceptance of existing site conditions.

3.02 PREPARATION OF SUBSOIL

A. Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials and undesirable plants and their roots. Do not bury foreign material beneath areas to be sodded. Remove contaminated subsoil.

3.03 LAYING SOD

A. Moisten prepared surface immediately prior to laying sod.

B. Lay sod immediately on delivery to site and within 24 hours after harvesting to prevent deterioration.

C. Lay sod tight with no open joints visible, and no overlapping; stagger end joints 12-inches overlapping; minimum. Do not stretch or overlap sod pieces.

D. Lay smooth. Align with adjoining grass areas. Place top elevation of sod 1/2 inch below adjoining paving or curbs.

E. On slopes 6 inches per foot and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet on center. Drive pegs flush with soil portion of sod.

F. Prior to placing sod, on slopes exceeding 8 inches per foot or where indicated, place wire mesh over topsoil. Securely anchor in place with wood pegs sunk firmly into the ground.

G. Water sodded areas immediately after installation. Saturate sod to 4 inches of soil.

H. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities.

I. Sod shall be laid in all ditch areas and slopes that are equal to or steeper than 1 vertical to 3 horizontal or in areas determined by the Engineer to "erosion problem" areas. Sod shall be pinned down for stabilization in these areas.

END OF SECTION 02211

SECTION 02222 - TRENCHING, BACKFILLING AND COMPACTING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The extent of trenching, backfilling and compacting is shown on the drawings.

B. This section includes furnishing equipment, labor and materials, and performing all operations necessary and incidental to perform the required work.

PART 2 – PRODUCTS NOT USED

PART 3 - EXECUTION

3.01 CLEARING THE SITE

A. The site of the work shall be cleared of all trees, shrubs, paving and objectionable material which interfere with the prosecution of the proposed work. Trees and shrubs which will not interfere with construction shall be protected from damage. Clearing shall be considered as an incidental item of excavation.

3.02 EXCAVATION

A. General:

1. Perform excavation described of whatever substance encountered to the dimensions and depths specified or shown on the drawings.

2. Undercutting will not be permitted, except when ordered by the ENGINEER. Material suitable for backfill shall be stockpiled near the site.

3. Rock or other material undesirable for backfill shall be spoiled outside the area in a neat manner, as directed by the ENGINEER.

4. Where it is necessary to cut roots projecting into an excavation or where it is necessary to trim branches for equipment clearance, all severed root ends or cuts to branches over 1/2-inch diameter shall be treated with an asphalt base pruning paint.

5. Backfill over exposed roots as soon as possible.

B. Rock:

1. Where encountered in the trench bed, rock shall be excavated to a depth of 1/4 of the pipe diameter below the bottom of the pipe but in no case less than 4-inches.

2. All undercut trench excavation shall be backfilled and tamped with materials as specified in the following paragraphs under Unstable Subgrade.

C. Unstable Subgrade:

1. In the event that unsuitable material is encountered at or below the excavation depth specified or shown on the drawings, the ENGINEER shall be notified.

2. Such material shall be removed and replaced with suitable material. Methods and materials used for replacement shall be one of the following as directed by the ENGINEER in writing.

a. Suitable earth or sand, compacted in the trench. Materials shall be furnished as a part of the Bid Proposal item covering excavation and backfill.

b. Gravel or crushed limerock, compacted in the trench and paid for under the appropriate item.

c. Existing materials, stabilized after removal and then replaced and compacted in the trench at no additional cost to the OWNER.

2. The Engineer shall determine the methods and materials to be used, based upon the condition of the excavation, the pipe structure to be supported, and the availability and character of stabilizing materials.

D. Trenches:

1. Keep pipe laying operation as close to the excavation operation as possible during the prosecution of the work. The ENGINEER reserves the right to stop the excavation at any time when, in his opinion, the excavation is opened too far in advance of the pipe laying.

2. Pipe trenches shall be excavated to a depth that will insure a minimum of 36-inches of cover for ductile iron and PVC pipe and 54-inches of cover for polyethylene pipe, except service laterals.

a. Trenches shall be only of sufficient width to provide a free working space on each side of the pipe.

b. To prevent excess pressure on the pipe, the maximum width of trench at the top of the pipe and at the bottom of the trench shall not be greater than 2-feet more than the greatest exterior diameter of the pipe.

c. If this maximum width is exceeded, it shall be the CONTRACTOR's responsibility to provide, at no additional cost to the OWNER, such additional bedding or select backfill materials as the ENGINEER may require.

d. The excavation below the spring line shall be made to conform as near as possible to the shape of the lower third of the pipe.

e. To protect the pipe lines from unusual stresses, all work shall be done in open trenches.

f. Excavation shall be made for bells of all pipes and of sufficient depth to permit access to the joint for construction and inspections. In no case will the bells be used to support the body of the pipe.

3. In order to avoid existing utilities, at times it may be necessary for the pipe to be laid deeper than the minimum cover specified in the preceding paragraph. At such time the CONTRACTOR will not be allowed extra compensation for additional excavation involved.

4. In case excavation has been made deeper than necessary, a layer of concrete, fine gravel or other material satisfactory to the ENGINEER shall be placed, at no extra cost, to secure a firm foundation for the lower third of each pipe.

a. Where possible, excavated material shall be placed so as not to interfere with public travel.

b. Bridging shall be provided to afford necessary access to public or private premises.

c. Bridging shall be considered as part of the excavation operation and shall be supplied at no additional cost to the OWNER.

E. Structural: (For inlets, manholes, valve pits and similar structures)

1. Remove sufficient material to allow proper space for erecting and removing forms. The elevations of the bottoms of footings, if shown on the drawings, shall be considered as approximate only, and the ENGINEER may order, in writing, such changes in dimensions or elevations of footings as may be deemed necessary to secure a satisfactory foundation. Excavation for structures shall be sufficient to leave at least 12-inches in the clear between their outer surfaces and the embankment of timber that may be used to protect them. Backfill of earth under structures will not be permitted. Excess excavation for structures shall be filled with thoroughly compacted sand, gravel, or concrete at the expense of the CONTRACTOR.

2. After excavation for a structure is completed, the CONTRACTOR shall notify the ENGINEER to that effect. No concrete or reinforcing steel shall be placed until the ENGINEER has approved the depth of the excavation and the character of the foundation material.

F. Sheeting and Shoring:

1. The CONTRACTOR shall provide all trench and structural bracing, sheeting or shoring necessary to construct and protect the excavation, existing utilities, structures and private property of all types and as required for the safety of the employees. Sheeting shall be removed or cut off by the CONTRACTOR during backfilling operations as directed by the ENGINEER. Sheeting which is left in place by order of the ENGINEER will be paid for under the item, Lumber left in Place. Removal of shoring for structures shall be done in such a manner as not to disturb or mar finished masonry or concrete surfaces.

3.03 DRAINAGE

A. Grading shall be controlled in the vicinity of excavations so that the surface of the ground will be properly sloped to prevent water from running into trenches or other excavated areas. Any water which accumulates in the excavations shall be removed promptly by well point or by other means satisfactory to the ENGINEER in such a manner as to not create a nuisance to adjacent property or public thoroughfare. Trenches shall be kept dry while pipe is being laid. Bridging of dewatering pipe shall be provided where necessary. Pumps and engines for well point systems shall be operated with mufflers, and at a minimum noise level suitable to a residential area. The CONTRACTOR will not be allowed to discharge water into the OWNER’s storm drainage system without the written approval of the ENGINEER. Approval will be subject to the condition that the storm sewer be returned to its original condition.

B. The CONTRACTOR is responsible for carrying the water to the nearest ditch or body of water and for obtaining the necessary permission to use same. The CONTRACTOR shall be financially responsible for any nuisance created due to carrying off water from his drainage system.

3.04 BACKFILL

A. Trenches:

1. Trenches shall be backfilled immediately after the pipe is laid unless other protection for the pipeline is provided. Clean earth, sand, crushed limerock or other material approved by the ENGINEER shall be used for backfill. Backfill material shall be selected, deposited and compacted (simultaneously on both sides of the pipe) so as to eliminate the possibility of lateral displacement of the pipe. Backfill material shall solidly tamped around the pipes in layers to a level at least 1-foot above the top of the pipe. Each layer shall be compacted to a maximum thickness of 6-inches.

2. In unpaved areas, the remainder of the backfill shall be deposited and then compacted by puddling, water flooding or mechanical tampers. Mechanical tamping of layers in unpaved areas shall be to a maximum thickness of 12-inches. In areas to be paved or repaved, the entire depth of backfill shall be deposited in layers and compacted by hand or mechanical tampers to a maximum thickness of 6-inches. Compaction shall be carried out to achieve a density of at least 98% of the maximum density as determined by AASHTO, Method T-180. Under areas to be paved, puddling may be used for backfill consolidation after tamping to 1-foot over the pipe, as specified, provided the method is first approved by the ENGINEER and the density requirements are met.

3. In areas to be paved, density tests for determination of the specified compaction shall be made by a testing laboratory and spaced one in every 300-feet of trench cut. It is the intent of this specification to secure a condition where no further settlement of trenches will occur. When backfilling is completed, the roadway base for pavement replacement may be placed immediately. It will be the responsibility of the CONTRACTOR to restore the surface to the original grade wherever settlement occurs.

B. Wet Trenches (CONTRACTOR's Option):

1. Backfill for the pipe bed in wet trenches shall be crushed, graded limerock, compacted in the trench. After the pipe is laid, a graded limerock backfill shall be placed and worked in around the haunches to a point 6-inches above the pipe. The width of the limerock material around the pipe shall not be less than the outside diameter of the pipe plus 6-inches on each side of the pipe. Material shall be carefully distributed

along the pipe so as to provide full and uniform support under and around the pipe. Six inches above the top of the pipe and up to the water level, material from the excavations with no rock or earth exceeding 4-inches in any one dimension shall then be lifted to the trench and released at the water level. Material shall be uniformly distributed for the full width of the trench. Backfill and compaction above the eater level in the trench shall be as specified above. All costs for graded limerock placed in wet trenches shall be included in the cost of stage excavation and backfill for the various sizes of pipe.

C. Bedding and Backfill - Flexible Pipe:

1. For polyvinyl chloride pipe, the bedding and backfill materials shall be such as to limit the vertical ring deflection to 5% of the inside pipe diameter. A deflection greater than 5% of the inside diameter shall be cause for rejection of the pipe.

2. Class IV or Class V materials as defined in ASTM D2321-74 shall not be used for bedding, haunching or initial backfill for flexible pipes.

3. For polyvinyl chloride plastic pipe, bedding shall be in accordance with ASTM D2321-74, using Class I, II or III materials, except under wet conditions. In any area where the pipe will be installed below existing or future groundwater levels or where the trench could be subject to inundation, Class I material shall be placed to the springline of the pipe.

4. A minimum of effort is needed to compact the material. However, in the initial stage of placing this type of material, take care to ensure that sufficient material has been worked under the haunch of the pipe to provide adequate side support. Take precautions to prevent movement of the pipe during placing of the material under the pipe haunch. Except for the protection of the pipe from large particles of backfill material, little care need be taken and no compaction is necessary in placing backfill material in the balance of the initial backfill area above the pipe. Where unstable trench wall exist because of migratory materials, such as water-bearing silts or fine sand, take care to prevent the loss of side support through the migratory action.

5. All bedding requirements for flexible pipe specified in the preceding paragraphs shall be included in the price bid for the applicable pipe material and no additional compensation for bedding material will be allowed.

D. Structural:

1. After completion of foundation footings and walls and other construction

below the elevation of the final grades, and prior to backfilling, forms shall be removed and the excavation shall be cleared of all trash and debris.

2. Material for backfilling shall consist of the excavation, borrow sand or other approved materials, and shall be free of organics, trash, lumber or other debris.

3. Backfill shall be placed in horizontal layers not in excess of 9-inches in thickness, and have a moisture content such that a density may be obtained to prevent excessive settlement or shrinkage.

4. Each layer shall be compacted by hand or approved machine tampers to 98% density per AASHTO method T-180.

5. Backfill shall be placed and compacted evenly against the exposed surfaces to prevent undue stress on any surface.

6. The Contractor shall submit samples and gradation analysis of backfill material to be placed behind the seawall and compaction summary report Signed and Sealed by a Professional Engineer registered in the State of Florida or as approved by the Owner. The samples, analysis and compaction summary report shall be submitted by the Contractor for the Owner's review and approval prior to ordering the materials by the Contractor.

3.05 RESTORATION OF SURFACE IMPROVEMENTS

A. Roadways, including shoulders, alleys and driveways of shell, limerock, stabilized soil or gravel, grass plots, sod, shrubbery, ornamental trees, signs, fences, or other surface improvements on public or private property which have been damaged or removed in excavation, shall be restored to conditions equal to or better than conditions existing prior to beginning work.

1. Restoration of shoulders shall consist of seeding and mulching or stabilizing with limerock as selected by the ENGINEER.

2. The cost of doing this work shall be included in the cost of the various applicable items.

3. General Quality Control will be used as an aid in determining conditions prior to construction.

B. Materials for unpaved roadways, road shoulders, alleys, or driveways, shall be compacted as described in the plans. The cost of this work and furnishing new materials shall be included in the cost of the applicable items of work as no separate payment will be made, unless a separate bid item is provided.

3.06 FINE GRADING

A. Finished areas around structures shall be graded smooth and hand raked and shall meet the elevations and contours shown on the drawings. Lumber, earth clods, rocks and other undesirable materials shall be removed from the site.

3.07 DISPOSAL OF MATERIALS

A. Such portions of the excavated materials as needed and as suitable, shall be used for backfilling and grading about the completed work to the elevations as shown of the drawings or as directed. Excavated material in excess of the quantity required for this purpose shall be disposed of by the CONTRACTOR in those areas designated by the OWNER and as shown on the drawings. The CONTRACTOR shall leave the earth over the trenches or other excavations in a neat and uniform condition acceptable to the OWNER.

3.08 PAVEMENT REPLACEMENT

A. Asphalt pavement shall be removed by saw cutting on a straight line with edges as vertical as possible. Concrete pavement or asphalt surfaced concrete shall be removed by cutting with a concrete saw in as straight a line and vertically as possible. Materials to replace State Highway paving shall conform to the specifications required by the Florida Department of Transportation Specifications for Type S-I asphaltic concrete surface course, or as specifically shown in the plans.

B. Prior to replacing concrete or asphalt pavement replacement, a limerock base shall be laid. The base for concrete pavement shall be 6-inches of compacted thickness, and that for asphalt pavement shall be 8-inches of compacted thickness. The base course for each shall be compacted to a minimum of 98% of the maximum density as determined by AASHTO, Method T-180. The OWNER will have tests made by an independent testing laboratory to verify compaction results. One test will be made for each block of continuous trench cut.

C. Non-asphalt pavement replacement shall be replaced of like material and thickness. Asphalt or built-up asphalt pavement shall be replaced with like material or concrete as directed by the ENGINEER. Where asphalt or built-up asphalt pavement is replaced by concrete, the concrete shall have a minimum of 6-inches in thickness and be reinforced with 6 by 6 no. 6 gage welded wire fabric. Concrete for paving shall be 3,000 psi design strength. Where the pavement replacement is of like material, it shall be replaced in thickness equal to or better than that existing at the time of removal.

D. Unless the base is sealed or other temporary paving applied over areas to be repaved, pavement shall be replaced not later than 3-weeks after completion of backfill.

3.09 TESTS

A. The CONTRACTOR shall furnish facilities for making all density tests and make such restorations as may be necessary due to test operations. All density tests on backfill or base replacement will be made by a commercial testing laboratory employed by the CONTRACTOR and at such locations as may be recommended by the ENGINEER. If the densities as determined by the specified tests fall below the required minimums, the CONTRACTOR shall pay for all retests.

3.10 SIDEWALK, CURB AND GUTTER REMOVAL AND REPLACEMENT

A. Sidewalk, curb and gutter removal and replacement required in the construction of this work shall be done by the CONTRACTOR. Reasonable care shall be exercised in removing sidewalk and curb and gutter, and the CONTRACTOR shall either stockpile or dispose of this material as directed by the ENGINEER. Brick, concrete or built-up asphalt sidewalk replacement and curb and gutter replacement shall be replaced of like material in a manner and condition equal to or better than that existing at the time of removal. Materials and methods of replacing State Highway sidewalks or curbs shall conform to the Department of Transportation specifications.

END OF SECTION 02222

SECTION 02500 - PAVING QUALITY CONTROL SYSTEM

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The CONTRACTOR shall furnish and maintain a quality control system that will provide reasonable assurance that all materials and products submitted to the ENGINEER for acceptance conform to the contract requirements whether manufactured or processed by the CONTRACTOR or procured from suppliers or subcontractors.

B. The CONTRACTOR shall perform or have performed the inspection and tests required to substantiate product conformance to contract requirements and shall also perform or have performed all inspections and tests otherwise required by the contract.

C. The CONTRACTOR shall have a Quality Control Technician, who has been certified by FDOT as a Certified Asphalt Plant Technician; available at the asphalt plant at all times the CONTRACTOR is producing asphalt mix for the contract.

D. The CONTRACTOR's quality control procedures, inspection, and tests shall be documented and that information is available for review by the ENGINEER throughout the life of the contract.

E. The CONTRACTOR's person in responsible charge of the paving operations shall also be certified by the FDOT as an Asphalt Paving Technician and shall possess a valid certificate of qualification, and be present during all paving operations.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 ENGINEER'S INSPECTION:

A. The ENGINEER reserves the right to inspect materials not manufactured within the CONTRACTOR's facility.

B. The ENGINEER inspection shall not constitute acceptance nor shall it in any way replace the CONTRACTOR's inspection or otherwise relieve the CONTRACTOR of his responsibility to furnish an acceptable material or product.

C. When inspection of the subcontractor's or supplier's product is performed by the ENGINEER, such inspection shall not be used by the CONTRACTOR as evidence of effective inspection of such subcontractor's or supplier's product.

END OF SECTION - 02500

SECTION 02510 - GENERAL CONSTRUCTION REQUIREMENTS FOR ASPHALT PAVEMENT

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This Section specifies the general construction requirements for all plant-mixed hot bituminous pavements.

1.02 LIMITATIONS OF OPERATIONS:

A. Weather Limitations:

1. Plant Operations shall not begin unless all weather conditions are suitable for the laying operations.

1.03 LIMITATIONS OF LAYING OPERATIONS:

A. General:

1. The mixture shall be spread only when the surface, upon which it is to be laid has been previously prepared, is intact, firm and properly cured, and is dry.

2. Unless otherwise approved by the Engineer, no mixture shall be spread that cannot be finished and compacted during daylight hours.

B. Temperature:

1. The mixture shall be spread only when the air temperature (the temperature in the shade away from artificial heat) is 40E F and above for layers greater than one inch (100 pounds per square yard) in thickness and 45E F and above for layers one inch (100 pounds per square yard) or less in thickness.

2. No mixture shall be placed when there is evidence that the base is frozen.

C. Wind:

1. The mixture shall not be spread when the wind is blowing to such an extent that proper and adequate compaction cannot be maintained or when sand, dust, etc. are being deposited on the surface being paved, to the extent that the bond between layers will be diminished.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PREPARATION OF ASPHALT CEMENT:

A. The asphalt cement shall be delivered to the asphalt plant at a temperature not to exceed 350EF and shall be maintained within a range of 230EF to 350EF in advance of mixing operations.

B. Heating within these limits shall be constant and wide fluctuations of temperature during a day's production will not be permitted.

3.02 PREPARATION OF AGGREGATES:

A. Stockpiles:

1. Each aggregate component shall be placed in an individual stockpile, which shall be separated from the adjacent stockpiles, either by space or by system of bulkheads.

2. The intermingling of different materials in stockpiles shall be prevented at all times. Each stockpile, including RAP, shall be identified as shown on the Mix Designs.

3.03 PREVENTION OF SEGREGATION:

A. In the event that the method used for stockpiling coarse aggregate results in segregation of the aggregate, the Engineer will require that the stockpiles be built up in layers not higher than four feet, with each layer completely in place before the next is started.

B. Stockpiles shall not be formed by depositing material in one place or by coning.

3.04 BLENDING OF AGGREGATES:

A. Blending or proportioning from railroad cars will not be permitted.

B. All aggregates shall be stockpiled prior to blending or placing in the cold hoppers.

C. All aggregates to be blended or proportioned shall be placed in separate bins at the cold hopper and proportioned by means of securely positioned calibrated gates or other approved devices.

3.05 COLD BINS:

A. Adequacy of Bins:

1. The separate bin compartments of the cold aggregate feeder shall be so constructed as to prevent any spilling or leakage of aggregate from one bin to another.

2. Each bin compartment shall be of such capacity and design as to permit a uniform flow of aggregates.

3. All bin compartments shall be mounted over a feeder of uniform speed, which shall deliver the specified proportions of the separate aggregates to the drier at all times.

4. If necessary, the bins shall be equipped with vibrators to insure a uniform flow of the aggregates at all times.

3.06 GATES:

A. Each bin compartment shall be provided with a gate that is adjustable in a vertical direction.

B. The gate shall be so designed that it can be held securely at any specified vertical opening.

C. The gates shall be equipped with a measuring device for measuring the vertical opening of the gates from a horizontal plane level with the bottom of the feeder.

3.07 MINERAL FILLER:

A. If mineral filler is required in the mix, it shall be fed or weighed-in separately from the other aggregates.

3.08 HEATING AND DRYING:

A. The aggregates shall be heated and dried before screening.

B. The temperature of the aggregates shall be heated and dried before screening.

C. The temperature of the aggregates shall be co controlled that the temperature of the completed mixture at the plant will fall within the permissible range allowed by these specifications.

3.09 SCREENING UNIT:

A. OVERSIZE AGGREGATE:

1. Any oversized pieces of aggregate shall be removed by the use of a scalping screen.

2. This oversized material shall not be returned to the stockpile for reuse unless it has been crushed and reprocessed into sizes that will pass the scalping screen.

B. SCREENING:

1. Unless otherwise permitted by the Engineer, the quantity of aggregates being discharged onto the screens shall not be in excess of the capacity of the screens to actually separate the aggregates into the required sizes.

2. A minimum of ten percent plus-ten material will be permitted in the minus-ten bin.

3. The maximum amount of minus-ten material allowed in the plus-ten bins will be determined by the Engineer, in accordance with its effect on the uniformity of the mix.

C. MIXING DIFFERENT MATERIALS:

1. Unless written permission is obtained, coarse aggregates of different types shall not be mixed; nor shall coarse aggregates of different types be used alternately in sections less than on mile in length.

3.10 PREPARATION OF THE MIXTURE

A. BATCH MIXING:

1. Aggregates:

a) The dried aggregates and mineral filler (if required), prepared in the manner previously described, and combined in batches to meet the job mix formula by weighing each separate bin size, shall be conveyed to the empty mixer.

2. Bitumen:

a) The hot asphalt cement, accurately measured, shall be introduced into the mixer simultaneously with, or after, the hot aggregates.

b) Mixing shall continue until the mixture is thoroughly uniform, with all particles fully coated.

3. Mixing time:

a) The mixing time shall begin when the measuring devices for both the asphalt and the aggregates indicate that all the material is in the mixer, and shall continue until the material begins to leave the mixing unit.

b) The mixing time will vary in relation to the nature of the aggregates and the capacity of the mixer shall be as designated by the Engineer but in no case shall it be less than 35 seconds.

B. CONTINUOUS MIXING:

1. The dried aggregates and mineral filler (if required), prepared as specified and proportioned to meet the job mix formula by volumetric measurements, shall be introduced into the mixer in synchronization with the accurate feeding of the hop asphalt cement.

2. The rate of flow of material to the pug mill shall be such that the maintained depth of the mix will not exceed the tips of the paddles when in the upright position.

3. Mixing shall be sufficient to produce a thoroughly and uniformly coated mixture.

C. MIXING TEMPERATURE:

1. The ingredients of the mix shall be heated and combined in such a manner as to produce a mixture, which shall be at a temperature, when discharged from the pug mill or surge bin, within the range of 230EF to 310EF and within the tolerance shown in Table 1.

Table 1

Temperature Tolerance From Job Mix Formula

Any Single Measurement	"25EF
Average of Any Five Consecutive Measurements	"15EF

2. Any load or portion of a load of asphalt mix at the plant or on the road with mix temperature exceeding 335EF shall be rejected for use on the project.

3. Temperature of the completed mixture shall be determined by a quick-reading thermometer through a hole in the side of the loaded truck immediately after loading. The hole shall be located within the middle third of the length of the body, and at a distance of from six to ten inches above the surface supporting the mixture. If a truck body already has a hole located in the general vicinity of the above-specified location, this will be acceptable. At the Engineer's discretion, the temperature of the load may be taken over the top of the truck in lieu of using the hole in the side of the truck.

4. The mix temperature will be taken at the plant on the first five loads each day and on an average of once every five loads thereafter. If the temperature fails to fall within the specified tolerance range, the Contractor will be required to take corrective action.

3.11 MAXIMUM PERIOD OF STORAGE:

A. The maximum time that any mix may be kept in a hot storage or surge bin is 72 hours.

3.12 CONTRACTOR'S RESPONSIBILITY FOR MIXTURE REQUIREMENTS:

A. The responsibility for producing a homogeneous mixture, free from moisture and with no segregated materials, and meeting all requirements of the specifications for

the mixture, including compliance with the design limits, shall lie entirely with the Contractor.

B. These requirements shall apply also to all mixes produced by the drum mixer process and all mixes processed through a hot storage or surge bin, both before and after storage.

3.13 TRANSPORTATION OF THE MIXTURE

A. The mixture shall be transported in tight vehicles previously cleaned of all foreign material.

B. The inside surface of the truck bodies after cleaning shall be thinly coated with soapy water or an approved emulsion containing not over five percent oil.

C. The coasting shall be applied prior to the first loading each day and repeated as necessary throughout the day's operations.

D. After the truck bodies are coated before any mixture is placed therein, they shall be raised to drain out all excess liquids.

E. Each load shall be covered during cool and cloudy weather and at any time there is a probability of rain.

3.14 PREPARATION OF APPLICATION SURFACES

A. CLEANING:

1. Prior to the laying of the mixture, the surface of the base or pavement to be covered shall be cleaned of all loose and deleterious material by the use of power brooms or blowers, supplemented by hand brooming where necessary.

B. PATCHING AND LEVELING COURSES:

1. Where a surface course is constructed on an existing pavement of old base which is irregular, and wherever so indicated in the plans, the existing surface shall be brought to proper grade and cross section by the application of patching or leveling courses.

C. APPLICATION OVER SURFACE TREATMENT:

1. Where a surface course is to be placed over a newly constructed surface treatment, all loose material shall be swept from the paving area and disposed of by the contractor.

D. COATING SURFACES OF CONTACTING STRUCTURES:

1. All structures which will be in actual contact with the asphalt mixture, with the exception of the vertical faces of existing pavements and curbs or curb

and gutter, shall be painted with a uniform coating of asphalt cement to provide a closely bonded, watertight joint.

3.15 TACK COAT

A. TACK COAT REQUIRED:

1. A tack coat will be required on existing pavements that are to be overlaid with an asphalt mix and between successive layers of all asphalt mixes.

B. TACK COAT AT ENGINEER'S OPTION:

1. A tack coat will be required on the following surfaces only when so directed by the Engineer:

2. Freshly primed bases

3. Surface Treatment

3.16 PLACING MIXTURE

A. Requirements Applicable To All Types:

1. Alignment of Edges:

a) All asphaltic concrete mixtures other than adjacent to curb and gutter or other true edges, shall be laid by the string line method, to assure the obtaining of an accurate, uniform alignment of the pavement edge.

2. Temperature of Spreading:

a) The temperature of the mix at the time of spreading shall be within "25E F of the established mix temperature selected by the Contractor.

b) The minimum frequency for taking mix temperatures on the road will be an average of one per five trucks. If the temperature fails to fall within the specified tolerance range, corrective action by the contractor will be required.

3. Rain and Surface Conditions:

a) Transportation of asphalt mixtures shall immediately cease from the plant when rain begins at the roadway.

b) Asphalt mixtures shall not be placed while rain is falling, or when there is water on the surface to be covered.

c) As an exception, mixture caught in transit may be placed at the Contractor's risk if the only option is to waste this mixture, and provided the surface has been tacked (as required) prior to the rain and the surface broomed in front of the spreading operation.

d) Such mixture will be evaluated separately and if it should prove unsatisfactory in any way, in the opinion of the Engineer, it shall be removed and replaced with satisfactory mixture at the Contractor's expense.

4. Speed of Spreading:

a) The forward speed of the asphalt spreader shall be as established by the Engineer.

5. Number of Crews Required:

a) For each paving machine being operated, the Contractor will be required to use a separate crew; each crew operating as a full unit.

6. Checking Depth of Layer:

a) The depth of each layer shall be checked at frequent intervals, not to exceed 25 feet.

b) Any deviation from the required thickness, in excess of the allowable tolerance, shall be immediately corrected.

7. Hand Spreading:

a) In limited areas where the use of the spreader is impossible or impracticable, the mixture may be spread and finished by hand.

8. Straight-edging and Back-patching:

a) Straight-edging and back-patching shall be done after initial compaction has been obtained and while the material is still hot.

3.17 REQUIREMENTS APPLICABLE TO COURSES OTHER THAN LEVELING:

A. Spreading and Finishing:

1. Upon arrival, the mixture shall be dumped in the approved mechanical spreader and immediately spread and struck-off to the full width required and to such loose depth for each course that, when the work is completed, the required weight of mixture per square yard, or the specified thickness, will be secured.

2. An excess amount of mixture shall be carried ahead of the screed at all times.

3. Hand raking shall be done behind the machine as required.

B. Thickness of Layers:

1. Unless otherwise noted in the plans each course shall be constructed in layers of the thickness shown on FDOT Standard Index No. 513.

2. Type S-III Asphaltic Concrete shall be constructed in layers of thickness of not less than: inch nor greater than 13 inches.

C. Laying Width:

1. If necessary due to the traffic requirements, the mixture shall be laid in strips in such a manner as to provide for the passage of traffic.

2. Where the road is closed to traffic, the mixture may be laid to the full width, by machines traveling in echelon.

D. Correcting Defects:

1. Before any rolling is started the surface shall be checked, any irregularities adjusted, and all drippings, fat sandy accumulations from the screed, and fat spots from any source shall be removed and replaced with satisfactory material.

2. No skin patching shall be done.

3. When a depression is to be corrected while the mixture is hot, the surface shall be well scarified before the addition of fresh mixture.

3.18 REQUIREMENTS APPLICABLE ONLY TO LEVELING COURSES:

A. Patching Depressions:

1. Before any leveling course is spread, all depressions in the existing surface more than one inch deep shall be filled by spot patching with leveling course mixture and then thoroughly compacted.

B. Spreading Leveling Courses:

1. All courses of leveling shall be placed by the use of two motor graders - one of which is equipped with a spreader box - unless otherwise shown in the plans.

2. Other types of leveling devices may be used after the Engineer has approved them.

C. Rate of Application:

1. When the total asphalt mix provided for leveling exceeds 50 pounds per square yard, the mix shall be placed in two or more layers, with the average spread of any layer not to exceed 50 pounds per square yard.

2. When Type S-III Asphaltic Concrete is used for leveling, the average spread of a layer shall not be less than 50 pounds per square yard nor more than 75 pounds per square yard.

3. The quantity of mix for leveling shown in the plans represents the average for the entire project; however, the rate of application may vary throughout the project as directed by the Engineer.

4. When leveling in connection with base widening, the Engineer may require that all the leveling mix be placed prior to the widening operation.

D. Placing Leveling Course Over Existing Pavement:

1. When a leveling course is specified to be placed over cracked concrete pavement (including existing concrete pavement covered with an asphaltic surface), the first layer of leveling shall be placed as soon as possible but no later than 48 hours after cracking the concrete.

2. The remainder of the leveling course shall be placed in the normal sequence of operations.

E. Removal of Excess Joint Material:

1. Where a leveling course is to be placed over existing concrete pavement or bridge decks, the excess joint filler in the cracks and joints shall be trimmed flush with the surface prior to placing the first layer of the leveling course.

3.19 COMPACTING MIXTURE:

A. Provisions Applicable To All Types:

1. Equipment and Sequence:

a) For each paving or leveling train in operation, the Contractor shall furnish a separate set of rollers, with their operators.

b) The following equipment, sequence and coverage are suggested for use based on past successful performance; however, when density is required, the Contractor may select his own equipment, sequence and coverage of rolling to meet the minimum density requirement specified. Regardless of the rolling procedure used, the final rolling must be completed before the internal pavement temperature has dropped below 175E F.

c) Seal rolling, using tandem steel rollers (either vibratory or static) weighing 5 to 12 tons, following as close behind the spreader as is possible without pickup, undue displacement or blistering of the material. Vibratory rollers shall be used in the static mode for layers of one inch or less in thickness.

d) Rolling with self-propelled pneumatic-tired rollers, following up as close behind the seal rolling as the mix will permit. The roller shall cover every portion of the surface with at least five passes.

e) Final rolling with the 8 to 12-ton tandem steel roller, to be done after the seal rolling and pneumatic-tired rolling have been completed, but before the internal pavement temperature has dropped below 175E F.

f) Once the Contractor has selected the equipment and established the rolling procedures to achieve required density, then the Contractor must continue to use the same equipment and rolling procedure for the entire project. The Engineer must be notified prior to changing the rolling process.

g) Compaction at Crossovers, Intersections, etc: when a separate paving machine is being used to pave the crossovers, one 8- to 10-ton tandem steel roller may do the compaction of the crossovers. If crossovers and intersections are placed with the main run of paving, a traffic roller shall also be used in the compaction of these areas.

2. Rolling Procedures:

a) The initial rolling shall be longitudinal. Where the lane being placed is adjacent to a previously placed lane, the center joint shall be pinched or rolled, prior to the rolling of the rest of the lane.

b) Rolling shall proceed across the mat, overlapping the adjacent pass by at least six inches. The motion of the roller shall be slow enough to avoid displacement of the mixture, and any displacement shall be corrected at once by the use of rakes, and the addition of fresh mixture is required. Final rolling shall be continued until all roller marks are eliminated.

3. Speed of Rolling:

a) Rolling with the self-propelled, pneumatic-tired rollers shall proceed at a speed of 6 to 10 miles per hour, and the area covered by each roller shall not be more than 3,000 square yards per hour.

4. Number of Pneumatic-tired Rollers Required:

a) A sufficient number of self-propelled pneumatic-tired rollers shall be used to assure that the rolling of the surface for the required number of passes will not delay any other phase of the laying operation nor result in excessive cooling of the mixture before the rolling is complete.

b) In the event that the rolling falls behind, the laying operation shall be discontinued until the rolling operations are sufficiently caught up.

5. Compaction of Areas Inaccessible to Roller:

a) Areas which are inaccessible to a roller (such as areas adjacent to curbs, headers, gutters, bridges, manholes, etc.) shall be compacted by the use of hand tamps or other satisfactory means.

6. Correcting Defects:

a) The rollers shall not be allowed to deposit gasoline, oil or grease onto the pavement, and any areas damaged by such deposits shall be removed and replaced as directed by the Engineer.

b) While rolling is in progress, the surface shall be tested continuously and all discrepancies corrected to comply with the surface requirements.

c) All drippings, fat or lean areas and defective construction of any description shall be removed and replaced.

d) Depressions that develop before the completion of the rolling shall be remedied by loosening the mixture and adding new mixture to bring the depressions to a true surface.

e) Should any depression remain after the final compaction has been obtained, the full depth of the mixture shall be removed and replaced with sufficient new mixture to form a true and even surface.

f) All high spots, high joints and honeycomb shall be corrected as directed by the Engineer.

g) Any mixture remaining unbonded after rolling shall be removed and replaced.

h) Any mixture that becomes loose or broken, mixed or coated with dirt or in any way defective, prior to laying the wearing course shall be removed and replaced with fresh mixture that shall be immediately compacted to conform with the surrounding area.

3.20 JOINTS:

A. Transverse Joints:

1. Placing of the mixture shall be as continuous as possible and the roller shall not pass over the unprotected end of the freshly laid mixture except when the laying operation is to be discontinued long enough to permit the mixture to become chilled.

2. When the laying operation is thus interrupted, a transverse joint shall be constructed by cutting back on the previous run to expose the full depth of the mat.

B. Longitudinal Joints:

1. For all layers of pavement except the leveling course, placing of each layer shall be accomplished to cause longitudinal construction joints to be offset 6 to 12 inches laterally between successive layers.

2. The Engineer may waive this requirement where offsetting is not feasible due to the sequence of construction.

3.21 SURFACE REQUIREMENTS:

A. Contractor Responsibility:

1. The Contractor shall be responsible for obtaining a smooth surface on all pavement courses placed and therefore should straightedge all intermediate and final courses with a 15-foot rolling straightedge.

2. A 15-foot manual straightedge shall be furnished by the Contractor and shall be available at the job site at all times during the paving operation for checking joints and surface irregularities.

B. Texture of the Finished Surface of Paving Layers:

1. The finished surface shall be of uniform texture and compaction.

2. The surface shall have no pulled, torn, or loosened portions and shall be free of segregation, sand streaks, sand spots, or ripples.

3. Any area of the surface that does not meet the foregoing requirements shall be corrected.

4. Unless written permission is obtained, asphalt concrete mixtures containing aggregates which will cause a different color appearance shall not be used in the final wearing surface in sections less than one mile in length.

END OF SECTION 02510

SECTION 02512 - STABILIZING

DESCRIPTION:

The work specified in this Section consists of the stabilizing of designated portions of the roadbed to provide a firm and unyielding subgrade, having the required bearing value specified in the plans. When so called for in the plans this work shall also include the additional strengthening of the subbase, by additional stabilizing of the upper portion of the previously stabilized subgrade, within the limits called for. The work shall be constructed in accordance with these specifications and the lines, grades, thicknesses, and notes shown in the plans.

STABILIZED SUBGRADE:

For stabilized subgrade the type of materials, Commercial or Local, is at the Contractor's option. The stabilizing is designated as Type B, compliance with the bearing value requirements will be determined by the Limerock Bearing Ratio Method.

It is the Contractor's responsibility that the finished roadbed section meets the bearing value requirements, regardless of the quantity of stabilizing materials necessary to be added. Also, full payment will be made for any areas where the existing subgrade materials meet the design bearing value requirements without the addition of stabilizing additives, as well as areas where the Contractor may elect to place select high-bearing materials from other sources, within the limits of the stabilizing.

After the roadbed grading operations have been substantially completed, the Contractor shall make his own determination as to the quantity (if any) of stabilizing material, of the type selected by him, necessary for compliance with the bearing value requirements. The Contractor shall notify the Engineer of the approximate quantity to be added, and the spreading and mixing-in of such quantity of materials shall meet the approval of the Engineer as to uniformity and effectiveness.

MATERIALS:

1. **Commercial and Local Materials:** The particular type of stabilizing material to be used shall meet the requirements of Section 914 of FDOT Standard Specifications for Road and Bridge Construction.

2. **Use of Materials from Existing Base**: When the utilization of materials from an existing base is called for, (as all, or a portion, of the stabilizing additives) the Engineer will direct the locations, placing and distribution of such materials, and this work shall be done prior to the spreading of any additional commercial or local materials. Removal of any section of existing base will not be required until the need for it in maintaining traffic is fulfilled. No materials from an existing base will be eligible for payment as Commercial Materials.

   The utilization of materials from an existing base may be called for in combination with either of the designated types of stabilizing.

CONSTRUCTION METHOD:

1. **General:** Prior to the beginning of stabilizing operations, the area to be stabilized shall have been constructed to an elevation such that upon completion of stabilizing operations the completed stabilized subgrade will conform to the lines, grades and cross section shown in the plans. Prior to the spreading of any additive stabilizing material, the surface of the roadbed shall be brought to a plane approximately parallel to the plane of the proposed finished surface.

   The subgrade to be stabilized may be processed in one course, unless the equipment and methods being used do not provide the required uniformity, particle size limitation, compaction and other desired results, in which case, the Engineer will direct that the processing be done in more than one course.

2. **Application of Stabilizing Material:** When additive stabilizing materials are required, the designated quantity shall be spread uniformly over the area to be stabilized.

   When materials from an existing base are to be utilized in the stabilizing at a particular location, all of such materials shall be placed and spread prior to the addition of other stabilizing additives.

   Commercial stabilizing material shall be spread by the use of mechanical material spreaders except that where use of such equipment is not practicable other means of spreading may be used, but only upon written approval of the proposed alternate method.

3. **Mixing:** The mixing shall be done with rotary tillers, or other equipment meeting the approval of the Engineer. At the Contractor's election, the mixing of the materials may be accomplished in a plant of an approved type suitable for this work. The area to be stabilized shall be thoroughly mixed throughout the entire depth and width of the stabilizing limits.

   The mixing operations, as specified, (either in place or in a plant) will be required regardless of whether the existing soil, or any select soils placed within the limits of the stabilized sections, have the required bearing value without the addition of stabilizing materials.

   As an exception to the above mixing requirements, where the subgrade is of rock, the Engineer may direct that the mixing operations (and the work of stabilizing) be waived and no payment for stabilization will be made for such sections of the roadway.

4. **Maximum Particle Size of Mixed Materials:** At the completion of mixing, all particles of material within the limits of the area to be stabilized shall pass a 3 ½ inch ring. Any particles not meeting this requirement shall be removed from the stabilized area or shall be broken down so as to meet this requirement.

5. **Compaction:** Except where a stabilized subbase is also to be constructed after the mixing operations have been completed and requirements for bearing value, uniformity and particle size have been satisfied, the stabilized are shall be compacted, in accordance with Density Requirements of this section. The materials shall be compacted at a moisture content

permitting the specified compaction. If the moisture content of the material is improper for attaining the specified density, either water shall be added or the material shall be permitted to dry until the proper moisture content for the specified compaction is reached.

6. **Finish Grading:** The completed stabilized subgrade shall be shaped to conform with the finished lines, grades and cross section indicated in the plans. The subgrade shall be checked by the use of elevation stakes, or other means approved by the Engineer.

7. **Requirements for Condition of Completed Subgrade:** After the stabilizing and compacting operations have been completed the subgrade shall be firm and substantially unyielding, to the extent that it will support construction equipment and will have the bearing value required by the plans.

   All soft and yielding material, and any other portions of the subgrade which will not compact readily, shall be removed and replaced with suitable material and the whole subgrade brought to line and grade, with proper allowance for subsequent compaction.

8. **Maintenance of Completed Subgrade:** After the subgrade has been completed as specified above, the Contractor shall maintain it free from ruts, depressions and any damage resulting from the hauling or handling of materials, equipment, tools, etc. It shall be the Contractor's responsibility to maintain the required density until the subsequent base or pavement is in place. Such responsibility shall include nay repairs, replacement, etc., of curb and gutter, sidewalk, etc., which might become necessary in order to recompact the subgrade in the event of underwash or other damage occurring to the previously compacted subgrade. Any such work required for recompaction shall be at the Contractor's expense. Ditches and drains shall be constructed and maintained along the completed subgrade section.

BEARING VALUE REQUIREMENTS:

1. **General:** Bearing value samples will be obtained and tested at completion of satisfactory mixing of the stabilized area. For any area where the bearing value obtained is deficient from the value indicated in the plans, in excess of the tolerances established herein, additional stabilizing material shall be spread and mixed. This reprocessing shall be done for the full width of the roadway being stabilized and longitudinally for a distance of 50 feet beyond the limits of the area in which the bearing value is deficient.

   The Contractor shall make his own determination of the quantity of additional stabilizing material to be used in reprocessing.

2. **Tolerances in Bearing Value Requirements:** The following undertolerances from the specified bearing value, will be allowed as based on tests performed on samples obtained after mixing operations have been completed:

Specified Bearing Value	*Undertolerance*
LBR 40	5.0
LBR 35	4.0

LBR 30 (and under) 2.5
All Florida Bearing Values 5.0

DENSITY REQUIREMENTS:

1. **General:** Within the entire limits of the width and depth of the areas to be stabilized, the minimum density acceptable at any location will be 98 percent of the maximum density as determined by AASHTO T 180.

END OF SECTION 02512

SECTION 02518 - PAINTING TRAFFIC STRIPES

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work under this Section consists of painting reflectorized traffic stripes, including edge stripes and traffic guide.

PART 2 – MATERIALS

2.01 MATERIALS

A. Traffic Paint:

1. The paint used shall be reflective, fast dry traffic paint as specified in 971-13 of Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction, latest edition.

B. Glass Spheres (for Reflective Traffic Paint):

1. Glass spheres shall conform with the requirements of 971-14 of FDOT Standard Specifications for Road and Bridge Construction, latest edition.

2.02 EQUIPMENT

A. General:

1. All equipment shall be of a type and design which will readily obtain the required uniformity of application of the stripes, both as to thickness of coating and as to alignment.

B. Traveling Unit:

1. The traveling unit shall be capable of traveling at a uniform, predetermined rate of speed, both uphill and downhill, in order to produce a uniform application of paint.

C. Paint Sprayer and Tank:

1. The paint machine shall be of the spray type and shall be capable of spraying the paint to the required spread without thinning of the paint.

2. The paint tank shall be equipped with a mechanical agitator.

3. The nozzles shall have cut-off valves which will automatically apply broken or skip lines.

4. The nozzles shall be equipped with a mechanical bead dispenser that will simultaneously operate with the spray nozzle and distribute the beads in a uniform pattern at the rate specified.

5. Each nozzle shall also be provided with suitable line guides, either metallic shrouds or air blasts.

D. Corrective Devices:

1. Misalignment, defective surfaces, etc. shall be corrected by sand blasting or by any other type of mechanical device which, in the opinion of the ENGINEER, will effectively remove the paint without damage to the pavement surface.

2.03 ALIGNMENT FOR STRIPES

A. Tack points will be established at appropriate intervals for use in aligning stripes, and if found to be necessary to achieve accuracy a stringline will be set from such points.

2.04 TOLERANCES IN DIMENSIONS AND IN ALIGNMENT

A. Dimensions:

1. Longitudinal Lines:

a. No stripe shall be less than the specified width.

b. No stripe shall exceed the specified width by more than 2 inch.

c. The length of the ten-foot painted segment for skip stripe, and the 30-foot gap between segments, may each vary plus or minus one foot, except that over-tolerance and under-tolerance lengths shall approximately compensate.

2. Transverse Markings, Gore Markings, Arrows, and Messages:

a. When the specified width of the markings cannot be made with a single pass and multiple passes are required, the width of the line may vary by plus or minus 1 inch.

3. Alignment:

a. On tangents, and on curves up to one degree, the alignment of the painted strip shall not deviate from the stringline by more than 1 inch.

b. On curves exceeding one degree the maximum permissible deviation will be 2 inches.

c. In addition, the outer edge of the edge stripe shall fall uniformly at not less than 2 or more than 4 inches from the edge of the pavement, and shall have no noticeable breaks or deviations in alignment or width.

B. Correction Rates:

1. Any corrections of variations in the width or in the alignment of the stripes shall not be made abruptly but the stripes shall be returned to the design width at the rate of at least 10 feet for each 2-inch correction, and returned to the stringline at the rate of at least 25 lineal feet per inch of correction.

PART 3 - EXECUTION

3.01 APPLICATION OF PAINT AND SPHERES

A. Time of Application:

1. Painting shall be done only during daylight hours and, as far as practicable, shall be terminated in time to permit sufficient drying by sunset.

2. Placing of permanent pavement markings on all final asphaltic concrete surfaces shall not be accomplished prior to 30 calendar days after placement of the final surfaces.

3. Temporary pavement striping will be required during the 30 day period if the road is open to traffic.

B. Weather Limitations:

1. No paint shall be applied when any moisture is present on the surface to be painted or when the air temperature is below 40EF.

2. Painting shall not be done when winds are sufficient to cause spray dust.

C. Preparation of Surface to be Painted:

1. The surface which is to be painted shall be cleaned, by compressed air or other effective means, immediately before the start of painting, and shall be clean and dry when the paint is applied.

2. Any vegetation or loose soil shall be removed from the pavement before edge striping is begun.

D. Mixing Paint:

1. The paint shall be thoroughly mixed before it is poured into the painting machine and no thinning of the paint in the machine will be allowed at any time.

2. Before the start of each day's work the paint container, the connections, and the spray nozzles on the machine shall be thoroughly cleaned with paint thinner or other suitable cleaner.

E. Paint Application:

1. The traffic stripe shall be of the specified width, with clean, true edges and without sharp breaks in the alignment.

2. A uniform coating of paint shall be obtained and the finished stripe shall contain no light spots or paint skips.

3. Any stripes which do not have a uniform, satisfactory appearance, both day and night, shall be corrected.

F. Broken Stripes:

1. Broken (skip) stripes shall consist of a succession of solid white stripes, 10 feet in length, separated by unpainted spaces 30 feet in length.

NOTE:
All pavement markings other than standard pavement markings, such as parking stripes, shall be as specified in plans.

G. Rate of Paint Application: The minimum rate of application for paint shall be as follows:

1. Four-inch solid traffic stripe: 16.5 gallons per mile.

2. Four-inch skip traffic stripe: 4.12 gallons per gross mile.

3. Any other width stripe: a direct proportion of the above.

H. Required Film Thickness:

1. The minimum wet film thickness for all painted areas shall be 15 mils.

I. Alignment of Stripes:

1. Where a stripe deviates from the correct alignment, as indicated by the stringline, by more than 1 inch in any 50-foot length, it shall be obliterated

and the stripe corrected as specified in 710-3.4 of FDOT Standard Specifications.

J. Application of Spheres:

1. The glass spheres shall be applied uniformly and at not less than six pound nor more than 63 pounds of spheres to each gallon of paint.

2. The spheres shall be applied immediately following the paint application.

3.02 PROTECTION OF NEWLY PAINTED STRIPED AND OF TRAFFIC

A. Protection of Stripes:

1. All newly painted stripes, including edge stripes, shall be protected until the paint is sufficiently dry to permit vehicles to cross the stripe without damage from the tires.

2. While the center line stripes are being painted all traffic shall be routed to the right side of the painting operations and the new painted stripe.

3. When necessary, a pilot car shall be used to protect the painting operations from traffic interference.

B. Protection of Traffic:

1. Warning signs shall be set up before the beginning of each operation and extra signs shall be kept well ahead of the painting equipment.

2. The painting equipment shall be so operated that traffic may pass on the right side safely.

3. Warning signs are to be placed only where operations are in progress and are to be relocated as often as is necessary.

C. Protective Devices:

1. The CONTRACTOR shall erect adequate warning signs, provide a sufficient number of flagmen, and take all necessary precautions for the protection of the wet paint number of flagmen, and take all necessary precautions for the protection of the wet paint and the safety of the public.

2. Cones, rubber "Z" guards or similar protective devices shall be placed along the newly painted stripe to prevent traffic from crossing the wet paint.

3. Any such devices used shall be of a type that will not cause damage to vehicular traffic in the event that these objects are accidentally passed over.

4. All protective devices shall be removed not later than sunset to allow free movement of traffic at night.

5. If the CONTRACTOR elects to use fast dry traffic paint no protective devices will be required provided that the CONTRACTOR utilizes a trailing vehicle (behind striping machine) equipped with warning sign and flashing beacon and that he operates such vehicle in a manner consistent with the paint drying time.

D. Repair of Damaged Areas:

1. Any portions of the stripes damaged by passing traffic or from any other cause shall be repainted at the CONTRACTOR's expense.

3.03 CORRECTIVE MEASURES

A. All painted stripes which fail to meet the specifications, including the permissible tolerances and the appearance requirements, or are marred or damaged by traffic or from other causes, shall be corrected at the CONTRACTOR's expense.

B. All drip and spattered paint shall be removed to the satisfaction of the ENGINEER.

C. Whenever it is necessary to remove paint it shall be done by means, as approved by the ENGINEER, which will not damage the underlying surface of the pavement.

D. When necessary to correct a deviation which exceeds the permissible tolerance in alignment, that portion of the stripe affected shall be removed and repainted in accordance with these specifications.

3.04 ACCEPTANCE OF THE WORK

A. When the work under this Section has been completed to the satisfaction of the ENGINEER, including any corrections or repairs ordered by the ENGINEER, acceptance of the work painting will be made, independently of the remaining work under the Contract, and the contractor will be relieved of all maintenance of the painting except for damage due to his operations.

END OF SECTION 02518

SECTION 02520 - ASPHALT TESTING

Test results for testing asphalt densities, thickness and mix design shall be as specified by the Florida Department of Transportation Handbook for Road and Bridge Construction (latest edition).

PART 1 - GENERAL

1.01 TESTING AND ACCEPTANCE:

A. All roads over 1,000 feet will require coring for in-place density and asphalt thickness.

B. The cores will be cut at 1,000-foot intervals.

C. All expenses for these tests are to be paid by the CONTRACTOR.

D. All test results are to be turned in to ENGINEER before final 25% payment for road will be made.

E. Payment will be based on the following table, with target density being 96% of mix design lab density.

PAYMENT SCHEDULE FOR DENSITY CORES (Based on Average Density for Each Road)	
PERCENT OF TARGET DENSITY	**PERCENT OF PAY**
98.0 and above	100
97.0 to less than 98.0	95
96.0 to less than 97.0	90
Less than 96.0*	75

F. If ENGINEER deems asphalt is acceptable to remain in place, otherwise ENGINEER may require removal and replacement of asphalt.

1.02 THICKNESS:

A. Allowable Deficiencies:

1. The thickness shall be determined from the length of the core borings.

2. The maximum allowable deficiency from the specified thickness shall be ¼ inch.

B. Pavement Exceeding Allowable Deficiency in Thickness:

1. When Deficiency is Seriously in Excess:

a. Where the deficiency in thickness is in excess of _ inch, for pavement of less than 2½ inches in specified thickness the CONTRACTOR shall correct the deficiency either by replacing the full thickness for a length extending at least 50 feet from each end of the deficient area, or (when permitted by the ENGINEER) by overlaying as directed by the ENGINEER.

b. The CONTRACTOR will receive no compensation for any pavement removed, or for the work of removing such pavement.

2. When Deficiency is Not Seriously in Excess:

a. When the deficiency in the thickness of the pavement is over ¼ inch but not more than _ inch, for pavement of specified thickness less than 2½ inches the CONTRACTOR will be allowed to leave such pavement in place, but without compensation.

b. The areas of such pavement for which no square yard payment will be made shall be the product of the total distance between acceptable cores, multiplied by the width of the lane which was laid at the particular pass in which deficient thickness was indicated.

c. All costs of the overlaying and compacting shall be borne by the CONTRACTOR.

3. Correcting Deficiency by Adding New Surface Material:

a. For any case of excess deficiency of the pavement, the CONTRACTOR will be permitted, if approved by the ENGINEER for each particular location, to correct the deficient thickness by adding new surface material and compacting to the same density as the adjacent surface.

b. The area to be corrected and the thickness of new material added shall be as specified by ENGINEER.

c. All costs of the overlaying and compacting shall be borne by the CONTRACTOR.

1.03 MIX DESIGN:

A. An FDOT approved mix design will be provided to the ENGINEER or representative prior to beginning construction, and will not change without written consent of the ENGINEER prior to any change.

1.04 TRUCK TICKETS:

A. The CONTRACTOR will provide truck tickets to the ENGINEER or representative on a regular basis or as requested by the ENGINEER.

1.05 DAILY ASPHALT PLANT TESTING:

A. A minimum of one extraction, gradation to be done daily, as well as test performed for stability and flow to be done on each day's production of 100 tons or more. The results of these tests are to be provided to the engineer on a weekly basis.

STRICT COMPLIANCE OF THIS SECTION WILL BE ADHERED TO

END OF SECTION 02520

SECTION 02960 - RESTORATION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work includes the restoration of driveways, lawn areas, trees and plants, roadways, sprinkler systems, walks and any other existing improvement affected by the proposed work.

B. This section includes furnishing equipment, labor and materials, and performing all necessary and incidental operations to perform the required work.

PART 2 – PRODUCTS

2.01 SOD

A. Any slope equal to or steeper than 1 vertical to 3 horizontal shall be sodded and the sod shall be pinned down for stabilization.

B. The CONTRACTOR shall, at his expense, maintain the sodded areas in a satisfactory condition until final acceptance of the project. Such maintenance shall include watering, re-staking sod, filling, leveling and repairing of any washed or eroded areas, as may be necessary.

2.02 PLANTS AND TREES

A. Existing damaged plants and tress shall be replaced by plants and trees of equal type, quality and size whenever possible. All new plants and trees shall be sound, healthy, vigorous and free from defects, decay, disfiguring, bark abrasions, plant diseases, insect pests, their eggs or larvae. The new plants shall be approved by the ENGINEER before placing.

B. Existing plants may be removed, preserved, and replaced at the CONTRACTORs option. Plants shall be handled by an approved nursery.

C. Plants shall be watered and cared for until new growth appears. Dead and dying plants shall be immediately replaced. Plants used shall be in accordance with the standards for Florida No. 1 or better as given in Grades and Standards for Nursery Plants Part 1.

D. Plants shall conform to the sizes indicated by the OWNER.

E. Trees shall be guaranteed for one year. If the replaced tree dies within one year of project completion it shall be replaced by the CONTRACTOR at no expense to the City.

2.03 MULCH

A. Match existing mulch.

2.04 WATER

A. The water used in the performance of this Contract shall be of drinking water quality, clean and free from injurious amounts of oil, acid, alkali, or organic matter. The CONTRACTOR shall purchase all testing water from the County.

2.05 PLANTING MIXTURE:

A. The 18 inch planting mixture, when required, shall consist of a thorough mixture of 40% peat and 60% sand. The peat shall be Florihome peat or equivalent and the sand shall be clean and free from debris of any kind.

2.06 FERTILIZER

A. Fertilizer shall be pelletized 13-13-13, or approved equal.

PART 3 - EXECUTION

3.01 LANDSCAPING RESTORATION

A. Lawn Areas: Any lawn area affected by the required work shall be restored to a condition equal or better than the conditions existing before the commencement of work.

B. Balled Plants: Plants where required shall be adequately balled with firm natural balls of soil, sized as set forth in "Horticultural Standards." Balls shall be firmly wrapped with burlap or equally approved strong cloth. No balled plant will be planted if the ball is cracked or broken before or during the process of planting.

C. Preparation of Plant Pits: All plant pits shall be circular in outline and have vertical sides. Tree pits shall be two feet wider than the width of the ball and one foot deeper than the depth of the ball. Shrubs that are either B&B or 3 gallons + shall have pits that are two feet wider than the width of the plant ball and 6 inches deeper than the depth of the ball. Smaller shrubs shall have pits that are at least one foot wider than the width of the plant ball and 6 inches deeper than the ball depth.

D. Setting Plants: All plants except as otherwise specified, shall be centered in pits. Deep planting shall be avoided and unless otherwise specified, plants shall be set at such a level that after settlement they will bear the same relation to the required grade as they have to the natural grade before being transplanted.

E. Balled and burlapped plants and palm trees shall be placed on 6 inches to 12 inches of tamped planting mixture and adjusted so as to be at the proper level.

The rope and burlap shall be cut away and the burlap folded down to the bottom of the pit. Very large B&B plants shall remain wrapped until fully backfilled and then just the upper portion of the burlap shall be removed. Backfill of planting mix shall be placed halfway up the pit and then water tamped. After this water has drained away, backfill around the ball to grade and water tamp again. Finally, form a ridge of soil around the edge of the pit to form a saucer and full area three times with water.

F. Water: Water to be used initially during plant installation shall be furnished by the CONTRACTOR. The existing irrigation system, where damaged, shall be promptly repaired after the installation of the plants.

G. Options as to Methods: Any plant may be furnished container grown instead of balled if all other requirements are met.

H. Immediately before sod is placed, 8-8-8 fertilizer shall be applied at the rate of approximately 500 pounds per acre, by broadcasting and raking into the planting area.

I. Sod shall be firmly embedded by light tamping. Wherever necessary to prevent an erosion condition caused by vertical edges at the outer limits of the sodded area, the sod shall be tamped so as to produce a featheredge at the outer limits. The sod shall be kept in a moist condition after it is planted. Water shall not be applied between the hours of 8 A.M., and 4 P.M., nor when there is danger of freezing.

J. The CONTRACTOR shall, at his expense, maintain the planted areas in a satisfactory condition until final acceptance of the project. Such maintenance shall include watering, filling, leveling and repairing of any washed or eroded areas, as may be necessary.

3.02 PAVEMENT REPLACEMENT

A. Asphalt pavement shall be removed by saw cutting on a straight line with edges as vertical as possible. Concrete pavement or asphalt surfaced concrete shall be removed by cutting with a concrete saw in as straight a line and vertically as possible.

B. Non-asphalt pavement replacement shall be replaced of like material and thickness. Asphalt or built-up asphalt pavement replacement shall be replaced with like material or concrete as directed by the ENGINEER.

1. Where asphalt or built-up asphalt pavement is replaced by concrete, the concrete shall have a minimum of 6 inches in thickness and be reinforced with 6 by 6 No. 6 gage welded wire fabric. Where the pavement replacement is of like material, it shall be replaced in thickness equal to or better than that existing at the time of removal.

C. Road cuts across City or County roads shall not be cut.

D. Unless the base is sealed or other temporary paving applied over driveway areas to be repaved, pavement shall be replaced not later than three weeks after completion of backfill.

3.03 CURB REMOVAL AND REPLACEMENT

A. Curb removal and replacement required in the construction of this work shall be done by the CONTRACTOR. Reasonable care shall be exercised in removing the curb, and the CONTRACTOR shall either stockpile or dispose of this material as directed by the ENGINEER. Curb shall be replaced of like material in a manner and condition equal to or better than that existing at the time of removal. Materials and methods of replacing State Highway sidewalks or curbs shall conform to the Department of Transportation specifications.

3.04 TESTS

A. The CONTRACTOR shall furnish facilities for making all density tests and make such restorations as may be necessary due to test operations. All density tests on backfill or base replacement will be made by a commercial testing laboratory employed by the CONTRACTOR at such locations as may be recommended by the ENGINEER. If the densities as determined by the specified tests fall below the required minimums, the CONTRACTOR shall pay for all retests.

END OF SECTION 02960

SECTION 03310 - CONCRETE WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Extent of concrete work is shown on Drawings.

1.03 SUBMITTALS

A. Product Data:

1. Submit data proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by ENGINEER.

B. Shop Drawings, Reinforcement:

1. Submit original shop drawings for fabrication, bending, and placement of concrete reinforcement.

2. Comply with American Concrete Institute (ACI) 315 “Manual of Standard Practice for Detailing Reinforced Concrete Structures” showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement.

3. Include special reinforcement required for openings through concrete structures.

C. The ENGINEER’s review is for general engineering applications and features only. Design of formwork for structural stability and efficiency is the CONTRACTOR’s responsibility.

D. Laboratory Test Reports:

1. Submit laboratory test reports for concrete materials and mix design test.

1.04 QUALITY ASSURANCE

A. Codes and Standards:

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

a) ACI 301 “Specifications for Structural Concrete for Buildings.”

b) ACI 318 “Building Code Requirements for Reinforced Concrete.”

c) Concrete Reinforcing Steel Institute (CRSI) “Manual of Standard Practice.”

B. Concrete Testing Services:

1. A testing laboratory shall be engaged that is acceptable to the ENGINEER to perform material evaluation tests and to design concrete mixes.

2. Materials and installed work may require testing and retesting at anytime during progress of work.

3. Tests, including retesting of rejected materials for installed work, shall be done at the CONTRACTOR’s expense.

1.05 PROJECT CONDITIONS

A. Protect Footings Against Freezing:

1. Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against the possibility of freezing.

2. Maintain cover for time period as necessary.

B. Protect adjacent finish materials against spatter during concrete placement.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Forms for Exposed Finish Concrete:

1. Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces.

2. Furnish in largest practicable sizes to minimize number of joints.

B. 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.

C. Forms for Unexposed Finish Concrete:

1. Plywood, lumber, metal, or other acceptable material.

2. Provide lumber dressed on at least two edges and one side for tight fit.

D. Form Coatings:

1. Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

E. Form Ties:

1. Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal.

2. Provide units which will leave no metal closer than 1 ½ inches to surface.

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

2.02 REINFORCING MATERIALS

A. Reinforcing Bars:

1. American Society of Testing and Materials (ASTM) A 615

2. Grade 60.

3. Deformed.

B. Steel Wire:

1. ASTM A 82

2. Plain.

3. Cold-drawn steel.

C. Welded Wire Fabric:

1. ASTM A 185.

2. Welded steel wire fabric.

D. Welded Deformed Steel Wire Fabric:

1. ASTM A 497.

E. Supports for Reinforcement:

1. Use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place.

2. Use wire bar type supports complying with CRSI specifications.

F. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

G. Fiber Mesh Reinforcement

1. ASTM C1116/C 1116M.

2.03 CONCRETE MATERIALS

A. Portland Concrete:

1. ASTM C 150, Type I.

2. Use one brand of cement throughout project, unless otherwise acceptable to the ENGINEER.

B. Normal Weight Aggregates:

1. ASTM C 33, and as herein specified.

2. Provide aggregates from a single source for exposed concrete.

3. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.

C. Water:

1. Drinkable.

2.04 RELATED MATERIALS

A. Polyvinyl Chloride (PVC) Waterstops:

1. Corps of Engineers CRD-C 572.

2. Manufacturer: Subject to compliance with requirements, provide products of one of the following or equal:

    a. AFCO Products.

    b. The Burke Co.

    c. Edoco Technical Products.

    d. Greenstreet Plastic Products.

    e. Harbour Town Products.

    f. W. R. Meadows.

    g. Progress Unlimited.

    h. Schleigel Corp.

    i. Vinylex Corp.

B. Granular Base:

1. Use evenly graded mixture of fine and coarse aggregates to provide, when compacted, a smooth and even surface below slabs on grade.

C. Vapor Retarder:

1. Provide vapor retarder cover over prepared base material where indicated below slabs on grade.

2. Use only materials which are resistant to decay when tested in accordance with ASTM E 154, as follows:

    a. Polyethylene sheet not less than 8 mils thick.

    b. Non-Shrink Grout: CRD-C 621, factory pre-mixed grout.

3. Products: Subject to compliance with requirements, provide one of the following or equal:

    a. Metallic:

        1) “Vibrofoil,” A. C. Horn, Inc.

        2) “Metallic Spec. Grout,” The Burke Co.

3) "Embeco 636," Master Builders.

4) "Ferrolith GDS," Sonneborn-Rexnord.

5) "Hi-Mod Grout," Euclid Chemical Co.

6) "Kemox G," Sika Chemical Co.

7) "Ferrogrout," L & M Const. Chemical Co.

8) "Supreme Plus," Gifford-Hill/American Admixtures.

b. Non-Metallic:

1) "Set Grout," Master Builders.

2) "Sonogrout," Sonneborn-Rexnord.

3) "Euco-NS," Euclid Chemical Co.

4) "Supreme," Gifford-Hill/American Admixtures.

5) "Crystex," L &M Const. Chemical Co.

6) "Sure-Grip Grout," Dayton Superior Corp.

7) "Horngrout," A. C. Horn, Inc.

8) "Five Star Grout," U. S. Grout Corp.

D. Liquid Membrane-Forming Curing Compound:

1. Liquid type membrane-forming curing compound complying with ASTM C 309, Type I, Class A.

2. Moisture loss not more than 0.055 grams per square centimeter (gr./sq. cm.) when applied at 200 square feet per gallon (sq. ft./gal).

3. Products: Subject to compliance with requirements, provide one of the following or equal:

a. "Masterseal," Master Builders.

b. "A-H 3 Way Sealer," Anti-Hydro Waterproofing Co.

c. "Ecocure," Euclid Chemical Co.

d. "Clear Seal," A. C. Horn, Inc.

e. "Sealco 309," Gifford-Hill/American Admixtures.

f. "J-20 Acrylic Cure," Dayton Superior.

g. "Spartan-Cote," The Burke Co.

h. "Sealkure," Toch Div. – Carboline.

i. "Kure-N-Seal," Sonneborn-Rexnord.

j. "Polyclear," Upco Chemical/USM Corp.

k. "L & M Cure," L & M Construction Chemicals.

l. "Klearseal," Setcon Industries.

m. "LR-152," Protex Industries.

n. "Hardtop," Gifford-Hill.

2.05 PROPORTIONING AND DESIGN OF MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If a trial batch method is used, use an independent testing facility acceptable to the ENGINEER for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.

B. Submit written reports to Structural Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by the ENGINEER.

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

1. 4,000 pounds per square inch (psi) 28-day compressive strength; W/C ratio, 0.44 maximum (non-air-entrained).

2. 3,000 psi 28-day compressive strength; W/C ratio, 0.58 maximum (non-air-entrained).

3. 2,500 psi 28-day compressive strength; W/C ratio, 0.67 maximum (non-air-entrained).

D. Lightweight Concrete:

1. Proportion mix as herein specified.

2. Design mix to produce strength and modulus of elasticity as noted on Drawings, with a split-cylinder strength factor (Fct) of not less than 5.5 for 3,000 psi concrete and a dry weight of not less than 95 pounds (lbs) or more than 110 lbs. after 28 days.

3. Limit shrinkage to 0.03 percent at 28 days.

E. Adjustment to Concrete Mixes:

1. Mix design adjustments may be requested by the CONTRACTOR when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to the OWNER and as accepted by the ENGINEER.

2. Submit laboratory test data for revised mix design and strength results to the ENGINEER for acceptance before using in work.

F. 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 1½ percent within the following limits:

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

1. Ramps, slabs, 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 HRWR admixture (super-plasticizer): Not more than 8 inches after addition of HRWR to site-verified 2 to 3 inches slump concrete.

4. Other concrete: Not less than 1 inch and not more than 4 inches.

2.06 CONCRETE MIXING

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

B. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.

PART 3 - EXECUTION

3.01 GENERAL

A. Coordinate the installation of joint materials and vapor retarders with placement of forms and reinforcing steel.

3.02 FORM

A. Design, erect, support, brace, and maintain formwork to support vertical and lateral, static, and dynamic loads that might be applied until such loads can be supported by concrete structure.

B. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position.

C. Maintain formwork construction tolerances complying with ACI 347.

D. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.

E. Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades, level, and plumb work in finished structures.

F. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required for this Work.

G. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

H. Fabricate forms for easy removal without hammering or prying against concrete surfaces.

I. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.

J. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only.

K. Provide Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

L. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete.

1. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar.

2. Locate temporary openings on forms at inconspicuous locations.

M. 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.

N. Provisions for Other Trades:

1. Provide openings in concrete formwork to accommodate work of other trades.

2. Determine size and location of openings, recesses, and chases from trades providing such items.

3. Accurately place and securely support items built into forms.

4. Other trades shall provide location and size of openings. The forms for such openings shall be constructed and set in place under this section.

O. Cleaning and Tightening:

1. Thoroughly clean forms and adjacent surfaces to receive concrete.

2. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed.

3. Retighten forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.

3.03 VAPOR RETARDER INSTALLATION

A. Place vapor retarder sheeting with longest dimension parallel with direction of pour following the completion of leveling and tamping of granular base for slabs on grade.

B. Lap joints 6 inches and seal with appropriate tape.

3.04 PLACING REINFORCEMENT

A. Comply with CRSI's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports, and as herein specified.

B. Avoid cutting or puncturing vapor retarder during reinforcement placement and concreting operations.

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

D. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations.

E. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

F. Place reinforcement to obtain at least minimum coverages for concrete protection.

1. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations.

2. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

G. Install welded wire fabric in as long lengths as practicable.

1. Lap adjoining pieces at least one full mesh and lace splices with wire.

2. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.05 JOINTS

A. Construction Joints:

1. Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to the ENGINEER.

2. Place construction joints perpendicular to main reinforcement.

3. Continue reinforcement across construction joints, except as otherwise indicated.

B. Waterstops:

1. Provide waterstops in construction joints as indicated.

2. Install waterstops to form continuous diaphragm in each joint.

3. Make provisions to support and protect exposed waterstops during progress of work.

4. Fabricate field joints in waterstops in accordance with Manufacturer's printed instructions.

C. Isolation Joints in Slabs-on-Ground:

1. Construct isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.

3.06 INSTALLATION OF EMBEDDED ITEMS

A. General:

1. Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete.

2. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.

3.07 PREPARATION OF FORM SURFACES

A. Clean re-used forms of concrete matrix residue, repair and patch as required returning forms to acceptable surface condition.

B. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

C. Thin form-coating compounds only with thinning agent of type, amount, and under conditions of form-coating compound Manufacturer’s directions.

D. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed.

E. Apply in compliance with Manufacturer’s instructions.

3.08 CONCRETE PLACEMENT

A. Pre-Placement Inspection:

1. Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in.

2. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work.

3. Moisten wood forms immediately before placing concrete where form coatings are not used.

4. Apply temporary protective covering to lower 2 feet of finished walls adjacent to poured floor slabs and similar conditions, and guard against spattering during placement.

B. General:

1. Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," and as herein specified.

2. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has sufficiently hardened to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

3. Placing Concrete in Forms:

a Deposit concrete in forms in horizontal layers not deeper than 24 inches and in a manner to avoid inclined construction joints.

b Where placement consists of several layers, place each layer while the preceding layer is still plastic to avoid cold joints.

c Consolidation of Concrete:

1) Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping.

2) Use equipment and procedures for consolidation of concrete in accordance with ACI 309.

3) Do not use vibrators to transport concrete inside forms.

4) Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine.

5) Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer.

6) 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 segregation of mix.

4. Placing Concrete Slabs:

   a Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

   b Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

   c Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface; free of humps or hollows.

   d Do not disturb slab surfaces prior to commencement of finishing operations.

   e Maintain reinforcing in proper position during concrete placement operations.

5. Cold Weather Placing:

   a Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

   b When air temperature has fallen to or is expected to fall below 40 degrees Fahrenheit (F)/4 degrees Celcius (C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F (10 degrees C), and not more than 80 Degrees F (27 degrees C) at point of placement.

   c Do not use frozen materials or materials containing ice or snow.

   d Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

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

6. Hot Weather Placing:

   a When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

b Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F (32 degrees C).

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.

d Use of liquid nitrogen to cool concrete is the CONTRACTOR's option.

e Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the temperature of the steel does not exceed the ambient air temperature immediately before embedment in concrete.

f Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.

g Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

3.09 FINISH OF FORMED SURFACES

A. Rough Form Finish:

1. For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated.

2. 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 Form Finish:

1. For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material directly applied to the concrete, or a covering material directly applied to the concrete, such as waterproofing, dampproofing, veneer plaster, painting, or other similar system.

2. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams.

3. Repair and patch defective areas with fins or other projections completely removed and smoothed.

C. Grout Cleaned Finish:

1. Provide grout cleaned finish to scheduled concrete surfaces which have received smooth form finish treatment.

2. Combine one part Portland cement to 1½ parts fine sand by volume, and mix with water to consistency of thick paint.

3. Use proprietary additives at the CONTRACTOR's option.

4. Blend standard Portland cement and white Portland cement (amounts determined by trial patches) so that final color of dry grout will match adjacent surfaces.

5. Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes.

6. Remove excess grout by scraping and rubbing with clean burlap.

7. Keep damp by fog spray for at least 36 hours after rubbing.

D. Related Unformed Surfaces:

1. Strike-off smooth tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces and finish with a texture matching adjacent formed surfaces.

2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 MONOLITHIC SLAB FINISHES

A. ASTM E 1155, "Standard Test Method for Determining Floor Flatness and Levelness Using the "F Number System (inch-pound-units)," shall be used for these finishes as follows:

1. Scratch Finish:

a. Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, Portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.

b. After placing slabs, plane surface to tolerances for floor flatness (FF) of 15 and floor levelness (FL) of 13.

c. Slope surfaces uniformly to drain where required.

d. After leveling, roughen surface before final set, with stiff brushes, brooms, or rakes.

2. Float Finish:

a. Apply float finish to monolithic slab surface to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.

b. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating.

c. Begin floating when surface water has disappeared or when concrete has sufficiently stiffened to permit operation of power-driven floats, or both.

d. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units.

e. Check and level surface plane to tolerances of FF 18 - FL 15.

f. Cut down high spots and fill low spots.

g. Uniformly slope surfaces to drains.

h. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

3. Trowel Finish:

a. Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.

b. After floating, begin first trowel finish operation using a power-driven trowel.

c. Begin final troweling when surface produces a ringing sound as trowel is moved over surface.

d. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances of FF 20 - FL 17.

e. Grind smooth surface defects which would telegraph through applied floor covering system.

4. Trowel and Fine Broom Finish:

a. Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.

5. Non-Slip Broom Finish:

a. Apply non-slip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

b. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route.

c. Coordinate required final finish with the ENGINEER before application.

3.11 CONCRETE CURING AND PROTECTION

A. General:

1. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

2. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing.

3. Continuously keep concrete moist for not less than 7 days, weather permitting.

4. Begin final curing procedures immediately following initial curing and before concrete has dried.

5. Continue final curing for at least 7 days in accordance with ACI 301 procedures.

6. Avoid rapid drying at end of final curing period.

B. Curing Methods:

1. Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.

2. Provide moisture curing by the following methods:

   a. Keep concrete surface continuously wet by covering with water.

   b. Continuous water-fog spray.

   c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and continuously keeping wet.

   d. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-inch lap over adjacent absorptive covers.

3. Provide moisture-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 of adhesive.

   b. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

4. Provide curing slabs and sealing compounds to exposed interior slabs and to exterior slabs, walks, and curbs, as follows:

   a. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours).

   b. Uniformly apply in continuous operation by power-spray or roller in accordance with Manufacturer's directions.

   c. Recoat areas subjected to heavy rainfall within 3 hours after initial application.

   d. Maintain continuity of coating and repair damage during curing period.

5. Do not use membrane curing compounds on surfaces that are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile and glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to the ENGINEER.

6. Curing Formed Surfaces:

   a. Cure formed concrete surfaces, including undersides of beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed.

b. If forms are removed, continue curing by methods specified above, as applicable.

7. Curing Unformed Surfaces:

a. Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.

b. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

8. Sealer and Dustproofer:

a. Apply a second coat of specified curing and sealing compound only to surfaces given a first coat.

3.12 SHORES AND SUPPORTS

A. Remove shoring from ground to roof for structures four stories or less, unless otherwise permitted.

B. Remove shores and re-shore in a planned sequence to avoid damage to partially cured concrete.

C. Locate and provide adequate re-shoring to safely support work without excessive stress or deflection.

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

3.13 REMOVAL OF FORMS

A. 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 no less than 50 degrees F (10 degrees 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. 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.

3.14 RE-USE OF FORMS

A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces.

B. Apply new form coating compound as specified for new formwork.

C. Thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints when forms are extended for successive concrete placement.

D. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to the ENGINEER.

3.15 MISCELLANEOUS CONCRETE ITEMS

A. Filling-In:

1. 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.

2. Mix, place, and cure concrete as herein specified, to blend with in-place construction.

3. Provide other miscellaneous concrete filling shown or required to complete work.

B. Curbs:

1. Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Provide machine and equipment bases and foundations, as shown on Drawings.

2. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of Manufacturer furnishing machines and equipment.

3. Grout base plates and foundations as indicated, using specified non-shrink grout.

4. Use non-metallic grout for exposed conditions, unless otherwise indicated.

D. Reinforced Masonry:

1. Provide concrete grout for reinforced masonry lintels and bond beams where indicated on Drawings and as scheduled, including filling of concrete modular unit cavities where called for on plans.

2. Maintain accurate location of reinforcing steel during concrete placement.

3.16 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas:

1. Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to the ENGINEER.

2. Cut out honeycomb, 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 of less than 1 inch.

3. Make edges of cuts perpendicular to the concrete surface.

4. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent.

5. Place patching mortar after bonding compound has dried.

B. Repair of Formed Surfaces:

1. Remove and replace concrete having defective surfaces if defects cannot be repaired to the satisfaction of the ENGINEER. Surface defects, as such, include:

a. Color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets.

b. Fins and other projections on surface.

c. Stains and other discolorations that cannot be removed by cleaning.

2. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.

3. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

C. Repair of Unformed Surfaces:

1. Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish.

2. Correct low and high areas as herein specified.

3. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.

D. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing cracks in excess of 0.01 inch wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

1. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

2. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete.

3. Finish repaired areas to blend into adjacent concrete.

4. Proprietary patching compounds may be used when acceptable to the ENGINEER.

E. Repair Defective Areas:

1. Cut out and replace with fresh concrete except random cracks and single holes not exceeding 1 inch in diameter.

2. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least ¾-inch clearance all around.

3. Dampen concrete surfaces in contact with patching concrete and apply bonding compound.

4. Mix patching concrete of same materials to provide concrete of same type or class as original concrete.

5. Place, compact, and finish to blend with adjacent finished concrete.

6. Cure in same manner as adjacent concrete.

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

G. Use repair methods not specified above, subject to acceptance of the ENGINEER.

3.17 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. The OWNER may employ a testing laboratory to perform tests and to submit test reports.

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

1. Sampling Fresh Concrete:

a. ASTM C 172, except modified for slump to comply with ASTM C 94.

2. Slump:

a. ASTM C 143, one test at point of discharge for each day's pour of each type of concrete and additional tests when concrete consistency seems to have changed.

3. Concrete Temperature:

a. Test hourly when air temperature is 40 degrees F (4 degrees C) and below, and when 80 degrees F (27 degrees C) and above, and each time a set of compression test specimens are made.

4. Compression Test Specimen:

a. ASTM C 31, one set of four standard cylinders for each compressive strength test, unless otherwise directed.

b. Cylinders for laboratory cured test specimens shall be molded and stored except when field-cure test specimens are required.

5. Compressive Strength Tests:

a. ASTM C 39, one set for each day's pour exceeding 5 cubic yards plus additional sets for each 50 cubic yards over and above the first 25 cubic yards of each concrete class placed in any 1 day:

1) One specimen tested at 7 days.
2) Two specimens tested at 28 days.
3) One specimen retained in reserve for later testing if required.

b. When frequency of testing will provide less than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or form each batch if fewer than five are used.

C. Test results will be reported in writing to Structural Engineer and the CONTRACTOR within 24 hours after tests.

D. Reports of compressive strength tests shall contain:

1. The project identification name and number.
2. Date of concrete placement.
3. Name of concrete testing service.
4. Concrete type and class.
5. Location of concrete batch in structure.
6. Design compressive strength at 28 days.
7. Concrete mix proportions and materials.
8. Compressive breaking strength.
9. Type of break for both 7- and 28-day tests.

E. Nondestructive Testing:

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

F. Additional Tests:

1. The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by the ENGINEER.

2. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3. The CONTRACTOR shall pay for such tests when unacceptable concrete is verified.

END OF SECTION 03310

SECTION 033000 - 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 for the following:

1. Footings.
2. Slabs-on-grade.
3. Suspended slabs.

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 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.

d. Concrete Subcontractor.
e. Special concrete finish Subcontractor.

2. Review inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, methods for achieving specified floor and slab flatness and levelness floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.5 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.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Architect.

E. Samples: For waterstops and vapor retarder.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, manufacturer and testing agency.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.

5. Waterstops.
6. Curing compounds.
7. Bonding agents.
8. Adhesives.
9. Vapor retarders and barriers.
10. Semirigid joint filler.
11. Joint-filler strips.
12. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency:

1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.

F. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

G. Field quality-control reports.

H. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. 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."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, 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. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.10 FIELD CONDITIONS

A. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated 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.
2. ACI 117.

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. High-density overlay, Class 1 or better.
   b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
   c. Structural 1, B-B or better; mill oiled and edge sealed.
   d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

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. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

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.

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 to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch 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, 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, 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, gray.
2. Blended Cement: ASTM C595/C 595 M, Type IL, gray.
3. Fly Ash: ASTM C 618, Class F or C.
4. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.

C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Lightweight Aggregate: ASTM C 330/C 330M, 3/4-inch nominal maximum aggregate size.

E. Air-Entraining Admixture: ASTM C 260/C 260M.

F. 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. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

G. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor

or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

H. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

I. Water: ASTM C 94/C 94M and potable.

2.6 WATERSTOPS

A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

2.7 VAPOR RETARDERS AND BARRIERS

A. Sheet Vapor Barrier: ASTM E 1745, Class A with a Perm Rating less than or equal to 0.018 perms (grains / (ft2 *hr *in. HG) as tested by ASTM E 96

1. Minimum thickness: 15 mil

B. Vapor Barrier Accessories:
1. Seal Tape: Water vapor transmission rate per ASTM E96 on 0.3 perm or less.
2. Vapor Proofing Mastic: Water vapor transmission rate per ASTM E96 of 0.3 perm or less.
3. Pipe Boots: Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

2.8 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. 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, nondissipating, certified by curing compound manufacturer to not interfere with

bonding of floor covering.

2.9 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 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 IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. High-Strength Epoxy Doweling System: Epoxy doweling system shall consist of an injectable two-part epoxy complying with the requirements of ASTM C881-90, Type IV, Grade 3, Class B and C except gel times. Epoxy doweling system shall be tested in accordance with ICC Acceptance Criteria 308 demonstrating compliance with the performance features of ACI 355.2. Epoxy doweling system shall have an ICC-ES Evaluation Report (ESR) indicating it is intended for use in cracked and uncracked normal weight concrete in Seismic Design Categories A and B. The epoxy doweling system shall be installed according to manufacturer's instructions.

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. Hilti HIT-HY 200 Adhesive Anchoring System (ICC ESR-3187)
b. ITW Red Head EPCON G5 Adhesive Anchoring System (ICC ESR-1137)
c. Powers AC100+ Gold Adhesive Anchor System (ICC ESR-2582)
d. Simpson Strong-Tie SET-XP Epoxy Adhesive Anchors (ICC ESP-2508)

F. Expansion Wedge Anchors: Expansion wedge anchors shall consist of threaded stud bolt body and integral wedge expander, nut, and washer complying with the requirements of Federal Specification A-A 1923A, Type 4. Expansion wedge anchors shall be tested in accordance with ICC Acceptance Criteria 193 demonstrating compliance with the performance features of ACI 355.2. Expansion wedge anchors shall have an ICC-ES Evaluation Report (ESR) indicating it is intended for use in cracked and uncracked normal weight concrete in Seismic Design Categories A and B. Anchors shall be made of zinc-plated carbon steel meeting ASTM B633 or Type 304 stainless steel.

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. Hilti Kwik Bolt 3 (KB3) Concrete Anchors (ICC ESR-2302)
b. ITW Red Head TRUBOLT Wedge Anchor (ICC ESR-2251)
c. Powers Power-Stud+ SD1/SD2 Anchor (ICC ESR-2818/ESR-2502/)
d. Simpson STRONG-BOLT/STRONG-BOLT 2 Wedge Anchor (ICC ESR-1771/ESR-3037)

2.10 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.11 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.

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.
2. Combined Fly Ash and Pozzolan: 20 percent.
3. Ground Granulated Blast-Furnace Slag: 50 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
5. Silica Fume: 10 percent.
6. Combined Fly Ash,, Pozzolans, Ground Granulated Blast-Furnace Slag and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 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.
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 for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Normal-weight concrete.

1. Minimum Compressive Strength: As indicated at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Slump Limit: 5 inches and 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 3 percent, plus or minus 1 percent at point of delivery for 1-inch nominal maximum aggregate size.

B. Slabs-on-Grade: Normal-weight concrete.

1. Minimum Compressive Strength: As indicated at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Minimum Cementitious Materials Content: 470 lb/cu. yd..
4. Slump Limit: 4 inches, plus or minus 1 inch.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

C. Suspended Slabs: Lightweight concrete.

1. Minimum Compressive Strength: As indicated at 28 days.
2. Calculated Equilibrium Unit Weight: 115 lb/cu. ft., plus or minus 3 lb/cu. ft. as determined by ASTM C 567/C 567M.
3. Slump Limit: 5 inches, plus or minus 1 inch.
4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.13 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

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

B. Project-Site Mixing: Not permitted.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, 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.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch 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 Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F 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.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material 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. Lap joints 6 inches and seal with manufacturer's recommended tape.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

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.

1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

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. 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. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

C. 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 or more than 1 inch 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.

D. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 WATERSTOP INSTALLATION

A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.8 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.

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.
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 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.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated 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.

3.9 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, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

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

3.10 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 in one direction.

1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings.

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 and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

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, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:

    a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.

3. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed

anywhere on the surface does not exceed 1/4 inch.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated and 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.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

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.

3.11 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. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 4 inches high unless otherwise indicated, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4000 psi at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
6. Coordinate anchor installation with equipment manufacturer.

3.12 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 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 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 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, 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 manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

3.13 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. 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 deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 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 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 in any dimension to solid concrete. Limit cut depth to 3/4 inch. 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 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 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 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 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 to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch 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.

3.15 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.

5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.

D. 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., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31.

    a. Cast and laboratory cure four 6x12 or five 4x8 cylinder specimens for each composite sample.
    b. One cylinder size shall be used throughout the project.
    c. Each cylinder shall be weighed and the weight recorded directly prior to performing the compression test.

7. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimen at 7 days and two 6x12 or three 4x8 specimens at 28 days, and retain one specimen for later testing at 56 days if 28 day strength falls below the required specified strength.

    a. A compressive-strength test shall be the average compressive strength from a set of two 6x12 or three 4x8 specimens obtained from same composite sample and tested at age indicated.

8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. 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.
10. 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.

11. 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.
12. 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.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

END OF SECTION 033000

SECTION 042200 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Decorative concrete masonry units.
3. Pre-faced concrete masonry units.
4. Mortar and grout.
5. Steel reinforcing bars.
6. Masonry-joint reinforcement.
7. Embedded flashing.
8. Miscellaneous masonry accessories.
9. Masonry-cell fill.

B. Products Installed but not Furnished under This Section:

1. Cast-stone trim in concrete unit masonry.

C. Related Requirements:

1. Section 033000 "Cast-In-Place Concrete" for foundation installation.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection:

1. Decorative CMUs, in the form of small-scale units.
2. Pre-faced CMUs.
3. Colored mortar.
4. Weep holes/vents.

D. Samples for Verification: For each type and color of the following (if specified on architectural plans):

1. Exposed & Decorative CMUs.
2. Pre-faced CMUs.
3. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Material Certificates: For each type and size of the following:

1. Masonry units.

    a. Include data on material properties.

2. Integral water repellant used in CMUs.
3. Cementitious materials. Include name of manufacturer, brand name, and type.
4. Mortar admixtures.
5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
6. Grout mixes. Include description of type and proportions of ingredients.
7. Reinforcing bars.
8. Joint reinforcement.
9. Anchors, ties, and metal accessories.

C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
2. Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.

D. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified in accordance with ASTM C1093 for testing indicated.

1.6 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.

1.7 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 (600 mm) down both sides of walls, and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by

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.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. 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/ACI 530.1/ASCE 6 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 and will be within 20 feet (6 m) vertically and horizontally of a walking surface.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated per Architectural Plans (if applicable).

1. Where fire-resistance-rated construction is indicated, units are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.3 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners unless otherwise indicated.

B. Integral Water Repellent: Provide units made with integral water repellent for exposed units and where indicated.

1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested in accordance with ASTM E514/E514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen.

C. Insulated CMUs: Where indicated on architectural plans, units contain rigid, specially shaped, molded-polystyrene insulation units complying with ASTM C578, Type I, designed for installing in cores of masonry units.

D. CMUs: ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi (19.3 MPa).
2. Density Classification: Normal weight unless otherwise indicated.
3. Size (Width): Manufactured to dimensions 3/8 inch (10 mm) less-than-nominal dimensions.
4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
5. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

E. Concrete Building Brick: ASTM C55.

2.4 CONCRETE AND MASONRY LINTELS

A. General: Provide one of the following:

B. Concrete Lintels Matching CMU in Color, Texture: ASTM C1623, matching density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than that of CMUs.

C. Precast or Formed-in-Place Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 032000 "Concrete Reinforcing," and with reinforcing bars indicated.

D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.5 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold- weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content is not more than 0.1 percent when tested in accordance with ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C91/C91M.

E. Mortar Cement: ASTM C1329/C1329M.

F. Mortar Pigments (if required by architectural plans): Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.

G. Aggregate for Mortar: ASTM C144.

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 (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) 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.

H. Aggregate for Grout: ASTM C404.

I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

J. Water: Potable.

2.6 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A615/A615M Grade 60 (Grade 420).

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77- mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

C. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A951/A951M.

1. All Walls: 316 Stainless Steel
2. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
3. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
4. Spacing of Cross Rods: Not more than 16 inches (407 mm) O.C.
5. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.

2.7 TIES AND ANCHORS

A. General: Ties and anchors extend at least 1-1/2 inches (38 mm) into masonry but with at least a 5/8-inch (16-mm) cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
1. Stainless Steel Wire: ASTM A580/A580M, Type 316.
2. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Corrugated-Metal Ties: Metal strips not less than 7/8 inch (22 mm) wide with corrugations having a wavelength of 0.3 to 0.5 inch (7.6 to 12.7 mm) and an amplitude of
0.06 to 0.10 inch (1.5 to 2.5 mm) made from 0.078-inch- (1.98-mm-) thick stainless steel sheet with dovetail tabs for inserting into dovetail slots in concrete.

D. Partition Top Anchors: 0.105-inch- (2.66-mm-) thick metal plate with a 3/8-inch- (9.5-mm-) diameter metal rod 6 inches (152 mm) long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from stainless steel.

E. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTMA 153/A153M] or Epoxy coating 0.020 inch (0.51 mm) thick.

2.8 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.016 inch (0.40 mm) thick.
2. Copper: ASTM B370, Temper H00, cold-rolled copper sheet, 16-oz./sq. ft. (4.9-kg/sq. m) weight or 0.0216 inch (0.55 mm) thick or ASTM B370, Temper H01, high-yield copper sheet, 12-oz./sq. ft. (3.7-kg/sq. m) weight or 0.0162 inch (0.41 mm) thick.
3. Fabricate continuous flashings in sections 96 inches (2400 mm) long minimum, but not exceeding 12 feet (3.7 m). Provide splice plates at joints of formed, smooth metal flashing.
4. Fabricate metal drip edges from stainless steel. Extend at least 3 inches (76 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.
5. Fabricate metal sealant stops from stainless steel. Extend at least 3 inches (76 mm) into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch (19 mm) and down into joint 1/4 inch (6 mm) to form a stop for retaining sealant backer rod.
6. Fabricate metal expansion-joint strips from stainless steel to shapes indicated.
7. Solder metal items at corners.

B. Flexible Flashing: Use the following unless otherwise indicated:

1. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.
   a. Self-Adhesive Sheet with Drip Edge: Elastomeric thermoplastic flashing, 0.025 inch (0.64 mm) thick, with a 0.015-inch- (0.38-mm-) thick coating of rubberized- asphalt adhesive. Where flashing extends to face of masonry, rubberized-asphalt coating is held back approximately 1-1/2 inches (38 mm) from edge.

1) Color: Gray or Black.

b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

C. Application: Unless otherwise indicated, use the following:

1. Where flashing is indicated to receive counterflashing, use metal flashing.
2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing elastomeric thermoplastic flashing with a drip edge.
4. Where flashing is fully concealed, use metal flashing or flexible flashing.

D. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from UV-resistant, high-density polyethylene. Cell flashing pans have integral weep spouts designed to be built into mortar bed joints and that extend into the cell to prevent clogging with mortar.

E. Solder and Sealants for Sheet Metal Flashings:

1. Solder for Stainless Steel: ASTM B32, Grade Sn96, with acid flux of type recommended by stainless steel sheet manufacturer.

F. 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. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

2.10 MASONRY-CELL FILL

A. Loose-Fill Insulation: Perlite complying with ASTM C549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).

B. Lightweight-Aggregate Fill: ASTM C331/C331M.

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. For reinforced masonry, use portland cement 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. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For all masonry use Type M or Type S.

D. Pigmented Mortar (if specified on architectural plans): Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments does not exceed 10 percent of portland cement by weight.
2. Pigments does not exceed 5 percent of masonry cement or mortar cement by weight.
3. Mix to match Architect's sample.
4. Application (if applicable): Use pigmented mortar for all exposed mortar joints other than CMU piers.

E. Colored-Aggregate Mortar (if required): Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Mix to match Architect's sample.
2. Application: Use colored-aggregate mortar for exposed mortar joints with the

following units (if applicable):

a. Decorative CMUs.
b. Pre-faced CMUs.
c. Cast-stone trim units.

F. Grout for Unit Masonry: Comply with ASTM C476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C476, Table 1.
3. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured in accordance with ASTM C143/C143M.

G. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.

1. Application: Use epoxy pointing mortar for exposed mortar joints with pre-faced CMUs.

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.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that would impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Build chases and recesses to accommodate items specified in this and other Sections.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent

to opening.

C. 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 (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) 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 (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) 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 (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm).

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).

2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

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.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches (100 mm). Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

D. 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.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

G. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

H. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.

2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Lay solid CMUs 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.

C. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.

1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Wet joint surfaces thoroughly before applying mortar.
3. Rake out mortar joints for pointing with sealant.

D. Rake out mortar joints at pre-faced CMUs to a uniform depth of 1/4 inch (6 mm) and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.

E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

F. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

G. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 16 inches (406 mm) o.c.
2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO CONCRETE FOUNDATION

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
   1. Refer to structural plans. Vertical steel reinforcement with standard hooks into footings and standard lap lengths within wall shall be installed.

3.8 CONTROL AND EXPANSION JOINTS (if specified on structural plan set)

A. General: Install control- and expansion-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 concrete masonry using one of the following methods:

   1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
   2. Install preformed control-joint gaskets designed to fit standard sash block.
   3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
   4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.

3.9 LINTELS

A. Provide concrete or masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.

B. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.10 FLASHING

A. General: Install embedded flashing at ledges and other obstructions to downward flow of water in wall 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 lintels, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
3. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
4. Install metal drip edges and sealant stops with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
5. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.

C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.11 REINFORCED UNIT MASONRY

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

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.12 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will 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 is done at Contractor's expense.

B. Testing Prior to Construction: One set of tests.

C. Testing Frequency: One set of tests for each of the following for Items D through G below:
1. 1000 sq. ft. (464 sq. m) of wall area or portion thereof.
2. Minimum of one test per individual structure.
3. Minimum of one test every eight piers at staff residence structures.

D. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, in accordance with ASTM C780.

E. Mortar Test (Property Specification): For each mix provided, in accordance with ASTM C780. Test mortar for mortar air content and compressive strength.

F. Grout Test (Compressive Strength): For each mix provided, in accordance with ASTM C1019.

G. Prism Test: For each type of construction provided, in accordance with ASTM C1314 at 7 days and at 28 days.

3.13 PARGING

A. Parge exterior faces of below-grade masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch (19 mm). Dampen wall before applying first coat, and scarify first coat to ensure full bond to subsequent coat.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot (3 mm per 300 mm). Form a wash at top of parging and a cove at bottom.

C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.14 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. 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 or Engineer's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry 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 concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.15 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.

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

END OF SECTION 042200

SECTION 051200 - STRUCTURAL STEEL 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. Structural steel.
2. Field-installed shear connectors.
3. Grout.

B. Related Requirements:

1. Section 053100 "Steel Decking" for field installation of shear connectors through deck.
2. Section 055000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame miscellaneous steel fabrications and other steel items not defined as structural steel.
3. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" and Section 099600 "High-Performance Coatings" for surface-preparation and priming requirements.

1.3 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. 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.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

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.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

D. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, fabricator, professional engineer, and testing agency.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural steel, including chemical and physical properties.

E. Product Test Reports: For the following:

1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shear stud connectors.
5. Shop primers.
6. Nonshrink grout.

F. Survey of existing conditions.

G. Source quality-control reports.

H. Field quality-control reports.

I. Domestically sourced in the United States: Written Certification the structural steel has been 100% milled and 100% fabricated in the United States only with domestically sourced materials.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: The fabricator must meet one of the two following requirements.

1. A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172).
2. A qualified fabricator with a minimum of 5 years experience in fabricating structural steel similar to that indicated for this project and with a record of successful in-service performance, and one of the two options below:
    a. An independent auditor certification of their quality control program.

B. Installer Qualifications: The installer must meet one of the two following requirements.

1. A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.
2. A qualified installer with a minimum of 5 years experience in installing structural steel similar to that indicated for this project and with a record of successful in-service performance.
    a. Provide three project references with Owner contact information with the bid.
    b. Provide a copy of the installers Policy for Quality and Policy for Safety with the bid.

C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 or to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

E. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 341 and AISC 341s1.
3. AISC 360.
4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.9 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.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC 360.
2. Use Load and Resistance Factor Design; data are given at ultimate load level.

2.2 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992.

B. Channels, Angles, M, S-Shapes: ASTM A 36.

C. Plate and Bar: ASTM A 36 or as indicated otherwise.

D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade C (Fy=50 ksi), structural

tubing.

E. Steel Pipe: ASTM A 53, Type E or Type S, Grade B.

1. Weight Class: As indicated.
2. Finish: Black except where indicated to be galvanized.

F. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.

B. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip or mechanically deposited zinc coating.
2. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating finish.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Plain.

D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

E. Unheaded Anchor Rods: ASTM F 1554, Grade 36, unless otherwise indicated.

1. Configuration: Straight.
2. Nuts: ASTM A 563 heavy-hex carbon steel.
3. Plate Washers: ASTM A 36/A 36M carbon steel.
4. Washers: ASTM F 436, Type 1, hardened carbon steel.
5. Finish: Plain.

F. Threaded Rods: ASTM A 36.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Washers: ASTM F 436, Type 1, hardened carbon steel.
3. Finish: Plain.

2.4 PRIMER

A. Primer: Comply with Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."

B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

C. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.5 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to 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 2, "Hand Tool Cleaning."

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel 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.

2.7 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 and AWS D1.8 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 maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.8 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.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.
6. Surfaces enclosed in interior construction.

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 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."
3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
4. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

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. 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.

D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

2.9 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 are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels shelf angles attached to structural-steel frame and located in exterior walls.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

D. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than-continuous

360-degree flash or welding repairs to any shear connector.

2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

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. Baseplates and 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. Weld plate washers to top of baseplate.
3. 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.
4. 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 303, "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 are 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.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

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 and AWS D1.8 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, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "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 testing agency to perform tests and inspections.

B. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.

1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

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/A 780M.

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.

C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

D. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

END OF SECTION 051200

SECTION 053100 - STEEL DECKING

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. Composite floor deck.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.

D. Evaluation Reports: For steel deck, from ICC-ES.

E. Field quality-control reports.

F. Domestically sourced in the United States: Written Certification the steel decking has been 100% milled and 100% fabricated in the United States only with domestically sourced materials.

G. QUALITY ASSURANCE

H. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

I. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. 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 COMPOSITE FLOOR DECK

A. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section

properties indicated, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 50, G90 zinc coating.
2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: Triple span or more.

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0747 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

J. Galvanizing Repair Paint: ASTM A 780.

K. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions 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 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 3/4 inch, nominal.
2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches apart, but not more than 18 inches apart.
3. Weld Spacing: Space and locate welds as indicated.
4. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches and as indicated in the drawings, and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
2. Fasten with a minimum of 1-1/2-inch-long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Prepare test and inspection reports.

3.5 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

C. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

END OF SECTION 053100

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Steel framing and supports for countertops.
2. Steel tube reinforcement for low partitions.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Metal ladders.
6. Miscellaneous steel trim.
7. Metal bollards.
8. Metal downspout boots.
9. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
3. Section 051200 "Structural Steel Framing."

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats

are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. 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.

1.4 ACTION SUBMITTALS

A. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Steel framing and supports for countertops.
2. Steel tube reinforcement for low partitions.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Metal ladders.
6. Miscellaneous steel trim.
7. Metal bollards.
8. Metal downspout boots.
9. Loose steel lintels.

B. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders.

B. Structural Performance of Aluminum Ladders: Aluminum ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.

D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

E. Steel Tubing: ASTM A 500/A 500M, Grade C (Fy=50 ksi), cold-formed steel tubing.

F. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

G. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless

otherwise indicated.

H. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.

I. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

J. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

K. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.
2. Provide stainless-steel fasteners for fastening stainless steel.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.

E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

F. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

G. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.4 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

B. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.

C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

H. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 4000 psi.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with primer specified in Section 099600 "High-Performance Coatings" where indicated.

2.7 METAL LADDERS

A. General:

1. Comply with ANSI A14.3.

B. Aluminum Ladders:

1. Space siderails 16 inches apart unless otherwise indicated.
2. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches deep, 3/4 inch wide, and 1/8 inch thick.
3. Rungs: Extruded-aluminum tubes, not less than 3/4 inch deep and not less than 1/8 inch thick,

with ribbed tread surfaces.

4. Fit rungs in centerline of siderails; fasten by welding or with stainless-steel fasteners or brackets and aluminum rivets.
5. Provide platforms as indicated fabricated from pressure-locked aluminum bar grating or extruded-aluminum plank grating, supported by extruded-aluminum framing. Limit openings in gratings to no more than 1/2 inch in least dimension.
6. Support each ladder at top and bottom and not more than 48 inches o.c. with welded or bolted aluminum brackets.
7. Provide minimum 72-inch- high, hinged security door with padlock hasp at foot of ladder to prevent unauthorized ladder use.

2.8 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize and prime exterior miscellaneous steel trim.

D. Prime exterior miscellaneous steel trim with primer specified in Section 099600 "High-Performance Coatings."

2.9 METAL BOLLARDS

A. Fabricate metal bollards from steel shapes, as indicated.

1. Cap bollards with 1/4-inch- thick steel plate.
2. Where bollards are indicated to receive controls for door operators, provide cutouts for controls and holes for wire.
3. Where bollards are indicated to receive light fixtures, provide cutouts for fixtures and holes for wire.

B. Fabricate bollards with 3/8-inch- thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.

1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.

C. Prime bollards with primer specified in Section 099600 "High-Performance Coatings."

2.10 METAL DOWNSPOUT BOOTS

A. Provide downspout boots made from cast iron in heights indicated with inlets of size and shape to suit downspouts. Provide units with flanges and holes for countersunk anchor bolts.

B. Prime cast-iron downspout boots with primer specified in Section 099600 "High-Performance Coatings."

2.11 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

C. Prime plates with zinc-rich primer.

2.12 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.

C. Galvanize and prime loose steel lintels located in exterior walls.

D. Prime loose steel lintels located in exterior walls with primer specified in Section 099600 "High-Performance Coatings."

2.13 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.14 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.15 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12.

B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

C. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLING METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

1. Do not fill removable bollards with concrete.

B. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

C. Anchor internal sleeves for removable bollards in place with concrete footings. Center and align sleeves in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace sleeves in position until concrete has cured.

D. Place removable bollards over internal sleeves and secure with 3/4-inch machine bolts and nuts. After

tightening nuts, drill holes in bolts for inserting padlocks. Owner furnishes padlocks.

E. Fill bollards solidly with concrete, mounding top surface to shed water.

1. Do not fill removable bollards with concrete.

3.4 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting." and Section 099123 "Interior Painting."

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000

SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Aluminum pipe and tube railings.

1.2 SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.
2. Railing brackets.
3. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.
3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.

a. Show method of connecting and finishing members at intersections.

D. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

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

1.3 QUALITY ASSURANCE

A. Contractor's Qualifications: Employ only experienced Contractors (Installers) skilled in the successful installation of the specified materials and assemblies on similar projects for not less than five (5) years.

B. Manufacturer's Qualifications: Employ only manufacturers with not less than five (5) years of successful experience making the specified materials as a current catalog and regular production item.

C. Welding Standards: Comply with applicable provisions of AW S D1.2 "Structural Welding Code-- Aluminum".

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

D. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry for installation of stair work. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

1. See Concrete and Masonry Sections of these Specifications for installation of inserts and anchorage devices.

A. Shop Assembly: Pre-assemble 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 field welded re-assembly and coordinated installation. Bolted connections are no allowed, except to structure.

B. Single Source Responsibility: Unless otherwise indicated, provide handrails through a single source and from one manufacturer for each indicated type of unit Specified.

1.4 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver, store and handle units in strict accordance with manufacturer's written recommendations.

B. Shop Assembly: As much as possible, assemble handrail units in shop and ship to job site when construction schedule and conditions are ready for immediate installation.

1. Handrails shall not be stored at the job site.

1.5 WARRANTY

A. Warranty: Material and workmanship including finish.

1. One (10) year warranty.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
b. Infill load and other loads need not be assumed to act concurrently.

C. General: Handrails and railings shall conform with applicable requirements of the following:

1. Accessibility Requirements Manual from the Florida Department of Community Affairs, Florida Board of Building Codes and Standards.
2. NFPA 101, Life Safety Code.
3. Florida Building Code.

2.2 METALS, GENERAL

A. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

1. Provide brackets of type indicated; provide type with concealed fasteners.

2.3 ALUMINUM

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

B. Extruded Bars and Tubing: ASTM B 221, Alloy 6063-T5/T52.

C. Extruded Structural Pipe and Round Tubing: ASTM B 429, Alloy 6063-T6.

D. Drawn Seamless Tubing: ASTM B 210, Alloy 6063-T832.

E. Plate and Sheet: ASTM B 209, Alloy 6061-T6.

F. Die and Hand Forgings: ASTM B 247, Alloy 6061-T6.

G. Castings: ASTM B 26, Alloy A356.0-T6.

H. ASTM E98: Standard Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings.

2.4 FASTENERS

A. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Masonry Anchorage Devices: Expansion shields, FS FF--325.

C. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class, and style as required.

D. Concrete Anchor Bolts: Hexagon head "Kwik Bolt" by Hilti Fastening System, Tulsa, OK.

E. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and W here Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AW S specifications for metal alloy welded.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION

A. Assemble handrails in the shop and ship to the jobsite when construction conditions allow immediate installation. Do not store handrails at the jobsite.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form work true to line and level with accurate angles and surfaces.

D. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
5. Use of Bondo type fillers or putty is prohibited.

E. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

F. Form changes in direction by bending.

G. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

H. Close exposed ends of railing members with prefabricated end fittings.

I. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.

J. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush- resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

2.7 ALUMINUM FINISHES

A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1- 1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required for design loading. Secure wall brackets and wall return fittings to building construction as follows:

1. Use type of bracket with predrilled hole for exposed bolt anchorage.
2. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
3. For hollow masonry anchorage, use toggle bolts having square heads.

B. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by

mechanical or other means without further cutting or fitting.

2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.

3.2 ANCHORING POSTS

A. Use cast aluminum pipe sleeves preset and anchored into concrete for installing exterior railing. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

3.3 ATTACHING RAILINGS

A. Attach railings to wall with wall brackets and concealed fasteners. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

B. Secure wall brackets and railing end flanges to building construction as indicated.

3.4 PROTECTION AND CLEANING

A. Protect finishes of railings from damage during construction with manufacture’s protective covering.

B. Clean aluminum surfaces in accordance with manufacturer’s instructions and recommendations. Remove dirt, grime, and other contaminates completely.

END OF SECTION 055213

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Wood grounds, nailers, blocking, and sleepers
2. Plywood backer panels

1.2 REFERENCES

A. Lumber Standard: Comply with PS-20 and with applicable rules of the respective grading and inspecting agencies for species and products indicated.

B. Plywood Product Standards: Comply with PS 1 (ANSI A199.1) or, for products not manufactured under PS 1 provisions, with applicable APA Performance Standard PRP-108 for type of panel indicated.

1.3 DEFINITIONS

A. Rough carpentry includes carpentry work not specified as part of other Sections and generally not exposed, unless otherwise specified.

1.4 SUBMITTALS

A. Product Data:

1. Chemical treatment manufacturer's instructions for handling, storing, installation, and finishing of treated material
2. Treating plant’s certification of compliance stating type of preservative used and method of treatment employed, net amount of preservative retained, and compliance with applicable standards
3. For water-borne treated products include statement that moisture content of treated materials was reduced to levels indicated prior to shipment to project site

B. Certification that chemical treatment complies with specification for each type of treatment

1.5 DELIVERY, STORAGE, AND HANDLING

A. Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

1. For pressure treated lumber and plywood, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Lumber Standards: Furnish lumber manufactured to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

B. Inspection Agencies: SPIB - Southern Pine Inspection Bureau.

C. Grade Stamps: Provide lumber with each piece factory-marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

D. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

1. Provide dressed lumber, S4S, unless otherwise indicated.
2. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.
3. "Standard" grade.
4. Southern Pine graded under SPIB rules.

2.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. Provide lumber for support or attachment of other construction including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

C. Grade: "Standard" grade light-framing-size lumber of any species or board-size lumber as required. No. 2 Boards per SPIB rules.

D. Wood grounds, nailers, and sleepers shall be pressure treated as specified.

2.3 PLYWOOD PANELS

A. Construction Panel Standards: Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood construction panels and, for products not manufactured under PS 1 provisions, with APA PRP-108.

B. Trademark: Furnish construction panels that are each factory-marked with APA trademark evidencing compliance with grade requirements.

C. Electrical or Telephone Equipment Backing Panels: DOC PS-1, Exposure 1 CD Plugged, fire retardant treated, Thickness: Minimum 15/32 inch. Paint per Division 09.

2.4 FASTENERS

A. Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. All fasteners used in conjunction with pressure treated (ACO or CDDC) wood shall be G185 hot dipped galvanized or stainless steel.

B. Nails, Wire, Brads, and Staples: ASTM F1667.

C. Power Driven Fasteners: National Evaluation Report NER-272.

D. Wood Screws: ANSI B18.6.1.

E. Lag Bolts: ANSI B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A563 hex nuts and where indicated, flat washers.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of rough carpentry construction and that are too small to use in fabricating rough carpentry with minimum joints or optimum joint arrangement.

B. Set rough carpentry to required levels and lines, with members plumb and true to line and cut and fitted.

C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Coordinate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

D. Attach rough carpentry work to substrate by anchoring and fastening indicated.

E. Use screws, unless otherwise indicated. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required.

F. Use IPBC treated products at interior locations and ACO or CDDC treated products at exterior locations.

G. Apply field treatment complying with AWPA M4 to cut surfaces of preservative- treated lumber and plywood.

H. All pressure treated wood installed in contact with steel decking, studs, or other framing members shall be separated by a minimum 40mil peel and stick membrane.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attachment of other work. Form to shapes as shown

and cut as required for true line and level of work to be attached.

B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

C. Install permanent grounds of dressed, preservative treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

D. Provide pressure treated blocking at all locations in contact with concrete. Fire treated where required.

3.3 INSTALLATION OF EQUIPMENT BACKER BOARDS

A. Install 3/4 inch panels mounted to fire-retardant treated 2 by 4, providing a 3 1/2 inch space behind panel for wiring.

END OF SECTION 061000

SECTION 064116 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.

1. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate faced architectural counter unless concealed within other construction before installation.

1.2 SUBMITTALS

A. Product Data: For each type of product, including high-pressure decorative laminate and cabinet hardware and accessories.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
2. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural plastic-laminate cabinets.

C. Samples for Verification:

1. Plastic laminates, 8 by 10 inches, for each color, pattern, and surface finish, with one sample applied to core material.
2. PVC edge material

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver casework until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in Field Conditions Article.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where cabinets 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. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.

B. Grade: Custom.

C. Type of Construction: As Indicated.

D. Counter Style: As Indicated.

E. Cabinet, Door, and Drawer Front Interface Style: As indicated.

F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

1. Colors, Patterns, and Finishes: As indicated on the in the finsh lsits, Or Equal.

G. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS.
2. Vertical Surfaces: Grade VGS.
3. Edges: Grade HGS.

H. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade CLS.

a. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade CLS.

2. Sides and Backs: White Birch or White Maple plywood; not less than 3/8-inch thick; clear finish.
3. Bottoms: White Birch or White Maple plywood; not less than 1/4-inch thick; clear finish.

I. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

J. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Drawer Sides and Backs: Refer to Millwork Notes on the Drawings.
2. Drawer Bottoms: White Birch or White Maple plywood; not less than 1/4-inch thick.

K. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Match Existing – As indicated on Drawings

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Medium-Density Fiberboard: ANSI A208.2, made with binder containing no urea formaldehyde.
2. Plywood: APA Grade A-C; HPVA HP-1, made with adhesive containing no urea formaldehyde.

a. Thickness: 3/4-inch unless otherwise indicated.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

B. Hinges:

1. Product and Manufacturer – Basis of Design: A-Series hinge, 110-degree swing; Hafele America Co., or Equal.

C. Pulls: Steel Bar Pulls, Match Architects sample.

D. Adjustable Shelf Supports/ Shelf Rests: plastic two-pin type with shelf hold-down clip.

1. Product and Manufacturer – Basis of Design: Item No. 282.47.402 Shelf Support, Double Pin, transparent plastic; Hafele America, Archdale, NC, or Equal.

E. Drawer Slides:

1. Product and Manufacturer – Basis of Design: Series 3832 AA Action Assist, full extension drawer slide; 100 pound rating; Accuride International, or Equal.

F. Door and Drawer Silencers: BHMA A156.16, L03011.

1. Color: To be selected from manufacturer's standard color selections.

G. PVC Edge Banding: Polyethylene molding strip for counter edges; PVC edge

banding for all counter doors, and drawers.

1. Products and Manufacturer: Subject to compliance with requirements, available products and manufacturers that may be incorporated into the Work include, but are not limited to, the following:

    a. 3M and Charter Industries, Grand Rapids, MI, or Equal.

        1) Colors: To be selected by the Architect.
        2) Thickness: 3mm.
        3) Width: Full width of edge.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.5 FABRICATION

A. General: Fabricate cabinets and shelves to dimensions, profiles, and details indicated.

1. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. W here necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

2. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

B. Countertops: Provide plastic-laminate backer sheet, Grade BKL, on underside of countertop substrates.

C. Shelves: 3/4-inch plywood core with high pressure laminate all sides and edges.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

A. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

B. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

C. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

D. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.

1. Use filler matching finish of items being installed.

E. Cabinets: Install without distortion so 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 installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semi-exposed surfaces.

END OF SECTION 064116

SECTION 066116 - SOLID SURFACING FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Window Stools (Interior Sills) and countertops

1.2 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Details of fabrication.
2. Recommendations for handling, protection, and maintenance.
3. For fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: Show assembly methods, joint details, and accessories.

1. Show field measurements and concealed framing, blocking, and reinforcement locations

C. Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

D. Sample warranty

1.3 QUALITY ASSURANCE

A. Supply window stools and counter tops by one manufacturer.

B. Tolerances:

1. Variation in component size: +/- 1/8 inch
2. Location of openings: +/- 1/8 inch from indicated location

C. Perform work to (custom) quality in accordance with "Quality Standards" of the Architectural Woodwork Institute (AWI).

D. Fire-Test-Response Characteristics: Provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL or another nationally known testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cast polymer materials until painting and similar operations that could damage synthetic marble have been completed in installation areas. If cast polymer materials must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cast polymer materials until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where cast polymer materials are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication.

1. Coordinate concealed framing, blocking, and reinforcements that support cast polymer materials work.

1.6 WARRANTY

A. Manufacturer's ten year warranty, starting on the Date of Substantial completion, against defects in materials, including damages caused by physical or chemical abuse or excessive heat. Provide warranty for materials and labor for repair or replacement of defective materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Refer to Interior Design documents for cast polymer manufacturer, style, and color.

2.2 CAST POLYMER

A. Material: Homogeneous filled solid polymer; not coated, laminated, or of a composite construction; meeting IAPMO Z124.3 and IAPMO Z124.6 Requirements.

B. Fire Hazard Ratings:

1. Classified in accordance local codes and ordinances, ASTM E84 and the following:

a. Class A
b. Flame Spread: 0 – 25
c. Smoke Developed: 0-450

C. Colors: Architect may choose any color(s) from Color Group A, Color Group B, and Color Group C.

D. Window Stools (Interior Sills):

1. Homogeneous cast polymer window stools, 1/2 inch or 3/4 inch thick, size as shown on Drawings. Ease exposed edges. Color by Architect

2.3 INSTALLATION MATERIALS

A. Adhesive and Sealant: As recommended by cast polymer manufacturer.

2.4 FABRICATION

A. General:

1. Shop assemble cast polymer materials for delivery to Site in units easily handled and to permit passage through building openings.

2. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trip for scribing and site cutting.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify adequacy of backing and support framing. Do not start installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Condition cast polymer materials to average prevailing humidity conditions in installation areas a minimum of 24 hours before installation.

3.3 INSTALLATION

A. All window stools shall be installed as shown on Drawings and as specified by manufacturer.

B. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with final Shop Drawings and product data.

3.4 ADJUSTING AND CLEANING

A. Keep components clean during installation. Remove adhesives, sealants and other stains. Keep clean until Date of Substantial Completion. Replace stained and damaged components.

B. Protect surfaces from damage until Date of Substantial Completion. Repair work or replace damaged work which cannot be repaired to Owner's Representative's satisfaction.

END OF SECTION 066116

SECTION 071300 - SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes elevator pit membrane for:

1. Blindside sheet waterproofing
2. Underslab membrane waterproofing

1.2 SYSTEM PERFORMANCE

A. Provide sheet waterproofing products that have been produced and installed to establish and maintain continuous watertight seals.

B. Coordinate concrete placement within 30 days of membrane application.

1.3 SUBMITTALS

A. Product Data

1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing
2. Maintain records at the Site of the batch numbers of all materials supplied for Project

B. Samples of sheet membrane waterproofing and auxiliary materials mounted on plywood.

C. Certifications

1. Certification by waterproofing materials manufacturer that products supplied comply with local VOC regulations.
2. Certification that waterproofing system and components are provided by a single source supplier
3. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements

D. Pre-installation conference meeting minutes

E. Field Quality Control Reports

F. Sample warranties including pre-concealment inspection reports

1.4 QUALITY ASSURANCE

A. Obtain primary waterproofing materials of each type required from a single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

B. Installer Qualifications: A firm with not less than ten waterproofing projects similar to requirements for this Project with satisfactory in-service performance, certified by or acceptable to primary waterproofing materials manufacturer.

C. Pre-installation Conference: Prior to installing waterproofing and associated work, meet at the Site with Installers, inspection and testing agency representatives (if any), installers of work requiring coordination with waterproofing work, and the manufacturer's technical representative. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs. Notify Architect and Manufacturer's representative a minimum of 48 hours before conducting meeting.

1. Manufacturer's technical representative shall review installation of sheet membrane waterproofing prior to concealment. This shall be conducted as part of the warranty requirements.

1.5 PROJECT CONDITIONS

A. Substrate: Proceed with work after substrate construction, openings, and penetrating work have been completed and areas are free of standing or running water, and is in condition to receive waterproofing.

B. Weather: Proceed with work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturer's recommendations and warranty requirements.

C. Schedule Work such that membrane will not be exposed to the elements longer than that recommended by manufacturer but no longer than 30 days.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers with labels identifying product name and manufacturer.

B. Store materials in a dry area in accordance with manufacturer's instructions.

C. Store adhesives at temperatures above 40 Deg F and below 90 deg F.

D. Protect materials during handling and application to prevent damage and contamination.

1.7 WARRANTY

A. Warranty: Executed by the manufacturer, agreeing to repair or replace sheet membrane waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Failure includes, but is not limited to, failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch in width.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 RUBBERIZED ASPHALT SHEET WATERPROOFING

A. Rubberized asphalt self-adhering membrane integrally bonded to polyethylene sheeting, formed into uniform flexible sheets of not less than 56 mils thick, complying with the following:

1. Tensile Strength: 250 psi minimum; ASTM D 412.
2. Ultimate Elongation: 300 percent minimum; ASTM D 412.
3. Brittleness Temperature: Minus 25 deg F; ASTM D 746.
4. Hydrostatic Head Resistance: 150 feet minimum.
5. Water Absorption: Not more than 0.15 percent weight gain after 48 hours' immersion at 70 deg F; ASTM D 570.
6. Vapor Permeance: 0.05 perms, ASTM E 96, Water Method.

B. Products: Subject to compliance with requirements, provide one of the following:

1. MEL-ROL, W.R. Meadows, Inc.
2. Bituthene 3000, W.R. Grace & Co.
3. MiraDRI 860 by Carlisle Coatings and Waterproofing, Incorporated
4. WP 200, Henry Company

2.2 AUXILIARY MATERIALS

A. Primers: Provide primers, conditioners, patching materials, mastics, adhesives, and tapes as recommended by manufacturer of sheet waterproofing material for applications required.

B. Metal Termination Bars: Aluminum bars, predrilled, approximately 1 by 1/8 inch thick.

C. Protection Board: Provide type of protection board recommended by waterproofing sheet manufacturer. Include adhesives recommended by manufacturer.

2.3 UNDERSLAB PREMOULDED MEMBRANE WATERPROOFING

A. Provide the following underslab premoulded membrane waterproofing under elevator core and under all sensitive floor areas.

1. Basis of Design: “Premoulded Membrane Vapor Seal with Plasmatic Core” by W.R. Meadows, Inc.

B. Permanently bonded multi-ply semi-flexible core board. Core shall consist of plasmatic matrix encased in two layers of pure blown, high-meltpoint asphalt. The three-ply core is sandwiched between liners of asphalt saturated felt and a glass-mat liner. Asphalt weather coat shall be applied to the glass-mat liner covered with a polyethylene anti-stick sheet.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Verify subgrade meets specified requirements on Civil Documents or manufacturer’s requirements, whichever is more stringent.

3.2 PREPARATION

A. Comply with manufacturer's instructions for preparing surface.

B. Substrates must be smooth with no gaps or voids greater than 1/2 inch. Grout all penetrations such as utility conduits.

1. Horizontal Surfaces: Free of loose aggregate and sharp protrusions.

2. Vertical Surfaces: Provide concrete, plywood, insulation, or other approved substrate for waterproofing membrane support.

C. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

D. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

E. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

F. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Install sheet strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.

G. Bridge and cover construction joints with overlapping sheet strips as required to maintain warranty.

H. Corners: Prepare, prime, and treat inside and outside corners according to manufacturer’s details, maintaining warranty.

I. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to manufacturer’s details, maintaining warranty.

J. Apply primer to substrate surfaces at rate recommended by manufacturer of primary waterproofing materials. Prime only area that will be covered by waterproofing membrane in same working day. Re-prime areas not covered by waterproofing membrane within 24 hours of initial primer application.

3.3 INSTALLATION

A. Comply with manufacturer's instructions for handling and installing sheet waterproofing materials.

1. Orient membrane per manufacturer’s instructions

2. Position succeeding sheets to overlap the previous sheet a minimum 4 inches, or as recommended by manufacturer. Ensure underside of succeeding sheet is clean and ready to install.
3. At end-to-end lap, apply 3 inch mastic strip at end of sheet. Overlap next sheet and apply even pressure with a roller to ensure full adhesion.
4. Membrane Terminations: Apply 12 inch wide area of fabric detail tape with 6 inches on each side of lap edge.
5. Remove any protective coverings.
6. Inspect membrane prior to concrete placement. Repair any issues per manufacturer's instructions.

B. Coordinate installing waterproofing materials with associated work to provide complete system complying with combined recommendations by manufacturers and installers involved in Work. Schedule installation to minimize exposure of sheet waterproofing materials.

C. Seal penetrations and seal seams. Bond to vertical surfaces and also, where shown or recommended by manufacturer, bond to horizontal surfaces.

D. Top Edge Seal: For vertical and sloped-wall membrane, finish in reglet (where provided); otherwise finish under flashing or under masonry in joint. Caulk exposed edges with mastic or sealant.

E. Expansion Joints: Install joint filler with protruding rounded surface, as recommended by manufacturer.

1. Apply continuous 8-inch-wide strip of membrane on joint, followed by membrane application.

F. Coat exposed areas of sheet and flashing materials. Comply with sheet manufacturer's recommendations for applying and curing the coating.

G. Protection Board: Install protection board over completed membrane, complying with manufacturer's recommendations for both waterproofing sheet and protection course materials.

H. Install underslab membrane waterproofing in strict accordance with the manufacturers written installation instructions.

1. Coordinate extents of underslab membrane where wood floors are adjacent to other types of flooring.

I. Provide a continuous watertight seal between the two types of waterproofing where the two join. Watertight seal shall be as recommended by the manufacturers of the types of waterproofing being used.

3.4 FIELD QUALITY CONTROL

A. Engage a full-time site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; membrane application, flashings, protection, and drainage components.

3.5 CLEANING

A. After completion, remove any masking materials and stains from exposed surfaces caused by waterproofing installation.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.6 PROTECTION

A. Protect completed membrane during installation of other materials or processes over membrane until concrete is placed or vertical surfaces are backfilled. Do not allow unnecessary traffic of any type on unprotected membrane.

END OF SECTION 071300

SECTION 072200 - ROOF AND DECK INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes polyisocyanurate roof insulation and accessories.

1.2 SUBMITTALS

A. Product Data:

1. Roof insulation boards
2. Fasteners

B. Shop Drawings: Insulation layout and attachment patterns for roof and saddle areas

1.3 QUALITY ASSURANCE

A. Insulation shall meet physical properties of ASTM C1289, Type II; Class 1 and provide a minimum Long Term Thermal Resistance (LTTR) value of 5.67 per inch (the basis for establishing thickness).

1. The use of aged R-values based on the RIC-TIMA conditioning procedure 281-1 is not acceptable.

B. Design roof system to meet wind-loading requirements for FBC. Refer to Structural Drawings for wind and design pressures.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer’s original packaging, dry, undamaged, with seals and labels intact.

B. Store products in weather protected environment, clear of ground and moisture, and in accordance with manufacturer’s instructions.

C. Protect from direct exposure to sunlight.

D. Do not install insulation that has become wet or damaged.

1.5 WARRANTY

A. Refer to Division 07 Section, Mechanically Attached Flexible Sheet Roofing for required system warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Basis of design: Energy 3 by Johns Manville

B. Polyisocyanurate roof insulation:

1. Atlas Roofing Corp.
2. Firestone Building Products

3. Hunter Panels
4. Rmax, Inc.

C. Roof Insulation shall meet:

1. FM Class 1 construction
2. Glass fiber reinforced facer sheets integrally laminated to both sides of polyisocyanurate
3. Total LTTR value shall be minimum 30, unless otherwise indicated.
4. Achieve LTTR by assembly of layers using a maximum individual board thickness of 2 inches
5. Cover Board: Glass mat faced gypsum board with water resistant core, 1/2-inch thickness. Dens Deck DuraGuard roof board by Georgia Pacific Corporation or ACFoam-HS Coverboard by Atlas Roofing when acceptable to meet Performance requirements of the roof assembly.
    a. Cover board shall be as tested when a tested assembly is required.
6. Compressive Strength: 25 pounds per square inch minimum.
7. Board Size: 4 foot x 8 foot maximum

D. Roof Saddle System: Glass fiber reinforced face sheets on both sides with iso core. Conform to ASTM C728.

E. Cants and Edge Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.

F. Tapered Insulation: Provide factory-tapered insulation boards fabricated to 1/4 or 1/2 inch per foot slope unless otherwise indicated.

G. Fasteners: Fasteners shall be approved by the membrane manufacturer to assure that required conditions are met to provide a system roof warranty. Fasteners shall also meet the following requirements:

1. FM 4470 SPRI Corrosion Test Procedure for Roofing Fasteners. To pass, the fasteners shall not accumulate more that 15 percent red rust after the "required number cycles" in the Kesternich cabinet.
    a. The required number of cycles is as currently recommended by FM and SPRI, but in no case shall it be less than 15.

H. Adhesives: Conform to manufacturer's recommendations.

2.2 COMPATIBILITY OF PRODUCTS

A. Verify the compatibility of products specified in this Section with products specified in Division 07 Section, Modified Bituminous Membrane Roofing. Substitution of components that restrict or limit the warranty will not be accepted.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with insulation manufacturer's instructions and recommendations for the handling, installation, and bonding or anchorage or insulation to substrate.

B. Install cover board in accordance with final Shop Drawings and roof system Performance Requirements

C. Insulation: Lay in multiple courses. Butt edges to provide contact, do not deform or place in surface compression. Cut and fit insulation around projections and vertical surfaces. Miter edges at ridges and elsewhere to prevent open joints. Stagger end joints in adjoining courses or base course. Stagger joints in succeeding layers with joints of layer below.

1. Mechanically fastened at metal deck locations: Secure all layers of insulation to deck using approved mechanical fasteners specifically designed and sized for attachment of specified insulation type to metal deck. Fasteners penetrating metal deck shall be exposed not more than a maximum of 1/2 to 3/4 inch beyond top flute of the deck.

a. Option: Mechanically fasten first layer to metal decking and adhere top layer(s) per manufacturers tested assemblies meeting Performance Requirements of roofing system and warranty requirements.

D. Attach roof insulation to roof deck in accordance with ASCE 7-10 requirements.

3.2 COORDINATION

A. Coordinate installation with other relative work preceding and subsequent to actual insulation installation including, but not limited to, the following:

1. Nailers, blocking, and insulation strips
2. Roof curbs
3. Flashings
4. Roof membrane

END OF SECTION 072200

SECTION 072713 - SELF-ADHERED SHEET MEMBRANE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes, self-adhering sheet membrane vapor permeable air barrier.

1.2 PERFORMANCE REQUIREMENTS

A. Provide an air and vapor barrier system to perform as a continuous barrier to air infiltration/exfiltration and water vapor transmission and to act as a liquid water drainage plane flashed to discharge any incidental condensation or water penetration.

1.3 SUBMITTALS

A. Product Data: Product data to include use limitations and substrate preparation recommendations.

B. Shop Drawings: Show locations and extent of air and vapor barrier system including details for terminations flashings, penetrations, window and door openings and treatment of substrate joints and cracks.

C. Installers qualifications

D. Samples: Minimum 4 inch by 6 inch section of the following for approval:

1. Air Barrier Membrane
2. Transition Membrane
3. Through Wall Flashing

E. Sample warranty

1.4 QUALITY ASSURANCE

A. Manufacturer: Air and vapor barrier systems shall be manufactured by a firm with a minimum of 20 years experience in the production of waterproofing and air barrier products.

B. Installer: Certified or otherwise approved by the primary product manufacturer

C. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include but not be limited to the following:

1. Review of submittals.
2. Review of surface preparation, minimum curing period and installation procedures.
3. Review of special details and flashings.
4. Sequence of construction, responsibilities and schedule for subsequent operations.
5. Review of mock-up requirements.
6. Review of inspection, testing, protection and repair procedures.

D. Mock-up:

1. Construct a typical exterior wall section, 8 feet long and 8 feet wide, incorporating back-up wall, cladding, window and doorframe and sill, insulation, flashing and any other critical junction (i.e.: roof, foundation).
2. Mock-up may remain as part of the work.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.

B. Do not double-stack pallets of fluid applied membrane components on the job site. Provide cover on top and all sides, allowing for adequate ventilation.

1.6 PROJECT CONDITIONS

A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer. Proceed with installation only when the substrate construction and preparation work is complete and in condition to receive the air and vapor barrier membrane.

1.7 WARRANTY

A. Provide manufacturer's warranty that air and vapor barrier and accessories are free of defects at time of delivery and are manufactured to meet manufacturer's published physical properties and material specifications.

B. Warranty Period: Five years from date of completion of the air and vapor barrier membrane installation.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis of Design: Perm-A-Barrier VSP by Grace Construction Products

B. Also acceptable:

1. BlueskinVP 160 by Henry Company

2.2 SELF-ADHERED AIR BARRIER MEMBRANE

A. Description: A self-adhered membrane consisting of a breathable carrier film with a specially designed adhesive.

B. Performance Requirements:

Property	Test Method	Typical Value
Air Permeance at 75Pa (0.3 in. water) Differential Pressure	ASTM E 2178	<0.02 L/(m^2) (<0.004 cfm/ft^2)

Assembly Air Permeance at 75Pa (0.3 in. water) Differential Pressure	ASTM E 2357	<0.2 L/m^2 (<0.04 cfm/ft^2)
Water Vapor Permeance	ASTM E 96, Method B	Less than 15 Perms

2.3 TRANSITION MEMBRANE

A. Description: 36 mil of self-adhesive rubberized asphalt integrally bonded to 4 mil of cross-laminated, high-density polyethylene film to provide a min. 40 mil thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed. (Perm-A-Barrier Detail Membrane)

2.4 FLEXIBLE MEMBRANE THROUGH-WALL FLASHING

A. Description: Min. 32 mil of self-adhesive rubberized asphalt integrally bonded to 8 mil of cross-laminated, high-density polyethylene film to provide a min. 40 mil thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.

2.5 AIR & VAPOR BARRIER ACCESSORIES

A. Primer: Water-based primer which imparts an aggressive, high tack finish on the treated substrate (Perm-A-Barrier Primer Plus)

B. Wall Primer: Water-based primer which imparts an aggressive, high tack finish on the treated substrate (Perm-A-Barrier WB Primer)

C. Liquid Membrane for Details and Terminations: Bituthene Liquid Membrane manufactured by Grace Construction Products; a two-part, elastomeric, trowel grade material designed for use with self-adhered membranes and tapes. 10 g/L max. VOC content.

D. Substrate Patching Membrane: Bituthene Liquid Membrane manufactured by Grace Construction Products; a two- part, elastomeric, trowel grade material designed for use with self-adhered membranes and tapes. 10 g/L max. VOC content.

E. Joint Sealant: Refer to sealant manufacturer’s recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions of substrates and other conditions under which this work is to be performed.

1. Confirm Dry-bulb temperatures for are acceptable for high and low limits.
2. Confirm allowable moisture contents are within acceptable ranges for substrate and ambient environment.
3. Confirm surface profiles are within acceptable ranges.
4. Verify that concrete has cured and aged for minimum time period recommended by air-barrier manufacturer.
5. Verify that concrete is visibly dry and free of moisture. Test for

capillary moisture by plastic sheet method according to ASTM D 4263.

6. Verify that masonry joints are flush and completely filled with mortar.

B. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, spalled areas, loose aggregate, and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods that are acceptable to manufacturer of the fluid-applied waterproofing.

B. Related Materials: Treat construction joints and install flashing as recommended by air barrier manufacturer.

3.3 INSTALLATION

A. Refer to manufacturer's literature for recommendations on installation

B. Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.

C. Application of Self-Adhered Air Barrier Membrane

1. Install air & vapor barrier to dry surfaces at air and surface temperatures of 40°F and above in accordance with manufacturer's recommendations, at locations indicated on Construction Documents.
2. Prime substrate to receive air barrier membrane as required per manufacturers written instructions.
3. Precut pieces of air & vapor barrier into easily handled lengths.
4. Remove silicone-coated release paper and position membrane carefully before placing length horizontally against the surface.
5. Begin installation at the base of the wall placing top edge of membrane immediately below any masonry reinforcement or ties protruding from substrate.
6. When properly positioned, place against surface by pressing firmly into place. Roll membrane with extension-handled countertop roller immediately after placement.
7. Overlap horizontally adjacent pieces 2 in. and roll seams.
8. Subsequent sheets of membrane applied above shall be positioned immediately below masonry reinforcement or ties. Bottom edge shall be slit to fit around reinforcing wires or ties, and membrane shall overlap the membrane sheet below by 2 in. Roll firmly into place.
9. Seal around masonry reinforcing or ties and all penetrations with termination mastic.
10. Coordinate the installation of air & vapor barrier with roof installer to ensure continuity of membrane with rooftop air & vapor membrane.
11. At end of each working day seal top edge of air & vapor barrier to substrate with termination mastic.
12. Do not expose air & vapor barrier membrane to sunlight for more than

thirty days prior to enclosure.

13. Inspect installation prior to enclosing and repair punctures, damaged areas and inadequately lapped seams with a patch of the membrane sized to extend 6 in. in all directions from the perimeter of the affected area.

3.4 TRANSITION MEMBRANE INSTALLATION

A. Install strips, transition membrane, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier. Install all transition membrane only after application of air barrier.

B. Apply primer to substrates to receive transition membrane at required rate and allow to dry. Limit priming to areas that will be covered by transition tape in same day. Re-prime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing not covered with air membrane material with number of prime coats needed to achieve required bond, with adequate drying time between coats.

C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge transition membrane to substrate with termination sealant.

E. Apply joint sealants forming part of air barrier assembly within sealant manufacturer's recommended application temperature ranges. Consult sealant manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition membrane so that a minimum of 3 inches of coverage is achieved over both substrates.

1. Transition Membrane: Roll firmly to enhance adhesion.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

H. Repair punctures, voids, and deficient lapped seams in transition membrane. Slit and flatten fish-mouths and blisters. Patch with transition membrane extending 6 inches beyond repaired areas in strip direction.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed, if applicable.
7. Laps in transition membrane have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fish-mouths.
8. Termination sealant has been applied on cut edges.
9. Transition membrane has been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

C. Tests: Testing to be performed will be determined by Owner's testing agency from among the following tests:

1. Qualitative Testing: Air barrier assemblies will be tested for evidence of air leakage according to ASTM E1186, smoke pencil with pressurization or depressurization.

D. Remove and replace deficient air barrier components and retest as specified above.

3.6 PROTECTION AND CLEANING

A. Protect membrane from exposure to bulk water immediately after application.

B. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

C. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than 150 days.

D. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

E. Remove masking materials after installation.

END OF SECTION 072713

SECTION 074646 - FIBER CEMENT SIDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fiber cement siding.

1.2 SUBMITTALS

A. Product Data: Show Florida Product Approval in accordance with Florida Building Code rule 9N-3 of the Florida Administrative Code.

B. Shop Drawings: Show profiles and installation details not included in Product Data standard published details.

C. Samples: 12-inch pieces of proposed siding and shingle in texture shown.

D. Mock-Ups

E. Sample warranties

1.3 QUALITY ASSURANCE

A. Manufacturer shall have a minimum of 10 years experience in projects of similar scope.

B. No asbestos shall be used in the manufacturing process or present in the final product.

C. Siding to be non-combustible when tested in accordance with ASTM test method E136.

1.4 JOB CONDITIONS

A. Mock-Ups

1. Install an approximately 8’-0 by 4’-0 panel of each the lap siding for review and as the basis of quality for the remainder of the work.
2. Mock-ups may be incorporated in work in protected during construction.
3. Mock-up to be painted and sealant installed before Architect’s review.

1.5 WARRANTY

A. Warrant product against manufacturing defects in lap siding and panel products for 50 years, and shingle products for 30 years.

B. Workmanship: Application limited warranty for two years from the Date of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack claddings on edge or lay flat on a smooth, level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis of Design: Hardiplank, by James Hardie Building Products.

B. Products of other manufacturers will be considered provided they equal or exceed the material requirements and design qualities of the specified product.

2.2 MATERIALS

A. Non-asbestos fiber-cement siding to comply with ASTM Standard Specification C1186 Grade II, Type A.

B. Panels/Siding:

1. Lap Siding: Cedarmill Select 9-1/2" W / 6" exposure
2. 4 foot by 8 foot, smooth texture

C. Trim: 5/4 by width shown on drawings, smooth

D. 15# fiberglass felts as shown on Drawings for use on plywood substrates.

2.3 FASTENERS

A. Corrosion resistant screws or nails as recommended by manufacturer

B. Provide fasteners with sufficient size and length for penetration to withstand structural loading requirements including wind and design pressures.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Lap Siding:

1. Starting: Install a minimum 1/4 inch thick lath starter strip at the bottom course of the wall. Apply planks horizontally with minimum 1 1/4 inch wide laps at the top. The bottom edge of the first plank overlaps the starter strip.
2. Allow minimum 1 inch vertical clearance between roofing and bottom edge of siding.
3. Face nail to sheathing.
4. Locate splices at least 12 inches away from window and door openings.

B. Paneling:

1. Install flashing around all wall openings.
2. Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 3/4 inch or full thickness

of sheathing. Additional fasteners may be required to ensure adequate security.

3. Place fasteners no closer than 3/4 inch and no further than 2 inch from side edge of trim board and no closer than 1 inch from end. Fasten maximum 16 inch on center.
4. Maintain clearance between trim and adjacent finished grade.
5. Trim inside corner with single board.
6. Install single board of outside corner board then align second corner board to outside edge of first corner board. Do not fasten Harditrim board to Harditrim board.
7. Allow 1/8 inch gap between trim and siding.
8. Seal gap with high quality, paint-able caulk
9. Shim frieze board as required to align with corner trim.
10. Install Harditrim fascia over structural subfascia.

C. Refer to Division 07 Joint Protection for installation of sealants at lap siding.

3.3 DAMAGED MATERIAL

A. Repair or replace damaged material to the satisfaction of the Architect if damage has been caused by the manufacturer or wall panel erector/contractor.

B. Protect of completed and installed walls from damage by other trades.

END OF SECTION 074646

SECTION 075400 - THERMOPLASTIC MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Single-ply TPO roofing system

1. Coordinate with Division 07 Section, Roof and Deck Insulation

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

C. Base wind load design on requirements of the FBC based on requirements of ASCE 7-10 for Large Missile Impact, Level-E, for an Essential Facility Risk Category IV building. Refer to the Structural Drawings for wind Velocity.

1.3 SUBMITTALS

A. Product Data:

1. Manufacturer's technical data for each type of roofing product required
2. Roof Maintenance and Inspection Manual

B. Shop Drawings: Include roof outline, slopes, penetrations, terminations, insulation type and thickness, crickets, saddles, cants, piece layout, perimeters and parapet sizes, and special details that may affect the suitability and installation of the roofing system.

1. Calculations for wind load design shall be signed and sealed by a Professional Engineer in the State of Florida verifying compliance with Chapter 16 of the Florida Building Code, 2020 7th Edition and Chapter 23- 30 of ASCE 7 per the Structural Engineers Design Load Calculations and associated wind loads, pressures to meet the of an Essential Facility, Risk Category IV building on the Project Site.

C. Sample warranty

D. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.4 QUALITY ASSURANCE

A. Inform roofing manufacturer, with regard to warranties, that warranties shall be issued, based on the acceptance of the roofing work, and that deficiencies noted on inspection reports have been corrected. Manufacturer shall not refuse or restrict the provisions of its warranty, based on noted deficiencies.

1. Manufacturer’s representative shall inspect the roof within one year after the Date of Substantial Completion.

B. Membrane formulation to have a minimum 10 year performance record without change to the formulation.

C. Roofing installer must have a minimum 5 years experience in the type of roofing system specified.

D. A foreman/supervisor with a minimum 3 years experience in the type of roofing specified or the roofing manufacturer's technical field representative shall be present at all times when roofing work is being preformed.

E. Installer to be certified by or otherwise approved by the membrane manufacturer.

F. All roofing materials shall be labeled Class A per ASTM E108 and be certified by a nationally recognized independent testing laboratory.

G. Preinstallation Conference:

1. Conduct Conference at the Site with installer, installers of deck, installers of other work in and around roofing that must follow the roofing work (including Mechanical Work, if any), Architect, and other representatives directly concerned with performance of the work, including (where applicable) insurers, test agencies, product manufacturers, governing authorities, and the Owner. Record discussions, agreements, and disagreements. Furnish a copy of the record to each party attending. Review foreseeable methods and procedures related to roofing work, including, but not necessarily limited to, the following:

a. Project requirements (Contract Documents)
b. Submittals, both completed and yet to be completed
c. Status of substrate work, including drying, structural loading limitations, and similar considerations
d. Structural loading limitations
e. Availability of materials, tradesmen, equipment, and facilities needed to make progress and avoid delays
f. Inspection, testing, certifying, and accounting procedures
g. Forecasted weather conditions and procedures for coping with unfavorable conditions, including the possibility of temporary roofing
h. Code compliance regulations, environmental protection, health, safety, fire, and similar considerations
i. Procedures needed for protection of roofing during the remainder of the construction period
j. Roof inspection and repair procedures

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the Site in original, unopened containers, with legible labels and in sufficient quantity to allow continuity of work.

1. Deliver materials having fire resistance classifications to the Site with labels attached as required.
2. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

B. Store products indoors or in protected areas outdoors. Provide continuous protection against wetting, moisture absorption, and sunlight. Emulsion shall be stored in temperature above 40 degrees F.

1. Materials stored outdoors shall be on raised platforms. Cover top and sides with waterproofed materials. Discard wet products.
2. Handle roll goods to prevent edge and end damage.
3. Store flammable materials in a cool, dry area away from sparks and open flame. Comply with precautions on container and SDS.
4. Do not store roofing materials in concentrated areas of roof deck.

1.6 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.7 WARRANTY

A. Furnish a written guarantee warranting the roofing, insulation, and flashing work, including the installation of products furnished by others and installed under this Section, against defects in materials and workmanship for a period of 5 years from the Date of Substantial Completion.

1. Guarantee shall include, but not be limited to, roofing, roof insulation, sheet metal flashings and gravel stops, gutters and downspouts, flexible flashings, expansion joints, control joints, and curbs at roof openings.
2. Guarantee period shall begin on the date of Substantial Completion for the Project or such date that the roof is accepted by the Architect and Owner, if the date is after the date of Substantial Completion.
3. Repairs required, either permanent or temporary, to roofing system under this guarantee to keep the roof watertight shall be made within 3 days after notice of the need for repairs. Should the Contractor fail to make such repairs within the time period, the Owner may have such repairs made and charge the cost to the Contractor.

B. In addition to the guarantee above, provide to the Owner a written NDL warranty from the roofing membrane manufacturer, warranting the roofing system membrane, insulation, flashing, walkways, and expansion joint covers against leaks and defects in materials and workmanship for a period of 20 years from the Date of Substantial Completion.

1. Warranty shall not be limited by windloading less than the design windloading and wind uplift. Include a wind warranty rider up to the designed wind and design pressures.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:

1. BoD: Carlisle SynTec Incorporated
2. Firestone Building Products Company
3. Versico Roofing Systems

2.2 THERMOPLASTIC POLYOLEFIN ROOFING MEMBRANE

A. Roofing Membrane: Thermoplastic Polyolefin based membrane having a minimum nominal thickness of 60 mils and Meeting ASTM D6878 – Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing

1. Color: Tan or White

B. Cover Tape: Cured butyl membrane as recommended by manufacturer meeting Performance Requirements

C. Cant Strips, tapered Edge Strips, and Flashing Accessories: Types recommended by manufacturer and meeting Performance Requirements

D. Flashings: Manufacturer’s standard meeting Project conditions and Performance requirements

1. Provide pre-molded pipe seals and pre-molded corners

2.3 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.

B. Bonding Adhesive: Manufacturer's standard bonding adhesive meeting Performance Requirements.

C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

D. Termination Bars: Manufacturer's standard predrilled aluminum bars, approximately 1 by 1/8 inch thick; with stainless steel anchors.

2.4 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick, and acceptable to membrane roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify deck condition is suitable for the installation of the specified roofing

system. Do not proceed until unsatisfactory conditions have been corrected.

1. Substrate should provide positive slope and subsequent positive drainage of new Roofing System.
2. Substrate shall be smooth without significant surface depressions or irregularities. Camber differentials greater than 3/16 inch must be leveled using a cementitious grout.
3. Verify blocking, curbs, and nailers are anchored to deck at penetrations and terminations and that nailers match insulation thickness.

B. Finished surfaces shall be free of moisture, dust, loose debris and other irregularities that may hinder the performance of Roofing System

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 ADHERED ROOFING MEMBRANE INSTALLATION

A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.

B. Align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Bonding Adhesive: Apply bonding adhesive to substrate and membrane as required at rate required by manufacturer and install roofing membrane after flash-off requirements. Do not apply bonding adhesive to splice area of roofing membrane.

D. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

E. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
2. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.

F. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

3.4 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply solvent-based bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with sheet flashing.

D. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.

3.5 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.6 MANUFACTURER'S INSPECTION

A. Prior to the date of Substantial Completion, the membrane manufacturer's representative, in the presence of the Owner, Architect, and Construction Manager shall inspect the Roof System. Discrepancies shall be recorded and rectified.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.

B. Owner will engage a qualified testing agency to perform the following tests:

1. Flood Testing: Flood test each roof area for leaks, according to recommendations in ASTM D5957, after completing roofing and flashing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.

a. Flood to an average depth of 2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of base flashing.
b. Flood each area for 48 hours.
c. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installations are watertight.

1) Cost of retesting is Contractor's responsibility.

d. Testing agency shall prepare survey report indicating locations of initial leaks, if any, and final survey report.

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.

D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.8 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

3.9 ATTACHMENTS

A. Manufacturer's Notice of Intent to Issue Roof Warranty

END OF SECTION 075400

SECTION 076000 - FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Aluminum flashing and counterflashing
2. Downspouts
3. Exposed metal trim units
4. Miscellaneous sheet metal accessories
5. Coping caps
6. Collection boxes
7. Scuppers
8. Precast concrete splash blocks

1.2 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Design coping assemblies in accordance with the FBC. Refer to structural drawings for wind and design pressures.

1. Coping design shall meet ANSI/SPRI ES-1 per the FBC
2. Coping design shall be compliant with Florida Building Code rule 9N-3 for statewide product approval for Essential Facility Risk Category IV building.

C. Delegated Design: Engage a qualified registered Professional Engineer to design exterior manufactured roof specialties.

D. Structural Loads:

1. Wind Loads: As indicated on Structural Drawings in accordance with Florida Building Code (FBC) and ASCE 7 requirements for Components and Cladding.
2. Other Design Loads: As indicated on Structural Drawings.
3. Miami Dade Acceptance or Florida Product Approval: Provide roof specialties for the building exterior having a Notice of Acceptance (NOA) letter from the Miami Dade County Building Code Compliance Office (BCCO) or Florida Product Approval letter.

E. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. 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, ambient; 180 deg F, material surfaces.

F. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.3 SUBMITTALS

A. Shop Drawings:

1. Showing layout, profiles, methods of joining, and anchorages details, including major counterflashings, trim/fascia units, and scuppers
2. Plans to be at 1/4-inch scale and details at 3-inch scale, for all sheet metal pieces and accessories
3. Coping cap shop drawings are to be designed to meet the wind loading requirements of ASCE 7-10 (Essential Facility Risk Category IV building) and shall be signed and sealed by a licensed engineer registered in the State of Florida

B. Samples:

1. 8-inch-square samples of specified sheet materials to be exposed as finished surfaces
2. 12-inch-long samples of factory-fabricated products exposed as finished work. Provide complete with specified factory finish
3. Manufacturer’s standard color chart for specified coating system

C. Sample warranties

1.4 QUALITY ASSURANCE

A. Except as otherwise shown on Drawings or specified, the workmanship of sheet metal work, method for forming joints, anchoring, cleating and provisions for expansion shall conform to the standard details and recommendations of the Copper and Brass Research Association; and workmanship shall be of the best quality, in accordance with best trade practice and the recommendations and specifications of the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).

B. Where pre-engineered manufactured systems are specified, other field fabricated or shop fabricated substitutions will not be accepted.

C. Downspouts shall conform to SMACNA “Architectural Sheet Metal Manual” for sizing components for rainfall intensity determined by a storm occurrence of 1 in 10 years.

D. Fabricator and installer shall be a company specializing in sheet metal work and installation with five (5) years documented experience.

E. Forming and assembling of sheet metal components shall be performed using methods that will not void the manufacturer's finish warranties.

1.5 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.

1.6 WARRANTIES

A. Flashing warranty shall be part of the roofing system warranty. Refer to Division 07 Section, Modified Bituminous Sheet Roofing

B. Coping warranty shall be a wind warranty matching the roofing membrane design wind pressures.

1. Warranty period: 20 years starting on the Date of Substantial Completion

PART 2 - PRODUCTS

2.1 MATERIALS

A. The type and locations of the various kinds, gages, thickness, and finish of sheet metal to be used is specified hereinafter under the individual items. Where sheet metal is indicated on Drawings and kind or type of metal is not definitely specified, sheet metal shall match the type as used on the rest of the project.

B. Aluminum Sheet: ASTM B 209, Alloy 3003, 3004, 3105, or 5005, Temper suitable for forming and structural performance required, but not less than H14:

C. Extruded Aluminum: Manufacturer's standard extrusions of sizes and profiles indicated, 60063-T52, AA-C22A41 clear anodized finish; 0.080-inch minimum thickness for primary legs of extrusions.

D. Finish (exposed to view)

1. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
2. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.
3. Fluoropolymer Coating (where indicated on Drawings): Manufacturer's standard three-coat, thermo-cured, full-strength 70 percent Kynar 500 FSF resin, 1 mil thick with 0.5 mil clear coat and 30 percent reflective gloss when tested in accordance with ASTM D 523. A 20 year limited warranty against failure of the finish shall begin on the Date of Substantial Completion

E. Prefabricated reglets and counterflashings by

1. Manufacturers:

a. Basis of Design: Fry Reglet Corp.
b. Architectural Products Co.

2. Type: "SM" made of .025 Epox-E-Koted aluminum with slots for expansion, punched approximately 16 inches o.c. for surface mounting.

Provide factory fabricated mitered corners.

a. Provide Type MA at masonry
b. Provide Type ST/STX for stucco
c. Provide Type CO for concrete embedment (poured in place only)

3. Provide Fry "Springlock" counterflashing.

F. Shop fabricate aluminum flashings to configurations indicated on Drawings.

1. Fabricate flashings and drip edges from nominal, 0.040 inch thick aluminum sheet with factory applied finish.
2. Color shall be as selected by Architect.
3. Fascia shall be provided with concealed splice plates for joints 10 feet on center.

G. Metal termination bar shall be 1/8 inch by one inch aluminum bar.

H. Coping Caps:

1. .063 inches aluminum formed as indicated on the Drawings and as required for the installation. Support shall be coping cleat assembly. Concealed splice plate shall match color and finish of coping caps.
2. Finish: Kynar 500 FSF finish where indicated on the Drawings.
3. Manufacturers:

a. Permasnap Coping by W.P. Hickman Company
b. Roof Edge Systems by Metal Era

4. Shop or field fabricated coping caps are not acceptable.
5. All corners shall be pre-formed, mitered, and welded tight.
6. Provide continuous cleats at all copings.

I. Downspouts:

1. Downspouts: 0.032 aluminum except for grade to 8 feet provide 0.125 extruded. Coordinate with drawings for cross section size.
2. Finish: Match copings

J. Collection Boxes and Scuppers: Fabricate from 20 gage hot dipped galvanized steel with Kynar 500 FSF finish in color as selected by Architect. Configuration as indicated.

1. Fabricate using sheet aluminum to profiles and details shown.
2. Lock seam corners, solder watertight and hem outer exposed edges.
3. Provide 4-inch wide minimum flanges formed to fit cants, decks and vertical wall surface.
4. Shop punch flanges for fastenings at 6 inches on center.
5. Finish to match copings

K. Precast concrete splashblocks shall be 12” wide by 24” long; 3000 psi minimum with an integral water repellent. Provide one splashblock for each downspout that empties on the low roof areas or on grade.

2.2 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Fasteners: Stainless steel

B. Bituminous Coating: SSPC - Paint 12, solvent-type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.

C. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, non- drying, nonmigrating sealant.

D. 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 Division 07 Section, Joint Protection.

E. Epoxy Seam Sealer: 2-part noncorrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior nonmoving joints including riveted joints.

F. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet.

G. Paper Slip Sheet: 5-lb. rosin-sized building paper.

H. Polyethylene Underlayment: Minimum 6-mil carbonated polyethylene film resistant to decay when tested in accordance with ASTM E 154.

I. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar items required for installation, matching or compatible with material being installed, noncorrosive, size and gage required for performance.

J. Elastic Flashing: Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.030 inch.

K. Roofing Cement: ASTM D 4586, asbestos-free.

2.3 FABRICATION

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.

B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.

C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

E. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

F. Aluminum Extruded Units: Fabricate extruded aluminum running units with formed or extruded aluminum joint covers for installation behind main members where possible. Fabricate mitered and welded corner units.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine substrates and conditions under which items will be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Separate dissimilar metals from each other by painting each metal surface in area of contact with a heavy application of bituminous coating.

3.3 INSTALLATION REQUIREMENTS

A. General: Comply with recommendations with SMACNA "Architectural Sheet Metal Manual." 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. Lap seam at movement joints and flat lock at non-movement joints.

B. Install work with provisions for thermal expansion of flashings, gravel stops, and other items exposed for more than 15 feet continuous length. Maintain a watertight installation at expansion seams. Locate expansion seams where shown, or if not shown, in conformance with applicable recommendations of "Architectural Sheet Metal Manual" by SMACNA.

C. Sheet metal work shall be watertight and weathertight; lines, arises, and angles sharp and true; plain surfaces free from waves and buckles. Workmen shall be experienced in the trade and thoroughly capable of performing the Work in accordance with these requirements.

D. Underlayment: Where 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.

E. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

F. Install elastic flashing in accordance with manufacturer's recommendations. Where required, provide for movement at joints by forming loops or bellows in width of flashing. Locate cover or filler strips at joints to facilitate complete drainage of water from flashing. Seam adjacent flashing sheets with adhesive, seal and anchor edges in accordance with manufacturer's recommendations.

G. Install reglets to receive counterflashing in manner and by methods indicated. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division 3 sections. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division 4 sections.

1. Apply continuous bead of sealant or plastic cement to back of type "SM" reglet.
2. Install Type "SM" reglet on surface of flexible flashing on wall parallel to roof slope with fasteners furnished by manufacturer. Fill top groove with sealant and tool tight against wall with surface of sealant sloping to outside.

H. Install counterflashing in reglets, either by snap-in seal arrangement or by welding in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.

I. Flashing installations at roof penetrations not detailed on the Drawing shall be performed according to the recommendations and specifications of the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), subject to approval by the Architect.

J. Install coping caps in accordance with the manufacturer’s written installation instructions to furnish the wind warranty.

3.4 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Protection: Provide 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 SECTION 076000

SECTION 081100 - METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes hollow metal doors and frames.

B. Refer to Division 08 Section, Glazing for glass requirements.

1.2 DEFINITIONS

A. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.3 SUBMITTALS

A. Product Data: Details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.

B. Shop Drawings:

1. Show elevations, details and methods of assembling sections, hardware locations and installation methods, dimensions, shapes of materials, anchorage and fastening methods, wall opening construction details, and weatherstripping.
2. Provide schedule of doors and frames using same reference numbers for details and openings as those on Contract Documents.
3. Calculations for wind load design shall be signed and sealed by a Professional Engineer in the State of Florida verifying compliance with Chapter 16 of the Florida Building Code, 2020 7th Edition and Chapter 23- 30 of ASCE 7 per the Structural Engineers Design Load Calculations and associated wind loads, pressures to meet the of an Essential Facility, Risk Category IV building on the Project Site.
4. Sample of Approved Product Label and location of attachment to assembly.
5. Submit current Miami-Dade NOA for all exterior door and window units

C. Label Construction Certification: For fire-rated assemblies exceeding limitations of labeled assemblies, submit manufacturer's certification that each assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

1. Each label is to include the fire protection rating of the individual frame/door assembly.

D. Sample warranty

1.4 QUALITY ASSURANCE

A. Provide hollow metal work from a single manufacturer complying with Steel Door Institute "Recommended Specifications for Standard Steel Doors and Frames" ANSI/SDI A250.8 and as specified.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.

1. Door frames shall receive a permanent embossed label. Window and side light frames shall receive a mylar label.

C. Hollow metal supplier shall be a qualified direct distributor of products to be furnished. In addition, the distributor shall have in their regular employment an A.H.C./C.D.C. who will be available at reasonable times to consult with the Architect regarding matters affecting the doors and frames.

D. Design exterior steel door assemblies to meet wind-loading requirements for the FBC. Refer to Structural Drawings for wind and design pressures.

1. All exterior door assemblies shall carry a Miami Dade NOA for Large Missile Impact, Level-E, for an Essential Facility Risk Category IV building.

E. Positive Pressure Test: Where fire rated assembly is required, provide doors that comply with ANCI/UL 10C, Category A, per the FBC.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish.

B. Inspect units upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged units as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4 inches high wood blocking. Avoid use of non-vented plastic or canvas shelters that 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide products from one of the following manufacturers:

1. Amweld Building Products
2. Ceco Door Products
3. Steelcraft, an Ingersoll-Rand business
4. Curries Company
5. Mesker Door, Inc.
6. Firedoor Corp.
7. Architectural Openings, Inc.

2.2 MATERIALS

A. Cold-Rolled Steel Sheets: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Galvanized Steel Sheets: ASTM A 653, Commercial Steel (CS), Type B; with minimum A60 metallic coating.

C. Supports and Anchors: Fabricate of not less than 18-gage Commercial Steel (CS) 40Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008 or ASTM A 1011, hot-dip galvanized according to ASTM A 153, Class B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153.

E. Asphaltic Emulsion Coating: Water-based, brush applied, emulsion dampproofing.

1. Provide products within VOC limits specified for Non Porous sealant primer in Division 07 Section, Joint Protection.

2.3 FABRICATION, GENERAL

A. Fabricate units rigid, free from defects, warp, or buckle. Form metal to required sizes and profiles. Wherever practicable, fit and assemble units in the manufacturer's plant. Identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at the Site.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

1. Lock edge of doors: Bevel 1/8 inch in 2 inches.

C. Fabricate panels and edge channels from galvanized sheet steel for exterior doors. For interior doors, fabricated from cold rolled sheet steel.

D. Fabricate concealed stiffeners, reinforcement, edge channels, and moldings from either cold rolled or hot rolled steel (at fabricator's option).

E. Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws.

F. Hardware Preparation:

1. Prepare hollow metal units to receive mortised and concealed door hardware, including cutouts, reinforcing, drilling, and tapping in accordance with final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI/SDI A250.6 and ANSI/DHI A115 Series "Specifications for Door and Frame Preparation."
2. Reinforce hollow metal units to receive surface applied hardware. Drilling and tapping for surface applied door hardware may be done on Site.
3. Locate finish hardware as shown on final shop drawings, or if not shown, in accordance with recommended hardware locations specified

in ANSI/SDI A250.8.

4. Reinforce all steel doors and frames to receive surface mounted closers, whether or not scheduled to receive them.

G. Shop Painting

1. Clean, treat, and shop paint all surfaces of fabricated hollow metal doors and frames, including galvanized surfaces plus back priming at the following conditions:

   a. All exterior doors in concrete or masonry
   b. Interior doors in concrete or masonry. Back priming shall not void any labeling requirements for fire rated assemblies.

2. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before the application of the shop coat of paint.
3. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive field applied paint.

   a. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

H. Asphaltic Emulsion Coating: Shop apply to frames; field application is not acceptable.

2.4 DOOR TYPES

A. Conform to the Steel Door Institute Standards, ANSI/SDI A250.8, and as follows:

B. Exterior Doors: Grade III, 1-3/4 inches extra heavy duty, 16 gage galvanized, Model 2, seamless design. (Coordinate gage with tested assemblies required for wind loading at exterior locations.)

1. Form door face sheets from one sheet of metal, with no visible seams on the door face or edges.
2. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
3. Design: Flush panel
4. Core: Rigid polystyrene slabs bonded to door face sheets.

C. Interior Doors: Grade II, 1-3/4 inch heavy duty, 18 gage cold rolled, Model 1, full flush, hollow steel construction.

1. Form door face sheets from one sheet of metal with no face seams. Seams on vertical door edges shall be tight, smooth, and devoid of irregularities. A kraft resin impregnated honeycomb core or rigid polystyrene slab shall be permanently bonded to both door skins with adhesive recommended by the manufacturer.

2. For 1 1/2 hour and 1 hour doors used in stairway enclosures the average temperature rise developed on the unexposed side shall not exceed 450 °F at the end of 30 minutes of standard fire test. Fire labeled doors with a temperature rise rating shall have a mineral fiber core

D. Seamless construction by welding and filling at factory only.

2.5 DOOR ACCESSORIES

A. Glass Stops and Moldings: Provided for vision light openings.

1. Glaze doors from the secure side.

B. Verify undercut requirements with Division 08 Section, Finish Hardware, for exterior doors with thresholds. Standard undercut will not be acceptable for low profile handicap thresholds.

C. Provide plastic water stop insert at the top of all doors where steel closure is not provided at top.

2.6 FRAME TYPES

A. Frames for Exterior Door Openings: 14 gage

1. Frames for exterior use shall be hot-dipped galvanized steel after fabrication.

B. Frames for Interior Door and Window Openings: 16 gage, fabricated from cold rolled sheet steel.

C. Welded Frames: Weld flush face joints continuously, grind, fill, dress, and make smooth, flush and invisible. Knock-down frame types are not permitted.

2.7 FRAME ASSEMBLIES

A. Frame Anchors

1. Wall anchors for frame attachment to masonry construction: Adjustable, flat, corrugated or perforated ‘T’ shaped anchors with leg not less than 2 inches wide by 10 inches long or masonry “wire” type not less than 3/16 inch diameter.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

a. Size anchors to accommodate frame jamb depth and face dimension on all welded frames

3. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 30 inches o.c.
4. Floor anchors:

a. Angle clip type
b. 16 gage minimum
c. Two fasteners per jamb
d. Weld to the bottom of each jamb

5. Head Struts: For frames not anchored to masonry or concrete construction provide ceiling struts spot welded to jambs each side extending to building structure where called for on schedule.
6. Sleeve anchors shall be fire rated for the types of openings required.

B. Stops and Beads: 20 gage, installed on the interior side of exterior frames.

C. Mortar Boxes: 26 gage steel, welded to the frame, at back of hardware cutouts where mortar or other materials might obstruct hardware operation.

D. Sidelites, Transom Bars, and Interior Window 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.

E. Door Silencers: Drill stops and install 3 silencers on strike jambs of single swing frames and 2 silencers on heads of double swing frames.

2.8 FIRE DOORS AND FRAMES

A. Provide approved and labeled hollow metal fire doors and frames at locations indicated in Door Schedule.

B. Labeled metal frames are required for labeled wood doors.

C. All labels shall be metal, attached to the frame where required by code. Stamped labels will not be acceptable.

2.9 LOUVERS

A. Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020 inch thick, cold-rolled steel sheet set into0.032 inch thick steel frame.

1. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.
2. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same testing and inspecting agency that established fire-resistance rating of door assembly.

a. Doors with louvers shall not incorporate a glass cutout.
b. Louvers shall be installed by the supplying steel door manufacturer.
c. Louvers are permitted in 1-1/2 hour and 3/4 fire doors.
d. The louver shall be a fusible link type no larger than 24 inches by 24 inches, tested in accordance with ASTM E 152, and listed by an independent testing and listing agency. Louver shall bear a listing mark indicating that the louver is listed. Listed fire door louvers are designed to close by the use of a fusible link and a weight. Design link to break at a predetermined temperature (135 degrees F to 160 degrees F), releasing the weight closing the louver blades.

e. Install louvers in the bottom of fire doors, one louver per leaf.

B. All profiles, design, and louver blades of rated and non-rated louvers shall match.

C. Exterior louvers to meet performance requirements for door assembly.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install standard steel doors, frames, and accessories in accordance with final Shop Drawings and the Contract Documents.

B. Placing Frames: Comply with ANSI A250.11.

1. Except for frames located at existing concrete, masonry or drywall installations, place frames prior to construction of walls.
2. Set frames, plumbed, aligned, and braced until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders.

   a. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

3. In masonry construction, locate 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb.

   Coordinate installation to allow for grouting frames solid. Do not allow frames to deform by grout forces.
4. Install fire-rated frames in accordance with NFPA Standard No. 80.
5. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels.
6. Anchor bottom of frames to floors with expansion bolts or with power fasteners. Where frames require ceiling struts or other structural overhead bracing, anchor to ceilings or structural framing above, as indicated or specified.
7. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb.
8. Finished work shall be rigid, neat in appearance, and free from defects. Form molded members straight and true with joints coped or mitered, well formed, and in true alignment. Welded joints on exposed surfaces shall be dressed smooth so they are invisible after finishing.
9. Refer to Division 04 Section, Concrete Masonry Units for metal frame grout. Do not spot grout metal frames in gypsum wallboard partitions.
10. Recess bolt heads, bondo and sand smooth where anchor bolts are used in concrete or masonry openings
11. Provide filler plate at all hardware preps, such as hinge and strike preps,

that are unused.

C. Door Installation: Fit hollow metal doors accurately in frames, within clearances specified in ANSI/SDI A250.8.

1. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
2. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
3. Install fire-rated doors with clearances as specified in NFPA 80

3.2 ADJUST AND CLEAN

A. Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

B. Protection Removal: Immediately prior to final inspection, remove protective plastic wrappings from prefinished doors.

C. Final Adjustments: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

3.3 FIELD QUALITY CONTROL

A. Damaged work will be rejected. Replace with new work at no additional cost to the Contract.

B. After installation, protect doors and frames from damage during subsequent construction activities.

END OF SECTION 081100

SECTION 081213 - HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes hollow-metal frames.

1.2 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-
HMMA 803 or SDI A250.8.

1.3 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.

1.4 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. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
2. Locations of reinforcement and preparations for hardware.
3. Details of each different wall opening condition.
4. Details of anchorages, joints, field splices, and connections.
5. Details of moldings, removable stops, and glazing.

1.5 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.

1. Provide additional protection to prevent damage to factory-finished units.

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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Amweld International, LLC.
2. Ceco Door; ASSA ABLOY.
3. Curries Company; ASSA ABLOY.
4. Republic Doors and Frames.
5. Steelcraft; an Allegion brand.

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.

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. Heavy-Duty Frames: SDI A250.8, Level 2.

1. Physical Performance: Level B according to SDI A250.4.
2. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
3. Frames: Fabricated from same thickness material as adjacent door frame.
4. Construction: Knocked down or slip on frames.
5. Exposed Finish: Factory.

2.4 FRAME ANCHORS

A. Jamb Anchors:

1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

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.

2.5 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. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

E. 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.

2.6 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: W here 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. 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. Floor Anchors: W eld 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.
4. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Stud-W all 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.

5. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
6. 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.

2.7 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.

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. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. 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 for doors, transoms, sidelites, borrowed lites, and other openings, 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. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    d. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

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. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
5. 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. 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.

C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081213

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors.
2. Factory machining for hardware.

1.2 SUBMITTALS

A. Product Data: For each type of door and pocket door frame. Include details of core and edge construction, and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: For wood doors. Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data, and other pertinent data, including the following:

1. Undercuts.
2. Fire-protection ratings for fire-rated doors.

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 finished Work.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist), or show telegraphing of core construction in face veneers.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

2. Warranty shall be in effect during the following period of time from date of Certificate of Occupancy.

a. Solid-Core Interior Doors: Manufacturer’s standard warranty.

PART 2 - PRODUCTS

2.1 SOLID-CORE WOOD DOORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Flush Wood Doors:

a. Algoma Hardwoods Inc.
b. Eggers Industries; Architectural Door Division.
c. Marshfield DoorSystems, Inc.
d. VT Industries, Inc.

2.2 DOOR CONSTRUCTION, GENERAL

A. Urea-Formaldehyde: Wood materials shall contain no added urea-formaldehyde.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium.
2. Finish: Match Architect’s samples.
3. Wood Species: White birch.
4. Cut: Rotary cut.
5. Construction: Five plies. Stiles and rails bonded to core; entire unit abrasive planed before veneering.
6. Vertical and Top Edges: Same species as faces.
7. Bottom Edge: Manufacturer’s option.
8. Top and Bottom: Provide veneer to match door faces or compatible veneer matching door faces.

2.4 DOORS FOR OPAQUE FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium.
2. Finish: Factory primed.
3. Faces: Any paint-grade closed-grain hardwood of mill option.
4. Construction: Manufacturer’s standard.
5. Vertical and Top Edges: Same species as faces.
6. Bottom Edge: Fabricator’s option.
7. Top and Bottom: Provide veneer to match door faces or compatible veneer matching door faces.

2.5 LIGHT FRAMES

A. Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.0478-inch- thick, cold-rolled steel sheet; factory primed.

1. Jamb: Split jamb with zinc coated steel sides and back.

2.6 FABRICATION

A. General: Fabricate doors in sizes indicated for Project-site fitting.

1. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

B. Clearances: Additional means of gap covering shall be provided where either code required or the room use dictates privacy.

1. Non-Fire-Rated Doors: Not more than 1/8 inch at jambs and heads, and not more than 1/8 inch between meeting stiles of pairs of doors; 3/4 inch at bottom unless otherwise indicated.

C. Machining: Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.

1. Light Openings: Trim openings with moldings of material and profile indicated.

E. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Provide screw-attached metal labels.
2. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
4. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

F. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-1 or Grade LD-2, made with binder containing no urea-formaldehyde.
2. Blocking: Provide wood blocking in particleboard-core doors asneeded to eliminate through-bolting hardware.

3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

a. Screw-Holding Capability: Minimum 550 lbf per WDMA T.M.-10.

G. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.

2. Blocking: Provide composite blocking with improved screw-holding capability

approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.

a. 5-inch top-rail blocking.
b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
c. 5-inch midrail blocking, in doors indicated to have armor plates.
d. Provide lock blocks, as required, in doors indicated to have exit devices.

3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

a. Screw-Holding Capability: Minimum 550 lbf per WDMA T.M.-10.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."

B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

C. Job-Fitted Doors: 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. Machine doors for hardware. Seal cut surfaces after fitting and machining.

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold.
2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 083100 - ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes access doors.

B. Refer to MEP documents for additional requirements.

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical data for each type of access door assembly, including setting drawings, and directions for installation of anchorage devices.

1. Schedule, including types, general locations, sizes, wall and ceiling construction details, finishes, latching, or locking provisions, and other pertinent installation data.

1.3 QUALITY ASSURANCE

A. Coordinate locations and sizes of access doors with Electrical and Mechanical Drawings. Provide access doors as required for access to concealed valves, pipes, connections, motors, and other items that will need to be accessed for maintenance purposes.

B. Fire Rated Openings: Provide only units which have been tested and listed by UL, FM, or WH and are acceptable to the authorities having jurisdiction and for the types required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide framed access doors by one of the following:

1. Cesco Products
2. Milcor, Inc., A Gibraltar Co.
3. Nystrom, Inc.

2.2 MATERIALS AND FABRICATION

A. Provide each access door assembly manufactured as an integral unit, complete, ready for installation.

B. Provide stainless steel doors and frames at kitchen/food service, restrooms high humidity areas and where located on Drawings for conditions noted.

1. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type
304. Remove tool and die marks and stretch lines or blend into finish.
2. Finish: Directional Satin Finish, No. 4

C. Gypsum Board Walls and Ceilings:

1. Frames: 16 gage cold rolled steel, perforated with galvanized drywall bead attached to all four sides
2. Recess: 5/8 inch
3. Hinges: Cold rolled with stainless steel pin, continuous piano type
4. Doors: 20 gage cold rolled steel
5. Size: 24 by 24 inch, unless indicated otherwise

D. Masonry Walls:

1. Frames: 16 gage cold rolled steel with adjustable metal masonry anchors
2. Doors: 20 gage cold rolled steel
3. Hinges: Cold rolled with stainless steel pin, continuous piano type
4. Size: 24 x 24 inch, unless indicated otherwise

E. Provide one key-operated cam lock per access door. Furnish 2 keys per lock. Key locks alike, unless otherwise scheduled.

1. Only one key operated latching device is required per panel.

F. Factory primed with manufacturer's standard primer for condition indicated.

2.3 MATERIALS AND FABRICATION FOR CONCEALED FRAME UNITS

A. Gypsum Board Walls and Ceilings:

1. Frames: Aluminum 6063-T6
2. Recess: For 5/8 inch GWB, type to match scheduled ceiling
3. Hinges: Manufacturer's standard concealed
4. Size: 24 x 24 inch, unless indicated otherwise

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide UL Labeled, fire-rated access doors and panels when required to be installed in fire-rated walls or ceilings.

B. Comply with manufacturer's instructions for installation of access doors and panels.

C. Install frameless access where detailed or scheduled on Drawings.

D. Coordinate installation with work of other trades.

E. Coordinate locking requirements with the Owner.

F. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

G. Finish: Field paint by Division 09 Section, Painting.

3.2 ADJUST AND CLEAN

A. Adjust hardware and panels after installation for proper operation.

B. Remove and replace panels or frames which are warped, bowed, or otherwise damaged.

END OF SECTION 083100

SECTION 084113 - ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes aluminum doors and frame storefront systems

1.2 PERFORMANCE REQUIREMENTS

A. Design aluminum door and frame assemblies in accordance with the FBC. Refer to structural drawings for wind and design pressures.

1. All exterior assemblies shall be compliant with Florida Building Code rule 9N-3 for statewide product approval and require a Florida Product approval or NoA number for Large Missile Impact, Level-E, for an Essential Facility Risk Category IV building.

B. System Assembly: Accommodate without damage to components or deterioration of seals, movement within system, movement between system and peripheral construction, dynamic loading and release of loads, deflection of structural support framing.

C. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of
1.57 lbf/sq. ft.

D. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glass, and heel bead of glazing compound.

E. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of highest positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

F. Provide for expansion and contraction within system components caused by cycling temperature range of 180 degrees F over a 12 hour period without causing detrimental effect to system components, anchorage, and other building elements.

1. Ensure doors function normally within limits of specified temperature range.

G. Delegated Design: Engage a qualified registered Professional Engineer to design exterior manufactured building components.

H. Structural Loads:

1. Wind Loads: As indicated on Structural Drawings in accordance with Florida Building Code (FBC) and ASCE 7 requirements for Components and Cladding.
2. Other Design Loads: As indicated on Structural Drawings.
3. Miami Dade Acceptance or Florida Product Approval: Provide roof specialties for the building exterior having a Notice of Acceptance (NOA) letter from the Miami Dade County Building Code Compliance Office (BCCO) or Florida Product Approval letter.

I. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below them to less than 1/8 inch and clearance between members and operable units directly below them to less than 1/16 inch.

J. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

K. Windborne-Debris-Impact-Resistance Performance: Provide aluminum-framed systems that pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996.

1. Large-Missile (Level E) Impact: For aluminum-framed systems located within 30 feet of grade.
2. Small-Missile Impact: For aluminum-framed systems located more than 30 feet above grade.

1.3 SUBMITTALS

A. Product Data:

1. Manufacturer’s published data for specified system
2. Maintenance Data to include in maintenance manuals for aluminum, glass, and sealants.

B. Shop Drawings:

1. Show elevations, details and methods of assembling sections, hardware locations, glass and infill details, dimensions, shapes of materials, anchorage and fastening methods, wall opening construction details, and weatherstripping.
2. Provide schedule of doors and frames using same reference numbers for details and openings as those on Drawings and Schedules.
3. Shop Drawings shall be signed and sealed by a licensed engineer registered in the State of Florida.
4. Calculations for wind load design shall be signed and sealed by a Professional Engineer in the State of Florida verifying compliance with Chapter 16 of the Florida Building Code, 2020 7th Edition and Chapter 23- 30 of ASCE 7 per the Structural Engineers Design Load Calculations and associated wind loads, pressures to meet the of an Essential Facility, Risk Category IV building on the Project Site.
5. Sample of Approved Product Label and location of attachment to assembly for exterior applications.

C. Certifications:

1. Provide test reports from AAMA accredited laboratories certifying the performance as specified.
2. Test reports shall be accompanied by the storefront manufacturer's letter of certification stating that the tested storefront meets or exceeds the referenced criteria for the appropriate storefront type.
3. Sample of Approved Product Label and location of attachment to assembly.

D. Hardware Schedule: Complete itemization of each hardware item provided for each entrance door, cross-referenced to door identification numbers in Contract Documents.

E. Pre-Installation Conference minutes

F. Field quality-control test and inspection reports.

G. Sample warranties

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.

1. Engineering Responsibility: Preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM E699 for testing indicated.

C. Design Requirements:

1. Drawings are diagrammatic and do not purport to identify nor solve problems of thermal or structural movement, glazing, anchorage, or moisture disposal.
2. Requirements shown by details are intended to establish basic dimension of units, sight lines and profiles of members.
    a. If modifications are proposed, submit explanatory data to Architect for review
3. Provide storefront systems, including necessary modifications, to meet specified requirements and maintaining visual design concepts.
4. Anchors, fasteners and braces shall be structurally stressed not more than 50 percent of allowable stress when maximum loads are applied.
5. Provide for expansion and contraction due to structural movement without detriment to appearance or performance.
6. Assemblies shall be free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.
7. Not Permitted: Vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum- framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.
    1. Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum-framed systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handle Products in accordance with AAMA – CW-10, Care and Handling of Architectural Aluminum from Shop to Site.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

C. Follow manufacturer's instructions for storing materials.

1.7 WARRANTY

A. Special Assembly Warranty: Manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.
    1. Failures include, but are not limited to, the following:
        a. Structural failures including, but not limited to,

excessive deflection.

b. Noise or vibration caused by thermal movements.

c. Deterioration of metal finishes and other materials beyond normal weathering.

d. Water leakage through fixed glazing and framing areas.

e. Failure of operating components.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: ENV-450 Fixed Window Wall System with ENV-350 Medium Stile Entrance Door by Enviralum Industries, Inc.

B. Products of the following manufacturers are also acceptable if they equal or exceed the design criteria for this Project:

1. YKK AP America Inc.
2. EFCO
3. Kawneer Company, Inc.
4. Tubelite, Inc.
5. United States Aluminum Commercial Products Group

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B209
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221
3. Extruded Structural Pipe and Tubes: ASTM B429.
4. Structural Profiles: ASTM B308
5. Welding Rods and Bare Electrodes: AWS A5.10

B. Steel Reinforcement (if required): With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment.

1. Structural Shapes, Plates, and Bars: ASTM A36
2. Cold-Rolled Sheet and Strip: ASTM A1008
3. Hot-Rolled Sheet and Strip: ASTM A1011

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads and meet Performance Requirements.

1. Framing members are composite assemblies of two separate extruded-aluminum components permanently bonded by an elastomeric material of low thermal conductance.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Fasteners and Accessories: Manufacturer's standard concealed, corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials and meeting Performance requirements.

1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners (where concealed is not possible) with countersunk Phillips screw heads, stainless steel with finish matching storefront.

E. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

F. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section, Glazing.

B. Glazing Gaskets: Manufacturer’s standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric types.

D. Glazing Sealants: As recommended by manufacturer for joint type.

2.5 DOOR HARDWARE

A. Heavy-duty units required for operation and to meet Performance Requirements; finish to match door. Install reinforcing for hardware as necessary.

1. Offset Pivot Sets: Comply with ANSI A156.4, Grade 1; exposed parts of cast aluminum alloy; provide intermediate pivot for doors.
2. Overhead Closers: LCN 4040XP Surface Closer; or Architect approved equal. Provide parallel arms only.
3. Cylinders are supplied under Division 08 Section, Finish Hardware
4. Exit Device: Concealed Rod Device for double door set.
5. Pull Handles: As scheduled or selected by Architect.
6. Thresholds: Provide thermal thresholds for system specified that meet accessibility requirements.
7. Weatherstripping as required for single or double door sets.

2.6 ACCESSORIES

A. Anchors: Adjustable, that accommodates fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer, and meeting Performance Requirements.

B. Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

C. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30mil thickness per coat.

D. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.7 FABRICATION

A. Form aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Sharp profiles, straight and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from interior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing (without projecting stops).

E. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.

F. Doors: Reinforce doors as required for installing hardware.

1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.
3. Provide nonremovable glazing stops on outside of door.

G. Hardware Installation: Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.

2.8 FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.

1. Color: As selected by Architect from full range of industry colors and color densities.

D. Shop and Touch-Up Primer for Steel Components: SSPC-Paint 25, zinc oxide, alkyd, linseed oil primer.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas for compliance with requirements for installation tolerances, methods of attachment, and other conditions affecting performance of work.

1. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this section.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Coordinate attachment and seal of perimeter air and vapor barrier materials.
4. Fit joints to produce hairline joints free of burrs and distortion.
5. Rigidly secure nonmovement joints.
6. Seal joints watertight, unless otherwise indicated.
7. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.
8. Provide thermal isolation where components penetrate or disrupt building insulation.
9. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
10. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
3. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section, Joint Protection and to produce weathertight installation.

E. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work. Allow for adjustments to accommodate construction tolerances.

F. Install glazing as specified in Division 08 Section, Glazing to meet Performance Requirements

G. Install perimeter joint sealants as specified in Division 07 Section, Joint Protection and to produce weathertight installation.

H. Entrances: Install to produce smooth operation and tight fit at contact points.

1. Install to produce tight fit at weather stripping and weathertight closure.
2. Field-Installed Hardware: Install surface-mounted hardware according to hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

I. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum tolerances:

1. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/4 inch accumulative.
2. Plumb: 1/8 inch in 10 feet, 1/4 inch in 40 feet
3. Level: 1/8 inch in 20 feet, 1/4 inch in 40 feet
4. Alignment:

    a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
    b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

5. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

1. Testing and inspecting agency will interpret tests and state in each

report whether tested work complies with or deviates from requirements.

B. Testing Services: Test and inspect representative areas to determine compliance of installed systems with specified requirements. Architect will determine areas to be tested. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

1. Subsill water Test: Test each installed subsill per AAMA 511 by filling the subsill that has been temporarily sealed for 15 minutes.
2. Water Penetration: Test according to ASTM E1105 (or AAMA 503 except minimum test pressure of 6.24 lbf/sq. ft.) at a minimum uniform and cyclic static-air-pressure difference of 0.67 times the static-air-pressure difference specified for laboratory testing under Part 1 "Performance Requirements" Article. Results shall not evidence water penetration.
3. Water Spray Test: Before installation of interior finishes has begun, a minimum of one window unit on each floor larger than 5 foot wide, designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

C. Repair, or remove and replace non-complying storefront assemblies.

D. Upon failure, additional testing will be at the discretion of the Architect for location and frequency, at no additional cost to the Owner.

3.4 ADJUSTING

A. Entrances: Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions.

1. For doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.

3.5 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by method acceptable to sealant manufacturer.

END OF SECTION 084113

SECTION 085113 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Aluminum windows.

1.2 PERFORMANCE REQUIREMENTS

A. Design aluminum window frame assemblies in accordance with the FBC. Refer to structural drawings for wind and design pressures.

1. All exterior assemblies shall be compliant with Florida Building Code rule 9N-3 for statewide product approval and require a Florida Product approval or NoA number for Large Missile Impact, Level-E, for an Essential Facility Risk Category IV building.

B. System Assembly: Accommodate without damage to components or deterioration of seals, movement within system, movement between system and peripheral construction, dynamic loading and release of loads, deflection of structural support framing.

C. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft.

D. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glass, and heel bead of glazing compound.

E. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of highest positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

F. Provide for expansion and contraction within system components caused by cycling temperature range of 180 degrees F over a 12 hour period without causing detrimental effect to system components, anchorage, and other building elements.

1. Ensure doors function normally within limits of specified temperature range.

G. Delegated Design: Engage a qualified registered Professional Engineer to design exterior manufactured building components.

H. Structural Loads:

1. Wind Loads: As indicated on Structural Drawings in accordance with Florida Building Code (FBC) and ASCE 7 requirements for Components and Cladding.
2. Other Design Loads: As indicated on Structural Drawings.
3. Miami Dade Acceptance or Florida Product Approval: Provide roof specialties for the building exterior having a Notice of Acceptance (NOA) letter from the Miami Dade County Building Code Compliance Office (BCCO) or Florida Product Approval letter.

I. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below them to less than 1/8 inch and clearance between members and operable units directly below them to less than 1/16 inch.

J. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

K. Windborne-Debris-Impact-Resistance Performance: Provide aluminum-framed systems that pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996.

1. Large-Missile (Level E) Impact: For aluminum-framed systems located within 30 feet of grade.
2. Small-Missile Impact: For aluminum-framed systems located more than 30 feet above grade.

1.3 TESTING AND PERFORMANCE REQUIREMENTS

A. Test Units:

1. Air, water, and structural test unit shall conform to requirements set forth in ANSI/AAMA/NWWDA 101/I.S.2-97.

B. Test Procedures and Performances:

1. Windows shall conform to ANSI/AAMA/NWWDA 101/I.S.2-97 requirements for the window type referenced. In addition, the following specific performance requirements shall be met.

   a. Performance Class: HC.
   b. Performance Grade: 65.

2. Provide AAMA-certified aluminum windows with an attached label.

3. Life Cycle Testing: Test in accordance with AAMA 910. There shall be no damage to fasteners, hardware parts, support arms, activating mechanisms, or any other damage that would cause the window to be inoperable. Air infiltration and water resistance tests shall not exceed specified requirements.

4. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/WDMA 101/I.S.2/NAFS, Air Infiltration Test.

   a. Maximum Rate: 0.3 cfm/sq. ft. (5 cu. m/h x sq. m) of area at an inward test pressure of 6.24 lbf/sq. ft. (300 Pa).

5. Water Resistance: No water leakage as defined in AAMA/W DMA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/WDMA 101/I.S.2/NAFS, Water Resistance Test.

   a. Test Pressure: 15 percent of positive design pressure, but not less than 12 lbf/sq. ft. (720 Pa).

6. Uniform Load Deflection Test: With window sash and ventilators closed and locked, test unit in accordance with ASTM E 330 at a static air pressure difference (positive and negative) of 60 psf.

   a. During the course of the test no member shall deflect over L/175 of its span.

7. Uniform Load Structural Test: With window sash and ventilators closed and locked, test unit in accordance with ASTM E 330 at a static air pressure difference of 60 psf.

   a. At conclusion of test there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms, nor any other damage that would cause the window to be inoperable.

8. Thermal Movements: Provide aluminum windows, including anchorage, that accommodate thermal movements of units resulting from the following maximum change (range) in ambient and surface temperatures without buckling, distortion, opening of joints, failure of joint sealants, damaging loads and stresses on glazing and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to solar heat gain and nighttime-sky heat loss. 1)

    a. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C) material surfaces.

1.4 SUBMITTALS

A. Product Approval: Submit current Product Approval documentation in accordance with the Florida Building Code.

B. Engineering Responsibility: Prepare engineering data for curtain wall systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project as prepared by a professional engineer registered in the state of Florida.

C. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.

D. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer.

1. Include plans, elevations, sections, details, hardware, attachments to other W ork, and operational clearances, detailing fabrication and assembly of aluminum windows.

    a. Submit evidence of meeting performance requirements. Include Engineering Calculations signed and sealed by the qualified professional engineer who was responsible for their preparation.
    b. Demonstrate adequacy of receptor system.

2. Provide Engineer’s Computations and a P.E. Stamp from a Florida Licensed Engineer. Calculations are to be project specific and provide certification of structural adequacy for anchors, glass, mullions, meeting rails and window frames.

E. Samples for Initial Selection: For units with factory-applied finishes.

1. Include Samples of hardware and accessories involving color selection.

2. Include Samples of glazing with privacy film.

F. Samples for Verification: For aluminum windows and components required, showing full range of color variations for finishes, and prepared on Samples of size indicated below:

1. Exposed Finishes: 2 by 4 inches.
2. Exposed Hardware: Full-size units.
3. Include Samples of glazing with privacy film.

G. Qualification Data: For Installer, professional engineer and testing agency.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.

I. Field Quality-Control Test Reports: From a qualified testing and inspecting agency engaged by Contractor.

J. Test Reports: Test reports shall be accompanied by the window manufacturer's letter of certification, stating the tested window meets or exceeds the referenced criteria for the appropriate AAMA/NWWDA 101/I.S.2 - 97 window type.

K. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency, for each type, grade, and size of aluminum window. Test results based on use of down-sized test units will not be accepted.

L. Maintenance Data: For operable window sash, operating hardware, weather stripping, window system operators, and finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Experienced Installers skilled in the successful installation of the specified materials and assemblies on similar projects for a minimum of five (5) years.

1. Engineering Responsibility: Preparation of data for window systems including the following:

a. Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
b. Shop Drawings, pre-construction testing program development, and comprehensive engineering analysis by a qualified professional engineer.

B. Test Reports: Provide test reports from AAMA accredited laboratories certifying the performance as specified.

1. Test reports shall be accompanied by the window manufacturer’s letter of certification, stating the tested window meets or exceeds the referenced criteria for the appropriate ANSI/AAMA/NWWDA 101/I.S.2/NAFS-02 window type.

C. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.

D. Glazing Publications: Comply with published recommendations of glass manufacturers and GANA's "Glazing Manual" unless more stringent requirements are indicated.

E. Preinstallation Conference: Conduct conference at Project site.

1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review required testing and inspecting procedures.

F. Source Limitations for Glass: Obtain glass from one source from a single manufacturer for each glass type.

G. Welding Standards: Comply with applicable provisions of AWS D1.2, "Structural W elding Code-
-Aluminum."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 WARRANTY

A. Manufacturer’s W arranty: Manufacturer agrees to repair or replace components of aluminum- framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.

b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: 10 years from date of Final Completion.

B. Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 10 years from date of Final Completion.

PART 2 - PRODUCTS

2.1 ALUMINUM WINDOWS

A. Basis-of-Design Product: AA900 Fixed Window, Kawneer an Alcoa Company or a comparable product by one of the following:

1. Glass: 1-inch thick; spandrel, insulated, impact resistant

a. Exterior Lite: Black silicone coated Spandrel Glass #2 surface, Fully tempered, 3/16-inch thick.
b. 3/8-inch airspace
c. Interior Lite: Laminated; 0.090 PVB interlayer; 3/16-inch heat strengthened bonded to 3/16-inch heat strengthened glass.

B. Products of the following manufacturers are acceptable, providing their products equal or exceed the quality specified; and they can provide products of the type, size, function, and arrangement required.

1. EFCO, Corporation.
2. YKK AP America Inc;

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.

4. Bars, Rods, and W ire: ASTM B 211.
5. Welding Rods and Bare Electrodes: AW S A5.10.

B. Steel Reinforcement: Complying with ASTM A 36 for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 for hot-rolled sheet and strip.

C. Glazing Gaskets: As required to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.

D. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, nonmigrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.

E. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.

F. Compression Glazing Strips and W eather-Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action, and completely concealed when aluminum window is closed.

1. Weather-Stripping Material: Elastomeric cellular preformed gaskets complying with ASTM C 509.
2. Weather-Stripping Material: Dense elastomeric gaskets complying with ASTM C 864
3. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/NWWDA 101/I.S.2.

2.3 INSECT SCREENS

A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

1. Type and Location: Full, inside for project-out sashes.

B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.

C. Glass-Fiber Mesh Fabric: 18-by-14 or 18-by-16 mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D 3656/D 3656M.

1. Mesh Color: Manufacturer's standard.

2.4 COMPONENTS

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Reinforce members as required to retain fastener threads.
2. Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.

B. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

2.5 GLAZING

A. Tinted privacy glazing, Match Architects Sample.

B. Ballistic Resistance: Level 3 according to UL 752.

2.6 HARDWARE

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows and sized to accommodate sash or ventilator weight and dimensions. Cadmium-plated hardware is not permitted. Do not use aluminum in frictional contact with other metals. Where exposed, provide solid clear anodized, extruded, cast, or wrought aluminum, die-cast zinc with special coating finish, or nonmagnetic stainless steel.

B. Projected Windows: Provide the following operating hardware:

1. Operator: Push-bar operator designed to open and close ventilators.

2. Hinge: Concealed four-bar hinges with nylon bushings finished to match window.
3. Lock: Cam-action, sweep lock handle with strike or combination lever handle and cam action lock with concealed pawl and keeper.

    a. Provide two or more locks on units over 40 to 45 inches (1015 to 1140 mm) wide or high.

4. Limit Device: Concealed limit device; located on jamb of each ventilator. (A/E will determine amount of the opening permitted.)

2.7 ACCESSORIES

A. General: Provide manufacturer's standard accessories that comply with indicated standards, unless otherwise indicated.

B. Sill treatment shall be by an extruded sill receptor or 0.062-inch thick sill flashing finished to match windows. Sill profile shall be properly end dammed and sealed to the substrate.

2.8 FABRICATION

A. General: Manufacturer's standard fabrication that complies with the indicated standards. Include a complete system for assembling components and anchoring windows.

1. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.
2. Fabricate aluminum windows, in sizes indicated.

2.9 ALUMINUM FINISH

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components; Drawings; and Shop Drawings.

1. Do not install damaged components.
2. Seal joints watertight.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

D. Install glazing as specified Division 08 Section "Glazing."

E. Install sealants as specified in Division 07 Section "Joint Sealants."

F. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

G. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

H. Connections: Connect automatic operators to building electrical system.

3.3 ADJUSTING

A. Adjust operating ventilators, hardware, operators, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

B. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Field Testing and Performance Requirements: W indows shall be field tested in accordance with AAMA 502, “Voluntary Specification for Field Testing of W indows and Sliding Glass Doors,” using Test Method A.

1. Test one additional window or two percent of the window installation, whichever is greater, for air infiltration and water penetration as specified.
2. Cost for all successful tests, both original and retest shall be paid by the Contractor. All unsuccessful tests, both original and retest, shall be paid by the Contractor.
3. Testing shall be by an AAMA accredited testing agency selected by the architect and window manufacturer and employed by the responsible contractor.
4. Air infiltration field tests shall be conducted at the same uniform static test pressure as the laboratory test unit. The Maximum allowable rate of air leakage shall not exceed 1.5 times the laboratory test unit for hardware and glazing types consistent with the laboratory test unit. Performance values may be reduced due to deviations from the laboratory test unit such as product size, configuration, hardware selected, and glazing configuration. The field test air leakage rate shall not exceed 1.5 times the maximum allowable laboratory performance specified in the testing criteria listed in Section 1.05.A.1 for any configuration.
5. Water penetration field tests shall be conducted at a static test pressure of 2/3 of the laboratory test performance values for hardware and glazing types consistent with the laboratory test unit. Performance values may be reduced due to deviations from the laboratory test unit such as product size, configuration, hardware selected, and glazing variations. The field test water test pressure shall not be less than 2/3 of the minimum allowable laboratory performance specified in the testing criteria listed in Section 1.05.A.1 for any configuration.

C. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 PROTECTION AND CLEANING

A. All windows shall use positive graphic identification showing that there is glazing in

the frame while the window is being installed. Remove graphic identification when the window is cleaned.

B. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

C. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

D. Clean glass immediately after installation. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels and clean surfaces.

E. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 085113

SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Cylinders specified for doors in other sections.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

D. Standards: All hardware specified herein shall comply with the following industry standards:

1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.2 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions 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. 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.
    h. Warranty information for each product.

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. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

    a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.

b. Complete (risers, point-to-point) access control system block wiring diagrams.
c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Proof of Certification: Provide copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified installer of Windstorm assemblies.

E. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

F. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

G. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.3 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware 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.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing

facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

F. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." 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. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.

2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures.

H. At completion of installation, provide written documentation that components were applied to
manufacturer's instructions and recommendations and according to approved schedule.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

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, as applicable, permanent keys, cylinders, cores, access control credentials, software 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".

1.5 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 and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.6 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. 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. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. 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.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warrantyy Periods:
1. Five years for standard duty cylindrical (bored) locks and latches.
2. Five years for exit hardware.
3. Twenty five years for manual surface door closer bodies.
4. Two years for electromechanical door hardware.

1.7 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 Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

C. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity, unless otherwise indicated:

    a. Two Hinges: For doors with heights up to 60 inches.
    b. Three Hinges: For doors with heights 61 to 90 inches.
    c. Four Hinges: For doors with heights 91 to 120 inches.
    d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

    a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
    b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

    a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:

    a. 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 all out-swinging lockable doors.

5. Acceptable Manufacturers:

    a. Hager Companies (HA).
    b. McKinney Products (MK).
    c. Stanley Hardware (ST).

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut- outs.

1. Acceptable Manufacturers:

a. McKinney Products (MK).
b. Pemko Manufacturing (PE).
c. Stanley Hardware (ST).

2.3 POWER TRANSFER DEVICES

A. Electrified Quick Connect Continuous Geared Transfer Hinges: Provide electrified transfer continuous geared hinges with a 12" removable service panel cutout accessible without de- mounting door from the frame. Furnish with Molex™ standardized plug connectors with sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. W ire nut connections are not acceptable.

1. Acceptable Manufacturers or Equal:

a. McKinney Products (MK) - SER-QC (# wires) Option.
b. Pemko Manufacturing (PE) - SER-QC (# wires) Option.

B. Electric Door W ire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through- door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. W ire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:
a. McKinney Products (MK) - Electrical Connecting Kit: QC-R001.
b. McKinney Products (MK) - Connector Hand Tool: QC-R003.

2. Acceptable Manufacturers or Equal:

a. McKinney Products (MK) – QC-C Series.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

1. Manual flush bolts to be furnished with top rod of sufficient length to allow bolt location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Acceptable Manufacturers:

    a. Door Controls International (DC).
    b. Rockwood Manufacturing (RO).
    c. Trimco (TC).

B. Door Push Plates and Pulls: ANS/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

5. Acceptable Manufacturers or Equal:

    a. Rockwood Manufacturing (RO).
    b. Trimco (TC).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

1. Acceptable Manufacturers:

a. Corbin Russwin Hardware (RU).
b. Sargent Manufacturing (SA).
c. Schlage (SC).
d. Yale Locks and Hardware (YA).

C. Cylinders: Original manufacturer cylinders complying with the following:
1. Keyway: Manufacturer's Standard.

D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. New System: Key locks to a new key system as directed by the Owner.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

F. Construction Keying: Provide construction master keyed cylinders.

G. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

H. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Acceptable Manufacturers:

a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 2 (Standard Duty): ANSI/BHMA A156.2, Series 4000, Grade 2 certified.

1. Locks are to be non-handed and fully field reversible.

2. Acceptable Manufacturers:

   a. Corbin Russwin Hardware (RU) - CL3800 Series.
   b. Sargent Manufacturing (SA) - 7-Line.
   c. Schlage (SC) - AL Series.
   d. Yale Locks and Hardware (YA) - 5300LN Series.

2.7 AUXILIARY LOCKS

A. Mortise Deadlocks, Small Case: ANSI/BHMA A156.5, Grade 1, certified small case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. Steel or stainless steel bolts with a 1" throw and hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other specified locksets.

1. Acceptable Manufacturers:

   a. Corbin Russwin Hardware (RU) - DL4100 Series.
   b. Sargent Manufacturing (SA) - 4870 Series.
   c. Schlage (SC) - L460 Series.
   d. Yale Locks and Hardware (YA) - 350 Series.

2.8 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

3. Electromechanical Options: Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified in hardware sets. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.

4. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

5. Rail Sizing: Provide exit device rails factory sized for proper door width application.

6. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

7. Hurricane and Tornado Resistance Compliance: Conventional exit devices are to be U.L. listed for windstorm components where applicable. Provide the appropriate hurricane or tornado resistant products that have been independent third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Acceptable Manufacturers:

a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
b. Sargent Manufacturing (SA) - 80 Series.
c. Von Duprin (VD) - 35A/98 XP Series.

2.9 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.

4. Size of Units: Comply with manufacturer's written recommendations for sizing

of door closers depending on size of door, exposure to weather, and anticipated frequency of use. W here closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt and security type fasteners as required for proper installation.

B. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 certified surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.

1. Acceptable Manufacturers:

   a. Corbin Russwin Hardware (RU) - DC6000 Series.
   b. Dorma Products (DO) - 8900 Series.
   c. LCN Closers (LC) – 1450 Series.
   d. Norton Door Controls (NO) - 8500 Series.
   e. Sargent Manufacturing (SA) - 1431 Series.
   f. Yale Locks and Hardware (YA) - 3500 Series.

2.10 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:

a. Stainless Steel: 300 grade, 050-inch thick.

4. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

5. Acceptable Manufacturers or Equal:

a. Rockwood Manufacturing (RO).
b. Trimco (TC).

2.11 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. W here floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Acceptable Manufacturers or Equal:

a. Rockwood Manufacturing (RO).
b. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Acceptable Manufacturers:

a. Rixson Door Controls (RF).
b. Rockwood Manufacturing (RO).
c. Sargent Manufacturing (SA).

2.12 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and

elsewhere where indicated.

B. 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 according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. 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 according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and UBC 7-2, Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Acceptable Manufacturers:

1. National Guard Products (NG).
2. Pemko Manufacturing (PE).
3. Reese Enterprises, Inc. (RE).

2.13 ELECTRONIC ACCESSORIES

A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Acceptable Manufacturers or Equal:

a. Sargent Manufacturing (SA) – 3280 Series.
b. Securitron (SU) - DPS Series.

B. Power Supplies: Provide Nationally Recognized Testing Laboratory Listed 12VDC

or 24VDC (field selectable) filtered and regulated power supplies. Include battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Acceptable Manufacturers or Equal:

a. Securitron (SU) - BPS Series.

2.14 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.15 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

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.

PART 3 - EXECUTION

3. 1 EXAMINATION

A. Examine scheduled openings, 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. 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. PREPARATION
2

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3. INSTALLATION
3

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. 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."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. W here 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 reinstallation 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.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.5 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.6 DOOR HARDWARE SETS

A. The hardware sets 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. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. RO - Rockwood
4. AD - Adams Rite
5. YA - Yale
6. SA - Sargent

7. RF - Rixson
8. SU - Securitron
9. 00 - Other

Hardware Schedule TBD

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass.

1.2 DEFINITIONS

A. Manufacturer: A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.

1.1 PERFORMANCE REQUIREMENTS

A. Design glazing assemblies in accordance with the FBC. Refer to structural drawings for wind and design pressures.

1. All exterior assemblies shall be compliant with Florida Building Code rule 9N-3 for statewide product approval and require a Florida Product approval or NoA number for Large Missile Impact, Level-E, for an Essential Facility Risk Category IV building.

B. System Assembly: Accommodate without damage to components or deterioration of seals, movement within system, movement between system and peripheral construction, dynamic loading and release of loads, deflection of structural support framing.

C. Air Infiltration: Provide systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of
1.57 lbf/sq. ft.

D. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glass, and heel bead of glazing compound.

E. Water Penetration under Static Pressure: Provide systems that do not show evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of highest positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

F. Provide for expansion and contraction within system components caused by cycling temperature range of 180 degrees F over a 12 hour period without causing detrimental

effect to system components, anchorage, and other building elements.

G. Delegated Design: Engage a qualified registered Professional Engineer to design exterior manufactured building components.

H. Structural Loads:

1. Wind Loads: As indicated on Structural Drawings in accordance with Florida Building Code (FBC) and ASCE 7 requirements for Components and Cladding.
2. Other Design Loads: As indicated on Structural Drawings.

I. Miami Dade Acceptance or Florida Product Approval: Provide roof specialties for the building exterior having a Notice of Acceptance (NOA) letter from the Miami Dade County Building Code Compliance Office (BCCO) or Florida Product Approval letter.Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below them to less than 1/8 inch and clearance between members and operable units directly below them to less than 1/16 inch.

J. Structural-Test Performance: Provide systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

K. Windborne-Debris-Impact-Resistance Performance: Provide aluminum-framed systems that pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996.

1. Large-Missile (Level E) Impact: For aluminum-framed systems located within 30 feet of grade.
2. Small-Missile Impact: For aluminum-framed systems located more than 30 feet above grade.

1.3 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: For the following products, in the form of 12-inch- square Samples for glass.

1. Each glass type indicated.

C. Warranties: For glass types indicated.

1.4 QUALITY ASSURANCE

A. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

B. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.

1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

C. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA'S "Glazing Manual".

D. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 degrees F.

1.7 WARRANTY

A. Manufacturer's Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 HEAT TREATED FLOAT GLASS:

A. Fabrication Process: By vertical (tong-held) or horizontal (roller-hearth) process, at manufacturer's option, except provide horizontal process where indicated as tongless or free of tong marks.

B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent glass, flat); Quality q3 (glazing select); class, kind, and condition as indicated.

2.2 TEMPERED GLASS

A. Tempered Glass: Clear fully tempered float glass.

1. Thickness: 1/4-inch, minimum.
2. Labeling: Provide safety glazing labeling.

2.3 LAMINATED GLASS

A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

B. Windborne-Debris-Impact-Resistant Laminated Glass: Comply with requirements specified above for laminated glass except laminate glass with the following to comply with interlayer manufacturer's written instructions:

1. Polyvinyl butyral interlayer.

2.4 SPANDREL GLAZING

A. Silicone-Coated Spandrel Glass: ASTM C 1048, Type I, Condition C, Quality-Q3.

2.5 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.

1. Sealing System: Dual seal.
2. Spacer: Manufacturer's standard spacer material and construction.

2.6 ELASTOMERIC GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
2. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range for this characteristic.

B. Elastomeric Glazing Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied, chemically curing sealant in the Glazing Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

1. Additional Movement Capability: Where additional movement capability is specified in the Glazing Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements in ASTM C 920 for uses indicated.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.8 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where the length plus width is larger than 50 inches as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.5 PROTECTION AND CLEANING

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion.

END OF SECTION 088000

SECTION 089100 - LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes extruded aluminum, prefinished, drainable blade louvers

1.2 DEFINITIONS

A. Louver Terminology: Refer to AMCA Publication 501 for definitions of terms for metal louvers.

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Air Performance, Water Penetration, and Air Leakage Ratings: Provide louvers complying with performance requirements indicated as demonstrated by testing manufacturers stock units, of height and width indicated, according to Air Movement and Control Association (AMCA) Standard 500-L.

B. Airborne Sound Transmission Loss: Provide acoustical louvers complying with airborne sound transmission loss ratings indicated, as demonstrated by testing manufacturer's stock units according to ASTM E 90.

C. Design exterior louver assemblies in accordance with the FBC. Refer to structural drawings for wind and design pressures.

1. All exterior assemblies shall be compliant with Florida Building Code rule 9N-3 for statewide product approval and require a Florida Product approval number or NoA for Large Missile Impact, Level-E, for an Essential Facility Risk Category IV building.

D. Wind-Driven Rain Performance: Assembly must meet requirements of AMCA 550.

E. Windborne Debris Impact Performance Requirements: Assembly must meet requirements of AMCA 540.

F. Thermal Movements: Provide louvers 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 ambient, 180 Deg F material surfaces.

1.4 SUBMITTALS

A. Product Data: Test reports evidencing compliance of units with Performance Requirements.

B. Shop Drawings:

1. Plans, elevations, sections, and details showing profiles, angles, spacing of louver blades; unit dimensions related to wall openings and construction; free areas for each size indicated; and profiles of frames at jambs, heads and sills.
2. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
3. Shop Drawings shall be signed and sealed by a licensed engineer registered in the State of Florida.
4. Show compliance with AMCA 540 and 550
5. Calculations for wind load design shall be signed and sealed by a Professional Engineer in the State of Florida verifying compliance with Chapter 16 of the Florida Building Code, 2020 7th Edition and Chapter 23- 30 of ASCE 7 per the Structural Engineers Design Load Calculations and associated wind loads, pressures to meet the of an Essential Facility, Risk Category IV building on the Project Site.
6. Sample of Approved Product Label and location of attachment to assembly.

C. Color selection materials for type of finish specified

D. Product certificates signed by louver manufacturers certifying that their products which comply with Project requirements are licensed to bear AMCA Seal based on tests made in accordance with AMCA Standard 500 and complying with AMCA Certified Ratings Program.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents from a single source where alike in one or more respects with regard to type, design, and factory-applied color finish.

B. SMACNA Standard: Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for construction details and installation procedures.

1.6 PROJECT CONDITIONS

A. Field Measurements: Check openings by field measurements before fabrication; show recorded measurements on final Shop Drawings.

1.7 DELIVERY, STORAGE AND HANDLING

A. Delivery: Visually inspect all materials at time of delivery for damage. Any damaged boxes, crates, louver sections.

B. Storage: Per manufacturer’s instructions, off ground, covered with a weather proof flame resistant sheeting or tarpaulin.

C. Handling: Handle in accordance with manufacturer’s instructions

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Products of the following manufacturers are acceptable provided compliance with technical requirements.

1. American Warming and Ventilating
2. Airolite Co.
3. CS Louvers by Construction Specialties, Inc.
4. Industrial Louvers, Inc.
5. Ruskin Louvers
6. Greenheck Fan Corporation.
7. United Enertech Corp.

B. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product.

2.2 MATERIALS

A. Aluminum Extrusions: ASTM B 221, alloy 6063-T5 or T-52.

B. Aluminum Sheet: ASTM B 209, alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Aluminum Castings: ASTM B 26, alloy 319.

D. Fasteners: 300 Series stainless steel.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION, GENERAL

A. Assemble louvers in factory 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 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.

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 in accordance with tested assembly and Performance Requirements.

2.4 LOUVERS

A. Louvers shall be 6 inches deep with 35 degree stationary blades. Blades and frames shall be 0.081 inches extruded aluminum, alloy 6063-T5.

1. Louver shall be fitted with 16 by 18 mesh, 0.063 inches aluminum insect screen in a removable, rewireable extruded aluminum frames.

B. Louver blades shall be joined to each side frame and vertical stiffener with two, one inch long fillet Gas Metal Arc Welds with a minimum 1/8 inch throat.

1. Blades to be water separator type.

C. Louvers shall bear AMCA Ratings Seals for air performance and water penetration ratings.

D. Minimum Free Area: 7.68 sq. ft. per 4' X 4' unit.

E. Free area velocity: 721 fpm free area velocity at a pressure drop not exceeding .15 inches W.G. per AMCA Standard 500.

F. Water Penetration: No more than .01 ounces of water per square foot of free area at a free area velocity of 1250 fpm when tested for 15 minutes per AMCA Standard 500.

2.5 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. Fluoropolymer Coating: Manufacturer's standard three-coat, thermo-cured, full-strength 70 percent Kynar 500 FSR resin, 1 mil thick with 0.5-mil clear coat and 30 percent reflective gloss when tested in accordance with ASTM D 523. A 20 year limited warranty against failure of the finish shall begin on the Date of Substantial Completion.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings to receive the work. Do not proceed until any 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 and in accordance with manufacturer’s recommendations to meet Performance Requirements

B. Erection Tolerances:

1. Maximum variation from plane or location shown on the approved shop drawings: 1/8 inch per 12 feet of length, but not exceeding 1/2 inch in any total building length or portion thereof (noncumulative).
2. Maximum offset from true alignment between two members abutting end to end, edge-toedge in line or separated by less than 3 inch: 1/16 inch (shop or field joints). This limiting condition shall prevail under

both load and no load conditions.

3. Do not erect warped, bowed, deformed or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.

C. Cut and trim component parts during erection only with the approval of the manufacturer or fabricator, and in accordance with his recommendations. Restore finish completely. Remove and replace members where cutting and trimming has impaired the strength or appearance of the assembly.

D. Set in cast-in-place concrete in prepared openings.

3.4 ADJUSTING AND CLEANING

A. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

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 and vents 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.

D. Protect installed materials to prevent damage by other trades.

END OF SECTION 089100

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior gypsum board assemblies.

1.2 SUBMITTALS

A. Product Data: For each type of product.

1. Studs and Runners: Provide documentation that framing members' certification is according to SFIA's "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members". SFIA's program certifies that studs and runners comply with the IBC, ASTM C 645, AISI S100, and AISI S220. Mechanical properties, coatings, dimensions, and labeling are checked.
2. Manufacturers' limiting tables indicating products provided.
3. Manufacturer's Certification: Submit manufacturer's certification of product compliance with codes and standards along with product literature and data sheets for specified products.
4. Evaluation Reports: For Metal Framing, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

B. Delegated-Design by Specialty Structural Engineer (SSE) Delegated-Design Submittal: For steel framing, fasteners, accessories and support. The design professional, individual or organization having responsibility for the design of the specialty items. This responsibility shall be in accordance with the state's statues and regulations governing the professional registration and certification of architects or engineers.

1.3 QUALITY ASSURANCE

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 E 119 by an independent testing agency.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design steel framing systems.

1. Design framing systems in accordance with American Iron and Steel Institute Publication S220 “North American Specification for the Design of Cold-Formed Steel Framing – Non- Structural Members”, except as otherwise shown or specified.
2. Design loads: As indicated on the Architectural Drawings or 5 PSF minimum as required by the Building Code.
3. Design framing systems to accommodate deflection of primary building structure and construction tolerances and to withstand design loads with a maximum deflection of 1/240 inches and including finish material.

B. Fire-Test-Response Characteristics:Provide materials and construction identical to those tested according to ASTM E 119.

C. STC-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413.

2.2 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G60, hot-dip galvanized.
3. Depth: As indicated on Drawings.

4. Minimum Base-Metal Thickness: 0.0188 inch (25 gauge), except as indicated below.

a. Provide 3-5/8-inch, 20 DW gauge metal studs at 16 inches on center for walls between 10 to 12 feet in height.
b. Provide 3-5/8-inch, 20 STR gauge metal studs at 16 inches on center for walls between 12 to 16 feet in height.
c. Provide 0.0312-inch thick studs for framing supporting ceramic tile substrates.

B. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness,

with minimum 1/2-inch- wide flanges.

1. Depth: As indicated on Drawings.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.

C. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Depth: As indicated on Drawings.

D. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical or hat shaped.

E. Z-Shaped Furring: W ith slotted or nonslotted web, face flange of Insert depth, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.018 inch, and depth required to fit insulation thickness indicated.

F. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.
2. Steel Studs: ASTM C 645.

a. Minimum Base-Metal Thickness: 0.0179 inch.
b. Depth: As indicated on Drawings.

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.

a. Minimum Base Metal Thickness: 0.0312 inch.

2.3 AUXILIARY MATERIALS

A. Fasteners for Metal 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 D 226, 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 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
3. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.2 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 and other assembly components indicated.

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. Stud Spacing: 16-inches on center unless otherwise indicated.

E. Install tracks (runners) 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 penetrating partitions above ceiling.

1. Slip-Type Head Joints: W here 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 runner 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: W here indicated, install to maintain continuity of fire-resistance- rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

F. 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.

G. Z-Furring Members:

1. Erect insulation vertically and hold in place with Z-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.

H. 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.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backer board.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Protected Openings Identification: All fire-resistive construction including fire barriers, fire walls, and smoke barriers shall be permanently stenciled on the partition as follows.

1. Provide the following wording: FIRE AND SMOKE BARRIER - PROTECT ALL OPENINGS.

a. Letter Size: 6-inches high
b. Spacing: 4 feet on center, maximum.
c. Letter Font: Helvetica Regular
d. Letter Color: Red.

2. Also provide a 3-inch wide painted red line below the identification signage to identify the direction and extent/length of the rated wall. Extend the painted line the full length of the wall; identify directional changes and where rated walls end.

1.4 STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.5 PROJECT CONDITIONS

A. Environmental Limitations:Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36 or ASTM C 1396, as applicable to type of gypsum board indicated and whichever is more stringent.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. G-P Gypsum.
b. Lafarge North America Inc.
c. National Gypsum Company.
d. USG Corporation.

B. Regular Type and Type X (fire rated):

1. Thickness: As indicated.
2. Long Edges: Tapered.

2.2 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Paper-faced galvanized steel sheet.
2. Shapes: As indicated.

2.3 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Backer Board: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

D. Joint Compound for Backer Board: As recommended by backer unit manufacturer.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from
0.033 to 0.112 inch thick.
2. For fastening backer board, use screws of type and size recommended by panel manufacturer.

C. Acoustic 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.

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. Grabber Construction Products; Acoustical Sealant GSC.
b. Pecora Corporation; AC-20 FTR or AIS-919.
c. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.

d. USG Corporation; SHEETROCK Acoustical Sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS

A. General: Comply with ASTM C 840.

B. Examine panels before installation. Reject panels that are wet or moisture damaged.

C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

D. Tile Backer Board Units: Comply with manufacture’s instructions and recommendations.

1. Where backer board units abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

E. Penetrations:

1. Refer to Section 07 84 13 Penetration Firestopping regarding sealing of wall and ceiling penetrations.
2. Seal around all non-fire rated penetrations of gypsum panel walls and ceilings completely to minimum of Smoketight requirements.

3.3 INSTALLING TRIM ACCESSORIES

A. General: Attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 in specific locations identified, where approved by Architect, as indicated on the Drawings, and as follows:

1. Ceilings: Unless otherwise indicated install control joints as follows:

   a. Install control joints in areas exceeding2500 sq. ft.
   b. Space control joints not more than 50 feet on center.
   c. Install control joints where ceiling framing or furring changes direction.

2. Partitions and Furring: Unless otherwise indicated install control joints as follows:

   a. Install control joints in partitions and wall furring runs exceeding 30 feet.
   b. Space control joints not more than 30 feet on center.
   c. Install control joints in furred assemblies where control joints occur in base exterior wall.

3.4 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 3: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 4: All other locations.
3. Level 5: Locations indicated on the Drawings.

E. Tile Backer Board Units: Finish according to manufacturer's written instructions.

3.5 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet or moisture damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Porcelain ceramic mosaic tile
2. Porcelain tile
3. Waterproof membrane for thin-set tile installations
4. Shower waterproofing system
5. Aluminum trims

1.2 REFERENCES

A. TCNA Handbook for Ceramic Stone, and Glass Tile Installation by the Tile Council of North America, Inc. (TCNA).

1.3 PERFORMANCE REQUIREMENTS

A. Dynamic Coefficient of Friction on Walkway Surfaces: 0.42 minimum threshold per ANSI A137.1 AcuTest test protocol when used with slightly soapy water solution, in level interior spaces expected to be walked on when wet. 0.44 minimum on sloped surfaces using the same test methods.

1.4 SUBMITTALS

A. Product Data:

1. Published data for each type of tile, mortar, grout, and other products specified with VOC levels of adhesives and other products containing VOCs highlighted
2. One current TCNA Handbook on Site for reference

B. Shop Drawings:

1. Waterproofing details
2. Widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples:

1. Color samples showing the full range of colors, textures, and patterns in all price groupings. For the glazed ceramic tile use Color Groups 1 and 2 for the field and all color groups for accent and trim colors. Include samples of accent and trim involving color selection.
2. Color samples consisting of actual sections of grout (cured).

D. Delegated-Design Submittal: For custom shower systems indicated, provide performance requirements and design criteria.

1. Detail fabrication and assembly of custom shower systems.
2. Details of interface with building structure, drainage, and

other attachment interfaces.

E. Certification or other proof of installers attending training session.

F. Sealant testing results

G. Moisture test results

H. Mock-up

1.5 QUALITY ASSURANCE

A. 2019 TCNA Handbook or later, to be available on site at the request of the Architect or Owner

B. Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project.

1. Installers are required to attend a training session reviewing industry standards applicable to installations for this Project.
2. At a minimum, installers (one installer in each area) shall be Journeymen Tile Layers, as recognized by the Department of Labor, tested as part of the Certified Tile Installer Program offered thru the Ceramic Tile Education Foundation, or equivalent programs offered by the National Tile Contractors Association (Five star Contractor Program), the Tile Contractor's Association of America (Trowel of Excellence), or Tile- installer Thin-set Standards verification thru the University of Ceramic Tile and Stone.

C. Obtain each color, grade, finish, type, composition, and variety of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

D. Test sealants to show compliance with ASTM C920. Show sealants have been tested for performance per ASTM C719, C794, and C1248.

E. Do not use mortars for leveling or truing substrates unless product is specifically designed for that purpose.

F. Delegated Design: Design custom shower systems.

1. Include metal thickness, accessories, and attachment devices.

G. Mock-up:

1. Construct mockup for each tile type, minimum 6 foot by 4 foot, with waterproofing, finish grout, sealants, and scheduled accessories
2. Locate where directed
3. Mockup may remain as part of the work if protected thru Substantial Completion

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.

B. Prevent damage or contamination to materials by water, foreign matter, and other causes.

1.7 PROJECT CONDITIONS

A. Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained per manufacturer's written instructions.

B. Shade work areas from direct sunlight to prevent rapid evaporation caused by excessive heat.

1.8 EXTRA STOCK

A. Deliver tile, consisting of not less than 2 percent of the total quantity of each type, size, pattern, and color installed, to the Owner. Furnish tile in original boxes, properly marked.

B. Supply two pieces of each shape of trim tile used, by type, shape and color, in clean cartons for Owner's use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Refer to Finish List for manufacturer, style, and color of tile(s) required.

B. Tile-Setting and Grouting Materials:

1. American Olean Tile Co., Inc.
2. Ardex Engineered Cements
3. TEC a division of H. B. Fuller Co.
4. H. B. Fuller Co.
5. Laticrete International, Inc.
6. Mapei Corporation
7. Merkrete by Parex USA
8. SikaTile family of products by Sika Corporation
9. Summitville Tiles, Inc.
10. Upco Co. Div., Emhart Corp.

C. Substitutions: Where a basis of design has been specified, an equal or superior product may be accepted only upon review and written acceptance by the Architect and Interior Designer.

1. Submit substitutions in accordance with Contract Documents
2. Include actual samples of proposed tile (3 total of each tile type being requested)

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

a. LHT to be manufactured to meet physical properties of ANSI A137.3

B. Colors, Textures, and Patterns:

1. Architect shall select appearance characteristics from manufacturer's standard products, regardless of differing price groupings.
2. Architect reserves the right to use a maximum of 3 colors in each room/space at no additional cost.
3. Grout color as selected by Architect from all available price groups.

C. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, 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.

2.3 TILE PRODUCTS

A. Porcelain Ceramic Mosaic Tile (MT1, MT2):

1. Composition: As scheduled
2. Module Size: As scheduled
3. Nominal Thickness: 1/4 inch
4. Face: Pattern of design indicated
5. Grout Color: Selected by Architect from manufacturer’s full range of colors.

B. Porcelain Tile (PT1, PT2,, PT3, PT4):

1. Composition: Porcelain, ISO 13006 Groups AIa and BIa for water absorption and dimensional tolerances
2. Module Size: As indicated on Finish Schedule (Large Format is any tile 15 inches or more on any side.
3. Edges rectified
4. Grout Color: Selected by Architect from manufacturer’s full range of colors.

2.4 SETTING MATERIALS

A. Portland Cement: ASTM C150 Type 1

B. Improved Latex-Portland Cement Mortar: ANSI A118.15

1. Mixture of Dry-Mortar Mix and Latex Additive: Mixture of prepackaged dry-mortar mix and liquid acrylic latex additive.
2. For wall applications, provide non-sagging, latex-portland cement mortar complying with ANSI A118.15.
3. Use specifically formulated setting mortars for LHT.
4. Glazed Wall Tile: Minimum 450 psi mix
5. Porcelain Tile: Minimum 400 psi mix

C. Epoxy Mortar: ANSI 118.3, ISO Category R.

D. Water: Clean and drinkable

2.5 GROUTING MATERIALS

A. Standard Sanded Cement Grout: ANSI A118.6, for joints 1/8 inch or wider.

B. Standard Unsanded Cement Grout: ANSI A118.6, for joints less than 1/8 inch

C. Latex-Portland Cement Grout: ANSI A118.6 for materials described in Section H-2.4, composed as follows:

1. Sanded Dry-Grout Mix and Latex Additive: Factory-prepared, dry-grout mix and liquid acrylic latex additive.

D. One hundred percent solids epoxy grout, complying with ANSI A118.3.

E. Color: Selected by Architect.

2.6 SHOWER WATERPROOFING SYSTEM

A. Acceptable systems:

1. Schluter Shower System including KERDI and TROBA products together to make a complete shower system.
2. GoBoard Shower System by Johns Manville as a complete shower system.

2.7 MISCELLANEOUS MATERIAL

A. Latex Underlayment: Quick set type, as recommended by membrane manufacturer, as required to provide positive drainage to floor drains.

1. Refer to Division 03 Section Cement Based Underlayment for self leveling Underlayment

B. Waterproofing Membranes:

1. Thin-Set Locations: Noble Seal TS, 30 mil thick, non-plasticized chlorinated polyethylene (CPE) thermoplastic sheet membrane by the Noble Company
2. LHT: Chloraloy 240, 40 mil thick, non-plasticized chlorinated polyethylene (CPE) thermoplastic sheet membrane by the Noble Company or Kerdi-Drain by Schluter Systems
3. Membrane shall comply with ASTM D 4068.
4. Install waterproof membrane on sloped mortar to provide minimum slope to drains as required by the manufacturer’s written installation instructions.

C. Expansion Joints

1. If not indicated on the Drawings, expansion joints shall be installed in accordance with the Tile Council of North America, Inc., Handbook for Ceramic Tile Installation, Section EJ171, latest edition, as follows:

a. Interior: 20’ to 25’ in each direction.
b. Exterior: 8’ to 12’ in each direction.

c. Interior tilework exposed to direct sunlight or moisture: 8’ to 12’ in each direction.
d. Where tilework abuts restraining surfaces such as perimeter walls, dissimilar floors, curbs, columns, pipes, ceilings, and where changes occur in backing materials.
e. All expansion, control, construction, and cold joints in the structure shall continue through the tilework including such joints at vertical surfaces.
f. Joints through tilework directly over structural joints shall never be narrower than the structural joint.
g. Joints at perimeter of each space where no field joints are detailed.

D. Ceramic Tile Accessories

1. “Schluter-SCHIENE”, aluminum, tile termination strip. Use at all edges adjacent to different flooring materials. Height shall match adjacent flooring materials.
2. “Schluter-RENO”, aluminum, stepless termination strip. Use at all edges where the tile is higher than the adjoining different floor materials.
3. At outside corners: Quadec by Schluter
4. At exposed top edge: Jolly by Schluter

E. Sealant requirements per ASTM C920. Refer to Division 07 Section, Joint Protection for other requirements. Provide manufacturer’s recommended primers and backers for specific joints.

2.8 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.

PART 3 - EXECUTION

3.1 INSPECTION

A. Prior to installing tile, inspect surfaces to receive tile. Do not proceed with installation until such defects or conditions have been corrected.

1. Verify walls have no efflorescence
2. Examine drains, and clamping devices to verify that they are in a condition ready to receive waterproofing membrane with no deficiency that could result in a potentially defective installation
3. Verify floor meets L/360 minimum.
4. Verify wall substrate surfaces are a maximum of 1/8 inch in 10 feet, any direction.
5. Verify tolerances meet manufacturer’s recommendations for LHT

which may be more stringent than for thin set applications.

B. All flattening must be completed prior to any cleavage membranes or waterproofing membranes are installed.

C. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.2 PREPARATION

A. Consult Architect to establish floor levels and required pitch to drains and floor recesses before setting any work. Maximum surface variation shall not exceed 1/4 inch in 10 feet, non-accumulative.

1. Verify variations with manufacturer for LHT applications

B. Clean rough concrete slab surface of drippings and other debris. Roughen surface if necessary. Wash thoroughly with clean water permitting concrete to become saturated. Slush with neat cement grout to insure good bond.

1. Neutralize any trace of strong acid or alkali (PH level 7 to 9).

C. When necessary because of unevenness or roughness of base, or to bring tile to proper flattness, install leveling coat and permit to set and harden, wet cure.

D. Provide tape reinforcement at joints including inside corners and outside corners.

3.3 LAYOUT

A. Determine locations of movement joints before starting tilework.

B. Lay out tile work so as to minimize cuts less than one-half tile in size.

C. Locate cuts in both walls and floors so as to be least conspicuous.

D. Lay out tile wainscots to next full tile beyond dimensions shown.

E. Align wall joints to give straight, uniform grout lines, plumb and level.

F. Align floor joints to give straight uniform grout lines parallel with walls.

G. Make joints between tile sheets same width as joints within sheets so extent of each sheet is not apparent in finished Work.

H. Porcelain tile can have large variances in sizing. Do not mix sizes and types of tiles in pattern areas. Joints that do not line up or joint widths that vary will be unacceptable.

1. Joint Width: 1/4 inch wide, unless otherwise recommended.

3.4 MIXING MORTARS AND GROUT

A. Proportion mixes in accordance with latest ANSI standard specifications.

B. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions using mixing equipment designed for optimum performance characteristics for installations indicated.

C. Add materials, water, and additives in accurate proportions according to

manufacturer’s written instructions.

1. Liquid latex additive shall be added undulited.

3.5 SETTING METHODS

A. Comply with parts of ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. Install floor tile and base in accordance with Tile Council of North America recommendations.

C. All areas must have a crack isolation membrane installed under 100 percent of tiled floor area. Areas receiving a shower pan or waterproofing membrane are excluded.

D. Concrete Subfloors

1. New slabs on Grade (Thin-Set Method): TCNA F113 dry-set mortar with Tile Installation Specification ANSI A108.5.
2. Elevated Slabs (Thin-Set Method): TCNA F122 Latex-portland cement mortar bond coat with Tile Installation Specification ANSI A108.5.
3. LHT Mortar Bed Method (Interior): Latex-portland cement mortar bond coat using the mortar bed to assist in filling the irregular space between the tile and the underlayment, ANSI A118.15. Tile Installation Specification ANSI A108.19.

E. Walls

1. Cement Board (Thin-Set Method): TCNA W244C Cementitious backer; with Tile Installation Specification ANSI A108.11.
2. Fiber Cement Board (Thin-Set Method): TCNA W244F Cementitious bond coat, vapor retarder membrane; with Tile Installation Specification ANSI A108.4.
3. Fiber Cement Board (Thin-Set Method): TCNA W244F Cementitious bond coat, vapor retarder membrane except formulated specifically for LHT installations; with Tile Installation Specification ANSI A108.19.

F. Sound each tile after set. Replace all tiles sounding hollow.

3.6 INSTALLATION, GENERAL

A. Perform cutting and drilling of tile without marring visible surfaces. Grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

1. Smooth exposed cut edges.

B. Extend tile work into recesses and under or behind equipment and fixtures. Terminate work at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Ensure tile joints are uniform in width, subject to normal variance in tolerance allowed in tile size. Ensure joints are watertight, without voids, cracks, excess mortar or grout.

D. Locate expansion, control, contraction, and isolation joints, during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
2. Prepare joints and apply sealants to comply with requirements of Division 07 Section, Joint Protection.
3. Isolate repaired structural cracks and shrinkage cracks per TCNA Detail F125

E. Allow tile to set for a minimum of 48 hours prior to grouting. Follow manufacturer's directions if longer waiting period is required.

F. Curing:

1. Flattening Beds: Moist cure for 20 hours at minimum 70° F for dry-set mortar installations. Allow to dry before setting tile. Environmental conditions and manufacturer may require longer cure times.

3.7 GROUTING

A. Install grouting in accordance with ANSI A108.10 (A108.6 for epoxy) and manufacturer's written instructions during application and cleaning.

1. Floor application shall receive epoxy type grout and wall applications shall receive latex type grout.
2. Joint widths: Unless otherwise indicated, install tile with the following joint widths:Ceramic Mosaic Tile: 1/8 inch
3. Porcelain Tile: 1/4 inch

B. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

C. Where accent tile differs in thickness from field tile, very setting-bed thickness so that tiles are flush.

D. Rinse tile work with clean water before and after using chemical cleaners.

3.8 WATERPROOFING AND SHOWER PAN MEMBRANES

A. Install in accordance with manufacturer's written installation instructions.

B. Install waterproof membrane on sloped mortar to provide minimum slope to drains as required by the manufacturer's written installation instructions.

C. Upon completion of work, test for leaks by plugging the drain or damming areas and filling with water a minimum of 4 inches at curbs for a period of 24 hours. Inspect for leakage. Make necessary adjustments to stop all leakage and re-test until watertight, before mortar bed is installed.

3.9 CLEANING AND PROTECTING

A. Clean tile and grout as recommended by manufacturer. Remove all traces of grout.

B. Cover exposed hardware with a heavy coating of Vaseline to protect the metal from the possible effects of the acid or its fumes, when acid solutions are recommended by manufacturer to clean the face of finished tile work of surplus grouting or pointing mortar. Do not use acid solution for cleaning glazed tile.

C. Protect the tile against damage after installation. Damaged tile that appears in the finish work prior to the data of Substantial Completion is to be repaired or replaced. Protect adjoining areas and surfaces.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical ceiling tile.
2. Exposed grid suspension systems.
3. Perimeter and trim Accessories.

1.2 SUBMITTALS

A. Product Data: For products indicated.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Ceiling Panels: Set of 12-inch- square Samples of each type, color, pattern, and texture.
2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- long Samples of each type, finish, and color.

C. Maintenance Data: For ceiling panels and grid.

1.3 QUALITY ASSURANCE

A. Source Limitations:

1. Ceiling Panels: Obtain through one source from a single manufacturer.
2. Suspension System: Obtain each type through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Surface-Burning Characteristics: Provide acoustical panels with the following surface- burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:

a. Smoke-Developed Index: 450 or less.

C. Preinstallation Conference: Conduct conference at Project site.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings 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.

1.6 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A according to ASTM E 1264.
2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL PANELS

A. Basis-of-Design Product: As Indicated on the Finish List, Or Equal.

B. Products of the following manufacturers are acceptable, providing their products equal or exceed the quality specified; and they can provide products of the type, size, function, and arrangement required.

1. Armstrong World Industries, Inc.
2. Chicago Metallic Corporation.
3. United States Gypsum Company.

2.4 METAL SUSPENSION SYSTEM

A. Basis-of-Design Product: As Indicated on the Finish List.

B. Suspension systems shall meet or exceed the requirements of ASTM C 635 for dimensional tolerances, coatings and finishes, and load carrying capabilities. Individual component deflection shall not exceed 1/360 of the span.

C. Finishes and Colors: Provide hot-dipped galvanized finish G-60 on all ceiling suspension components. Exposed surfaces of suspension system components shall receive white baked- on enamel paint.

D. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.

a. Type: Postinstalled expansion anchors.
b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.

2. 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 hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by

ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three 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 wire.

2.5 MISCELLANEOUS MATERIALS

A. Concealed Acoustical Sealant: Nondrying, nonhardening, nonskinning, nonstaining, non- bleeding gunnable sealant complying with requirement specified in Section 07 92 00, Sealants and Caulking.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

2.7 ACOUSTICAL SEALANT

A. Products:

1. Acoustical Sealant for Exposed and Concealed Joints:

a. Pecora Corp; AC-20 FTR Acoustical and Insulation Sealant.
b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
c. Tremco Quart Acoustical Sealant 333.

B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION, GENERAL

A. General: Install acoustical panel ceilings to comply with ASTM C 636 per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's 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 structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with 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 and publications.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Do not attach hangers to steel roof deck. Attach hangers to structural members.

6. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
2. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient base.

1.2 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. Samples for Initial Selection: For each type of product indicated.

D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

E. Product Schedule: For resilient base.

1.3 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 F or more than 90 deg F.

1.4 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 resilient products 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. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RUBBER BASE

A. Basis-of-Design Product: As Indicated on the Finish List.

2.2 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: W ater-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.

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 W ork.

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 resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. 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. Do not install resilient products until they are the same temperature as the space where the y are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

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. Preformed Corners: Install preformed corners before installing straight pieces.

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:

1. Remove adhesive and other blemishes from exposed surfaces.

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.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Luxury vinyl plank (LVT)
2. Vinyl coved base

1.2 SUBMITTALS

A. Product Data: Manufacturer’s published data including maintenance data.

B. Samples: Manufacturer's color charts consisting of actual tiles or sections of tiles showing full range of colors and patterns available for each type of resilient floor tile and base indicated.

C. Results from Bond and Moisture Test.

D. Installer Statement of Compliance: Certify flooring is installed in accordance with manufacturer’s installation instructions, including moisture test values, to validate manufacturer’s warranty.

E. Sample warranty

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain each type, color, and pattern from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

B. Contractor Qualifications:

1. Employ contractors skilled in the successful installation of the specified materials and accessories on similar projects for a minimum of five years.
2. Installing company shall employ a minimum of three qualified installers each with a minimum of two years experience installing VCT flooring.

C. Fire Performance Characteristics: Determined by testing products per ASTM test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Critical Radiant Flux: 0.45 watts per sq. cm or more per ASTM E 648.
2. Smoke Density: Less than 450 per ASTM E 662.
3. Flame Spread: Less than 75 per ASTM E 84.

D. Bond and Moisture Tests: Conduct bond and moisture tests prior to installation. Bond and moisture tests shall be in accordance with manufacturer’s recommendations. Provide frequency of tests as recommended by manufacturer.

1. Test concrete slabs in accordance with ASTM F 1869 Standard Test

Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride to ensure emission of no more than 3 lbs of water/1000 sf of slab in 24-hour period.

2. When test cannot be conducted under temperature and humidity conditions that will prevail under normal conditions, provide and maintain the 75 Deg F (+/- 5 Deg F) temperature and 50 percent (+/- 10 percent) humidity for 48 hours prior to and during the test.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Site in original unopened containers each bearing names of product and manufacturer, project identification, and shipping and handling instructions.

B. Store materials in dry spaces protected from the weather. Maintain ambient temperatures between 50 and 90 degrees F.

C. Store tiles on flat surfaces. Condition materials in spaces where they will be installed a minimum of 48 hours prior to installation.

1.5 PROJECT CONDITIONS

A. Maintain a minimum temperature of 70 degrees F in spaces to receive tiles for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 degrees F.

B. Do not install tiles until they have been conditioned to the space where they are to be installed.

C. Close spaces to traffic during tile installation.

1.6 SEQUENCING AND SCHEDULING

A. Do not deliver or install products until building is enclosed, wet work completed, and HVAC system is operating and maintaining temperature and humidity at occupancy level during remainder of construction period.

B. Install tiles and accessories after other finishing operations, including painting, have been completed.

C. Do not begin installation until concrete slabs have cured, dry, and able to bond with adhesive as determined by manufacturer.

1.7 EXTRA MATERIALS

A. Furnish, not less than one box for each 50 boxes or fraction thereof, of each class, wearing surface, color, pattern and size of resilient floor tile installed.

B. Furnish not less than 30 linier feet of each type, color, pattern, and size of resilient base installed.

1.8 WARRANTY

A. Manufacturer’s Warranty: Standard warranty covering manufacturing defects

and installation integrity: Installation integrity is defined as products installed in accordance with the manufacturer's installation manual.

1. Flooring: Five years minimum
2. Base: One year minimum

B. Installer's Warranty: Guarantee flooring and base installation against defects in installation, workmanship and loss of adhesion for one year.

C. Warranty period begins on the Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TILE AND ACCESSORIES

A. Refer to Interior Design documents for selected manufacturers, styles and colors.

B. LVT: ASTM F1700, Class lll, Type B

1. Thickness: Not less than 0.10 inches
2. Wear Layer Thickness: Not less than 20 mil
3. Maximum static load must exceed 900 PSI
4. BoD: Reston 1588V by Patcraft

a. Size: 7 by 48

2.2 RESILIENT BASE

A. Manufacturers:

1. Johnsonite
2. Burke Industries
3. Roppe Rubber Corporation
4. Flexco Co.
5. Armstrong
6. Mannington

B. Vinyl Cove Base: ASTM F1861, Type TS (vulcanized thermoset rubber) or Type TP (thermoplastic rubber). 4 inch high by roll stock, 1/8-inch thick, ribbed back, rounded top, and set on type. (4 foot length base material is not acceptable.)

1. Provide molded corners 4 inches in height by 4 inches in length each way for internal and external corners.

2.3 MISCELLANEOUS MATERIALS

A. Adhesive: Recommended by manufacturer

B. Subfloor Filler: Portland cement-based latex underlayment; type recommended by flooring manufacturer.

C. Cleaner: "Spal Concentrate" by Huntington Laboratories or approved equal, required for vinyl composition tile.

D. Floor Polish: Equinox by Pioneer/Eclipse.

2.4 RESILIENT STAIR ACCESSORIES

A. Floor Tile for Landings: 3/16 inch thick minimum, 24 inch by 24 inch square tiles with a flame spread rating of 25 or less using ASTM E 84. Tile shall have sanded or abraded back, contain no asbestos fiber, and be made of top quality cured homogenous rubber compound. Color shall extend throughout tile. Tile shall have raised discs, 3/4 inch diameter Minimum. Color by Architect.

B. Stair Tread/Riser: 1/4 inch thick tread with tapering riser. Flame spread rating: 25 or less per ASTM E 84. Treads shall have sanded or abraded back. Color: Homogeneous, shall extend throughout the thickness and contain no asbestos fiber and shall be free from objectionable odors, blisters, cracks, and other imperfections which will detract from the serviceability and appearance of the treads. Color and tread design as selected by the Architect.

1. Nosing to have 3 inch wide, shark fin, integral stripe extending full width of tread at top and bottom tread of each run.
2. Type: TS (Rubber, volcanized thermoset) or TP (Rubber, thermoplastic)
3. Class: 2 (Pattern, embossed, hammered)
4. Group: 1(Embedded visually impaired insert strips)
5. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees
6. Nosing Height: 1 1/2 inch
7. Size: Length and depth to fit stair tread in one piece
8. Riser: Integral, smooth, flat; in height that fully covers substrate

C. Provide Square edge nosing design to comply with ADA, NFPA and ANSI codes at all stair treads and landings. Butt type nosing may be used at landings providing they are square edge design and meet the above referenced codes. Minimum depth of 3-1/2 inches with tapered edge to fit landing material, length as required. Color and design as selected by the Architect.

D. Install in accordance with manufactures instructions and recommended adhesive.

E. Basis of Design: Products by Tarkett

F. Products of the following Manufacturers will also be acceptable, providing they equal or exceed the quality specified.

1. Musson Rubber Company
2. Freudenberg Building Systems - Nora Rubber Flooring
3. R.C.A. Rubber Company
4. Endura System by Endura
5. Mercer
6. Roppe

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where installation of tiles will occur. Do not proceed until unsatisfactory conditions have been corrected.

B. Concrete Subfloors: Verify concrete slabs comply with ASTM F 710 and the following:

1. Dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by tile manufacturer.
2. Finishes of subfloors comply with tolerances and other requirements specified in Division 03 Section, Cast-In-Place Concrete for slabs receiving resilient flooring.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.
4. Provide a 100 percent solids epoxy membrane over concrete substrates that do not meet the required moisture vapor transmission rate, as recommended by flooring manufacturer to maintain warranty conditions.

3.2 PREPARATION

A. Comply with manufacturer's installation specifications to prepare substrates to receive tile.

B. Use trowelable leveling and patching compounds per tile manufacturer's directions to fill cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

D. Broom and vacuum substrates immediately before tile installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.

3.3 INSTALLATION

A. Comply with tile manufacturer's installation directions and other requirements indicated applicable to each type of tile installation scheduled.

B. Lay out tile from center marks established with principal walls so tiles at opposite edges of room are of equal width. Adjust to avoid using widths less than half of a tile. Install tiles square with room axis, unless otherwise indicated.

1. Install vinyl composition tiles in a parquet pattern.

C. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles in pattern with respect to location of colors, patterns, and sizes as indicated on Drawings.

D. Scribe, cut, and fit tiles to butt tightly to vertical surfaces, permanent fixtures, built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

E. Extend tiles into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent marking device.

G. Install tiles on covers for telephone and electrical ducts, and similar items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers.

H. Set tile to substrates without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed tile installation.

I. Use full spread of adhesive applied to substrate in compliance with tile manufacturer's directions for trowel notching, adhesive mixing, and adhesive open and working times. Spray applied adhesives are not allowed.

J. Hand roll tiles where required by tile manufacturer.

3.4 RESILIENT WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.

F. Premolded Corners: Install premolded corners before installing straight pieces.

G. Job-Formed Corners: Not allowed

3.5 RESILIENT STAIR TREAD INSTALLATION

A. Adhere treads to substrate throughout length of each piece, with tread in continuous contact with horizontal and vertical substrates.

B. Do not stretch during installation.

3.6 CLEANING AND PROTECTION FOR VCT

A. Perform the following operations immediately after completing tile installation:

1. Allow adhesive to dry for 48 hours after installation.
2. Remove visible adhesive and other surface blemishes using cleaner recommended by tile manufacturers.
3. Sweep or vacuum floor thoroughly.
4. Do not wash floor until after time period recommended by resilient floor tile manufacturer.
5. Damp-mop tile to remove black marks and soil.
6. Tiles with debris trapped underneath, shall be removed and replaced, prior to cleaning.

B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by tile manufacturer.

1. Apply protective floor wax (three coats) to tile surfaces that are free from soil, visible adhesive, and surface blemishes.

C. Clean tiles not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean tiles using method recommended by manufacturer.

1. Strip protective floor polish that was applied after completing installation prior to cleaning.
2. Reapply floor polish after cleaning.

3.7 CLEANING AND PROTECTION FOR LVT AND LVP

A. Sweep, dust mop or vacuum the floor thoroughly to remove all loose dust, dirt, grit and debris.

B. Remove any dried adhesive residue with a clean, white cloth dampened with mineral spirits, carefully following the warnings on the container.

C. Damp mop the floor with a properly diluted neutral (pH 6 to 8) detergent solution.

D. If necessary, scrub the floor using a rotary machine or auto scrubber with a properly diluted neutral detergent solution and the appropriate scrubbing brush (aggressiveness equivalent to 3M red pad for light scrub, 3M blue pad or equal for a deep scrub).

E. Thoroughly rinse the entire floor with fresh, clean water. Remove rinse water and allow the floor to dry completely.

F. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by tile manufacturer.

G. Clean tiles not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean tiles using method recommended by manufacturer.

END OF SECTION 096519

SECTION 096900 - ACCESS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cementitious-core steel panel access flooring.

1.2 COORDINATION

A. Coordinate location of mechanical and electrical work in underfloor cavity to prevent interference with access flooring.

B. Mark pedestal locations on subfloor to enable mechanical and electrical work to proceed without interfering with access-flooring pedestals installed after mechanical and electrical work.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review connections between access flooring and mechanical and electrical systems.
2. Review procedures for keeping underfloor space clean.

1.4 SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for access flooring.
2. Include loading capacities.

B. Shop Drawings: For access flooring:

1. Include layout of access flooring and relationship to adjoining W ork based on field- verified dimensions.
2. Details and sections with descriptive notes indicating materials, finishes,

fasteners, typical and special edge conditions, accessories, and understructures.

C. Samples: For the following products:

1. Floor Coverings: Full-size units for each color and texture specified.
2. Exposed Metal Accessories: Approximately 10 inches in length.
3. One full-size floor panel, pedestal, and understructure unit for each type of access flooring required.

1.5 INFORMATIONAL SUBMITTALS.

A. Qualification Data: For Installer.

B. Product Certificates: For each type of access flooring.

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. Panels: 10 square feet.
2. Pedestals: 10 square feet.
3. Stringers: 10 square feet.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 DESIGN REQUIREMENTS

A. Access floor system, where indicated on the design documents, shall consist of modular and removable fully encased cementitious filled welded steel panels fastened onto, and supported by, adjustable height pedestal assemblies. Pedestal head and panel corner design must provide a positive location and lateral engagement of the panel to the understructure support system without the use of fasteners.

B. Panel shall be easily removed by one person with a suction cup lifting device and shall be interchangeable.

1.9 FIELD CONDITIONS

A. Area to receive and store access floor materials shall be enclosed and maintained at ambient temperatures between 35□ to 95□ F and relative humidity levels between 20 to 80%. All floor panels shall be stored at ambient temperatures between 50□ to 90□ F for at least 24 hours before installation begins. All areas of installation shall be enclosed and maintained at ambient temperature between 50□ to 90□ F and at relative humidity levels between 20% to 80% and shall remain within these environmental limits throughout occupancy.

1.10 REFERENCES

A. CISCA (Ceilings & Interior Systems Construction Association) - "Recommended Test Procedures for Access Floors" shall be used as a guideline when presenting load performance product information.

1.11 PERFORMANCE CERTIFICATION

A. Product tests shall be witnessed and certified by independent engineering and testing laboratory based in the U.S. with a minimum of five years experience testing access floor components in accordance CISCA "Recommended Test Procedures for Access Floors".

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Design Load: Panel supported on actual understructure system shall be capable of supporting a point load of 1250 lbs applied on a one square inch area at any location on the panel without experiencing permanent set as defined by CISCA. The loading method used to determine design (allowable) load shall be in conformance with CISCA Concentrated Load test method but with panel tested on actual understructure instead of steel blocks.

B. Safety Factor: Panel supported on actual understructure system shall withstand a point load of no less than (2) two times the design load rating on a one square inch area anywhere on the panel without failure when tested in accordance with CISCA A/F, Section 2 "Ultimate Loading". Failure is defined as the point at which the system will no longer accept the load.

C. Ultimate Load: Panel supported on actual understructure system shall be capable of supporting a point load of at least 2500 lbs applied through a load indentor on a one square inch area at any location on the panel without failure (i.e. minimum safety factor of 2) when tested in accordance with CISCA A/F, Section 2, "Ultimate Loading".

D. Rolling Load: Panel supported on actual understructure system shall be able to withstand the following rolling loads at any location on the panel without developing a local and overall surface deformation greater than 0.040 inches when tested in accordance with CISCA A/F, Section 3, "Rolling Loads". Note: wheel 1 and wheel 2 tests shall be performed on two separate panels.

1. CISCA Wheel 1: Size: 3" dia x 1 13/16" wide Load: 1125 lbs. Passes:10
2. CISCA Wheel 2: Size: 6" dia x 2" wide Load: 875 lbs. Passes:10,000

E. Impact Load: Panel supported on actual understructure (the system) shall be capable of supporting an impact load of 150 lbs. dropped from a height of 36 inches onto a one square inch area (using a round or square indentor) at any location on the panel when tested in accordance with CISCA A/F Section 8, "Drop Impact Load Test".

F. Panel Drop Test: Panel shall be capable of being dropped face up onto to a concrete slab from a height of 36", after which it shall continue to meet all load performance requirements as previously defined.

G. Panel Cutout: Panel with an 8" diameter interior cutout supported on actual understructure shall be capable of maintaining its design load strength with a minimum safety factor of 2 anywhere on the panel without the use of additional supports.

H. Flammability: System shall meet *Class A* Flame spread requirements for flame spread and smoke development. Tests shall be performed in accordance with ASTM-E84-1998, Standard Test Method for Surface Burning Characteristics for Building Materials.

I. Combustibility: All components of the access floor system shall qualify as noncombustible by demonstrating compliance with requirements of ASTM E 136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 deg C.

J. Axial Load: Pedestal support assembly shall provide a minimum 6000 lb. axial load without permanent deformation when tested in accordance with CISCA A/F, Section 5, "Pedestal Axial Load Test.".

K. Overturning Moment: Pedestal support assembly shall provide an average overturning moment of 1000 in-lbs. when glued to a clean, sound, uncoated concrete surface when tested in accordance with CISCA A/F, Section 6, "Pedestal Overturning Moment Test". ICBO number for the specific system or structural calculations shall be required attesting to the lateral stability of the system under seismic conditions.

2.2 CEMENTITIOUS-CORE STEEL PANEL ACCESS FLOORING

A. Fabricate panels from cold-rolled steel sheet, with die-cut flat top sheet and die-formed and stiffened bottom pan welded together. Protect metal surfaces against corrosion using manufacturer's standard factory-applied finish. Fully grout internal spaces of completed units with manufacturer's standard cementitious fill.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Tate Access Floors, Inc; Concore or a comparable product by one of the following:

    a. ASM Modular Systems, Inc.
    b. Camino Modular Systems, Inc.

2. Configuration: Provide modular panels with nominal size of 24 by 24 inches, interchangeable with other field panels without disturbing adjacent panels or understructure.
3. Attachment to Understructure: Manufacturers Standard.
4. Finish: Manufacturer's standard.

B. Pedestal System Understructure: System consisting of base, column with provisions for height adjustment, and head (cap); made of steel.

1. Base: Square or circular base with not less than 16 sq. in. of bearing area.
2. Column: Of height required to bring finished floor to elevations indicated. W eld column to base plate.
3. Provide vibration-proof leveling mechanism for making and holding fine adjustments in height over a range of not less than +/- 1-inch and for locking at a selected height, so deliberate action is required to change height setting and prevent vibratory displacement.
4. Head: Designed to support the floor panel indicated.

    a. Bolted Assemblies: Provide head with four holes aligned with holes in floor panels for bolting of panels to pedestals.

2.3 ACCESSORIES

A. Provide manufacturer’s standard steps, ramps, fascia plate, perimeter support, and grommets where indicated on the contract drawings.

2.4 FINISHES

A. Carpet tile: Access floor system shall be designed to accommodate a modular carpet tile that precisely matches one carpet tile to one panel, by utilizing four positioning buttons on the carpet tile which engage into four positioning location holes within the

top surface of the access floor panel. Adhesives shall not be permitted except where the carpet is cut and more than two positioners are removed.

B. Fabrication Tolerances

1. Floor panel flatness measured on a diagonal: +/- 0.035”
2. Floor panel flatness measured along edges: +/-0.025”
3. Floor panel width or length of required size: +/-0.010”
4. Floor panel squareness tolerance: +/- 0.015”

2.5 FABRICATION

A. Panel Markings: Clearly and permanently mark floor panels on their underside with panel type and concentrated-load rating.

B. Bolted Panels: Provide panels with holes drilled in corners to align precisely with threaded holes in pedestal heads and to accept countersunk screws with heads flush with top of panel.

1. Captive Fasteners: Provide fasteners held captive to panels.

C. Cutouts: Fabricate cutouts in floor panels for cable penetrations and service outlets. Provide reinforcement or additional support, if needed, to make panels with cutouts comply with structural performance requirements.

1. Grommets: W here indicated, fit cutouts with manufacturer's standard grommets; or, if size of cutouts exceeds maximum grommet size available, trim edge of cutouts with manufacturer's standard plastic molding with tapered top flange. Furnish removable covers for grommets.

2.6 ACCESSORIES

A. Adhesives: Manufacturer's standard adhesive for bonding pedestal bases to subfloor.

B. Ramps: Manufacturer's standard ramp construction of width and slope indicated, but not steeper than 1:12, with raised-disc or textured rubber or vinyl-tile floor coverings, and of same materials, performance, and construction requirements as access flooring.

C. Panel Lifting Device: Provide (2) Panel manufacturer's standard portable lifting device for each type of panel required.

D. Perimeter Support: W here indicated, provide manufacturer's standard method for supporting panel edge and forming transition between access flooring and adjoining floor coverings at same level as access flooring.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer and manufacturer's authorized representative present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of conditions and deleterious substances that might interfere with attachment of pedestals.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Lay out floor panel installation to keep the number of cut panels at floor perimeter to a minimum. Avoid using panels cut to less than 6 inches.

B. Locate each pedestal, complete any necessary subfloor preparation, and vacuum subfloor to remove dust, dirt, and construction debris before beginning installation.

C. Slab shall be broom swept clean prior to installation.

3.3 INSTALLATION

A. Install access flooring and accessories under supervision of access-flooring manufacturer's authorized representative to produce a rigid, firm installation that complies with performance requirements and is free of instability, rocking, rattles, and squeaks.

B. Adhesive Attachment of Pedestals: Set pedestals in adhesive, according to access-flooring manufacturer's written instructions, to provide full bearing of pedestal base on subfloor.

C. Adjust pedestals so installed panels are flat, level, and at the proper height.

D. Install flooring panels securely in place, leaving them properly seated with panel edges flush. Do not force panels into place.

E. Scribe perimeter panels to provide a close fit, with adjoining construction having no

voids greater than 1/8 inch where panels abut vertical surfaces.

F. Finished floor shall be level, not varying more than 0.062” in 10 feet or 0.125” overall.

G. Inspect system prior to application of floor covering and replace any floor panels that are cracked, broken and structurally damaged and do not comply with specified requirements.

H. Installed panels shall be straight and square and spaced so that the distance from one end to the other of any line of 12 panels is not less than 24 feet and does not exceed 24’ 1/8”.

I. Acceptance: General contractor shall accept floor in whole or in part prior to allowing use by other trades.

J. All cable and wire openings shall be sealed with manufacturer’s removable cable cutout seal or grommets.

K. Install access flooring without change in elevation between adjacent panels and within the following tolerances:

1. Plus or minus 1/16 inch in any 10-foot distance.
2. Plus or minus 1/8 inch from a level plane over entire access flooring area.

3.4 PROTECTION

A. Prohibit traffic on access flooring for 24 hours and removal of floor panels for 72 hours after installation, to allow pedestal adhesive to set.

B. Replace access-flooring panels that are stained, scratched, or otherwise damaged or that do not comply with specified requirements.

END OF SECTION 096900

SECTION 099100 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exposed interior items and surfaces.
2. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available. Painting includes field painting of 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 installed and application of paint coats to all finish coated mechanical and electrical equipment, except as otherwise indicated.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

D. Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code- required labels or equipment name, identification, performance rating, or nomenclature plates.

1.2 SUBMITTALS

A. Product Data: For each paint system specified. Include primers.

1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.

1. After color selection, the Architect will furnish color chips for surfaces to be coated.

C. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

1. Provide stepped Samples, defining each separate coat, including primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.
3. On actual wall surfaces and interior building components, duplicate painted finishes of prepared samples. On at least 100 square feet of surface, as directed, provide full-coat finish samples until required sheen level., color and texture is obtained; simulate finished lighting conditions for review of in-place work.

D. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.3 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in 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 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.
8. VOC content.

B. 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 and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.5 PROJECT CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 degrees F.

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 degrees F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products and Manufacturers: Subject to compliance with requirements, products and manufacturers specified include, but are not limited to, the following:

1. The Sherwin-Williams Company

B. Other Products and Manufacturers: Subject to compliance with requirements, available products and manufacturers that may be incorporated into the Work include, but are not limited to, the following:

1. Benjamin Moore & Company (Moore)
2. Glidden Professional
3. PPG Industries, Inc. (PPG)

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide primers, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: Provide color selections made by the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.

1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of

substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

3.4 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.6 INTERIOR PAINT SCHEDULE

A. Gypsum Drywall – Walls:

1. Paint System, Application and Finish: Latex; two Finish Coats over Primer.

a. Primer: Promar 200 Zero VOC Latex Primer
b. Finish Coats: Promar 200 Zero VOC Interior Latex
c. Sheen Level: Refer to the Finish Legend.

B. Ferrous Metal: Includes steel doors and frames, handrails and railings.

1. Paint System, Application and Finish:

a. Primer: Kem Kromik Universal Metal Primer
b. Finish Coats: ProIndustrial Urethane Alkyd Enamel
c. Sheen Level: Refer to the Finish Legend.

3.7 EXTERIOR PAINT

A. For touch-up, match existing.

END OF SECTION 099100

SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior signage
2. Exterior building signage

1.2 SUBMITTALS

A. Product data for each item specified.

B. Samples:

1. Interior room number and name signs.
2. Exterior building signage

C. Provide a comprehensive list of all room names and numbers for each building space as well as quantities and locations for all other signs specified.

D. Provide one set of specialty tools required for changing and maintaining signage.

1.3 QUALITY ASSURANCE

A. Reference Codes and Specifications: FBC.

B. Each door to each occupied space shall have a room sign installed.

C. Signage shall conform with the Accessibility Requirements Manual from the Florida Department of Community Affairs, Florida Board of Building Codes and Standards.

1. All room signage and life safety signage shall be in Braille per the Florida Accessibility Code, 703.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver signage to the Site in protective wrap to prevent damage. Store in a dry area, protected from the elements.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Interior identifying devices, building letters, and dedication plaque shall be as manufactured by one of the following:

1. Rick’s Quality Printing & Signs, Inc.
2. Vital Signs of Orlando, Inc.
3. Sign Design of Florida, Inc.
4. Environmental Graphics, Inc.
5. Gemini, Inc.
6. Innerface Architectural Signage

7. Commercial Signs & Graphics
8. Signs Plus
9. APCO Graphics, Inc.
10. ASI Sign Systems
11. Best Sign Systems
12. Creative Signs Design

2.2 INTERIOR SIGNAGE

A. Below is a generic description for pricing. Final sign design to be determined and selected by Architect.

B. General

1. Graphic Process: Raised letters and Braille, formed as an integral part of the sign face.
2. Material: 1/8-inch thick clear matted acrylic plastic with all edges eased.
3. Size: 7-1/2 inches by 7-1/2 inches with 3/8-inch radius corners
4. Colors: Letters and background colors as selected by Architect from manufacturer's standard colors.
5. Letters: Letters and numbers shall have width to height ratio between 3:5 and 1:1 and a stroke width to height ratio between 1:5 and 1:10. Letters and numbers shall be raised 1/32-inch, uppercase, sans serif or simple sans serif type and shall be accompanied with Grade 2 Braille. Raised characters shall be 5/8-inch high minimum and 2 inches high maximum.
6. Characters and backgrounds must be eggshell, matte, or other nonglazed surface.

C. Maximum Occupancy Signage: Signs reading "MAXIMUM OCCUPANCY xx."

D. Toilet Room Accessibility Signs: Provide one sign depicting International Men/Women Symbol at each accessible toilet room.

E. Interior Room Name and Number Signs: Layout of room name and number shall be as directed by the Architect.

1. Layout of room name and number shall be as directed by the Architect.

F. Storage Signs: Provide at utility rooms to read NO STORAGE ALLOWED.

G. Fire Extinguisher and Fire Alarm Sending Station Sign:

1. Copy to read:

a. FIRE ALARM PULL STATION INSIDE
b. FIRE EXTINGUISHER INSIDE

2. Provide the above signs in the corridor adjacent to the primary door that has a fire pull station or fire extinguisher inside. White lettering on red background, same material, size, and mounting as Interior Room Name and Number Signs.

2.3 EXTERIOR BUILDING SIGNAGE

A. 16 inches high, 2 inches deep letters, baked enamel finish. Color as selected by Architect.

B. Letter Style: Arial, all caps

C. Material: Cast aluminum

D. Installation Method: Pin mounted, 3/4 inch from wall

E. Provide a clear back on building letters

F. Verify actual copy and layout with Owner and Architect prior to fabrication

G. Provide mounting and installation kits for mounting building letters.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Mount interior signage with concealed mechanical fasteners recommended by manufacturer.

C. Install interior signage in accordance with final Shop Drawings, Accessibility Requirements Manual from the Florida Department of Community Affairs.

D. Dedication Plaque: Install in accordance with final Shop Drawings.

E. Secure Work true to line and level.

F. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.

G. Isolate incompatible material as necessary to prevent deterioration.

H. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

1. Mount accessible signage at 60-inches above finished floor to the center line of the sign.

END OF SECTION 101400

SECTION 102110 - SHOWER AND DRESSING COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Shower compartments
2. Shower receptors

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, hardware, and finishes.

1. Maintenance manuals for shower compartments

B. Shop Drawings: For shower compartments. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of cutouts for compartment-mounted accessories
2. Show locations of centerlines of drains

C. Samples: For each type of compartment panel indicated.

D. Product Certificates: For each type of shower compartment, from manufacturer.

1.3 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with shower compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 SOLID SURFACING COMPARTMENTS

A. Basis-of-Design: Swanstone shower base and wall panels by Swan Surfaces, LLC.

B. Configuration: As shown on Drawings including grab bars and shower seat where scheduled.

C. Enclosure Style: One piece base receptor and three solid wall enclosure panels.

2.2 SHOWER RECEPTORS

A. General: Manufacturer's standard, prefabricated, solid surface receptor complete with integral drain.

1. Curb: Not less than 4 inches and not more than 6 inches deep when measured from the top of the curb to the top of the drain.
2. Floor: Finished, sloping uniformly toward the drain and not less than 1/4 unit vertical in 12 units horizontal and not more than 1/2 inch.
3. Refer to Plumbing documents for drain strainer and gaskets.

B. Finish: Manufacturer's standard finish on exposed surfaces, as selected by Architect from manufacturer's full range and with slip-resistant floor surface texture.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install compartments rigid, straight, level, and plumb. Secure compartments in position with manufacturer's recommended adhesives.

END OF SECTION 102110

SECTION 102116 - PHENOLIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes toilet partitions, urinal screens and accessories.

1.2 SUBMITTALS

A. Product Data: Maintenance instruction.

B. Shop Drawings: Fabrication drawings. Include appurtenances, cutouts, and all accessories. Provide template layouts for anchorage devices built into other work.

C. Color selection materials for components (actual samples) for all available color groups.

D. Sample warranty

1.3 QUALITY ASSURANCE

A. Field Measurements: Take field measurements prior to preparation of Shop Drawings, to ensure proper fitting of Work. Allow for adjustments where taking field measurements before fabrication might delay Work.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating toilet compartments without field measurements. Coordinate wall, floor, ceilings, and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

1.5 FLORIDA ACCESSIBILITY CODE FOR BUILDING CONSTRUCTION

A. Partition system shall conform with the Accessibility Requirements Manual from the Florida Department of Community Affairs, Florida Board of Building Codes and Standards.

1.6 WARRANTY

A. Manufacturer’s warranty indicating that products are and will remain free of material and manufacturing defects, and shall not warp for indicated period of time five years from the Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Sierra Series by Bobrick

B. Acceptable Manufacturers:

1. Accurate Partitions Corp.
2. AMPCO Products, Inc.
3. Flush Metal Partition Corp.
4. Metpar Corp.
5. Sanymetal Products Co. div. of Crane Plumbing
6. Weis/Robart Partitions, Inc.

2.2 MATERIALS

A. Provide materials which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.

B. Solid Phenolic Panels: NEMA LD-3 solid phenolic core with melamine laminate veneer material. Colors as selected by the Architect.

C. Anchorage and Tapping Reinforcement:

1. Concealed Anchorage Reinforcement: Minimum 0.108 inch (12 gage), galvanized steel sheet.
2. Concealed Tapping Reinforcement: Minimum 0.0785 inch (14 gage), galvanized steel sheet.

D. Pilaster Shoes and Caps: ASTM A 167, Type 302/304 stainless steel, not less than 3 inches high, 0.0396 inch thick (20 gage), finished to match hardware.

E. Stirrup Brackets: Manufacturer's standard design for attaching panels to walls and pilasters, solid stainless steel with No. 4 finish.

F. Hardware and Accessories: Manufacturer's standard design, heavy duty operating hardware and accessories of solid stainless steel.

G. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, chromium-plated steel, or brass, finished to match hardware, with theft-resistant-type heads and nuts. For concealed anchors, use hot-dip galvanized, cadmium-plated, or other rust-resistant protective-coated steel.

2.3 FABRICATION

A. Furnish standard doors, panels, screens, and pilasters fabricated for compartment system. Furnish units with cutouts, drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars, as indicated.

B. Door Dimensions: Unless otherwise indicated, furnish 24-inch-wide in-swinging doors for ordinary toilet stalls and 32-inch-wide (clear opening) out-

swinging doors for stalls equipped for use by handicapped.

C. Overhead-Braced Compartments: Furnish galvanized steel supports and leveling bolts at pilasters as recommended by Manufacturer to suit floor conditions. Provide shoe at each pilaster to conceal supports and leveling mechanism.

1. Provide floor/ceiling braced pilaster at accessible stall at connection to other compartments for termination of overhead bracing.

D. Wall-Hung Screens: Furnish panel units in sizes indicated, of same construction and finish as partition system panels.

E. Hardware: Furnish hardware for each compartment to comply with ANSI A117.1 for handicapped accessibility and as follows:

1. Hinges: Cutout inset type, adjustable to hold door open at any angle up to 90 degrees. Provide gravity type, spring-action cam type, or concealed torsion rod type to suit Manufacturer's standards.
2. Latch and Keeper: Recessed latch unit, designed for emergency access, with combination rubber-faced door strike and keeper.
3. Latch and Keeper - Handicapped: Manufacturer's standard surface-mounted latch unit, designed for handicapped accessibility, with combination rubber-faced door strike and keeper.
4. Coat Hook: Manufacturer's standard unit, combination hook and rubber-tipped bumper, sized to prevent door hitting mounted accessories.
5. Door Pull: Manufacturer's standard unit for out-swinging doors. Provide pulls on both faces of handicapped compartment doors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's recommended procedures and installation sequence. Install compartment units rigid, straight, plumb, and level. Provide clearances of not more than ½ inch between pilasters and panels, and not more than 1 inch between panels and walls. Secure panels to walls with not less than two stirrup brackets attached near top and bottom of panel. Locate wall brackets so that holes for wall anchorages occur in masonry or tile joints. Secure panels to pilasters with not less than two stirrup brackets located to align with stirrup brackets at wall. Secure panels in position with manufacturer's recommended anchoring devices.

B. Overhead-Braced Compartments: Secure pilasters to floor and level, plumb, and tighten installation with devices furnished. Secure overhead brace to each pilaster with not less than two fasteners. Hang doors and adjust so that tops of doors are parallel with overhead brace when doors are in closed position.

C. Screens: Attach with anchoring devices as recommended by manufacturer to suit supporting structure. Set units to provide support and to resist lateral impact.

3.2 ADJUST AND CLEAN

A. Hardware Adjustment: Adjust and lubricate hardware for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors (and entrance swing doors) to return to fully closed position.

B. Clean exposed surfaces of partition systems using materials and methods recommended by manufacturer, and provide protection as necessary to prevent damage during remainder of construction period.

END OF SECTION 102116

SECTION 102813 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes toilet accessory items.

1.2 SUBMITTALS

A. Product data for each toilet accessory item specified, including construction and mounting details, dimensions, gages, profiles, specified options, electrical characteristics, and finishes.

B. Schedule indicating types, quantities, sizes, and installation locations (by room) for each toilet accessory item to be provided for Project.

C. Setting Drawings where cutouts are required in other Work, including templates, substrate preparation instructions, and directions for preparing cutouts and installing anchorage devices.

D. Maintenance instructions including replaceable parts and service recommendations.

E. Sample warranties.

1.3 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish accessory Manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other Work to avoid delay.

B. Single-Source Responsibility: Provide products of same Manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Architect.

C. Performance Requirements:

1. Shower Seats and Grab Bar Structural Requirements: FBC 1607.7
2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70.
3. Shower Seats: Installed units are able to resist 250 lbf applied in any direction and at any point.

1.4 PROJECT CONDITIONS

A. Coordinate accessory locations, installation, and sequencing with other Work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

1.5 WARRANTY

A. Toilet Accessory Warranty: Provide manufacturers one year warranty from the Date of Substantial Completion, against defects in material and workmanship.

B. Mirror Warranty: Written warranty executed by mirror manufacturer, agreeing to replace mirrors that develop visible silver spoilage defects within 15 years from the Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TOILET ACCESSORY MANUFACTURERS

A. Manufacturers:

1. Basis of Design: Bobrick Washroom Equipment, Inc.
2. Bradley Corporation
3. American Specialties, Inc.
4. A&J Washroom Accessories

B. Electric Hand Dryer: XLerator XL-BW by Excel Dryer

2.2 MATERIALS, GENERAL

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.034-inch (22-gage) minimum thickness.

B. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16; Castings, ASTM B 30.

C. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 0.04-inch (20-gage) minimum. Surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A 527, G60.

E. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

F. Mirror Glass: Nominal 6.0-mm (0.23-inch) thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.

G. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

H. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

2.3 ACCESSORIES

A. Toilet Tissue (Roll) Dispenser (E)

1. Basis-of Design Product: Subject to compliance with requirements, provide Bobrick B-274 Multi-Roll Toilet Tissue Dispenser, or an equivalent product by one of the following manufacturers:

a. AJW Architectural Products.
b. American Specialties, Inc.
c. Bobrick Washroom Equipment, Inc.

d. Bradley Corporation.
e. GAMCO Specialty Accessories; a division of Bobrick.

2. Description: Roll-in-reserve dispenser with hinged front secured with tumbler lockset.
3. Mounting: Surface mounted.
4. Capacity: Designed for 5-1/2 inch diameter tissue rolls.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

B. Waste Receptacle (S)

1. Basis-of Design Product: Subject to compliance with requirements, provide Bobrick B- 3644 Recessed Waste Receptacle, or an equivalent product by one of the following manufacturers:

a. AJW Architectural Products.
b. American Specialties, Inc.
c. Bobrick Washroom Equipment, Inc.
d. Bradley Corporation.
e. GAMCO Specialty Accessories; a division of Bobrick.

2. Mounting: Open top, recessed.
3. Minimum Capacity: 12 gal.
4. Material and Finish: Stainless steel, No. 4 finish (satin).
5. Liner: Reusable vinyl liner.

C. Liquid-Soap Dispenser (P):

1. Basis-of Design Product: Subject to compliance with requirements, provide Bobrick B-8263 Counter Mounted Liquid Soap Dispenser, or an equivalent product by one of the following manufacturers:

a. AJW Architectural Products.
b. American Specialties, Inc.
c. Bobrick Washroom Equipment, Inc.
d. Bradley Corporation.
e. GAMCO Specialty Accessories; a division of Bobrick.

2. Designed for dispensing soap in liquid or lotion form.
3. Automatic dispenser with infrared sensor to detect presence of hands; electrically operated, with adapter for 110- to 240-V ac power supply; designed for dispensing soap in liquid or lotion form.
4. Mounting: Vertically oriented, surface mounted. Counter mounted.
5. Capacity: 27 oz.
6. Refill Indicator: LED indicator.
7. Low-Battery Indicator: LED indicator.

D. Liquid-Soap Dispenser (Q):

1. Basis-of Design Product: Subject to compliance with requirements, provide Bobrick B2013 Wall Mounted Soap Dispenser, or an equivalent product by one of the following manufacturers:

a. AJW Architectural Products.
b. American Specialties, Inc.
c. Bobrick Washroom Equipment, Inc.
d. Bradley Corporation.
e. GAMCO Specialty Accessories; a division of Bobrick.

2. Description: Automatic dispenser with infrared sensor to detect presence of hands; battery powered; designed for dispensing soap in liquid or lotion form.
3. Mounting: Surface mounted.
4. Capacity: 27 oz. (800 mL).
5. Refill Indicator: LED indicator.
6. Low-Battery Indicator: LED indicator.

E. Grab Bar (B, C, D):

1. Basis-of Design Product: Subject to compliance with requirements, provide Bobrick B- 5806 Stainless Steel Grab Bar, or an equivalent product by one of the following manufacturers:

a. AJW Architectural Products.
b. American Specialties, Inc.
c. Bobrick Washroom Equipment, Inc.
d. Bradley Corporation.
e. GAMCO Specialty Accessories; a division of Bobrick.

2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.

a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.

4. Outside Diameter: 1-1/4 inches (32 mm).
5. Configuration and Length: As indicated on Drawings.

F. Sanitary-Napkin Disposal Unit (F):

1. Basis-of Design Product: Subject to compliance with requirements, provide Bobrick B- 270 Sanitary Napkin Disposal, or an equivalent product by one of the following manufacturers:

a. AJW Architectural Products.
b. American Specialties, Inc.
c. Bobrick Washroom Equipment, Inc.
d. Bradley Corporation.
e. GAMCO Specialty Accessories; a division of Bobrick.

2. Mounting: Surface mounted.
3. Door or Cover: Self-closing, disposal-opening cover.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

G. Mirror Unit (N):

1. Basis-of Design Product: Subject to compliance with requirements, provide Bobrick B- 1556 Frameless Mirror or an equivalent product by one of the following manufacturers:

   a. AJW Architectural Products.
   b. American Specialties, Inc.
   c. Bobrick Washroom Equipment, Inc.
   d. Bradley Corporation.
   e. GAMCO Specialty Accessories; a division of Bobrick.

2. Frame: Frosted Frameless
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.

   a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

4. Size: As indicated on Drawings.

H. Robe Hook (V)

1. Basis-of Design Product: Subject to compliance with requirements, provide Bobrick B- 672 Classic Series Robe Hook, or an equivalent product by one of the following manufacturers

   a. AJW Architectural Products.
   b. American Specialties, Inc.
   c. Bobrick Washroom Equipment, Inc.
   d. Bradley Corporation.
   e. GAMCO Specialty Accessories; a division of Bobrick.

2. Description: Double-prong unit.
3. Material and Finish: Stainless steel, No. 4 finish (satin).

2.4 FABRICATION

A. No names or labels are permitted on exposed faces of toilet and bath accessory units. On either interior surface not exposed to view or on back surface, provide identification of each accessory item either by a printed, waterproof label or a stamped nameplate indicating Manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

C. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors or access panels with full-length, stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

D. Framed Mirror Units, General: Fabricate frames for glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror backing and support system that will permit rigid, tamperproof glass installation and prevent moisture accumulation, as follows:

1. Provide galvanized-steel backing sheet, not less than 0.034 inch (22 gage) and full mirror size, with non-absorptive filler material. Corrugated cardboard is not an acceptable filler material.

E. Mirror Unit Hangers: Provide system for mounting mirror units that will permit rigid, tamperproof, and theft proof installation, as follows:

1. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

F. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing and re-supply. Provide six keys to Owner's representative.

G. Baby Changing Stations: Meeting ASTM F2285 requirements.

2.5 MISCELLANIOUS ITEMS

A. Under Lavatory Guard

1. Basis-of-Design Product: Provide “Lav-Guard 2, EZ Series” undersink protective pipe cover kits as manufactured by Truebro by IPS Corporation.
2. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

B. Mop Holders with Shelf: Surface mounted utility shelf with spring loaded rubber cam holders to accommodate mop or broom handles. Bobrick No. B-239 X 34”

C. Utility Hooks: Surface-mounted, Type-304 stainless steel satin finish. Bobrick No. B-6707

D. Shower Rod: Bobrick No. B-207 Heavy Duty Shower Curtain Rod

E. Shower Curtain: Bobrick No. B-204 Vinyl Shower Curtain

F. Fold Down Wood Bench: Model Number TBF-30WS by Teakworks4U

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install toilet accessory units according to manufacturers' instructions, using

fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.

1. Remove temporary labels and protective coatings.

B. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to Manufacturer's instructions for type of substrate involved.

C. Install shower sears and grab bars to withstand a downward load of at least 250 lbf, complying with ASTM F 446, and in accordance with Performance Requirements.

D. Install changing stations to within static loads of 400 lbf. and per manufacturer’s recommended instructions.

3.2 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 102813

SECTION 104313 - DEFIBRILLATOR CABINETS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Automated external defibrillator (AED) cabinets.

B. Accessories.

1.2 REFERENCES

A. NFPA: National Fire Protection Association; 2007.

B. UL: Underwriters Laboratories Inc.; current edition.

1.3 PERFORMANCE REQUIREMENTS

A. Conform to applicable code, NFPA and UL standards and requirements.

B. Contractor shall coordinate sizing of AED cabinets, to accommodate the AED equipment, including telecommunication connections, provided by Owner.

1.4 SUBMITTALS

A. Shop Drawings: Indicate cabinet physical dimensions, rough-in measurements for recessed cabinets, wall bracket mounted measurements, location, and clearances.

B. Product Data: Provide color and finish and anchorage details.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 PRODUCT HANDLING

A. Wrap, crate, bundle, box, or otherwise package, handle transport, and store manufactured products as necessary to provide protection from damage by every cause, including transit to installation location.

B. Store and protect materials and equipment:

1. In accordance with manufacturer's instructions.
2. Above grade on non-staining supporting materials, protected from weather and construction activities.
3. Store materials in enclosed areas protected from physical damage, humidity, and extreme temperature exposures.

C. Remove from Project site materials or equipment in broken, damaged, rusted, deteriorated, unlabeled, or similar conditions unacceptable to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis of Design: Automated External Defibrillator (AED) cabinets: JL

Industries, Inc.

B. Other manufacturers are also acceptable that are also acceptable to the Defibrillator unit manufacturer.

2.2 AUTOMATED EXTERNAL DEFIBRILLATOR CABINETS

A. Cabinet and door: 22 gauge cold-rolled steel with white epoxy primer finish, full 1/4 inch thick minimum clear tempered glass door, 5/8 inch nominal thickness; JL Industries, Inc., Life Start Series AED Cabinets.

1. Surface-mounted: Series Number 1413, with 1-1/4 inch trim.
2. Semi - Recessed Flat Trim: Series Number 1416, with 1-1/2 inch trim; fire-rated where indicated on Drawings or required by applicable Code.
3. Semi - Recessed: Series Number 1417, with 3 inch trim; fire-rated where indicated on Drawings or required by applicable Code.
4. Suitable for interior or exterior installations, UV- and rain-proof.

2.3 ACCESSORIES

A. Manufacturer's standard hardware: continuous hinge, zinc-plated pull handle and roller catch, finish as indicated on Drawings or selected by Owner.

1. Roller Reed Ball Contact and Alarm Connectivity Switch: Model number DS-02 (open loop), located in bottom of cabinet.

B. Sensor/Controller: Manufacturer's standard alarm circuit board, Model number 1- 149-102, for activation when the cabinet door is opened.

1. Alarm: Siren/strobe combination, Model number LD-96, with visibly curved strobe cover, keyed switch and two keys, and integral disposable 9-volt lithium battery.

a. Door Alarm: Model number 14CB.
b. Strobe Light: Model number 14SA.

2. Siren Tones: Typical tone, sweep, and hi/low.
3. Siren Output: 110 +/- 3 dB at 1 foot. Provide 1 foot long power cord, and clear lens.
4. 3-Minute Automatic Shut-off: With manual reset and three warning signals.
5. 2-Second Tamper Feature: Cabinet door must remain open for 2 seconds before the alarm sounds, to prevent false alarms.

C. 3-Minute 5-second Alarm Duration Switch: Manufacturer's standard, located on the face of the Sensor/Controller.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, according to accepted shop drawings.

C. Mounting heights: Install top of cabinets 48 inches above finish floor, unless otherwise indicated on Drawings or required by applicable Code.

D. Coordinate telecommunication connections with requirements of Division 27 and 28.

E. Field finish cabinets as indicated on Drawings, in accordance with Division 09 Section, - Painting.

3.3 ADJUST AND CLEAN

A. Cleaning: Immediately clean exposed surfaces of staining foreign materials. Do not use cleaning materials or processes which alter exposed finishes.

B. Adjust operating mechanisms.

C. Secure rigidly in place.

D. Position cabinet signage as indicated in Contract Documents, or required by applicable Code.

END OF SECTION 104313

SECTION 122000 - WINDOW TREATMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Manual sun shades

B. Refer to Drawings for scheduled locations.

1.2 SUBMITTALS

A. Product Data:

1. Manufacturer's specifications for each type of unit required.
2. Maintenance instructions including recommended cleaning materials.
3. Operating hardware.

B. Shop Drawings: Plans showing locations of each unit and specific details not described in the manufacturer’s specifications.

C. Samples: Manufacturer’s standard color chain for each type of blind indicated.

1. Include fabric samples of each different type designated

D. Window Treatment Schedule: For all shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain blinds through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide blinds with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Resistance Ratings: Passes NFPA 701.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver blinds in factory packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in a window treatment schedule.

1.5 PROJECT CONDITIONS

A. Verify dimensions and conditions at jobsite. Dimensions noted on the Drawings are for guidance only.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturers are specified as the type, size, function, and quality of products required to be provided:

1. Manual Sun Shades:

a. Basis of Design: Mecho®/5 with EuroVeil 5300 Series, Group D, fabric by MechoShade
b. Draper Screen
c. Vimco

2. Fabric specified is for pricing, actual fabric will be selected by Architect.

2.2 MANUAL SUN SHADES

A. Manual, Chain drive, duel cylinder where scheduled.

B. Provide with optional side black-out channels where black-out is required.

C. Fabric: Manufacturer's standard woven polyester, approximately 5 to 6% (high 12% to low 3%) light transmittance.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Position items true to plumb line and level. Provide additional supports or attachment as required for installation.

B. Install track and all items and accessories in accordance with the manufacturer's written instructions and final Shop Drawings.

C. After installation, demonstrate to the Architect that components are fully operable and will perform as intended.

END OF SECTION 122000

SECTION 15060-PIPE AND FITTINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Special Conditions, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of pipes and pipe fittings required by this section is indicated on drawings and/or specified in other sections.

B. Types of pipes and pipe fittings specified in this section include the following:

1. Ductile - Iron Pressure Pipes (Pressure Pipe)
2. Plastic Pipes (Pressure Pipes)
3. Miscellaneous Piping Materials/Products

C. Pipes and pipe fittings furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other sections.

1.03. QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of pipes and pipe fittings of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years. **All fittings, valves, service saddles, etc. shall meet the requirements of the Safe Drinking Water Act including the Reduction of Lead in Drinking Water Act (Public Law 111-380).**

B. Codes and Standards:

1. Welding: Qualify welding procedures, welders and operators in accordance with ASME B31.1, or ASME B31.9, as applicable, for shop and project site welding of piping work.

2. Brazing: Certify brazing procedures, brazers, and operators in accordance with ASME Boiler and Pressure Vessel Code, Section IX, for shop and job-site brazing of piping work.

3. NSF Labels: Where plastic piping is indicated to transport potable water, provide pipes and pipe fittings bearing approval label by National Sanitation Foundation (NSF).

PART 2 - PRODUCTS

2.01 GENERAL:

A. Piping Materials: Provide pipe and tube of type, joint type, grade, size and weight (wall thickness or class) indicated for each service. Where type, grade or class is not indicated, provide proper selection as determined by Installer for installation requirements, and comply with governing regulations and industry standards.

B. Pipe/Tube Fittings: Provide factory-fabricated fittings of type, materials, grade, class and pressure rating indicated for each service and pipe size. Provide sizes and types matching pipe, tube, valve or equipment, connection in each case. Where not otherwise indicated, comply with governing regulations and industry standards for selections, and with pipe manufacturer's recommendations where applicable.

2.02 DUCTILE-IRON PRESSURE PIPES AND PIPE FITTINGS:

A. Ductile-Iron Pipe: ANSI A21.51; AWWA C151.

B. Ductile-Iron Fittings: AWWA C110.

C. Rubber-Gasket Joints: AWWA C111.

D. Where ductile iron pipe and fittings are to be below ground or installed in a casing pipe, the coating shall be a minimum 1.0 mil thick in accordance with ANSI/AWWA A21.51. Where ductile iron pipe and fittings are to be installed above ground, pipe, fittings and valves shall be thoroughly cleaned and given one field coat (minimum 1.5 mils dry thickness) of rust inhibitor primer. The intermediate and field coats of Alkyd shall also be applied by the Contractor (minimum 1.5 mil dry thickness each coat). Primer and field coats shall be compatible and shall be applied in accordance with the manufacturer's recommendations. Final field coat shall be blue.

E. All ductile iron pipe and fittings shall have an interior protective lining of cement-mortar with a seal coat of asphaltic material in accordance with ANSI/AWWA A21.4/C104.

F. Polyethylene – coatings for interior liners shall be American Polybond Plus, or approved equal.

2.03 PLASTIC PIPES AND PIPE FITTINGS:

A. Use SDR 9, Polyethylene Pipe (PE) ASTM D 1248, D 3350, Type III, Grade P 34 for water services.

B. Use Polyvinyl Chloride Pipe (PVC) AWWA C 900 (latest revision) for potable water mains and sanitary sewer mains 4” thru 12”. All pipe shall be DR 25 unless specified otherwise. The pipe color shall be blue for water and green for sewer.

C. Use Pressure Rated PVC Pipe conforming to ASTM D-2241 for potable water mains and sewer mains 3” and less. All pipe shall be SDR 21 unless specified otherwise. Pipe color shall be blue for water and green for sewer.

D. Pressure Pipe Fitting 3" and Larger: Use mechanical joint, ductile iron Class 350, compact fittings manufactured in accordance with ANSI/AWWA C110/A21.53-84, as manufactured by EBBA, or equal.

E. Pressure PVC Pipe Fittings 2” and Less: Use Solvent Weld push on type SCH 80 PVC

2.04 MISCELLANEOUS PIPING MATERIALS/PRODUCTS:

A. Welding Materials: Except as otherwise indicated, provide welding materials as determined by Installer to comply with installation requirements.

B. Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials.

C. Soldering Materials: Except as otherwise indicated, provide soldering materials as determined by Installer to comply with Installation requirements.

D. Gaskets for Flanged Joints: ANSI B16-21, full-faced for cast-iron flanges, raised-face for steel flanges, unless otherwise indicated.

PART 3 - EXECUTION

3.01 INSTALLATION:

General Instructions:

A. All excavation and backfilling for underground piping shall be done in accordance with the applicable sections of these specifications. All pipe, fittings, and valves shall be carefully handled at all times to prevent damage to the pipe or other installations on the job site. Install ductile-iron water mains and appurtenances in accordance with AWWA C 600. Install PVC pressure pipe in accordance with AWWA C605.

B. All joints shall be wiped free of all dirt, sand and foreign material and the pipe shall be carefully examined for defects before installation.

C. At times when pipe installation is not in progress, the open ends of the pipe shall be closed by approved means and shall remain closed until construction on that particular section is resumed, eliminating the possibility of any flow obstructions getting into the pipe.

D. Install pipes and pipe fittings in accordance with recognized industry practices which will achieve permanently leakproof piping systems, capable of performing each indicated service without piping failure. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, within 1/16" misalignment tolerance.

3.02 SPECIFIC INSTRUCTIONS:

A. All non-metallic water lines and sewer lines (except service lines) shall be installed with underground locator marking tape. Locator tape shall be installed 12 inches below the ground surface or pavement directly over the pipeline. Locator tape shall be of an inert polyethylene material having a minimum thickness of 0.1 mm and should be color-coded "Safety Green" as adopted by the American Public Works Association and the Florida Utilities Coordination Committee. The tape shall bear printed identification describing the type of pipeline buried below and shall contain a 0.025 mm thick metallic foil core. The imprint shall repeat itself for the entire length of the tape. Contractor shall use 12 gauge copper tracer wire for all non-metallic water lines and shall be placed 3 or 4” above the pipe.

3.03 PVC FITTINGS:

A. PVC fittings will not be used on pressure pipe 3" in diameter or larger. PVC Pipe Fittings shall be Solvent Weld push on type SCH 80 PVC.

3.04 PIPING SYSTEM JOINTS:

A. General: Provide joints of type indicated in each piping system.

B. Weld pipe joints of steel water pipe in accordance with AWWA C 206.

C. Flanged Joints: Match flanges within piping system, and at connections with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets.

D. Plastic Pipe/Tube Joints: Comply with manufacturer's instructions and recommendations, and with applicable industry standards.

E. Heat Joining of Thermoplastic Pipe: ASTM D 2657.

3.05 ANCHORAGE OF BENDS, TEES, AND PLUGS:

A. Limiting Pipe Diameter and Degree of Bend: Reaction of thrust backing shall be applied on all pipe lines at all tees, plugs, caps and at bends deflecting 11-1/4 degrees or more, or movement shall be prevented by attaching suitable metal rods or straps as directed.

3.06 CLEANING, FLUSHING, INSPECTING:

A. General: Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings (if any). Flush out piping systems with clean water before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items.

B. Inspect pressure piping in accordance with procedures of ASME B 31.

C. Disinfect water mains and water service piping in accordance with AWWA C 651.

3.07 HYDROSTATIC TESTING:

A. General: Provide temporary equipment for testing, including pump and gauges. Test piping system before insulation is installed wherever feasible, and remove control devices before testing. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurize for indicated pressure and time.

B. Hydrostatic testing shall be in accordance with AWWA C-600.

C. Should any test of combined sections of pipe disclose leakage greater than the specified limit, the Contractor shall, at his own expense, locate and repair the defective joints until the leakage is within the specified allowance.

D. Water for testing shall be provided by the Contractor.

E. Pipe may be subjected to hydrostatic pressure, inspected and tested for leakage at any convenient time after partial completion of backfill. The Contractor may test the system with joints exposed or backfilling complete at his option. The Engineer shall be notified at least 48 hours before beginning testing.

F. Drain test water from piping systems after testing and repair work has been completed.

END OF SECTION 15060

SECTION 15061 - DUCTILE IRON PIPE AND FITTINGS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The CONTRACTOR shall furnish all labor, materials, equipment, and incidentals required to install ductile-iron pipe and fittings complete, tested, and ready for use, as shown on the Drawings and/or as specified herein.

B. Omission of a specific item or component obviously necessary for the proper function of the system shall not relieve the CONTRACTOR from the responsibility of supplying that specific item or component at no additional expense to the OWNER.

1.02 SUBMITTALS

A. The CONTRACTOR shall submit to the ENGINEER, within 20 calendar days after receipt of Notice to Proceed, a list of materials to be furnished, and the names of the suppliers and the date of delivery of materials to the site.

B. The CONTRACTOR shall submit shop drawings to the ENGINEER for review in accordance with Section 00100, showing the complete laying plan of all pipes, including all fittings, adapters, valves, and specials along with the Manufacturer's drawings and specifications indicating complete details of all items.

C. The CONTRACTOR shall include a pipe class-laying schedule with pipe details, which specifies pipe class, class coding, joints, station limits, and transition stations, and a list of abbreviated terms with their full meaning.

D. The CONTRACTOR shall provide details of fittings to be furnished.

E. The CONTRACTOR shall submit the above referenced to the ENGINEER for approval before fabrication and shipment of these items.

F. The CONTRACTOR shall verify that locations of all pipes conform to the locations indicated on the Drawings. In most cases, a certain amount of flexibility in the positioning of pipes will be allowed.

G. Horizontal and vertical deflections may require beveled, special deflection; or short pipes.

H. The deflections at joints shall not exceed 75 percent of that recommended by the Manufacturer.

I. The CONTRACTOR shall furnish in duplicate to the ENGINEER, prior to each shipment of pipe, Manufacturer certifications and certified test reports that the pipe and linings and coating for this contract was manufactured and tested in accordance with the American Society of Testing and Materials (ASTM) and American National Standards Institute (ANSI)/American Water Works Association (AWWA) Standards specified herein.

1.03 QUALIFICATIONS

A. All ductile-iron pipe and fittings shall be furnished by Manufacturer's who are fully experienced, reputable, and qualified in the manufacturing of the material to be furnished.

B. The pipe and fittings shall be designed, constructed, and installed in accordance with the best practices and methods and shall comply with these specifications.

1.04 QUALITY ASSURANCE

A. The OWNER may provide an independent testing laboratory to conduct inspections at the foundry for compliance with these specifications for all ductile-iron pipe and fittings installed under this contract. All ductile-iron pipe and fittings shall be from a single Manufacturer.

B. The CONTRACTOR shall require the Manufacturer's cooperation in these inspections.

C. The OWNER will be responsible for any cost associated with the foundry inspections of all pipe approved for this contract.

D. The ENGINEER or other representatives of the OWNER will also inspect the pipe after delivery.

E. The pipe shall be subject to rejection at any time on account of failure to meet any of the specification requirements, even though pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall immediately be removed from the job.

F. Each joint of ductile-iron pipe shall be hydrostatically tested at the point of manufacture to 500 pounds per square inch (psi) for duration of at least 10 seconds. Testing may be performed prior to machining bell and spigot. Failure of ductile-iron pipe shall be defined as any rupture of pipe wall. Certified test certificates shall be furnished in duplicate to the ENGINEER prior to time of shipment.

1.05 CONNECTION TO EXISTING LINES

A. Lines installed under other Contracts, to which piping of this Contract must connect the following work shall be performed:

1. Removing the temporary or permanent plug provided in the pipe installed under another Contract (if any).

2. Furnishing and installing piping and accessories and making proper connections.

B. For connections to existing lines to which the piping of this Contract must connect, the following work shall be performed:

1. Expose buried lines to confirm or determine end connection, pipe material, and diameter.

2. Furnish and install appropriate piping and make proper connections.

PART 2 - PRODUCTS

2.01 MATERIALS

A. The CONTRACTOR shall use the following project specific pressure classes of ductile-iron pipe for sizes shown:

Pipe and Fitting Sizes	Pressure Class
12”	350
20”	250
24”	200
30”	150
36”	150

B. Ductile-iron pipe and fittings 3-inches through 54-inches for buried service shall meet the following requirements:

1. Ductile-iron pipe shall conform to ANSI A21.51 and AWWA C-151. Ductile-iron pipe shall have a minimum tensile strength of 60,000 psi with minimum yield strength of 42,000 psi and a minimum elongation of 10 percent. Type of bedding conditions used shall be as shown on the Drawings.

2. Unrestrained joint pipe shall be supplied in lengths not in excess of 21 feet. Unrestrained joint pipe shall be the push-on joint pipe. Unrestrained joint pipes for pipe sizes 36 inches and less shall be American Ductile Iron Fastite® or ENGINEER-approved equal.

3. Unrestrained fittings shall meet the requirements of AWWA C-110. Rubber gaskets shall conform to ANSI A21.11 for all joints. Mechanical joint fittings and restrained joint pipe shall be furnished with sufficient quantities of accessories as required for each joint.

4. Restrained joint fittings where shown or specified shall be manufactured in accordance with the requirements of ANSI/AWWA C151/A21.51, C110/A21.10, and C111/A21.11.

5. Push-on joints for such pipe shall be in accordance with ANSI/AWWA C111/A21.11.

6. Pipe thickness shall be designed in accordance with ANSI/AWWA C150/A21.50 and C151/A21.51.

7. Restrained joint fittings shall be ductile iron in accordance with applicable requirements of ANSI/AWWA C110/A21.10.

8. Mechanical joints for such fittings shall be in accordance with ANSI/AWWA C110/A21.10 and C111/A21.11.

9. Restrained joints, where shown or specified, shall be designed to withstand vertical and longitudinal forces and be capable of holding against withdrawal with no axial movement resulting from an internal hydrostatic pressure of 120 psi for the raw sewage force mains and 150 psi for reclaimed water irrigation mains and potable water mains.

10. Restrained pipe joints that achieve restraint by incorporating cut out sections in the wall of the pipe shall have a minimum wall thickness at the point of cut out that corresponds with the minimum specified wall thickness for the rest of the pipe.

11. Restrained joints shall be suitable for 120 or 150 psi working pressure for purpose as specified above and fabricated of heavy section ductile-iron casting. Gaskets shall meet the material requirements of ANSI/AWWA C111.

12. Restrained joint pipe and fittings shall be the push-on joint pipe.

13. Restrained joint pipes and fittings for pipe size 30 inches and less shall be American Ductile Iron Fastite® with Fast-Grip Gasket® or ENGINEER-approved equal.

14. Restrained joint pipe and fittings for pipe size 36 inches and larger shall be American Ductile Iron Flex-Ring® or ENGINEER-approved equal.

15. The minimum number of restrained joints required for resisting forces at fittings and changes in direction of pipe shall be determined from the length of restrained pipe on each side of fittings and changes in direction necessary to develop adequate resisting friction with the soil as shown on the Drawings.

16. All buried service pipe and fittings 12 inches and greater shall be ductile iron. Unless specified differently on the Drawings, all buried service pipe shall have single gasket, compression push-on type line joints.

17. All buried fittings shall be mechanical joint.

18. All fittings shall be mechanically restrained with Fast-Grip®, Flex Ring®, or Megalug Series 1100 or ENGINEER-approved equal.

19. Ductile-iron fittings, valves, and other appurtenances shall not be wrapped with polyethylene film.

20. Adapters to connect ductile-iron fittings to pipe or fittings of dissimilar materials shall be supplied by the CONTRACTOR in accordance with the pipe Manufacturer recommendations and as approved by the ENGINEER.

21. Pipe outlets where shown shall be made with tees, tapping saddles, or factory welded-on bosses for aboveground piping. Bosses shall be ductile iron, factory welded on ductile-iron pipe having a minimum Pressure Class 350 for 6- to 12-inch sizes, Pressure Class 250 for 16- to 36-inch sizes, and Pressure Class 150 for 42- to 48-inch sizes.

22. The CONTRACTOR may supply short body ductile iron fittings in conformance with AWWA C153 in lieu of C110 and C111 for 3- through 36-inch sizes.

23. All fittings shall be cast and machined at one foundry location to assure quality control and test data. The standard grade of iron shall be 70-50-05. Analyses of the ductile iron shall be made with the chemical limits set in this standard (C110 and/or C153). Results of chemical analyses shall be provided to the ENGINEER as part of the Shop Drawings.

C. Ductile iron pipe and fittings 3- through 54-inches for aboveground service or in below ground concrete pits shall meet the following requirements:

1. All aboveground ductile-iron pipes shall be flanged. Ductile-iron pipe shall conform to ANSI A21.51 and AWWA C-151.

2. Flanged ductile-iron pipe shall conform to current AWWA/ANSI Specification C115/A21.15 and C110/A21.10 with factory-applied screwed long hub flanges except as otherwise specified hereinafter. Flanges shall be fully machined faced and drilled after being screwed tight on the pipe, with flanges true to 90 degrees with the pipe axis and shall be flush with end of pipe conforming to ANSI B161.1, 125 pound standard or Class 250, for the purpose intended. No welding of flanges or accessories in the field will be acceptable.

3. Pipe for use with split-type flexible coupling joints shall have radius grooved ends.

4. Wall sleeve with integral water stops or wall pipe casings with integral thrust collars shall be continuously welded on each side of the waterstop or thrust collar and shall be of the sizes and types as shown on the Drawings.

5. Wall sleeves, where specified, shall be fabricated of Schedule 40 Type 304 stainless steel or polyvinyl chloride (PVC) and shall have integral water stops continuously welded on each side of the waterstop.

6. Seal strips for wall sleeves, where required on the Drawings, shall be Link Seal as manufactured by Thunderline Corp., Wayne, Michigan, or equal.

7. Full-face type 1/16-inch thick red rubber ring gaskets shall conform to ANSI A21.11. Ring gaskets shall be of approved composition suitable for the required service.

8. Pipe and fittings exposed to view in the finished work and to be painted in accordance with Section 09902 shall not receive the standard tar or asphalt coat on the outside surfaces but shall be shop primed on the outside with one coat of Kop Coat No. 622 Rust Inhibitive Primer or equal. Should portions of the pipe inadvertently be given the outside bituminous coating instead of the rust inhibitive primer as required for exposed piping, the surfaces shall be sealed with a non-bleeding sealer coat such as Kop Coat Tar Stop, Mobil Anti-Bleeding Aluminum Sealer or Aqua Lock Glidden. Sealing shall be a part of the work of this section.

9. Bolts and nuts on flanged pipe and fittings shall be low-alloy, high-strength steel equal to “Corten,” conforming to ANSI A21.11 and A21.15 or 304 stainless steel and shall be drilled to match ANSI B16.1 Class 125 or 250 flanges for the purpose intended.

2.02 LINING AND COATINGS

A. All pipe and fittings for potable water service and reclaimed water irrigation reuse mains shall have a cement mortar lining and a bituminous seal coat on the inside in accordance with ANSI A21.4 and be coated on the exterior with a 1-2 mils thick bituminous coat in accordance with ANSI A21.51.

B. All ductile-iron pipe and fittings for wastewater service (including but not limited to raw sewage lines, all process lines, and reject water lines) including pressure and gravity mains, unless otherwise noted, shall have a ceramic epoxy lining on the interior and bituminous coating on the exterior except for 6 inches back from the spigot end. The bituminous coating shall not be applied to the first 6 inches of the exterior of the spigot ends. All pipe and fittings shall be delivered to the application facility without asphalt, cement lining, or any other lining on the interior surface. Because removal of old linings may not be possible, the intent of this specification is that the entire interior of the pipe and fittings shall be as cast without ever having been lined with any substance prior to the application of the specified lining. Any pipe or fittings furnished for this project must not have been lined prior to the awarding of the contract for this project.

1. Lining Material:

   The material used for the lining shall be a two component amine cured epoxy of at least 87 percent solids. Protecto 401 by Vulcan Painters, Birmingham, Alabama or Permite 9043, Type II Glass Filled Epoxy by Permite Corporation, Atlanta, Georgia are the Standards of Quality.

   The following test requirements shall be certified by the material supplier, and a history of satisfactory performance for the material in the service required and upon the surface specified shall be submitted. The following are the minimum requirements to be met:

   a. A permeability rating of zero permeance when a film of at least 40 mils is tested according to ASTM D1653 or a permeability rating of 0.0 perms when measured using Method A of ASTM E66 procedure A with a test duration of 42 days.

   b. The material shall contain at least 20 percent by volume of ceramic quartz pigment in the dried film.

   c. The following test must be run on ductile iron panels with the results certified by the lining material supplier of the material being submitted.

Test		Rating/Method
1.	Direct Impact	ASTM D-2794
2.	3% Sulfuric Acid Immersion @ 120/F	ASTM D-714
3	25% Sodium Hydroxide Immersion @ 140/ F	ASTM D-714
4.	Deionized Water Immersion @ 160/ F	ASTM D-714
5.	Moisture and Ultraviolet Light Cycle 8 hours light 4 hours 100% humidity	ASTM G-5377

2. Application of Lining - The lining shall be applied by a competent firm with at least a 5-year history of applying linings to the interior of ductile pipe and fittings.

   a. Surface Preparation:

      1) Prior to abrasive blasting the entire area which will receive the protective compound shall be inspected for oil, grease, etc.

      2) Any areas where oil, grease, or any substance that can be removed by solvent is present, it shall be solvent cleaned using the guidelines outlined in SSPC-SP-1 Solvent Cleaning.

      3) After the surface has been made free of grease, oil, or other substances, all areas that are to receive the protective compounds shall be abrasive blasted using compressed air nozzles with sand or grit abrasive media.

      4) The blast media shall strike 100 percent of the surface area at sufficient force to remove rust and oxides.

      5) The entire surface to be lined shall be struck with the blast media so that all rust, loose, oxides, etc., are removed from the surface.

      6) Only slight stains and specks of tightly adhering oxides may be left on the surface. Any area where rust appears before coating must be reblasted to remove all rust.

b. Lining:

1) After surface preparation and within 8 hours of surface preparation of the barrel of the pipe from the inside shoulder of the gasket groove to the end of the interior spigot shall receive a minimum coating of 40 mils dry film thickness of the protective lining.

2) If flange fittings or pipe are included in the project the linings must not be used on the face of the flange; however, full-face gaskets must be used to protect the ends of the pipe.

3) All fittings shall be lined with a minimum of 40 mils of the protective lining.

4) Push-on type fittings shall be lined from the gasket groove to the gasket groove.

5) The 40 mils system shall not be applied in the gasket grooves.

c. Coating of Gasket Groove and Spigot Ends:

1) Due to the tolerances involved, the gasket groove and spigot end up to 6 inches back from the end of the spigot end must be coated with a minimum of 10 mils dry of Protecto Joint Compound.

2) This coating shall be applied by brush to ensure coverage.

3) Care should be taken that the coating is smooth without excess buildup in the gasket groove or on the spigot end.

4) All materials for the gasket groove and spigot end shall be applied after the application of the lining.

d. Number of Coats:

1) The number of coats of lining material applied shall be as recommended by the lining Manufacturer. However, in no case shall the material be applied above the dry thickness per coat recommended by the lining Manufacturer in printed literature.

2) The time between coats shall never exceed that time recommended by the lining material Manufacturer. If at any time the lining must be recoated beyond the lining material Manufacturer's recommended recoat time, the surface of the existing lining shall be roughened sufficiently to prevent delamination between coats.

3. Inspection:

   a. All pipe shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC-PA-2 film thickness testing.

   b. The barrel of all pipe and fittings shall be pinhole detected with a nondestructive 2,500-volt pinhole test.

   c. Each pipe joint and fitting shall be marked with the date of application of the lining system and with its numerical sequence of application on that date.

4. Certification: The pipe or fitting Manufacturer must supply a certificate attesting to the fact that:

   a. The Applicator met the requirements of this specification.

   b. The material used was as specified.

   c. The material was applied as required by the specification.

5. Repair: All pinholes and damaged lined areas shall be repaired in accordance with written repair procedure furnished by the Manufacturer of the lining material so that the repaired area is equal in performance to the undamaged lined areas.

6. The exterior of the pipe shall receive a bituminous coating approximately 1-2 mils thick in accordance with ANSI A21.51.

7. Pipe and fittings exposed to view in the finished work shall not receive the standard tar or asphalt coat on the outside surfaces but shall be shop primed on the outside with one coat of Kop Coat No. 622 Rust Inhibitive Primer or equal.

8. Should portions of the pipe inadvertently be given the outside coating of coal tar enamel instead of the rust inhibitive primer as required for exposed piping, the surfaces shall be sealed with a non-bleeding sealer coat such as Kop Coat Tar Stop, Mobil Anti-Bleeding Aluminum Sealer, or equal. Sealing shall be a part of the work of this section.

2.03 IDENTIFICATION

A. Each length of pipe and each fitting shall be marked with the name of the Manufacturer, size, and class. All gaskets shall be marked with the name of the Manufacturer, size, and proper insertion directions.

B. All aboveground piping and fittings shall be completely primed and painted in accordance to the below color code.

C. All below ground ductile iron pipe and fittings shall have an identification color code.

1. Raw sewage force mains and gravity sewer pipe - Green, similar to Kop Coat, No. 0336.

2. Reclaimed water irrigation reuse mains and service tubing - Purple, similar to Pantone 522C.

3. Potable water mains and service tubing - Blue, similar to Kop Coat No. 8155.

D. All buried ductile-iron pipe shall be painted along its entire length with 2-inch stripes on at least three quarter points for pipe sizes 12 inches and larger. For pipe sizes smaller than 12 inches, a single 2-inch wide stripe along the top of the pipe shall be provided. Paint and marking tape colors shall be as described above.

E. The CONTRACTOR shall install, 12 inches above the ductile-iron pipe, a 3-inch wide detector tape running the length of the pipe (color as described above).

2.04 FUTURE STRUCTURE AND MANHOLE CONNECTIONS

A. Pipe stubs for all future manhole or pipe connections shall not be less than 24 inches in length. Watertight plugs or caps shall be furnished.

PART 3 - EXECUTION

3.01 INSTALLING DUCTILE IRON PIPE AND FITTINGS

A. All water, sewer, and reclaimed water mains shall be installed in accordance with recommendations of the pipe Manufacturer and as specified herein.

B. All pipe deflection or bends deflected more than 6% shall be restrained in accordance with the Restrained Pipe Joint Table. All fittings and valves shall be restrained in accordance with the Restrained Pipe Joint Table. See detail sheet.

C. Care shall be taken in the handling, storage, and installation of pipe and fittings to prevent injury to the pipe or coatings. All pipe and fittings shall be examined before installing, and no pipe shall be installed which is found to be defective. Pipe or fittings shall not be dropped. All damage to the pipe coatings shall be repaired according to the Manufacturer's recommendations.

D. All pipe and fittings shall be kept clean and shall be thoroughly cleaned before installation.

E. Pipe shall be laid to the lines and grades shown on the Drawings with bedding and backfill as shown on the Drawings and as specified in Section 02222. Blocking under the pipe will not be permitted.

F. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when laid, shall conform to the lines and grades required.

Ductile-iron pipe and fittings shall be installed in accordance with requirements of AWWA Standard Specification C600 except as otherwise provided herein.

A firm, even bearing throughout the length of the pipe shall be constructed by tamping FDOT No. 89 stone at the sides of the pipe up to 6 inches over the top of the pipe, and then an additional 6 inches of selected material for a total of 12 inches over the top of the pipe. Blocking will not be permitted. If any defective pipe is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner by the CONTRACTOR, at his own expense.

G. When installation is not in progress, including lunchtime, or the potential exists for dirt of debris to enter the pipe, the open ends of the pipe shall be closed with watertight plugs or other approved means.

H. Under no circumstances shall the pipe or accessories be dropped into the trench.

I. All plugs, caps, bends and other locations where unbalanced forces exist shall be anchored by restrained joints. The length of pipe for which restrained joints shall be used are shown on the Drawings.

J. In all cases where ductile iron pipe is installed, a marking tape shall be located above the top of the pipe.

K. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be jointed with a bell shall be beveled to conform to the manufactured spigot end. Cement lining shall be undamaged.

3.02 PUSH-ON JOINTS

A. Push-on joints shall be made in accordance with the Manufacturer's instructions.

B. Pipe shall be laid with bell ends looking ahead.

C. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated.

D. The plain end of the pipe to be laid shall then be aligned and inserted in the bell of the pipe to which it is to be joined, and pushed home with a jack or by other means.

E. After joining the pipe, a metal feeler shall be used to make certain that the rubber gasket is correctly located.

3.03 FLANGED JOINTS

A. Flanged joints shall be installed where shown on the Drawings.

B. Extreme care shall be exercised to insure that there is no restraint on opposite ends of pipe or fitting which will prevent uniform gasket compression, cause unnecessary stress, bending or torsional strains to flanges or flanged fittings.

C. Adjoining push-on joints shall not be assembled until flanged joints have been tightened. Bolts shall be tightened alternately and evenly.

D. After installation apply a bitumastic coating to bolts and nuts.

3.04 RESTRAINED JOINTS

A. Restrained joints shall be installed in accordance with the Restrained Pipe Joint Table. See detail sheet.

B. Restrained joints shall be installed at all fittings, bends deflected more than 6 degrees and valves as shown on the Drawings and specified herein.

C. The joint assembly's for pipe sizes 30 inches and smaller shall be Fastite® Joint with Fast-Grip® Gasket by American Pipe Co. or ENGINEER approved equal.

D. The joint assembly's for pipe sizes 36 inches shall be Flex-Ring® Joint by American Pipe Co. or ENGINEER approved equal.

E. Restrained joints shall be installed in accordance with the Manufacturer's recommendations.

3.05 SLEEVE TYPE COUPLINGS

A. Couplings shall be installed where shown.

B. Couplings shall not be assembled until adjoining push-on joints have been assembled.

C. After installation, apply a heavy bitumastic coating to all bolts, nuts and accessories.

3.06 TESTING (PRESSURE PIPING)

A. All pressure mains shall be field-tested.

B. Hydrostatic pressure and leakage tests shall conform with Section 4 of AWWA C600 Specification with the exception that the CONTRACTOR shall furnish all gauges, meters, pressure pumps and other equipment needed to test the line.

C. The pressure required for the field hydrostatic pressure test shall be 100 psi for the raw sewage lift/pump stations and force mains and 150 psi for potable water mains and reclaimed water irrigation mains, unless otherwise noted.

D. The CONTRACTOR shall provide temporary plugs and blocking necessary to maintain the required test pressure. Fill line slowly with water. Maintain flow velocity of less than 2.0 feet per second.

E. Corporation cocks at least 1 inch in diameter, pipe riser and angle globe valves shall be provided at each pipe dead-end in order to bleed air from the line. Duration of pressure test shall be at least 2 hours. The cost of these items shall be included as a part of testing.

F. The leakage test shall be a separate test at the maximum operating pressure as determined by the ENGINEER following the pressure test and shall be of not less than 2 hours duration.

G. All leaks evident at the surface shall be repaired and leakage eliminated regardless of total leakage as shown by test.

H. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with.

I. Defective materials, pipes, valves and accessories shall be removed and replaced.

J. The pipe lines shall be tested in such sections as may be approved by the ENGINEER by shutting valves or installing temporary plugs as required.

K. The line shall be filled with water and all air removed and the test pressure shall be maintained in the pipe for the entire test period by means of a force pump to be furnished by the CONTRACTOR.

L. Accurate means shall be provided for measuring the water required to maintain this pressure. The amount of water required is a measure of the leakage.

M. The amount of leakage which will be permitted shall be in accordance with AWWA C600 Standards for all pressure. No pipe installation shall be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD(P)^{1/2}}{133{,}200}$$

N. In which L is the allowable leakage in gallons per hour; S is the length of pipe tested, in feet; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gauge.

O. The CONTRACTOR must submit his plan for testing to the ENGINEER for review at least 10 days before starting the test.

P. The CONTRACTOR shall remove and adequately dispose of all blocking material and equipment after completion and acceptance of the field hydrostatic test, unless otherwise approved by the ENGINEER. Any damage to the pipe coating shall be repaired by the CONTRACTOR. Lines shall be totally free and clean prior to final acceptance.

3.07 CHLORINATION OF POTABLE PIPELINES

A. Before being placed in service, all new potable water pipelines and reclaimed water irrigation mains including service connections and accessories shall be chlorinated using the continuous feed method specified in AWWA C651 “Standard Procedure for Disinfecting Water Mains.” The procedure shall be approved by the ENGINEER in advance.

B. The location of the chlorination and sampling points shall be determined by the ENGINEER in the field. Taps for chlorination and sampling shall be installed by the CONTRACTOR. The CONTRACTOR shall uncover and backfill the taps as required.

C. The general procedure for chlorination shall be first to flush all dirty or discolored water from the lines, and then introduce chlorine in approved dosages through a tap at one end, while water is being withdrawn at the other end of the line. The chlorine solution shall remain in the pipeline for about 24 hours.

D. Following the chlorination period, all treated water shall be flushed from the lines at their extremities, and replaced and water from the distribution system. All treated water flushed from the lines shall be disposed of by discharging to the nearest sanitary sewer or by other approved means. No discharge to any storm sewer or natural water course will be allowed.

E. Bacteriological sampling and analysis of the replacement water shall then be made by the ENGINEER in full accordance with AWWA Specification C651.

F. The CONTRACTOR will be required to rechlorinate, if necessary. The line shall not be placed in service until the requirements of the State of Florida Department of Health (DOH) and the jurisdictional County Public Health Department are met.

G. Special disinfecting procedures shall be used in connections to existing mains and where the method outlined above is not practical.

H. The CONTRACTOR shall make all arrangements necessary with the jurisdictional County Health Department for examination of water samples from disinfected water mains.

I. These samples shall be examined for compliance with DOH requirements.

J. Sampling shall be made daily and continuously until two successive examinations are found satisfactory.

K. Should three examinations be found unsatisfactory, the line shall be flushed and disinfected again.

L. The cost of all sampling, flushing and disinfecting shall be included in the contract price and no additional charge shall be made to the OWNER for this work.

M. The complete disinfection program and methods followed, especially if materially different from those specified, shall be in accordance with directives of the Florida Department of Environmental Protection (FDEP) and all methods employed shall have their approval.

N. Definite instructions as to the collection and shipment of the samples shall be requested from the FDEP and shall be followed in all respects.

O. Final approval of the bacterial samples shall be received from the FDEP prior to the time that the system is placed into operation.

P. The cost for all flushing, disinfecting and testing shall be borne by the CONTRACTOR.

3.08 FLUSHING

A. After the mains have been laid and pressure tested, each run of pipe shall be thoroughly flushed so as to remove all debris and foreign matter from the lines.

B. Flushing will ordinarily be done by opening fire hydrants or blowoffs along the pipe line.

C. Where fire hydrants or blowoffs are not available or are of insufficient capacity to permit adequate flushing, the pipe line shall be opened and flumes or piping shall be provided by the CONTRACTOR to waste the water to the nearest approved disposal point.

D. A minimum volume of water equal to six times the volume of the main shall be used to flush the mains.

E. The water shall be introduced into the mains to produce a velocity of not less than 3-feet per second, and this rate of flow shall be continued until the discharge is clear and no evidence of silt or foreign matter is visible.

3.09 CLEANING

A. At the conclusion of the work the CONTRACTOR shall thoroughly clean all of the new pipelines by flushing with water and pigged to remove all dirt, stones, pieces of wood, or other material which may have entered during the construction period.

B. Debris cleaned from the lines shall be removed from the job site. If, after this cleaning, any obstructions remain, they shall be removed.

C. After the pipelines are cleaned and if the groundwater level is above the pipe, or following a heavy rain, the ENGINEER will examine the pipe for leaks.

D. If defective pipes or joints are discovered at this time, they shall be repaired or replaced by the CONTRACTOR.

END OF SECTION 15061

SECTION 15062 - POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

PART 1 - GENERAL

1.01 SCOPE OF WORK:

A. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals required and install in the locations as shown on the Drawings.

B. The CONTRACTOR shall install the plastic piping, fittings and appurtenances (as specified herein) as shown on the Drawings.

1.02 DESCRIPTION OF SYSTEM:

The CONTRACTOR shall install the piping in the locations as shown on the Drawings.

1.03 QUALIFICATIONS:

A. All plastic pipe, fittings and appurtenances shall be furnished by a single Manufacturer who is fully experienced, reputable, and qualified in the manufacture of the items to be furnished.

B. The equipment shall be designed, constructed, and installed in accordance with the best practices and methods and shall comply with these Specifications.

1.04 SUBMITTALS:

A. The CONTRACTOR shall submit Shop Drawings that include dimensions and technical specifications for all piping to the ENGINEER.

B. The CONTRACTOR shall submit samples of all materials specified herein to the ENGINEER.

C. The CONTRACTOR shall submit and shall comply with pipe Manufacturer’s recommendation for handling, storing, and installing pipe and fittings.

D. The CONTRACTOR shall submit pipe Manufacturer’s certification of compliance with these Specifications.

1.05 TOOLS:

The CONTRACTOR shall furnish special tools, solvents, lubricants, and caulking compounds required for normal installation with the pipe.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Polyvinyl Chloride (PVC) Pipe:

1. Pressure PVC pipe and accessories 3 inches and smaller in diameter, where shown or as specified in the Drawings, shall meet the requirements of American Society for Testing and Materials (ASTM) D2241 "Polyvinyl Chloride (PVC) Pressure Pipe," and shall be SDR 21, rated pressure of 200 pounds per square inch.

2. PVC Pipe 4 to 8 inches in diameter shall meet the requirements of American Water Works Association (AWWA) Specifications C900 "Polyvinyl Chloride (PVC) Pressure Pipe," and shall be DR18 (Pressure Class 235).

3. PVC Pipe 10 and 12 inches shall meet the requirements of AWWA C900 and shall be DR25 (Pressure Class 165).

4. AWWA C900 DR18 (Pressure Class 235) pipe shall be required for all PVC fire lines downstream of any check valve.

5. PVC Pipe greater than 12 inches shall meet the requirements of AWWA C905 and shall be DR25 (Pressure Class 165).

6. Provisions shall be made for expansion and contraction at each joint with an elastomeric ring, and shall have an integral thickened bell as part of each joint.

7. PVC pipe shall be installed as recommended by the Manufacturer.

8. Pipe shall be furnished in nominal lengths of approximately 20 feet, unless otherwise directed by the ENGINEER.

9. Pipe and accessories shall bear the NSF mark indicating pipe size, Manufacturer's name(s), AWWA and/or ASTM Specification Number, working pressure, and production code.

10. Pipe shall be blue for potable water service, green for sewage force main service, and purple for reclaimed water mains (Pantone 522C).

11. All potable water pipe shall be NSF certified and copies of lab certification shall be submitted to the ENGINEER.

B. Joints:

1. The PVC joints for pipe shall be of the push-on type unless otherwise directed by the ENGINEER so that the pipe and fittings may be connected on the job without the use of solvent cement or any special equipment.

2. The push-on joint shall be a single rubber gasket joint designed to be assembled by the positioning of a continuous, molded rubber ring gasket in annular recess in the pipe or fitting socket and the forcing of the plain end of the entering pipe into the socket; thereby, compressing the gasket radially to the pipe to form a positive seal.

3. The gasket and annular recess shall be designed and shaped so that the gasket is locked in place against displacement as the joint is assembled.

4. The rubber ring joint shall be designed for thermal expansion or contraction with a total temperature change of at least 750 degrees Fahrenheit (F) in each joint per length of pipe.

5. The bell shall consist of an integral wall section with a solid cross section elastomeric ring which shall meet requirements of ASTM F-477.

6. The thickened bell section shall be designed to be at least as strong as the pipe wall.

7. Lubricant furnished for lubricating joints shall be nontoxic, shall not support the growth of bacteria, shall not have deteriorating effects on the gasket or pipe material, and shall not impart color, taste, or odor to the water.

C. Fittings and Specials:

1. All fittings for PVC pipe shall be cast iron/ductile iron with mechanical joints and shall conform to the specifications for cast iron/ductile iron fittings, unless otherwise directed by the ENGINEER. PVC C-900 fittings are allowable upon approval by the ENGINEER and required for sewage force main applications. DR ratio shall be the same as the pipe.

2. Fittings for Schedule 80 PVC pipe less than 3 inches in diameter shall be threaded and be PVC as shown on the Drawings, or as directed by the ENGINEER. Threaded PVC fittings shall conform to ASTM Specification D2464-69.

3. The Manufacturer of the pipe shall supply all PVC accessories as well as any adaptors and/or specials required to perform the Work as shown on the Drawings and specified herein.

4. Standard double bell couplings will not be accepted where the pipe will slip completely through the coupling.

2.02 COPPER LOCATION WIRE:

A. The CONTRACTOR shall install all piping (including service lines) with underground 12 gauge thermoplastic high heat-resistant nylon (THHN) insulated traceable copper wire.

B. The CONTRACTOR shall lay the insulated copper wire in the pipe trench 3 to 6 inches above the sewer force mains and shall be a continuous strand from valve box to valve box, wrapped two times around each valve and extended 24 inches inside each valve box to enable location devices to be attached without digging up the valve box.

C. The CONTRACTOR shall insulate all wire splices.

D. The CONTRACTOR shall backfill the trench following placement of the traceable wire with due caution to prevent displacement or damage to wire.

E. The CONTRACTOR shall perform a detection test after insulation and backfill have been completed in the ENGINEER's presence using a commercially available pipe detector furnished by the CONTRACTOR.

F. The CONTRACTOR shall replace any undetectable wire to the satisfaction of the ENGINEER at no additional expense to the OWNER.

PART 3 - EXECUTION

3.01 STORAGE/INSTALLATION:

A. The CONTRACTOR shall be in strict accordance with the Manufacturer's technical data and printed instruction for the storage and installation of plastic pipe.

B. The CONTRACTOR shall cover all plastic pipe to prevent fading.

C. The OWNER reserves the right to reject any pipe not properly stored or pipe that has faded.

3.02 INSPECTION AND TESTING:

A. The CONTRACTOR shall not disturb all pipelines for 24 hours to develop complete strength at all joints.

B. General:

1. Provide temporary equipment for testing, including pump and gauges.

2. Test piping system before insulation is installed (wherever feasible) and remove control devices before testing.

3. Expel air from the pipe before applying the specified test pressure.

4. Make taps (if necessary) at points of highest elevation, and afterwards tightly plugged.

5. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating.

6. Fill each section with water and subject to a hydrostatic pressure equal to the pressure rating of the pipe being tested.

C. The CONTRACTOR shall test for the required 2-hour period.

D. The CONTRACTOR shall test pipe at 150 pounds per square inch (psi), except where fittings are lower class or pressure rating.

1. Pressure Sewer Permissible leakage (2.2 gallons/1,000 feet/24 hours/inch diameter):

Inches	gallons/1,000 feet/24 Hours	gallons/1,000 feet/1 Hours
2”	4.4 gal.	0.19 gal.
3”	6.6 gal.	0.28 gal.
4”	8.8 gal.	0.37 gal.
6”	13.2 gal.	0.55 gal.
8”	17.8 gal.	0.74 gal.
10”	22.0 gal.	0.92 gal.
12”	26.4 gal.	1.10 gal.
14”	30.8 gal.	1.29 gal.
16”	35.2 gal.	1.47 gal.
18”	39.6 gal.	1.66 gal.

2. Water System Permissible Leakage:

Inches	gallons/1,000 feet/24 Hours	gallons/1,000 feet/1 Hours
2”	3.6 gal.	0.15 gal.
3”	5.4 gal.	0.23 gal.
4”	7.2 gal.	0.30 gal.
6”	10.8 gal.	0.45 gal.
8”	14.4 gal.	0.60 gal.
10”	18.0 gal.	0.75 gal.
12”	21.6 gal.	1.90 gal.
14”	25.2 gal.	1.05 gal.
16”	28.8 gal.	1.66 gal.
18”	32.4 gal.	1.66 gal.

E. The CONTRACTOR shall repair piping systems sections which fail required piping tests by disassembly and re-installation using new materials to the extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.

F. The CONTRACTOR shall, at his own expense, locate and repair the defective joints should any test of combined sections of pipe laid disclose leakage greater than the specified limit, until the leakage is within the specified allowance.

G. The CONTRACTOR shall provide water for testing.

H. The CONTRACTOR may subject pipe to hydrostatic pressure, inspect and test for leakage at any convenient time after partial completion of backfill.

I. The CONTRACTOR may test the system with joints exposed or backfilling complete at his/her option. The ENGINEER shall be notified at least 48 hours before beginning testing.

J. The CONTRACTOR shall drain test water from piping systems after testing and repair work has been completed.

3.03 CLEANING, FLUSHING, AND INSPECTING:

A. General:

1. Clean installed piping systems' exterior surfaces of superfluous materials and prepare for application of specified coatings (if any).

2. Flush out piping systems with clean water before proceeding with required tests.

3. Inspect each run of each system for completion of joints, supports, and accessory items.

B. The CONTRACTOR shall thoroughly flush each run of pipe after the mains have been laid and pressure tested so as to remove all debris and foreign matter from the lines.

1. Flushing will ordinarily be done by opening fire hydrants or blowoffs along the pipe line.

2. Where fire hydrants or blowoffs are not available or are of insufficient capacity to permit adequate flushing, the pipe line shall be opened and flumes or piping shall be provided by the CONTRACTOR to waste the water to the nearest approved disposal point.

3. A minimum volume of water equal to six times the volume of the main shall be used to flush the mains.

4. The water shall be introduced into the mains to produce a velocity of not less than 3 feet per second, and this rate of flow shall be continued until the discharge is clear and no evidence of silt or foreign matter is visible.

C. The CONTRACTOR shall inspect pressure piping in accordance with American Society of Mechanical Engineers (ASME) B31 procedures.

D. The CONTRACTOR shall disinfect water mains and water service piping in accordance with AWWA C601 and the Florida Department of Environmental Protection (FDEP), Chapter 17-22 requirements.

E. The CONTRACTOR is responsible for costs (including sampling and analysis) associated with disinfecting the potable water lines.

F. The CONTRACTOR shall submit sample results documenting compliance with disinfection testing requirements to the FDEP with a duplicate copy sent to the ENGINEER.

END OF SECTION 15062

SECTION 15063 - PVC ASTM D2241 PIPE

PART 1 - GENERAL

1.01 SCOPE OF WORK:

A. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals required.

B. The CONTRACTOR shall install the plastic piping, fittings and appurtenances as specified herein in the locations as shown on the Drawings.

C. The CONTRACTOR shall construe industry standards herein to be in reference to the latest edition or version.

1.02 SUBMITTALS:

The CONTRACTOR shall submit three certified copies of all required test reports to the ENGINEER with each shipment of pipe including the Quick Burst Test, American Society for Testing and Materials (ASTM) D1599.

1.03 DELIVERY AND STORAGE:

A. The CONTRACTOR shall protect and store pipe units in the same way they were protected while loaded on the truck. Pipe shall be strung out or stored flat to protect against bending.

B. The CONTRACTOR shall cover pipe with canvas or other opaque material to protect it from prolonged exposure to the sun if it is to be stored outside longer than 15 days.

PART 2 - PRODUCTS

2.01 PIPE:

A. Class-rated polyvinyl chloride (PVC) pipe and accessories, where shown or as specified on the Drawings, shall be manufactured in accordance with ASTM D2241, with a standard dimension ratio (SDR) of SDR 21, rated pressure of 200 pounds per square inch (psi) and shall have the iron pipe size (IPS) outside diameters.

B. The pressure-rated PVC pipe and accessories shall be made of one of the following pipe materials:

1. PVC 1120.

2. PVC 1220.

3. PVC 2120.

C. Each length of pipe shall be hydrotested to 150 psi for 2 hours.

D. Pipe shall be listed by Underwriters Laboratories.

E. Provisions shall be made for expansion and contraction at each joint with an elastomeric ring, and shall have an integral thickened bell as part of each joint.

F. PVC Class pipe shall be installed as recommended by the Manufacturer.

G. Pipe shall be furnished in nominal lengths of approximately 20 feet, unless otherwise directed by the ENGINEER.

H. Pipe and accessories shall bear the NSF mark indicating pipe size, Manufacturer's names, ASTM Specification Number, working pressure, and production code.

I. Pipe shall be green for sewage force main service.

2.02 JOINTS:

A. The PVC joints for pipe shall be of the push-on type unless otherwise directed by the ENGINEER so that the pipe and fittings may be connected on the job without the use of solvent cement or any special equipment.

B. The push-on joint shall be a single rubber gasket joint designed to be assembled by the positioning of a continuous, molded rubber ring gasket in annular recess in the pipe or fitting socket and the forcing of the plain end of the entering pipe into the socket; thereby, compressing the gasket radially to the pipe to form a positive seal.

C. The gasket and annular recess shall be designed and shaped so that the gasket is locked in place against displacement as the joint is assembled.

D. The rubber ring joint shall be designed for thermal expansion or contraction with a total temperature change of at least 750 degrees Fahrenheit (F) in each joint per length of pipe.

E. The bell shall consist of an integral wall section with a solid cross section elastomeric ring, which shall meet requirements of ASTM F-477.

F. The thickened bell section shall be designed to be at least as strong as the pipe wall.

G. Lubricant furnished for lubricating joints shall be nontoxic, shall not support the growth of bacteria, shall not have deteriorating effects on the gasket or pipe material, and shall not impart color, taste, or odor to the water.

2.03 FITTINGS AND SPECIALS:

A. Fittings and specials shall be ductile iron short body fittings conforming to the requirements of ANSI Standard A21.10 or ANSI A21.53/AWWA C153.

B. Joints for cast iron fittings shall be mechanical or push-on type designed in accord with ANSI Standard A21.11. Bolts and nuts shall be cast iron conforming to ANSI Standard A21.11.

C. All ductile iron fittings and specials shall be accordance with Section 15061 of these specifications, including coatings and markings.

D. Restrained joints for fittings for PVC piping shall be:

1. EBAA Iron, Inc., Megalug Series 2000 PV (4-inch through 36-inch sizes).

2. Uni-Flange, Series 1350 restrainers (2-inch through 36-inch sizes)

3. Sigma.

E. Restrained joints for PVC piping shall be:

1. EBAA Iron, Inc., Megalug Series 1600 (4-inch through 12-inch sizes)

2. EBAA Iron, Inc., Megalug Series 2800 (14-inch through 36-inch sizes).

F. After installation, apply a heavy bitumastic coating to all bolts, nuts, and accessories. Romac 600 Series pipe restraining systems can be used (4-inch through 12-inch sizes).

G. The minimum number of restrained joints required for resisting forces at fittings and changes in direction of pipe shall be determined from the length of restrained pipe on each side of fittings and changes in direction necessary to develop adequate resisting friction with the soil as shown on the Drawings.

H. All bolts and nuts for restrained joints shall be “Corten” type, low-alloy, high-strength steel.

2.04 COPPER LOCATION WIRE:

A. The CONTRACTOR shall install all sewer force mains (including service lines) with underground 12 gauge thermoplastic high heat-resistant nylon (THHN) insulated traceable copper wire.

B. The CONTRACTOR shall lay the insulated copper wire in the pipe trench 3 to 6 inches above the sewer force mains and shall be a continuous strand from valve box to valve box, wrapped two times around each valve and extended 24 inches inside each valve box to enable location devices to be attached without digging up the valve box.

C. The CONTRACTOR shall insulate all wire splices.

D. The CONTRACTOR shall backfill the trench following placement of the traceable wire with due caution to prevent displacement or damage to wire.

E. The CONTRACTOR shall perform a detection test after insulation and backfill have been completed in the ENGINEER’s presence using a commercially available pipe detector furnished by the CONTRACTOR.

F. The CONTRACTOR shall replace any undetectable wire to the satisfaction of the ENGINEER at no additional expense to the OWNER.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS:

A. The CONTRACTOR shall install all PVC pipe, fittings, specials, and appurtenances in accordance with the Manufacturer’s instructions.

B. The CONTRACTOR shall temporarily close the end of the pipe with a close-fitting stopper at the close of each day’s work and at other times when the pipe is not being laid.

C. Cleaning:

1. All necessary precautions shall be taken to prevent the entrance of mud, sand or other obstructing material into the pipelines.

2. As the work progresses, the interior of the main shall be cleaned of all dirt, jointing material, and superfluous materials of every description.

D. Handling:

1. Pipe must be handled in a way to ensure that it is not gouged or scratched to a depth of more than 10% of the wall thickness.

2. Pipe shall not be bent to a radius of less than 20 diameters at any time during installation.

3. Pipe shall be handled at all times with strapping that a combined width at each load area of at least half the pipe diameter to prevent point damage to the pipe. No wire rope slings shall be used.

3.02 STORAGE/INSTALLATION:

A. The CONTRACTOR shall be in strict accordance with the Manufacturer's technical data and printed instruction for the storage and installation of plastic pipe.

B. The CONTRACTOR shall cover all plastic pipe to prevent fading.

C. The OWNER reserves the right to reject any pipe not properly stored or pipe that has faded.

3.03 INSPECTION AND TESTING:

A. The CONTRACTOR shall not disturb all pipelines for 24 hours to develop complete strength at all joints.

B. General:

1. Provide temporary equipment for testing, including pump and gauges.

2. Test piping system before insulation is installed (wherever feasible) and remove control devices before testing.

3. Expel air from the pipe before applying the specified test pressure.

4. Make taps (if necessary) at points of highest elevation, and afterwards tightly plugged.

5. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating.

6. Fill each section with water and subject to a hydrostatic pressure equal to the pressure rating of the pipe being tested.

C. The CONTRACTOR shall test for the required 2 hour period or until the line has been completely inspected for visual leaks.

D. The CONTRACTOR shall test pipe at 160 psi, except where fittings are lower class or pressure rating.

E. Pressure Sewer Permissible leakage (2.2 gallons/1,000 feet/24 hours/inch diameter):

Inches	gallon/1,000 feet/24 Hours	gallon/1,000 feet/1 Hour
2”	4.55 gal	0.190 gal
3”	6.84 gal	0.285 gal
4”	9.12 gal	0.380 gal
6”	13.67 gal	0.570 gal
8”	18.23 gal	0.760 gal
10”	22.79 gal	0.950 gal
12”	27.35 gal	1.140 gal
14”	31.91 gal	1.329 gal
16”	36.47 gal	1.519 gal

F. The CONTRACTOR shall repair piping systems sections which fail required piping tests, by disassembly and re-installation using new materials to the extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.

G. The CONTRACTOR shall, at his own expense, locate and repair the defective joints should any test of combined sections of pipe laid disclose leakage greater than the specified limit, until the leakage is within the specified allowance.

H. The CONTRACTOR shall provide water for testing.

I. The CONTRACTOR may subject pipe to hydrostatic pressure, inspect and test for leakage at any convenient time after partial completion of backfill.

J. The CONTRACTOR may test the system with joints exposed or backfilling complete at his/her option.

K. The ENGINEER shall be notified at least 48 hours before beginning testing.

L. The CONTRACTOR shall drain test water from piping systems after testing and repair work has been completed.

3.04 CLEANING, FLUSHING, AND INSPECTING:

A. General:

1. Clean installed piping systems' exterior surfaces of superfluous materials and prepare for application of specified coatings (if any).

2. Flush out piping systems with clean water before proceeding with required tests.

3. Inspect each run of each system for completion of joints, supports, and accessory items.

B. The CONTRACTOR shall thoroughly flush each run of pipe after mains have been laid and pressure tested, so as to remove all debris and foreign matter from the lines.

1. Flushing will ordinarily be done by opening fire hydrants or blowoffs along the pipe line.

2. Where fire hydrants or blowoffs are not available or are of insufficient capacity to permit adequate flushing, the pipe line shall be opened and flumes or piping shall be provided by the CONTRACTOR to waste the water to the nearest approved disposal point.

3. A minimum volume of water equal to six times the volume of the main shall be used to flush the mains.

4. The water shall be introduced into the mains to produce a velocity of not less than 3 feet per second, and this rate of flow shall be continued until the discharge is clear and no evidence of silt or foreign matter is visible.

C. The CONTRACTOR shall inspect pressure piping in accordance with procedures of American Society of Mechanical Engineers (ASME) B31.

END OF SECTION 15063

SECTION 15080 - POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals required, and install polyvinyl chloride (PVC) ASTM D3034 (PVC) gravity sewer pipe and appurtenances as shown on the Drawings and as specified herein.

1.02 SUBMITTALS

A. Submittals during construction shall be made in accordance with Section 01300.

B. The CONTRACTOR shall submit to the ENGINEER not less than 20 calendar days after the date of the Notice to Proceed, a list of materials to be furnished, the names of suppliers and an expected schedule of delivery of materials to the site.

C. At least 3 days prior to beginning construction of any gravity sewer section or any portion of the system, the CONTRACTOR must submit to the ENGINEER for review “cut-sheets” for that portion to be constructed. The type of the “cut sheets” required shall be presented to the CONTRACTOR by the ENGINEER at the preconstruction meeting. The CONTRACTOR shall supply all “cut sheets.”

D. Furnish in duplicate to the ENGINEER, prior to each shipment of pipe, sworn certificates that all tests and inspections required by the Specifications under which the pipe is manufactured have been satisfied.

E. The pipe Manufacturer shall inspect all pipe joints for out-of-roundness and pipe ends for squareness. The Manufacturer shall furnish to the ENGINEER a notarized affidavit stating all pipe meets the requirements of American Society of Testing Materials, (ASTM), American Society of Civil Engineers (ASCE), American National Standards Institute (ANSI), etc., these Specifications, and the joint design with respect to square ends and out-of-round joint surfaces.

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM):

1. ASTM D1784 - Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

2. ASTM D2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.

3. ASTM D3034 - Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.

4. ASTM D3189 - Method for Rubber - Evaluation of Solution BR (Polybutadiene Rubber).

5. ASTM D3212 - Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

6. ASTM F477 - Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

7. ASTM F679 - Specification for Polyvinyl Chloride (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.

8. ASTM F758 - Specification for Smooth-Wall Polyvinyl Chloride (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage.

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.04 QUALITY ASSURANCE

A. All PVC pipe shall be from a single Manufacturer.

1. The supplier shall be responsible for provisions of all test requirements specified in ASTM D3034.

2. All tests, hydrostatic and material, if not performed by the Manufacturer as part of the Manufacturer standard quality control procedures, are to be performed by an independent laboratory at the expense of the Manufacturer.

3. In addition, all PVC pipe to be installed under this Contract may be inspected at the plant for compliance with these specifications by an independent testing laboratory provided by the OWNER.

4. The CONTRACTOR shall require the Manufacturer’s cooperation in these inspections. The cost of plant inspection of all pipe approved for this contract shall be borne by the OWNER.

B. Inspections of the pipe may also be made by the ENGINEER or other representative of the OWNER after delivery.

1. The pipe shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though sample pipes may have been accepted as satisfactory at the place of manufacture.

2. Pipe rejected after delivery shall be marked for identification and shall be removed from the job at once.

1.05 DELIVERY, STORAGE AND HANDLING

A. Care shall be taken in shipping, handling, and laying to avoid damaging the pipe and fittings. Extra care will be necessary during cold weather construction. Any pipe damaged in shipment shall be replaced as directed by the ENGINEER.

B. Any pipe or fitting showing a crack or which has received a blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.

C. While stored, pipe shall be adequately supported from below at not more than 3-foot intervals to prevent deformation. Pipe shall not be stacked higher than 6 feet. Pipe and fittings shall be stored in a manner which will keep them at ambient outdoor temperatures and out of the sunlight (or delivered to the site so that no pipe is exposed to the sunlight for more than (60) days). Temporary shading as required to meet this requirement shall be provided. Simple covering of the pipe and fittings which allows temperature buildup when exposed to direct sunlight will not be permitted. Pipe shall be protected from sunlight or weather conditions in accordance with the MANUFACTURER's recommendations.

1.06 INSPECTION, TEST REPORTS, MARKINGS AND SUBMITTALS

A. All pipe and accessories to be installed under this Contract shall be inspected and tested at the place of manufacture by the MANUFACTURER as required by the Standard Specifications to which the material is manufactured.

B. Each length of pipe shall be subject to inspection and approval at the factory, point of delivery, and site of work. Sample of pipe to be tested shall be selected at random by the ENGINEER or the testing laboratory and shall be delivered by the CONTRACTOR to the testing laboratory approved by the ENGINEER.

C. When the specimens tested conform to applicable standards, all pipe represented by such specimens shall be considered acceptable based on the test parameters measured. Copies of test reports shall be submitted to the ENGINEER before the pipe is installed in the project. Acceptable pipe will be stamped with an appropriate monogram under the supervision of the testing laboratory.

D. In the event that any of the test specimens fail to meet the applicable standards, all pipe represented by such tests shall be subject to rejection. The CONTRACTOR may furnish two additional test specimens from the same shipment or delivery for each specimen that failed and the pipe will be considered acceptable if all of these additional specimens meet the requirements of the applicable standards.

E. Pipe that has been rejected by the ENGINEER shall be removed from the site of the work by the CONTRACTOR and replaced with pipe which meets these specifications.

F. Other testing requirements specific to the type of pipe are included under the

appropriate paragraph in Part 2, below.

G. All 6-inch through 12-inch pipe and fittings shall be marked per Section No. 12 "Marking" of ASTM D3034. All 18-inch and 27-inch pipe and fittings shall be marked per Section 11 "Marking" of ASTM F679. For all pipe (6-inch through 12-inch), the MANUFACTURER's code including year, month, day, shift, plant and extruder of manufacture shall be clearly marked on each pipe section.

H. Prior to shipment of the pipe and fittings to the project site, the CONTRACTOR shall submit to the ENGINEER, test reports and certifications as described below duly certified by the MANUFACTURER's testing facility or an independent certified testing laboratory demonstrating full compliance with the applicable ASTM specifications described above. Certification from the supplier is NOT acceptable.

1. An original plus two copies of the following shall be submitted to the ENGINEER:

a) The name, address and phone number of the pipe and fittings MANUFACTURER.

b) The location of the plant at which they will be manufactured.

I. Certification and Certified Test Reports that each LOT of pipe has been manufactured, sampled and tested per Section 8 "Test Methods" of ASTM D3034 for 6-inch through 15-inch diameter and Section 11 "Marking" of ASTM F679 for 18-inch through 27-inch diameter pipe. The OWNER shall be provided in writing with the means to cross reference the markings with the certification and test reports (i.e., date of manufacture, lot number and shift number, etc.).

1. If this information is marked on the pipe in a code, the markings shall be decoded in writing.

2. A letter of certification from the fittings MANUFACTURER shall be provided for fittings stating compliance with ASTM D3034 for 6-inch through 15-inch diameter and with ASTM F679 for 18-inch through 27-inch.

PART 2 - PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. PVC gravity pipe and fittings 6-inches through 12-inches nominal diameter shall be solid wall and shall be type PSM, PVC SDR 35 with full diameter dimensions and shall conform to ASTM D3034, for sizes 4-inch through 15-inch and shall conform to ASTM F679 for sizes 18-inch through 27-inch. Straight pipe shall be furnished in lengths of not more than 13-feet. Saddle wyes will not be allowed. All PVC shall have a cell classification of 12454 B or C.

B. For depths of cover through 18 feet, a minimum wall thickness of SDR-35 is required. For depths of cover greater than 18-feet, a minimum wall thickness of SDR-26 is required. Fittings shall be either integrally cast (factory molded) or factory solvent welded and a separate section from the mainline pipe. SDR 26 fittings shall be used with SDR 26 pipe and SDR 35 fittings shall be used with SDR 35 pipe. At any time in a manhole run the depth of cover exceeds 18-ft, SDR 26 shall be used.

C. The supplier shall be responsible for the performance of all inspection and testing requirements specified in ASTM D-3034, ASTM D-3212, D3189, F679 and F789, as applicable. Complete records of inspections, examinations and tests shall be kept and submitted to the ENGINEER. The ENGINEER reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that materials and services conform to the prescribed requirements.

D. The pipe shall be joined with an integral bell and spigot push-on type gasketed joints. Each integral bell joint shall consist of a formed bell with an integral wall section of a solid cross-section elastomeric gasket securely locked in place to prevent displacement during assembly. Gaskets shall conform to ASTM F-477. Joints shall permit contraction, expansion and settlement, and yet maintain a watertight connection. Joints shall be tested in accordance with ASTM F477, D3139 or D3212.

E. PVC sewer fittings shall conform to the requirements of ASTM D-3034 specification. Fittings in sizes through 8-inches shall be molded in one piece with elastomeric joints and minimum socket depths as specified in Sections 6.2 and 7.3.2 of the ASTM D-3034 specification. Gaskets for elastomeric joints shall be molded and shall conform to ASTM F-477 specification. Fittings 10-inches and larger shall be molded or fabricated from pipe meeting ASTM D-3034 with MANUFACTURER's standard pipe bells and gaskets.

F. All fittings and accessories shall be furnished by one pipe supplier and shall have bell and/or spigot configurations compatible with the pipe.

2.02 IDENTIFICATION

A. Each length of pipe and each fitting shall be marked with the name of the MANUFACTURER, size, and class. All gaskets shall be marked with the name of the MANUFACTURER, size, and proper insertion directions. A color sample of the PVC pipe and fittings shall be submitted to the ENGINEER for approval prior to fabrication of any pipe and accessories.

B. All below ground polyvinyl chloride pipe and fittings shall have an identification color code. Gravity sewer pipe and service laterals - Green, similar to Kop Coat No. 0336.

C. All polyvinyl chloride pipe shall have identification marking tape similar to the

color listed above.

PART 3 - EXECUTION

3.01 LAYING POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. Polyvinyl Chloride (PVC) gravity sewer pipe shall be laid in accordance with the instructions of the MANUFACTURER and as specified herein. As soon as the excavation is completed to normal grade, as indicated on the Drawings, the CONTRACTOR shall immediately bed the pipe as specified in Section 02200 in the trench, to conform accurately to the line and grade indicated on the Drawings. Embedment of pipe shall conform to the details shown on the Drawings and ASTM D2321, "Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe." Bell holes shall be excavated so that after installation only the pipe barrel shall bear upon the trench bottom. Proper selection and placement of bedding and backfill materials are necessary to minimize deflection of the pipe diameter. No blocking under the pipe will be permitted.

B. No single piece of pipe shall be laid unless it is generally straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/4-inch per foot of length. If a piece of pipe fails to meet this requirement check for straightness, it shall be rejected and removed from the site. Laying instructions of the MANUFACTURER shall be explicitly followed.

C. The CONTRACTOR shall use care in handling and installing pipe and fittings. Storage of pipe on the job site shall be done in accordance with the pipe MANUFACTURER's recommendation and with approval of the ENGINEER. Under no circumstances shall pipe or fittings be dropped either into the trench or during unloading. The interior of the pipe shall be kept clean of oil, dirt and foreign matter, and the machined ends and couplings shall be wiped clean immediately prior to jointing.

D. The CONTRACTOR shall use a PVC pipe cutter where necessary to cut and machine all PVC pipe in the field. A "full insertion mark" shall be provided on each field cut pipe end. Field-cut pipe shall be beveled with a beveling tool made especially for plastic pipe. Bevels shall be in accordance with the MANUFACTURER's requirements.

E. Each length of pipe and each fitting shall be marked with the nominal size, the SDR designation, the name of the MANUFACTURER or his trademark, and the date of manufacture.

F. Rubber gaskets shall be marked with MANUFACTURERs identification sizes and proper insertion direction.

G. Pipe stubs for all future connections shall be not less than 26-ft. in length unless

otherwise shown on the Drawings. Install watertight plugs where required.

H. The laying of the pipe in finished trenches shall begin at the lowest point, with the spigot ends pointing in the direction of flow. The interior of the pipe and the jointing seal shall be free from sand, dirt, and trash before installing in the line. Extreme care must be taken to keep the bells of the pipe free from dirt and rocks so joints may be properly assembled without overstressing the bells. The jointing of the pipe shall be done in strict accordance with the pipe MANUFACTURER's instructions and shall be done entirely in the trench. Tolerances are 1-inch on grade or 5 percent of the design slope, whichever is smaller, and 6-inches on line in any section between manholes. Deviations exceeding these tolerances shall be grounds for rejection of the line.

I. All pipe shall be sound and clean before installation. When installation is not in progress, including lunchtime, the open ends of the pipe shall be closed by watertight plug or other approved means to prevent foreign material from entering the pipe. Good alignment shall be preserved during installation. The deflection of joints shall not exceed that recommended by MANUFACTURER. Fittings for service laterals, in addition to those shown on the plans, shall be provided, if required, in crossing utilities which may be encountered upon opening the trench.

J. The ENGINEER may examine each bell and spigot end to determine whether any preformed joint has been damaged prior to installation. Any pipe having defective joint surfaces shall be rejected, marked as such, and immediately removed from the job site.

K. Each length of the pipe shall be shoved home against the pipe previously laid and held securely until enough backfill has been placed to hold the pipe in place. Joints shall not be "pulled" or "cramped".

L. Before any joint is made, the pipe shall be checked to assure that a close joint with the next adjoining pipe has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to grade by striking it.

M. Precautions shall be taken to prevent flotation of the pipe in the trench.

N. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the screened gravel backfill. Trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below mid-diameter of the pipe. As trench boxes, moveable sheeting, shoring or plates are moved, screened gravel shall be placed to fill any voids created and the screened gravel and backfill shall be recompacted to provide uniform side support for the pipe.

O. Laser shall be used for maintaining pipe alignment.

3.02 JOINTING POLYVINYL CHLORIDE (PVC) SEWER PIPE AND FITTINGS

A. PVC push-on sewer pipe and fittings shall be jointed in accordance with the recommendations of the latest ASTM Standards and detailed instructions of the MANUFACTURER. The pipe MANUFACTURER shall furnish information and approve the installation of at least the first ten (10) joints of each pipe laying crew. The pipe MANUFACTURER shall visit the site on a quarterly basis to supervise and inspect and certify installation.

B. All manhole connections shall be as shown on the Drawings except that concrete and mortared connections shall be equipped with an integral O-ring or other sealant such that a positive watertight seal is established.

3.03 TESTS FOR GRAVITY SEWERS - GENERAL

A. Gravity sewers shall be required to pass a leakage test before acceptance. Leakage tests may be by the infiltration test or exfiltration test, depending on the level of the groundwater table or by the low-pressure air test all as described below.

B. Water infiltration or exfiltration or air loss, as applicable, rates will be measured by the ENGINEER. The tests shall be performed by the CONTRACTOR under the observation of the ENGINEER.

C. The groundwater height above the installed pipe shall be determined by a system of monitoring wells. The CONTRACTOR shall submit his method of establishing the groundwater height to the ENGINEER for approval prior to commencing testing.

D. Sewers will be checked by the ENGINEER prior to final restoration or the placing of asphalt to determine if pipe displacement has occurred. The CONTRACTOR shall give a minimum of 48 hours notice to the ENGINEER and furnish all necessary test equipment and labor required to allow the ENGINEER to perform this check. The CONTRACTOR shall also be responsible for pumping the system down and maintaining the pumped down condition for all pump station service areas.

The equipment shall include but not be limited to the following:

1. Hand held spotlight minimum 300,000 candle power and a power source for the light.

2. Appropriate ladders necessary to allow access to all manholes.

3. Mirrors

4. All equipment and manpower necessary to comply with confined space entry requirements (gas sensors, blowers, safety harness, etc.)

5. On pipelines under 12-inch in diameter the light shall be flashed down the center of the pipe from the upstream manhole and viewed from the downstream manhole. Measurements shall be taken at the top, each side and the bottom to determine the moon designation of the pipeline (example 8-inches - 1-inches out of alignment 7/8 moon, 2-inches out of alignment 3/4 moon, etc.). On pipelines 12-inches in diameter and larger the light shall be held at the upstream manhole and will be placed at the top, each side and bottom to allow for measurements to be taken in the same manner as for the pipelines under 12-inches in diameter.

6. Pipelines under 12-inches in diameter or greater which have a 7/8 moon or less shall be televised and recorded on video tape (as required in other sections of this specification) to verify the extent of the misalignment to determine in the opinion of the ENGINEER/OWNER if a point repair or relaying of the pipeline is necessary prior to any further restoration work being performed. The cost to maintain all traffic and roadways until a determination as to the acceptability of the pipeline is made shall be at the expense of the CONTRACTOR in addition to the actual cost of the repair.

E. Allowable Deflection Test

1. Deflection shall be measured with a rigid mandrel (Go/No-Go) device cylindrical in shape and constructed with a minimum of 9 or 10 evenly spaced arms or prongs. Drawings of the mandrel with complete dimensions shall be submitted to the ENGINEER for each diameter of pipe to be tested.

2. Pipe deflection shall be measured not less than 90 days after the backfill or permanent pavement base has been completed as specified and shall not exceed 5 percent of the base inside diameter of the pipe as listed in the following table.

	SDR-35		SDR-26	
Nominal SizeDiameter (Inches)	**Base Inside Mandrel (Inches)**	**5% Deflection Diameter (Inches)**	**Base Inside Mandrel (Inches)**	**5% Deflection (Inches)**
8	7.665	7.28	7.488	7.11
10	9.563	9.08	9.342	8.87
12	11.361	10.79	11.102	10.55
15	13.898	13.20	13.575	12.90

	TYPE T 1		TYPE T-2	
Nominal SizeDiameter (Inches)	**Base Inside Mandrel (Inches)**	**5% Deflection Diameter (Inches)**	**Base Inside Mandrel (Inches)**	**5% Deflection (Inches)**
18	16.976	16.13	17.054	16.20
21	20.004	19.01	20.098	19.09
24	22.480	21.36	22.586	21.46
27	25.327	24.06	25.446	24.17

3. If the CONTRACTOR performs the deflection testing rather than employing an approved test lab, the following shall apply:

4. The CONTRACTOR shall furnish the rigid mandrel, labor, materials and equipment necessary to perform the tests as approved by the ENGINEER. The mandrel shall be pulled through by Hand or a Hand operated reel through all sewer lines in the presence of the ENGINEER. Prior to performing the deflection tests, the CONTRACTOR shall submit to the ENGINEER certification that the minimum 9-arm mandrels are preset as stated above. Each mandrel shall be engraved with the following:

   a. Serial Number;
   b. Nominal pipe diameter;
   c. Either "ASTM D3034", year and either "SDR-35" or "SDR-26"
   d. or "ASTM F679", year and either "Type T-1" or "Type T-2"
   e. % deflection as stated above.

5. If the mandrel fails to pass any section of pipe, the CONTRACTOR shall excavate to the point of excess deflection and carefully compact around the point where excess deflection was found at no additional cost to the OWNER. After the permanent pavement base has been recompacted and resealed, the line shall be retested. If the mandrel fails to pass a second time, the section shall be replaced and retested. Rerounding is NOT permitted.

F. The CONTRACTOR shall repair all visible leaks in manholes even though the

leakage test requirements are met.

G. The ends of branches, laterals, tees, wyes, and stubs to be included in a test section shall be plugged to prevent water or air leakage. All plugs shall be secured to prevent blowout due to internal pressure. A test section is defined as the length of sewer between manholes.

3.04 LEAKAGE TEST - INFILTRATION METHOD

A. The water infiltration test shall not be considered a valid leakage test unless the top surface of the groundwater level is at least 4-feet or more above the pipe crown during the test measurement. The rate of infiltration of water into the sewers, including manholes and appurtenances, shall not exceed 200 gallons per day per inch diameter per mile of sewer. In the event groundwater does not submerge the pipe as specified, the CONTRACTOR shall conduct an exfiltration test described hereinafter.

B. A visual inspection and an infiltration test will be conducted on all completed sewers 30-inches or more when they are submerged by groundwater as specified above. The CONTRACTOR shall provide facilities to stop inflow from adjacent sections of sewer and to provide pondage to permit measurement of infiltration. Visible leaks, defective joints, and defective pipe shall be satisfactorily replaced.

3.05 LEAKAGE TEST - EXFILTRATION METHOD

A. Sewers not submerged by groundwater shall be tested for exfiltration or, if approved, by low-pressure air method. The ENGINEER reserves the right to waive the exfiltration test on any section of sewer based on his evaluation of the results of previous tests.

B. The hydrostatic head for test purposes shall be 4-feet or more above the sewer crown at the upstream end. Any arrangement of testing equipment which will provide observable and accurate measurement of water leakage under the specified conditions will be permitted. The rate of exfiltration of water out of the sewers, including manholes and appurtenances, shall not exceed 200 gallons per day per inch diameter per mile of sewer. Visible leaks, defective joints, and defective pipe shall be satisfactorily replaced.

C. The sewer test section may be filled 24 hours prior to time of exfiltration testing, if desired, to permit normal absorption into the sewers walls to take place.

3.06 LEAKAGE TEST - LOW PRESSURE AIR METHOD (PREFERRED METHOD)

A. Test Procedure. The following test procedures shall be used in making each test:

1. The section of sewer line to be tested shall be flushed and cleaned prior to conducting the low-pressure air test to clean out any debris, wet the pipe, and produce more consistent results.

2. Isolate the section of sewer line to be tested by means of inflatable stoppers or other suitable test plugs. One of the plugs shall have an inlet tap, or other provision for connecting a hose to a portable air source.

3. If the test section is below the groundwater level, determine the height of the groundwater above the springline of the pipe at each end of the test section and compute the average. For every foot of groundwater above the pipe springline, increase the gauge test pressure by 0.43 pounds per square inch.

4. Connect the air hose to the inlet tap and a portable air source. The air equipment shall consist of necessary valves and pressure gauges to control the rate at which air flows into the test section and to enable monitoring of the air pressure within the test relief device to prevent the possibility of loading the test section with the full capacity of the compressor.

5. Add air slowly to the test section until the pressure inside the pipe is raised to 4.0 psig greater than the average back pressure of any groundwater that may be over the pipe.

6. After a pressure of 4.0 psig is obtained, regulate the air supply so that the pressure is maintained between 3.5 and 4.0 psig (above the average groundwater back pressure) for a period of two-minutes to allow the air temperature to stabilize in equilibrium with the temperature of the pipe walls.

7. Determine the rate of air loss by the time pressure-drop method. After the two-minute air stabilization period, disconnect the air supply and adjust the pressure to 3.5 psig above the average to drop from 3.5 psig to 2.5 psig shall be determined by means of a stopwatch and this time interval will be compared to the required time in the tables to determine if the rate of air loss is within the allowable time limit. If the time is equal to or greater than the times indicated in the tables, the pipeline shall be deemed acceptable.

8. Defective joints, fittings and pipe shall be satisfactorily replaced.

B. The pipe shall be tested between adjacent manholes. The test time for the air pressure to drop the specified one pound shall be as listed below:

Pipe Diameter "D" in Inches

Length of Test Sec. "L" (ft.)	**8**	**10**	**12**	**15**	**18**	**21**	**24**
25	0.18	0.28	0.40	1.02	1.29	2.01	2.38
50	0.35	0.55	1.19	2.04	2.58	4.03	5.17
75	0.53	1.23	1.59	3.06	4.27	6.04	7.55
100	1.11	1.50	2.38	4.08	5.56	8.05	10.39

125	1.28	2.18	3.18	5.09	7.26	9.55	11.20
150	1.46	2.45	3.58	6.11	8.30	9.55	11.20
175	2.03	3.13	4.37	7.05	8.30	9.55	11.20
200	2.21	3.40	5.17	7.05	8.30	9.55	11.20
225	2.38	4.08	5.40	7.05	8.30	9.55	11.20
250	2.56	4.35	5.40	7.05	8.30	9.55	11.20
275	3.14	4.43	5.40	7.05	8.30	9.55	11.20
300	3.31	4.43	5.40	7.05	8.30	9.55	11.20
325	3.47	4.43	5.40	7.05	8.30	9.55	11.20
350	3.47	4.43	5.40	7.05	8.30	9.55	11.20
400	3.47	4.43	5.40	7.05	8.30	9.55	11.20
425	3.47	4.43	5.40	7.05	8.30	9.55	11.20
450	3.47	4.43	5.40	7.05	8.30	9.55	11.20
475	3.47	4.43	5.40	7.05	8.30	9.55	11.20
500	3.47	4.43	5.40	7.05	8.30	9.55	11.20

C. For sewer diameter between 27-inches and 36-inches inclusive, the pipeline may be tested between adjacent manholes, or segmentally. The test time shall be in accordance with the following formula.

T = .00493 (D x D) L
***where**:*
T= Test Time, Seconds; D = Diameter, Inches; L = Length of test Section, Feet.

3.07 FINAL SEWER CLEANING

A. Prior to final acceptance and final manhole-to-manhole inspection of the sewer system by the ENGINEER, flush and clean all parts of the system. Remove all accumulated construction debris, rocks, gravel, sand, silt, and other foreign material from the sewer system at or near the closest downstream manhole. If necessary, use mechanical rodding or bucketing equipment.

B. Upon the ENGINEER's final manhole-to-manhole inspection of the sewer system, if any foreign matter is still present in the system, reflush and clean the section and portions of the lines as required.

3.08 VACUUM TEST OF MANHOLES/WETWELLS

A. Pretest manhole/wet wells after connections have been completed but before backfilling. Results derived from this test will allow time for necessary repairs to be completed before further construction proceeds and hinders such repairs.

B. Plug all manhole/wet wells inverts and lift holes. Inverts shall be plugged using suitably-sized pneumatic or mechanical pipeline plugs. The plugs shall be placed a minimum of 6-inches beyond the manhole/wet wells wall to prevent temporary sealing of the inverts. Follow all MANUFACTURER'S recommendations and warnings for proper and safe installation of such plugs. Make sure such plugs are

properly rated for the pressures required for the test.

C. The standard test of 10-inch Hg. (mercury) is equivalent to approximately 5 psig (0.3 bar) back pressure. Unless such plugs are mechanically restrained, it is recommended that the plugs used have a two-times (2X) safety factor or a minimum 10 psig (.7 bar) back pressure usage rating. Brace inverts if lines entering if lines entering the manhole/wet wells have not been backfilled to prevent pipe from being dislodged and pulled into the manhole/wet wells.

D. Install the vacuum tester head assembly at the top access point of the manhole, preferably the ring area (Figures A and B). Adjust the cross brace to insure that the inflatable sealing element inflates and seals against the straight top section of the manhole/wet wells structure.

E. Attach the vacuum pump assembly to the proper connection on the test head assembly. Make sure the vacuum inlet/outlet valve is in the closed position.

F. Following all safety precautions and MANUFACTURER'S instructions, inflate sealing element to the recommended maximum inflation pressure.

G. Start the vacuum pump assembly engine and allow preset RPM to stabilize.

H. Open the inlet/outlet ball valve and evacuate the manhole to 10-inch Hg. (0.3 bar).

I. Close vacuum inlet/outlet ball valve, disconnect vacuum pump, and monitor vacuum for the specified time period (see table below). If the vacuum does not drop in excess of 1-inch Hg. over the specified time period, the manhole is considered acceptable and passes the test. If the manhole fails the test, identify the leaking areas by removing the head assembly, coating the interior surfaces of the manhole with a soap and water solution, and repeating the vacuum test for approximately thirty seconds. Leaking areas will have soapy bubbles. Once the leaks have been identified, complete all necessary repairs and repeat test procedures until satisfactory results are obtained.

J. Repeat the test procedure after backfilling for final acceptance test.

VACUUM TEST TIMETABLE

	DIAMETER - INCHES		
Depth - Feet	**48"**	**60"**	**72"**
4'	10 sec.	13 sec.	16 sec.
8'	20 sec.	26 sec.	32 sec.
12'	30 sec.	39 sec.	48 sec.
16'	40 sec.	52 sec.	64 sec.
20'	50 sec.	65 sec.	80 sec.
24'	60 sec.	78 sec.	96 sec.
*	05 sec.	6.5 sec.	8.0 sec.

*Add “T” times for each additional 2’ depth. (The values listed above have been extrapolated from ASTM designation C924-85.)

END OF SECTION 15080

SECTION 15100-VALVES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Special Conditions, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of valves required by this section is indicated on drawings.

B. Types of valves specified in this section include the following:
Gate Valves
Check Valves
Tapping Valves
Air Valves

C. Valves furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other.

1.03 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of valves, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years. **All fittings, valves, service saddles, etc. shall meet the requirements of the Safe Drinking Water Act including the Reduction of Lead in Drinking Water Act (Public Law 111-380).**

B. Valve Types: Provide valves of same type by same manufacturer.

C. Valve Identification: Provide valves with manufacturer's name (or trademark) and pressure rating clearly marked on valve body.

D. Codes and Standards:

1. ANSI Compliance: For face-to-face and end-to-end dimensions of flanged or welded-end valve bodies, comply with ANSI B16.10 "Face to Face and End-to-End Dimensions of Ferrous Valves".

2. UL and FM Compliance: Provide valves used in fire protection piping, which are UL-listed and FM approved.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of valve. Include pressure drop curve or chart for each type and size of valve. Submit valve schedule showing manufacturer's figure number, size, location, and valve features for each required valve. **Submit manufacturer's statement of certification as to conformance with the Reduction of Lead in Drinking Water Act (Public Law 111-380.)**

B. Shop Drawings: Submit manufacturer's assembly-type (exploded view) shop drawings for each type of valve, indicating dimensions, weights, materials, and methods of assembly of components.

C. Maintenance Data: Submit maintenance data and spare parts lists for each type of valve. Include this data, product data, and shop drawings in Maintenance Manual.

PART 2 - PRODUCTS

2.01 VALVES:

A. General: Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated. Provide proper selection as determined by Installer to comply with installation requirements. Provide end connections which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

B. Buried Valves: Provide 2" square nut operator. For quarter-turn valves 8" and larger, provide gear operator also. Provide one (1) valve key fabricated of carbon steel of suitable length for each four (4) valves of suitable strength.

C. Exposed Valves: Provide handwheels for all valves except quarter-turn valves, 6" and smaller. Provide lever handle for quarter-turn valves 6" and smaller. Provide one (1) lever handle for each valve pit.

2.02 GATE VALVES:

A. Three Inches and Smaller: All gate valves 3” or less shall be iron body, non-rising bronze or stainless steel stem, resilient seat wedge type with flanged, mechanical joint or threaded ends, depending on installation, furnished with all necessary joint materials. Flanged gate valves shall be provided with 125 lb. American Standard flanges. Threaded valves shall used brass or stainless steel fittings and hardware for transitions. Valves shall conform to AWWA Specifications C509

B. Over Three Inches: All gate valves over three inches shall be of the iron body, non-rising bronze or stainless steel stem, resilient seat wedge type with flanged, mechanical joint or spigot ends, depending on installation, furnished with all necessary joint materials. Flanged

gate valves shall be provided with 125 lb. American Standard flanges. Valves shall conform to AWWA Specifications C509-80.

C. Gate valves shall be M & H Valve Co., AWWA C 509, resilient seated gate valve or approved equal.

2.03 AIR VALVES

A. Combination Air Valves shall be of the single housing style that combines the operating features of both an Air/Vacuum and an Air Release Valve.

B. The Air/Vacuum portion shall automatically exhaust large quantities of air during the filling of the pipeline and automatically allows air to re-enter the pipeline when the internal pressure of the pipeline approaches a negative value due to column separation, draining of the pipeline, power outage, pipeline break/rupture, etc.

C. The Air Release portion shall automatically release small pockets of air from the pipeline while the pipeline is in operation and under pressure.

D. The Combination Air Valve shall have a 1" NPT inlet and outlet connections and a 1" Large orifice diameter and a 5/64" diameter air release orifice for a maximum working pressure of 300 psi.

E. The materials of construction shall be: Body, Cover and Baffle of Cast Iron; Float and all other trim shall be of Stainless Steel with the exception of the Buna-N-Seat and adjustable Viton Orifice Button.

F. Valves shall be Series Val-Matic Valve Model # 201C or approved equal.

2.04 CHECK VALVES:

A. Over Three Inches: The check valve over three inches shall be iron-body, bronze-mounted, spring and lever with flanged ends, except as specified herein. All working parts shall be spring-loaded to prevent slamming. The check valves shall be Clow, Model F-5381 - spring/lever or approved equal.

2.05 FLUSHING HYDRANTS:

A. Flushing hydrants shall be a post type flushing hydrant, non-freezing, self-draining, Mainguard No. 77 as manufactured by Kupferle Foundry Company, or approved equal. Provide three (3) valve keys to the City.

2.06 TAPPING VALVE AND SLEEVE:

A. Tapping valves and sleeves shall be ductile iron and used for tie-ins at the locations and of the size shown on the construction plans. The tapping sleeve shall be a full bolt around and shall have a flanged outlet. The tapping valve shall be a flanged mechanical joint valve. Valves shall be M & H Style 3751 or approved equal. The installation of the tapping sleeve shall be on a clean surface and shall have a minimum of 6 pipe diameters to the nearest existing joint. The tapping valve and sleeve shall be mounted and the wet tap made in accordance with the manufacturer's recommendation. The tapping sleeve shall be as manufactured by Ford (FTS coated) or approved equal.

2.07 VALVE BOXES:

A. Cast-iron boxes shall be provided for all underground valve installations. They shall consist of a base covering the operating nut and head of the valve, vertical shaft, at least 5-1/4 inches in diameter, and a top section extending to a point even with the finished ground surface. Provide a cast-iron cover marked "WATER" or “SEWER” and place it concentrically over the operating nut. The valve boxes shall be Clow F-2454 screw-type valve box USF 7500 or approved equal.

2.08 VALVE FEATURES:

A. General: Provide valves with features indicated and, where not otherwise indicated, provide proper valve features as determined by Installer for installation requirements. Comply with ASME B31.9 for building services piping, and ASME B31.1 for power piping.

B. Flanged: Valve flanges complying with ANSI B16.1 (cast iron), ANSI B16.5 (steel), or ANSI B16.24 (bronze).

C. Threaded: Valve ends complying with ANSI B2.1.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. General: Except as otherwise indicated, comply with the following requirements:

1. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.

2. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.

B. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.

3.02 ADJUSTING AND CLEANING:

A. Valve Adjustment: After piping systems have been tested and put into service, but before final testing, adjusting, and balancing, inspect each valve for possible leaks. Adjust or replace packing to stop leaks, replace valve if leak persists.

B. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 15100

SECTION 15120 - PIPING SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Special Conditions, apply to work of this section.

1.02 QUALITY ASSURANCE

Manufacturer's Qualifications: Firms regularly engaged in manufacture of piping specialties, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

PART 2 - PRODUCTS

2.01 FIRE HYDRANTS

A. All fire hydrants shall be 5-1/4 inch hydrants with two 2-1/2 inch connection and one pumper connection designed for 150 psi working pressure, and shall conform to the requirements of AWWA C-502-73 (Latest Revision).

B. Hydrants shall have mechanical joint inlets, shall be for a 3-foot bury, and shall have a compression type main valve which opens against pressures.

C. The hydrant main valve operating parts, including valve seal, valve seal insert, cross arm, and upper valve washer shall be all bronze, meeting either of the following ASTM B-61, or B-150 per C-502.

D. The inside of hydrants shall be coated in accordance with AWWA standards except for bronze and threaded machine parts.

E. Hydrant upper barrel shall be provided with an e-coat primer and top coated with a Hydrant Red 2-component polyurethane finish or fusion bonded epoxy coated and Fire Hydrant Red in color.

F. The barrel section of the hydrant shall be made in two or more sections, with a flange located at least two inches above the finished grade line, and provided with a break flange, flange clips or lugs at ground line.

G. Undercut bolts for the break connection are not acceptable.

H. The hydrants shall open left (counterclockwise).

I. The hydrants shall have pentagon shaped operating nuts and cap nuts measuring 1-1/2 inch from pint to flat.

J. The bonnet shall be of dry type top design, shall be weather proof and utilize a cast or ductile iron weather shield integral with the external wrench operating nut.

K. The weather shield nut shall be pentagon in shape.

L. The hydrants stem shall have "O" ring seals, and stem threads and bearing shall be protected with automatic self-oiling or grease case lubricant systems.

M. The nozzle threads shall be coated with anti-seize compound to facilitate removal of caps.

N. Hydrants having stem thread (upper or lower) that are constantly exposed or immersed in water are not acceptable.

O. All exposed or external nuts and bolts (bonnet, break flange, and shoe bolts and nuts) shall be stainless steel, no exceptions.

P. All fire hydrants shall be American Darling, AVK, or approved equal.

Q. The external color shall be red and the primer color shall not be yellow.

R. After installation the fire hydrants shall be free of scratches and paint chipping.

S. All fire hydrants shall be painted after installation if in the opinion of the ENGINEER the coating is not satisfactory.

T. Two fire hydrant wrench shall be supplied for this project.

U. All fire hydrants shall be covered with plastic when installed and removed when the line is placed into service.

2.02 CORPORATION STOPS

A. Corporation stops 1 inch and smaller shall be Ford Model No. F-1000 or approved equal.

B. Inlets shall have iron pipe threads and outlets shall have compression connections.

2.03 CURB STOPS

A. Curb stops/meter coupling shall be Ford Model B43-342W-G, B43-444W-G, or approved equal.

B. Inlets shall have compression connection and outlets shall have iron pipe threads.

2.04 SERVICE SADDLES

All service saddles shall be Ford F202 double strap saddle or approved equal.

2.05 HOSE BIBBS AND SAMPLE TAPS

Hose bibbs and sample taps shall be Crane No. 58 or approved equal.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 15120

SECTION 16010 –GENERAL ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General Conditions and Supplementary General Conditions sections apply to work specified in Division 16.

1.2 DESCRIPTION OF WORK:

Furnish all labor, materials, equipment and incidentals required to complete all electrical work at the Gulf Coast Electric Cooperative Hurricane Safe Room in Wewahitchka, FL as specified here and shown on the Contract Drawings.

The work, apparatus and materials furnished under these Specifications and accompanying Drawings shall include all items listed here and shown on the Drawings. Line voltage connections to equipment furnished as specified in other sections of these Specifications or shown on other than the Electrical Drawings shall be governed by this Division of the Specifications.

Each bidder or his authorized representatives shall visit the job site and carefully inspect the present conditions before preparing his bid. The submission of a bid will be considered evidence that such a visit and inspection was performed by the bidder and that he takes full responsibility for all factors governing his work.

It is the intent of these Specifications and Drawings that the electrical systems shall be complete, fully operational, and suitable in every way for the service required. Drawings are diagrammatic in nature and do not show in every detail all devices and incidental materials necessary to accomplish the intent. Therefore, the Contractor shall understand that such devices and incidental materials required shall be furnished at no cost to the Owner.

1.3 TEMPORARY LIGHTING AND POWER:

Provide temporary lighting and power as required during construction.

The Contractor shall pay all service connection fees for temporary power installation and all electrical bills for temporary construction power required for completing the project.

Temporary wiring shall be done in a safe and neat manner. See Article 305 of the NEC.

1.4 SERVICE:

Contractor shall pay all fees and charges as required to obtain temporary and permanent service(s) if applicable. Contractor shall coordinate with electrical utility company to determine the location of the service transformer(s) and all utility company requirements for the service.

1.5 SUBMITTALS:

Manufacturers' data in the form of "cut sheets" and engineering drawings shall be submitted to the Engineer on the equipment listed below and in other Sections of Division 16 before delivery to the work site. Review of the submittal by the Engineer is to check for general conformance to the design intent and shall not relieve the Contractor of the responsibility for the correctness of all dimensions and the correct fitting of all parts of the work.

Panelboards and Circuit Breakers
Shore Power Pedestals
Disconnect Switches
Plugs and Receptacles
Lighting Fixtures
Lighting Controls
Surge Protective Devices
Control Panels

The manufacturers' names and catalog numbers shall be submitted for the following materials:

Conduit, Fittings, and Couplings
Boxes and Fittings
Wire and Cable

The submittal shall be thoroughly checked by the Contractor for accuracy and compliance with the contract requirements. Shop drawings and "cut sheets" shall bear the date checked and shall be accompanied by a statement by the Contractor that they have been checked for conformity to Specifications and Drawings. Shop submittals not so checked and noted will be returned without review.

1.6 CODES, INSPECTION AND FEES:

Division 16 work shall be in accordance with the latest edition of the following codes and ordinances:

The National Electrical Code (NFPA 70)
The National Electrical Safety Code
The Life Safety Code (NFPA 101)
The Southern Standard Building Code (SBCCI)
Serving Utility Company
State and Municipal

Contractor shall pay all fees for permits and inspections.

1.7 RECORD DRAWINGS:

At Job Close-out submit three (3) copies of the following:

Complete and accurate sets of Record Drawings showing clearly deviations to the Contract Drawings.

Bound sets of Equipment Operation and Maintenance Instructions.

Test results required in other sections of this division.

1.8 GUARANTEES:

In addition to the guarantee of equipment by the manufacturer the Contractor shall also guarantee such equipment for a period of one (1) year from final acceptance by the Owner. The Contractor's one (1) year guarantee shall be for equipment, materials, and labor.

Additional guarantee requirements may be in the General and Special Conditions of these specifications.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS:

Furnish materials or equipment specified by manufacturer's names unless approval of other manufacturers is listed in addendum to these specifications.

The materials furnished shall be new, undamaged, and packed in the original manufacturer's packing.

Equipment and materials shall at all times during construction be protected from mechanical and water damage. Equipment shall not be stored out-of-doors. Damaged materials and equipment shall be replaced by the Contractor at no cost to the Owner.

All electrical panels, enclosures, raceways, conduit, and boxes shall be fabricated of metal unless indicated otherwise.

2.2 EQUIPMENT AND MATERIALS STANDARDS:

The design and fabrication of electrical equipment and materials furnished under Division 16 shall comply with the latest edition and revisions of the following codes and standards:

The American National Standards Institute (ANSI)
The American Society of Mechanical Engineers (ASME)
The American Society for Testing and Materials (ASTM)
The Institute of Electrical and Electronic Engineers (IEEE)
The National Electrical Manufacturers Association (NEMA)

The Occupational Safety and Health Administration (OSHA)
The Underwriters Laboratories (UL)
The National Fire Protection Association (NFPA)
The National Electrical Code (NEC)

PART 3 - EXECUTION

3.1 SUPERVISION

The electrical work shall be supervised by a licensed journeyman or master electrician who shall be on the job site at all times while work is in progress.

3.2 EQUIPMENT IDENTIFICATION:

Engraved nameplates shall be of laminated plastic with black surface and white 1/8" high letters secured with stainless steel screws.

All major components of the distribution system shall have engraved nameplates.

All panelboards, motor starters, contactors, disconnect switches, and control panels shall have engraved nameplates identifying the equipment served.

Panelboards shall have typed directories with all loads indicated for each circuit.

3.3 CLEANING:

All equipment and boxes shall be thoroughly cleaned inside and outside at the completion of installation. Do not leave dirt and debris inside panelboard and equipment cabinets, device and junction boxes, etc.

3.4 PAINTING:

Touchup scratched or marred surfaces of lighting fixtures, panelboards, switchboards, etc. with paint furnished by the equipment manufacturers specifically for the purpose.

3.5 EXCAVATION, TRENCHING AND BACKFILLING:

Perform all excavation and trenching to install raceways indicated on the drawings.

No tunneling shall be allowed unless written permission is received by the Architect / Engineer.

Excavated material not suitable for backfill shall be removed from the job site.

Insure that the bottom of trenches is uniform (without large rocks or lumps of dirt) which could damage the raceway or conductors.

Backfill with material that will compacted readily.

Compact backfill material from bottom of excavation up to 95% of surrounding undisturbed material.

Cover shall not be less than surrounding grade and no greater than 2" above surrounding grade.

3.6 TESTS:

Contractor shall test all wiring for shorts and proper grounding before energizing. Equipment shall be thoroughly checked and adjusted for proper operation. All process control shall be set and tuned to perform as intended. Motors shall be checked for proper rotation.

END OF SECTION 16010

SECTION 16110 – RACEWAYS AND FITTINGS

PART 1 - GENERAL

1.1 SCOPE OF WORK:

Furnish and install complete raceway systems as indicated on the Drawings and as specified here.

1.2 APPLICATIONS:

All above grade exterior wiring shall be installed in rigid PVC or rigid Aluminum conduit, and all embedded in concrete or below grade wiring shall be in Rigid PVC conduit unless indicated otherwise on the drawings.

All exterior, above grade, conduits shall be rigid aluminum.

Liquid Tight flexible metal raceway is acceptable as long as installed per NEC.

All conduit of a given type shall be the product of one manufacturer.

Utility service conduit(s) shall be as required by the utility company.

PART 2 - PRODUCTS

2.1 RIGID CONDUIT AND FITTINGS:

Rigid aluminum conduit shall be conforming to the requirements of UL 6 and ANSI C80.1 standards.

Fittings for rigid aluminum conduit shall be the threaded type manufactured by RACO, Steel City, or Thomas & Betts (T&B).

Plastic conduit for direct burial shall be UL labeled Schedule 40 PVC manufactured to NEMA TC 2-1983 specifications, WC-1094A Federal specifications, and UL-651 specifications unless otherwise noted or required.

Fittings for plastic conduit shall be manufactured to NEMA TC 3-1982 specifications.

2.2 FLEXIBLE METAL CONDUIT, COUPLINGS, AND FITTINGS:

All flexible metal conduit for damp or exterior applications shall be Liquid Tight UL listed spiral wound galvanized steel with a PVC outer jacket type.

Fittings for liquid tight conduit shall be manufactured RACO, Steel City, or T&B.

2.3 CONDUIT MOUNTING EQUIPMENT:

Hangers, rods, backplates, beam clamps etc. shall be STAINLESS steel or aluminum suitable for in a corrosive environment. They shall be as manufactured by the Appleton Electric Co., Thomas and Betts Co., Unistrut Corp., or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION:

Provide pull strings in all conduits (utilized and spare conduits).

No conduit shall any have more than three 90 degree bends in any one run. Pull boxes shall be provided as required or directed.

No wire shall be pulled until the conduit system is complete in all details.

The ends of all conduits shall be tightly plugged to exclude dust and moisture during construction.

Aluminum conduit threads shall be cleaned and coated with a grease metallic type conductive compound suitable for use on nonferrous conduits.

Conduit support shall be spaced at intervals of 8 ft. or less, adjacent to all couplings, and additionally as required to obtain rigid construction.

Conduit hangers shall be attached to structural steel by means of beam or channel clamps.
Bends in parallel conduit runs shall be concentric. All conduits shall be run perfectly straight and true.

Conduit terminating in knockouts shall have Meyer’s hubs.

Conduits shall be installed using threaded fittings and couplings.

Flexible conduit lengths shall not exceed 1'-6" in length for this application.

Liquid Tight Flexible metal conduit used for installing lighting fixtures shall not exceed 6' in length.

Provide expansion coupling every 100 feet for long runs of conduit and at concrete expansion joints. Provide ground bonding jumpers around expansion couplings, used on metallic conduit, sized according to Table 250-95 of the NEC.

Set top of underground conduits a minimum of 2’ below finish subgrade, or as required for

conditions defined by NEC, or as required per local codes. Service conduits shall be at minimum depth required by the serving electric utility company.

END OF SECTION 16110

SECTION 16120 – WIRE AND CABLES

PART 1- GENERAL

1.1 SCOPE OF WORK:

Furnish, install and test all wire, cable, and appurtenances as shown on the Drawings and as hereinafter specified.

1.2 APPLICATIONS:

Wire for lighting and single power circuits shall be type THHN/THWN-2, 90 degree C temperature rating, suitable for the environment (wet, damp, etc.) unless otherwise noted.

Single conductor wire for control, indication, and metering shall be type THHN/THWN-2, minimum No. 14 AWG, stranded.

Tray Cable shall contain a minimum of 20 conductors and shall be No. 12 AWG, stranded.

Ground wires shall be Green and Neutrals shall be White or Gray. Green and White shall be used for these purposes only.

Color coding of all ungrounded service, feeder, and branch circuits conductors shall be required according to the following convention:

120/240 Volt, 1 phase: black and red

Parallel wire runs shall be run in separate conduits of the same material and as close as possible to the same length.

1.3 MINIMUM SIZES:

Except for control and signal leads, no wire smaller than No. 12 AWG shall be used.

PART 2- PRODUCTS

2.1 MATERIALS:

Wires and cables shall be of annealed, 98% conductivity, soft drawn copper unless indicated otherwise on the Drawings or in these Specifications.

All conductors No. 14 AWG and larger sizes shall be stranded.

2.2 600 VOLT WIRE:

Type THHN/THWN-2 shall be manufactured by Southwire, Okonite Co., or equal.
Multi-conductor control cable shall be stranded copper, 600 Volt polyvinyl chloride insulated and jacketed Type PNR as manufactured by Cerro Wire and Cable Co., General Electric, The Okonite Co., or equal.

2.3 INSTRUMENTATION CABLE:

Process instrumentation wire shall be twisted pair, 600 Volt, polyethylene insulated, copper tape shielded, polyvinyl chloride jacketed, manufactured by General Electric Co., Okonite Co., Belden Corp., or equal.

2.4 WIRE AND CABLE MARKERS:

Wire and cable markers shall be "Omni-Grip" as manufactured by W.H. Brady Co., or equal.

PART 3 - EXECUTION

3.1 INSTALLATION:

All conductors shall be carefully handled to avoid kinks or damage to insulation.

Wiring of different system voltages shall be installed in separate raceways.

All wires, cables, and each conductor of multi-conductor cables shall be uniquely identified at each end by color or with wire and cable markers. Lighting and receptacle wiring shall be distinctly differentiated and junction boxes marked.

Lubrications shall be used, if required, to facilitate wire pulling. Lubricants shall be U.L. approved for use with the insulation specified.

Shielded instrumentation wire shall be installed from terminal to terminal with no splicing at any intermediate point.
Shielding on instrumentation wire shall be grounded at the transmitter end only.

3.2 TESTS:

All 600 Volt wire insulation shall be tested with a "megger" after installation. Tests shall be made at not less than 500 Volts.

END OF SECTION 16120

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pipe sleeves.

B. Pipe sleeve-seals.

1.02 REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2022a.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

C. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified this section.
   1. Minimum three years experience.

C. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.04 WARRANTY

A. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 1 inch (25 mm) above finished floor.
   2. Provide sealant for watertight joint.
   3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.

B. Plastic or Moisture-Resistant Fiber: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

C. Pipe Passing Through Below Grade Exterior Walls:
   1. Zinc coated or cast iron pipe.
   2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

D. Clearances:
   1. Provide allowance for insulated piping.
   2. Wall, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external pipe diameter.

3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.02 PIPE-SLEEVE SEALS

A. Modular Mechanical Sleeve-Seal:
   1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
   2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
   3. Size and select seal component materials in accordance with service requirements.
   4. Service Requirements:
      a. Corrosion resistant.
      b. Underground, buried, and wet conditions.
      c. Fire Resistant: 1 hour, UL (DIR) approved.
   5. Glass-reinforced plastic pressure end plates.

B. Sealing Compounds:
   1. Provide packing and sealing compound to fill pipe to sleeve thickness.
   2. Combined packing and sealing compounding to match partition fire-resistance hourly rating.

C. Pipe Sleeve Material:
   1. Bearing Walls: Steel, cast iron, or terra-cotta pipe.
   2. Masonry Structures: Sheet metal or fiber.

D. Wall Sleeve: PVC material with waterstop collar, and nailer end-caps.

E. Pipeline-Casing Seals:
   1. End Seals: 1/8 inch (3.1 mm), pull-on type, rubber or synthetic rubber based.

PART 3 - EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

E. Structural Considerations: Do not penetrate building structural members unless indicated.

F. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
   1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
   2. Aboveground Piping:
      a. Pack solid using mineral fiber complying with ASTM C592.
      b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.
   3. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

G. Manufactured Sleeve-Seal Systems:
   1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
   2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
   3. Locate piping in center of sleeve or penetration.
   4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
   5. Tighten bolting for a water-tight seal.
   6. Install in accordance with manufacturer's recommendations.

H. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.03 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION 220517

SECTION 220519 - METERS AND GAUGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pressure gauges.

B. Thermometers.

C. Pressure-temperature test plugs.

1.02 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2022.

B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014 (Reapproved 2020).

C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014 (Reapproved 2021).

1.03 SUBMITTALS

A. Product Data: Provide red-marked product data sheets for each furnished item with associated components and accessories.

PART 2 - PRODUCTS

2.01 PRESSURE GAUGES

A. Bourdon Tube for Liquids and Gases:
   1. Dial Size and Cover: 4-1/2 inch (115 mm) diameter scale with polycarbonate window.
   2. Dial Text and Markings: Black color on white background with scaled kPa and psi units.
   3. Accuracy: ASME B40.100, adjustable commercial grade (D) with 5 percent of span.
   4. Process Connection: Lower-back, 1/4 inch (8 mm, DN) NPT male except where noted.

B. Accessories:
   1. Air or Gas Sensor: Static pressure with compression fittings for bulkhead mounting and 1/4 inch (6.35 mm) diameter tubing.
   2. Gauge Cock: Carbon steel with tee or lever handle for maximum 150 psi (1034 kPa).

2.02 THERMOMETERS

A. General:
   1. Product Compliance: ASTM E1.
   2. Lens: Clear glass, except where stated.
   3. Accuracy: One percent, when tested in accordance with ASTM E77, except where stated.
   4. Scale: Black markings depicting single scale in degrees F where expected process value falls half-span of standard temperature range.

B. Thermometers - Straight: 5 inch (127 mm) v-shape lead-free brass case with clear glass window scale, 2 inch (50.8 mm) NPT stem, 3-1/4 inch (82.5 mm) NPT thermowell, and red or blue non-toxic organic liquid filled glass tube.

C. Thermometers - Adjustable Angle: 7 inch (177.8 mm) v-shape aluminum case with clear glass window scale, 6 inch (152.4 mm) NPT stem, red or blue organic non-toxic liquid filled glass tube, and adjustable joint with positive locking device allowing 360 degrees in horizontal plane or 180 degrees in vertical plane adjustments.

D. Thermometers - Dial Type:
   1. Fixed: 5 inch (125 mm) diameter dial with black pointer, stainless steel case, silicone damping bimetal element, hermetically sealed lens, recalibrating screw, and 2-1/2 inch (63.5 mm) NPT stem.
   2. Adjustable Angle: 5 inch (125 mm) diameter dial with black pointer, stainless steel case, silicone damping bimetal element, hermetically sealed lens, recalibrating screw, and 2-1/2 inch (63.5 mm) NPT stem.

2.03 PRESSURE-TEMPERATURE TEST PLUGS:

A. Size: 500 psi (34.5 bar) capacity; 1/2 inch (13 mm) MPT brass fitting with gasket, cap, and retaining strap for 1/8 inch (3 mm) pressure gauge or temperature probe.

B. Wetted Materials per Temperature Range:
   1. Up to 200 degrees F (93 degrees C): Brass probe with neoprene core.

C. Accessories: Lead-free brass, lever-handle cock and snubber-filter.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports, and test plugs.

3.02 INSTALLATION

A. Install pressure gauges as follows:
   1. Include gauge cock to isolate each gauge and extend nipples for insulation clearance.
   2. Include siphons on high temperature systems and select type according to service rating.
   3. Adjust gauges to selected viewing angle, clean thoroughly, and calibrate to zero.

B. Install thermometers as follows:
   1. Hot Water Heaters: Place upstream and downstream of heater. Add one on the inlet end when using steam as the water heating medium.
   2. Piping: Install thermometers in branch butt weld connection fitting or socket-weld thermowell. Enlarge pipes smaller than 2-1/2 inch (60 mm) to accommodate sockets. Ensure sockets are above insulation clearance.

Locate PT (pressure-temperature) test plugs as indicated on drawings.

END OF SECTION 220519

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Angle valves.

B. Ball valves.

C. Check valves.

D. Flow limiting valves.

1.02 RELATED REQUIREMENTS

A. Section 083100 - Access Doors and Panels.

B. Section 220553 - Identification for Plumbing Piping and Equipment.

C. Section 220719 - Plumbing Piping Insulation.

D. Section 221005 - Plumbing Piping.

1.03 ABBREVIATIONS AND ACRONYMS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Non-rising stem.

E. OS&Y: Outside screw and yoke.

F. PTFE: Polytetrafluoroethylene.

G. RS: Rising stem.

H. TFE: Tetrafluoroethylene.

I. WOG: Water, oil, and gas.

1.04 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013 (Reaffirmed 2018).

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

C. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.

D. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2022.

E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

F. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2020.

G. ASME B31.9 - Building Services Piping; 2020.

H. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.

I. ASTM A351/A351M - Standard Specification for Castings, Austenitic, for Pressure-Containing Parts; 2018, with Editorial Revision (2019).

J. ASTM B61 - Standard Specification for Steam or Valve Bronze Castings; 2015 (Reapproved 2021).

K. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.

L. AWWA C606 - Grooved and Shouldered Joints; 2022.

M. MSS SP-45 - Drain and Bypass Connections; 2020.

N. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.

O. MSS SP-85 - Gray Iron Globe and Angle Valves, Flanged and Threaded Ends; 2011.

P. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

Q. NSF 61 - Drinking Water System Components - Health Effects; 2023.

R. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.05 SUBMITTALS

A. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

B. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

1.06 QUALITY ASSURANCE

A. Manufacturer:
   1. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.
      a. Provide temporary inlet and outlet caps.
      b. Maintain caps in place until installation.
   2. Store valves in shipping containers and maintain in place until installation.
      a. Store valves indoors in dry environment.
      b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

PART 2 - PRODUCTS

2.01 APPLICATIONS

A. See drawings for specific valve locations.

B. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

C. Provide the following valves for the applications if not indicated on drawings:
   1. Shutoff: Ball.
   2. Throttling: Provide ball.
   3. Swing Check (Pump Outlet):
      a. 2 inch (50 mm, DN) and Smaller: Bronze swing check valves with bronze or nonmetallic disc.

D. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.

E. Required Valve End Connections for Non-Wafer Types:
   1. Steel Pipe:
      a. 2 inch (50 mm, DN) and Smaller: Threaded ends.
   2. Copper Tube:
      a. 2 inch (50 mm, DN) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

F. Domestic, Hot and Cold Water Valves:
   1. 2 inch (50 mm, DN) and Smaller:
      a. Bronze and Brass: Provide with solder-joint ends.
      b. Bronze Angle: Class 125, bronze disc.
      c. Ball: Two piece, full port, brass or bronze with brass trim.
      d. Bronze Swing Check: Class 125, bronze disc.

G. Sanitary Waste and Storm Drainage Water Valves:
   1. 2 inch (50 mm, DN) and Smaller:
      a. Bronze and Brass: Provide with solder-joint.
      b. Bronze Angle: Class 125, bronze disc.
      c. Bronze Swing Check: Class 125, bronze disc.
   2. 2-1/2 inch (65 mm, DN) and Larger:
      a. Iron, 2-1/2 inch (65 mm, DN) to 4 inch (100 mm, DN): Provide with threaded or flanged ends.
      b. Iron Swing Check: Class 125, metal seats.
      c. Iron Swing Check with Closure Control: Class 125, lever and spring.
      d. Iron Grooved-End Swing Check: 300 CWP.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:
   1. Handwheel: Valves other than quarter-turn types.
   2. Hand Lever: Quarter-turn valves 6 inch (150 mm, DN) and smaller except plug valves.

D. Insulated Piping Valves: With 2 inch (50 mm, DN) stem extensions and the following features:

1. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
2. Memory Stops: Fully adjustable after insulation is installed.

E. Valve-End Connections:
1. Threaded End Valves: ASME B1.20.1.
2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
3. Pipe Flanges and Flanged Fittings 1/2 inch (15 mm, DN) through 24 inch (600 mm, DN): ASME B16.5.
4. Solder Joint Connections: ASME B16.18.
5. Grooved End Connections: AWWA C606.

F. General ASME Compliance:
1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
2. Solder-joint Connections: ASME B16.18.
3. Building Services Piping Valves: ASME B31.9.

G. Potable Water Use:
1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

H. Valve Bypass and Drain Connections: MSS SP-45.

2.03 BRONZE, ANGLE VALVES

A. Class 150; CWP Rating: 300 psi (2070 kPa):
1. Comply with MSS SP-80, Type 1.
2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
3. End Connections: Pipe thread.
4. Stem: Bronze.
5. Disc: Bronze.
6. Packing: Asbestos free.
7. Handwheel: Bronze or aluminum.

2.04 BRASS, BALL VALVES

A. Two Piece, Full Port with Brass Trim and Female Thread, Male thread, or Solder Connections:
1. Comply with MSS SP-110.
2. WSP Rating: 150 psi (1035 kPa).
3. CWP Rating: 600 psi (4140 kPa).
4. Body: Forged brass.
5. Seats: PTFE.
6. Stem: Brass.
7. Ball: Chrome-plated brass.
8. Operator: Lockable handle and stem extension.

2.05 BRONZE, BALL VALVES

A. General:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.

B. One Piece, Reduced Port with Bronze Trim:
   1. Comply with MSS SP-110.
   2. WSP Rating: 400 psi (2760 kPa).
   3. CWP Rating: 600 psi (4140 kPa).
   4. Body: Bronze.
   5. End Connections: Pipe press.
   6. Seats: PTFE.
   7. Stem: Bronze.
   8. Ball: Chrome plated brass.
   9. Operator: Provide lockable handle and stem extension.

2.06 STAINLESS STEEL, BALL VALVES

A. Two Piece, Full Port with Stainless Steel Trim:
   1. Comply with MSS SP-110.
   2. WSP Rating: 150 psi (1035 kPa).
   3. CWP Rating: 1,000 psi (6895 kPa).
   4. Seats: PFTE.
   5. Stem: Stainless steel, blowout proof.
   6. Ball: Stainless steel, vented.
   7. End Connections: Threaded or socket weld.
   8. Operator: Lockable handle with stem extension.

B. Two Piece, Full Port, Fire Safe, Class 150, Flanged with Stainless Steel Trim:
   1. WSP Rating: 150 psi (1035 kPa).
   2. Seats: TFM.
   3. Stem: Stainless steel, blowout proof.
   4. Ball: Stainless steel, vented.
   5. Operator: Lockable handle with actuator-mounting pad.
   6. Pressure and Temperature Rating: ASME B16.34.

2.07 BRONZE, LIFT CHECK VALVES

A. General:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125:
   1. Comply with MSS SP-80, Type 1, Metal Disc to Metal Seat and Type 2, Nonmetallic Disc to Metal Seat.
   2. CWP Rating: 200 psi (1380 kPa).
   3. Design: Vertical flow.
   4. Body: Comply with ASTM B61 or ASTM B62, bronze.
   5. End Connections: Threaded or soldered.

6. Disc (Type 1): Bronze.

2.08 BRASS, INLINE CHECK VALVES

A. Class 150:
   1. CWP Rating: 200 psi (1380 kPa).

B. Maximum Service Temperature: 250 degrees F (121.1 degrees C).

C. Body: Forged brass.

D. Disc: Forged brass.

E. Seal: PTFE, bubble-tight.

F. End Connections: Soldered.

2.09 BRASS, HORIZONTAL SWING CHECK VALVES

A. Class 125, Threaded or Soldered End Connections:
   1. CWP Rating: 200 psi (1380 kPa).
   2. Body: Forged brass.
   3. Disc: Forged brass.
   4. Hinge-Pin, Screw, and Cap: Forged brass.

2.10 BRONZE, SWING CHECK VALVES

A. General:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125:
   1. Pressure and Temperature Rating: MSS SP-80, Type 3.
   2. Design: Y-pattern, horizontal or vertical flow.
   3. CWP Rating: 200 psi (1380 kPa).
   4. Body: Bronze, ASTM B62.
   5. End Connections: Threaded or soldered.
   6. Disc: Bronze.

C. Class 150:
   1. Pressure and Temperature Rating: MSS SP-80, Type 3.
   2. Design: Y-pattern, horizontal or vertical flow.
   3. WSP Rating: 150 psi (1034 kPa).
   4. CWP Rating: 200 psi (1380 kPa).
   5. Body: Bronze, ASTM B62.
   6. End Connections: Threaded or soldered.
   7. Disc: Bronze.

2.11 STAINLESS STEEL, SWING CHECK VALVES

A. Class 150:
   1. Body and Disc: ASTM A351/A351M-CF8M.
   2. Design: T-pattern, horizontal or vertical flow.
   3. CWP Rating: 150 psi (1034 kPa).
   4. Connection Ends: Flanged.
   5. Pressure and Temperature Rating: ASME B16.34.

2.12 FLOW LIMITING VALVES

A. Size: As indicated on drawings, female threaded.

B. Flow Setting: As indicated on drawings.

C. Flow Accuracy: Plus or minus 5 percent.

D. Body and Cap: Lead-free brass.

E. Cap and Plug: Lead-free brass.

F. Cartridge: Stainless steel with replaceable EPDM seal.

G. Maximum Service Pressure: 600 psi (4137 kPa), WOG.

H. Maximum Service Temperature: 250 degrees F (121.1 degrees C).

I. Accessories: Provide hanging tag and test-plug outlet extensions.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Install check valves where necessary to maintain direction of flow as follows:
   1. Lift Check: Install with stem plumb and vertical.
   2. Swing Check: Install horizontal maintaining hinge pin level.
   3. Orient plate-type into horizontal or vertical position, between flanges.

END OF SECTION 220523

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Prefabricated trapeze-framed systems.

B. Strut systems for pipe or equipment support.

C. Beam clamps.

D. Pipe hangers.

E. Pipe supports, guides, shields, and saddles.

F. Anchors and fasteners.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 055000 - Metal Fabrications.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

M. FM (AG) - FM Approval Guide; Current Edition.

N. MFMA-4 - Metal Framing Standards Publication; 2004.

O. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

P. UL (DIR) - Online Certifications Directory; Current Edition.

Q. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

B. Installer's Qualifications: Include evidence of compliance with specified requirements.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

A. Comply with applicable building code.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.

B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.

C. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.

D. Fire Resistance: Provide hardware rated for 60 minutes resistance unless specifically indicated by the authority having jurisdiction.

E. Materials for Metal Fabricated Supports: Comply with Section 055000.
   1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
   2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.

F. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.
   1. Outdoor, Damp, or Wet-Indoor Locations: Use stainless steel or approved equivalent unless otherwise indicated.

2.02 PREFABRICATED TRAPEZE-FRAMED SYSTEMS

A. Prefabricated Trapeze-Framed Metal Strut Systems:
   1. MFMA-4 compliant, prefabricated, side-loading continuous-slot metal strut channel bracket with associated tracks, fittings, and related accessories.
   2. Strut Channel or Bracket Material:
      a. Indoor Dry Locations: Use zinc-plated steel or galvanized steel.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
   3. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
   4. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

2.03 STRUT SYSTEMS FOR PIPE OR EQUIPMENT SUPPORT

A. Strut Channels:
   1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
   2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.

B. Hanger Rods:
   1. Threaded zinc-plated steel unless otherwise indicated.
   2. Minimum Size, Unless Otherwise Indicated or Required:
      a. Equipment Supports: 1/2 inch (13 mm, DN) diameter.
      b. Piping up to 1 inch (25 mm, DN): 1/4 inch (6 mm, DN) diameter.

c. Piping larger than 1 inch (25 mm, DN): 3/8 inch (10 mm, DN) diameter.
d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) in length.

C. Channel Nuts:
1. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring as indicated on drawings.

2.04 BEAM CLAMPS

A. C-Clamp: MSS SP-58 type 23, malleable iron and steel with stainless steel and zinc finish.

B. Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with zinc finish. For inverted usage provide manufacturer listed size(s).

C. FM (AG) and UL (DIR) Approved Beam Clamp: MSS SP-58 type 19, plated finish.

D. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.

E. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2.05 PIPE HANGERS

A. Swivel Ring Hangers, Adjustable:
1. MSS SP-58 type 10, epoxy-painted, zinc-colored.
2. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
3. FM (AG) and UL (DIR) listed for specific pipe size runs and loads.

B. Clevis Hangers, Adjustable:
1. UL (DIR) listed: Pipe sizes 2-1/2 to 8 inch (65 to 200 mm, DN).
2. FM (AG) listed: Pipe sizes 2-1/2 to 8 inch (65 to 200 mm, DN).

2.06 PIPE CLAMPS

A. Riser Clamps:
1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, stainless steel, or zinc plated finish.
3. UL (DIR) listed: Pipe sizes 1/2 to 8 inch (15 to 200 mm, DN).

B. Extension Split Pipe Clamp:
1. MSS SP-58 type 12, hinged split ring and yoke roller hanger with epoxy copper or zinc finish.
2. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.
3. Provide hanger rod and nuts of the same type and material for a given pipe run.
4. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

C. Offset Pipe Clamps: Double-leg design two-piece pipe clamp.

D. Strut Clamps:
   1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.
   2. Cushioned Pipe or Tubing Strut Clamp: Provide strut clamp with thermoplastic elastomer cushion having dielectric strength of 670 V/mil (26,398,000 V/m).
   3. Service Temperature Range: Minus 65 to 275 degrees F (Minus 53.8 to 135 degrees C).

E. Insulation Coupling:
   1. Two bolt-type clamps designed for installation under insulation.
   2. Material: Carbon steel with epoxy copper or zinc finish.

2.07 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES

A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

B. U-Bolts:
   1. MSS SP-58 type 24, carbon steel u-bolt for pipe support or anchoring.

C. Intermediate Anchors and Pipe Alignment Guides:
   1. Pipe Sizes 6 inch (150 mm, DN) and Smaller: Minimum clearance of 0.16 inch (4 mm).
   2. Use pipe clamps with oversize pipe sleeve that provides clearance around pipe.

D. Pipe Shields for Insulated Piping:
   1. MSS SP-58 type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
   2. General Construction and Requirements:
      a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
      b. Shields Material: UV-resistant polypropylene with glass fill.
      c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch (321 mm).
      d. Service Temperature: Minus 40 to 178 degrees F (Minus 40 to 81 degrees C).
      e. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

E. Pipe Supports:
   1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
   2. Liquid Temperatures Up to 178 degrees F (81 degrees C):
      a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.
      b. Support From Below: MSS SP-58 types 35 through 38.
   3. Operating Temperatures from 122 to 446 degrees F (50 to 230 degrees C):
      a. Overhead Support: MSS SP-58 type 1 or 3 through 12 clamps with appropriate saddle of MSS SP-58 type 40 for insulated pipe.
      b. Roller Chair: MSS SP-58 types 41 or 43 through 46 roller chair support with appropriate saddle of MSS SP-58 type 39 for insulated pipe.
      c. Sliding Support: MSS SP-58 types 35 through 38.

F. Pipe Supports, Thermal Insulated:
   1. General Requirements:
      a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
      b. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.
      c. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
      d. Provide pipe supports for 1/2 to 30 inch (15 to 750 mm, DN) pipes.
      e. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.
   2. PVC Jacket:
      a. Pipe insulation protection shields to be provided with ball bearing hinge and locking seam.
      b. Maximum Service Temperature: 180 degrees F (82 degrees C).
      c. Moisture Vapor Transmission: 0.0071 perm inch (0.0092 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
      d. Minimum Thickness: 60 mil, 0.06 inch (1.524 mm).

G. Thermal Insulated, Surface-Mounted Pipe Supports:
   1. Material: Carbon steel with epoxy copper or zinc finish.
   2. Weather and UV light resistant foam, plastic, or rubber material with built-in strut. Maximum Load: 50 lb (22.7 kg) for single pipe or multiple landed on top strut.

2.08 ANCHORS AND FASTENERS

A. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

B. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.

C. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.

D. Hollow Masonry: Use toggle bolts.

E. Hollow Stud Walls: Use toggle bolts.

F. Steel: Use beam ceiling clamps, beam clamps, machine bolts, or welded threaded studs.

G. Beam Ceiling Flanges: ASTM A47/A47M Grade 32510, malleable iron or stainless steel with copper, stainless steel, or zinc finish.

H. Sheet Metal: Use sheet metal screws.

I. Plastic and lead anchors are not permitted.

J. Hammer-driven anchors and fasteners are not permitted.

K. Preset Concrete Inserts: Continuous metal strut channel and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
   1. Channel Material: Use galvanized steel.
   2. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm) minimum base metal thickness.

3. Manufacturer: Same as manufacturer of metal strut channel framing system.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

G. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

I. Secure fasteners according to manufacturer's recommended torque settings.

J. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. Inspect support and attachment components for damage and defects.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 220529

SECTION 220553 – IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

D. Ceiling tacks.

1.02 RELATED REQUIREMENTS

A. Section 099100 – Painting.

1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.04 SUBMITTALS

A. Schedules:

1. Submit plumbing component identification schedule listing equipment, piping, and valves.
2. Detail proposed component identification data in terms of of wording, symbols, letter size, and color coding to be applied to corresponding product.
3. Valve Data Format: Include id-number, location, function, and model number.

B. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 - PRODUCTS

2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

A. Nameplates:

1. Water heaters.
2. Control panels, transducers, and other related control equipment products.
3. Pumps, tanks, filters, water treatment devices, and other plumbing equipment products.

B. Tags:

1. Piping: 3/4 inch (20 mm) diameter and smaller.
2. Manual operated and automated control valves.
3. Ceiling tacks placed on lay-in ceiling surface to reference plumbing components.

C. Pipe Markers: 3/4 inch (20 mm) diameter and higher.

2.02 NAMEPLATES

A. Description: Laminated piece with up to three lines of text.

1. Letter Color: Black.
2. Letter Height: 1/2 inch (13 mm).
3. Background Color: White.
4. Nameplate Height: 1 inch (25.4 mm).

5. Nameplate Material:
    a. Flexible: Vinyl with adhesive backing per ASTM D709.
    b. Metal: Brass with center-side holes for screw fastening.

2.03 TAGS

A. Flexible: Vinyl with engraved black letters on light contrasting background color with up to three lines of text. Minimum tag size 1-1/2 inch (40 mm) in diameter.

B. Metal: Brass, 19 gauge 1-1/2 inch (40 mm) in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.

C. Valve Tag Chart: Typewritten 12-point letter size list in anodized aluminum frame.

2.04 PIPE MARKERS

A. Comply with ASME A13.1.

B. Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.

C. Flexible Tape Marker: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

D. Identification Scheme, ASME A13.1:
    1. Primary: External Pipe Diameter, Uninsulated or Insulated.
        a. 3/4 to 1-1/4 inches (19 to 32 mm): Use 8 inch (203 mm) field-length with 1/2 inch (13 mm) text height.
        b. 1-1/2 to 2 inches (38 to 51 mm): Use 8 inch (203 mm) field-length with 3/4 inch (19 mm) text height.
        c. 2-1/2 to 6 inches (64 to 152 mm): Use 12 inch (305 mm) field-length with 1-1/4 inch (32 mm) text height.
    2. Secondary: Color scheme per fluid service.
        a. Fire Quenching Fluids: White text on red background.
        b. Water; Potable, and Other: White text on green background.
    3. Tertiary: Other Details.
        a. Directional flow arrow.

2.05 CEILING TACKS

A. Description: Steel with 3/4 inch (20 mm) diameter color coded head.

B. Color code as follows:
    1. Plumbing Equipment: Yellow.
    2. Plumbing Valves: Green.

PART 3 - EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive identification products.

3.02 INSTALLATION

A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags in clear view and align with axis of piping

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.

E. Apply ASME A13.1 Pipe Marking Rules:
   1. Place pipe marker adjacent to changes in direction.
   2. Place pipe marker adjacent each valve port and flange end.
   3. Place pipe marker at both sides of floor and wall penetrations.
   4. Place pipe marker every 25 to 50 feet (7.6 to 15.2 m) interval of straight run.

F. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 220553

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cellular glass insulation.

B. Cellular melamine insulation.

C. Glass fiber insulation.

D. Jacketing and accessories.

1.02 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

B. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

C. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2019).

D. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.

E. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2022.

F. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

G. ASTM C1410 - Standard Specification for Cellular Melamine Thermal and Sound-Absorbing Insulation; 2017 (Reapproved 2023).

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.06 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 CELLULAR MELAMINE INSULATION

A. Insulation: Flexible preformed open-cell polymeric foam tubing, slit lengthwise for installation, complying with applicable requirements of ASTM C1410.
   1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
   2. Maximum Service Temperature: 350 degrees F (176 degrees C).
   3. Density: 0.56 pcf (8.97 kg/cu m).
   4. Factory-Applied Jacketing Material: Paper/Foil/Scrim, PVC, flexible and reinforced, and PVC, semi-rigid.
      a. Color: White.
   5. Jacketing material to be field-applied.

2.03 GLASS FIBER INSULATION

A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
   2. Maximum Service Temperature: 850 degrees F (454 degrees C).
   3. Maximum Moisture Absorption: 0.2 percent by volume.

B. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm (0.029 ng/(Pa s m)).

C. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

D. Vapor Barrier Lap Adhesive: Compatible with insulation.

E. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

2.04 CELLULAR GLASS INSULATION

A. Insulation: ASTM C552, Type II, Grade 6.
   1. K (Ksi) Value: 0.35 (0.050) at 100 degrees F (38 degrees C).
   2. Service Temperature Range: From 250 degrees F (121 degrees C) to 800 degrees F (427 degrees C).
   3. Water Vapor Permeability: 0.005 perm inch (0.007 ng/(Pa s m)) maximum per inch.
   4. Water Absorption: 0.5 percent by volume, maximum.

2.05 JACKETING AND ACCESSORIES

A. PVC Plastic Jacket:
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
      b. Maximum Service Temperature: 150 degrees F (66 degrees C).
      c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/(Pa s m)), maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil, 0.010 inch (0.25 mm).
      e. Connections: Brush on welding adhesive.

B. Aluminum Jacket:
   1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch (0.41 mm) with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
   2. Thickness: 0.016 inch (0.40 mm) sheet.
   3. Finish: Smooth.
   4. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
   5. Fittings: 0.016 inch (0.40 mm) thick die-shaped fitting covers with factory-attached protective liner.
   6. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.

C. Aluminum-Foil Laminate Jacket:
   1. Factory-applied, pressure sensitive adhesive jacketing on paper release liner.
   2. Finish: Aluminum smooth.
   3. Comply with ASTM C1775.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

E. Install cellular melamine with factory-applied jackets with a manufacturer-approved adhesive along seams, both straight lap joints and circumferential lap joints.
   1. Install seal over seams with factory-approved room temperature vulcanization (RTV) silicone sealant to ensure a positive vapor barrier seal in outdoor and sanitary washdown environments.

F. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

G. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

H. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.

I. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

J. Inserts and Shields:
   1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert Location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.

K. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.

L. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with PVC jacket and fitting covers.

M. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

N. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil, 0.001 inch (0.025 mm) thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

3.03 SCHEDULES

A. Plumbing Systems:
   1. Domestic Hot Water Supply:
      a. Cellular Melamine Foam Insulation.
      b. Glass Fiber Insulation.
      c. Cellular Glass Insulation.
   2. Domestic Hot Water Recirculation:

a. Cellular Melamine Foam Insulation.
b. Glass Fiber Insulation.
c. Cellular Glass Insulation.

END OF SECTION 220719

SECTION 221005 - PLUMBING PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Sanitary waste piping, buried within 5 feet (1500 mm) of building.

B. Sanitary waste piping, above grade.

C. Domestic water piping, buried within 5 feet (1500 mm) of building.

D. Domestic water piping, above grade.

E. Pipe flanges, unions, and couplings.

F. Pipe hangers and supports.

G. Pipe sleeve-seal systems.

H. Ball valves.

I. Butterfly valves.

J. Balancing valves.

K. Flow-balancing valves.

L. Control and service valves.

M. Pressure-temperature valves.

N. Strainers.

1.02 RELATED REQUIREMENTS

A. Section 099100 - Painting.

B. Section 220553 - Identification for Plumbing Piping and Equipment.

1.03 REFERENCE STANDARDS

A. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2020).

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

D. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV; 2021.

E. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings—DWV; 2022.

F. ASME B31.9 - Building Services Piping; 2020.

G. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2023.

H. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.

I. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

J. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2021.

K. ASTM B32 - Standard Specification for Solder Metal; 2020.

L. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2020.

M. ASTM B43 - Standard Specification for Seamless Red Brass Pipe, Standard Sizes; 2020.

N. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

O. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

P. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2020.

Q. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.

R. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.

S. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.

T. ASTM C1277 - Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings; 2020.

U. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020.

V. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

W. AWWA C550 - Protective Interior Coatings for Valves and Hydrants; 2017.

X. AWWA C606 - Grooved and Shouldered Joints; 2022.

Y. AWWA C651 - Disinfecting Water Mains; 2014, with Addendum (2020).

Z. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.

AA. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.

BB. IAPMO IGC 361 - Continuous Flexible Self-Plunging Waste Pipes; 2019.

CC. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).

DD. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).

EE. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).

FF. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.

GG. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

HH. MSS SP-67 - Butterfly Valves; 2022.

II. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

JJ. NSF 61 - Drinking Water System Components - Health Effects; 2023.

KK. NSF 372 - Drinking Water System Components - Lead Content; 2022.

LL. UL (DIR) - Online Certifications Directory; Current Edition.

MM. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

B. Welders' Certificates: Submit certification of welders' compliance with ASME BPVC-IX.

C. Sustainable Design Documentation: For soldered copper joints, submit installer's certification that the specified installation method and materials were used.

D. Project Record Documents: Record actual locations of valves.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.

E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

2.02 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. Cast Iron Pipe: ASTM A74 extra heavy weight.
   1. Fittings: Cast iron.
   2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

C. Copper Tube: ASTM B306, DWV.
   1. Fittings: ASME B16.23, cast copper, or ASME B16.29, wrought copper.
   2. Joints: ASTM B32, alloy Sn50 solder.

2.03 SANITARY WASTE PIPING, ABOVE GRADE

A. Continuous Flexible Self-Plunging Waste Pipes: IAPMO IGC 361, provide to connect lavatories and sink tail piece to PVC sanitary waste piping.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. Copper Tube: ASTM B306, DWV.
   1. Fittings: ASME B16.29, wrought copper, or ASME B16.23, sovent.
   2. Joints: ASTM B32, alloy Sn50 solder.

D. Aluminum DWV Pipe:
   1. Fittings: Cast iron.
   2. Joints: ASTM C564, thermoplastic rubber coupling and stainless steel clamps.

E. Brass Pipe: ASTM B43, chrome plated.
   1. Fittings: ASME B16.23, cast bronze, chrome plated.
   2. Joints: Mechanical compression.

2.04 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. Copper Pipe: ASTM B42, hard drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.

2. Joints: ASTM B32, alloy Sn95 solder.

2.05 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Pipe: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.
   3. Mechanical Press Sealed Fittings: Prohibited.

2.06 PIPE FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 inch (80 mm, DN) and Under:
   1. Ferrous Pipe: Class 150 malleable iron threaded unions.
   2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Sizes Over 1 inch (25 mm, DN):
   1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
   2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
   1. Dimensions and Testing: In accordance with AWWA C606.
   2. Housing Material: Provide ASTM A47/A47M malleable iron, ductile iron, or _____, galvanized.
   3. Gasket Material: Nitrile rubber suitable for operating temperature range from minus 20 degrees F to 180 degrees F (minus 29 degrees C to 82 degrees C).
   4. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
   5. When pipe is field grooved, provide coupling manufacturer's grooving tools.

D. No-Hub Couplings:
   1. Testing: In accordance with ASTM C1277 and CISPI 310.
   2. Gasket Material: Neoprene complying with ASTM C564.
   3. Band Material: Stainless steel.
   4. Eyelet Material: Stainless steel.

2.07 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.
   4. Vertical Pipe Support: Steel riser clamp.

B. Plumbing Piping - Drain, Waste, and Vent:
   1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Carbon steel, adjustable swivel, split ring.

2. Hangers for Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
3. Wall Support for Pipe Sizes to 3 inch (80 mm, DN): Cast iron hook.
4. Wall Support for Pipe Sizes 4 inch (100 mm, DN) and Over: Welded steel bracket and wrought steel clamp.
5. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Plumbing Piping - Water:
1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Carbon steel, adjustable swivel, split ring.
2. Hangers for Cold Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
3. Wall Support for Pipe Sizes Up to 3 inch (80 mm, DN): Cast iron hook.
4. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
5. Floor Support for Hot Pipe Sizes to 4 inch (100 mm, DN): Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Comply with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Comply with ICC-ES AC01.
3. Concrete Screw Type Anchors: Comply with ICC-ES AC193.
4. Masonry Screw Type Anchors: Comply with ICC-ES AC106.
5. Concrete Adhesive Type Anchors: Comply with ICC-ES AC308.
6. Other Types: As required.

2.08 PIPE SLEEVE-SEAL SYSTEMS

A. Modular Mechanical Seals:
1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
3. Size and select seal component materials in accordance to service requirements.
4. Service Requirements:
   a. Corrosion resistant.
   b. Underground, buried, and wet conditions.
   c. Fire Resistant: 1 hour, UL (DIR) approved.
5. Glass reinforced plastic pressure end plates.

B. Wall Sleeve: PVC material with water-stop collar, and nailer end-caps.

C. Sleeve-Forming Disk: Non-conductive plastic-based material, 3 inch (76.2 mm) thick.

D. Pipeline-Casing Seals:
1. Coated metallic boltless casing-spacer for 4 inch (100 mm) carrier pipe.
2. End Seals: 1/8 inch (3.1 mm), pull-on type, rubber or synthetic rubber based.

2.09 BALL VALVES

A. Construction, 4 inch (100 mm, DN) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

2.10 BUTTERFLY VALVES

A. Construction 1-1/2 inch (40 mm, DN) and Larger: MSS SP-67, 200 psi (1380 kPa) CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.

B. Provide gear operators for valves 8 inches (150 mm, DN) and larger, and chain-wheel operators for valves mounted over 8 feet (2400 mm) above floor.

2.11 BALANCING VALVES

A. Construction: Class 125, brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

B. Automatic Flow Limiting Cartridge, Size 3/4 inch (20 mm, DN):
   1. Class 125, brass or bronze body, stainless steel cartridge, threaded connections with built-in union, dual PT (hot and cold pressure-temperature) test ports for 400 psi (2,758 kPa), 0.5 gpm (1.9 Lpm) WOG service.

C. Automatic Flow Limiting Cartridge with Ball Valve, Size 1/2 to 1 inch (15 to 25 mm, DN):
   1. Class 125, brass or bronze body, stainless steel cartridge, leak-proof stem, threaded or soldered connections with built-in union, dual PT (hot and cold pressure-temperature) test ports for 400 psi (2,758 kPa), 0.25 to 1.5 gpm (0.9 to 5.6 Lpm) WOG service.

D. Calibration: Control flow within five percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

2.12 FLOW-BALANCING VALVES

A. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

B. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

2.13 CONTROL AND SERVICE VALVES

A. Flow Control Valves:
   1. Size: 1/2 to 40 inch (15 to 1,000 mm, DN), Class 150 flange ends.
   2. AWWA C550 compliant cast iron globe valve, elastomeric diaphragm, seat disc and epoxy coated both internally and externally.
   3. Differential Pressure Based Rate-of-Flow Pilot-Operator:
      a. Operating Range: 25 to 50 psi (1.72 to 3.4 Bar).
      b. Connected into brass, bronze, or copper pilot piping and fittings.
      c. Precision fixed-flow restrictor, strainer, pressure gauges, and isolation valves.

2.14 PRESSURE-TEMPERATURE VALVES

A. ANSI Z21.22, AGA certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F (98.9 degrees C), capacity ASME BPVC-IV certified and labelled.

2.15 STRAINERS

A. Size 1/2 inch (15 mm, DN) to 3 inch (80 mm, DN):
   1. Class 150, threaded or soldered forged bronze Y-pattern body, stainless steel perforated mesh screen with cap, and rated for 150 psi (1,034 kPa), 250 deg F (121.1 deg C) WOG service.

B. Size 2 inch (50 mm, DN) and Smaller:
   1. Threaded brass body for 175 psi (1200 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
   2. Class 150, threaded bronze body 300 psi (2070 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Provide access where valves and fittings are not exposed.

H. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
   1. See Section 099100 for painting of interior plumbing systems and components.

I. Install valves with stems upright or horizontal, not inverted. See Section 220523.

J. Install water piping to ASME B31.9.

K. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

L. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

M. Sleeve pipes passing through partitions, walls, and floors.

N. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

O. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as indicated.
   3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
   4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
   5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   7. Provide copper plated hangers and supports for copper piping.
   8. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
   9. Support cast iron drainage piping at every joint.

P. Pipe Sleeve-Seal Systems:
   1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
   2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
   3. Locate piping in center of sleeve or penetration.
   4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
   5. Tighten bolting for a watertight seal.
   6. Install in accordance with manufacturer's recommendations.

3.04 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

D. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Install ball valves for throttling, bypass, or manual flow control services.

F. Provide spring-loaded check valves on discharge of water pumps.

G. Provide flow controls in water recirculating systems where indicated.

3.05 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/4 inch per foot (1:50) slope.

B. Water Piping: Slope at minimum of 1/32 inch per foot (1:400) and arrange to drain at low points.

3.06 FIELD TESTS AND INSPECTIONS

A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.

B. Domestic Water Systems:
   1. Perform hydrostatic testing for leakage prior to system disinfection.
   2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
   3. General:
      a. Fill the system with water and raise static head to 10 psi (345 kPa) above service pressure. Minimum static head of 50 to 150 psi (345 to 1,034 kPa). As an exception, certain codes allow a maximum static pressure of 80 psi (551.6 kPa).

C. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.07 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed, and clean.

B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.08 SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage.

B. Provide new water service complete with approved backflow preventer water meter as indicated on civil drawings.

1. Provide 18 gauge, 0.0478-inch (1.21 mm) galvanized sheet metal sleeve around service main to 6 inch (150 mm) above floor and 6 feet (1800 mm) minimum below grade. Size for minimum of 2 inches (50 mm) of loose batt insulation stuffing.

3.09 SCHEDULES

A. Pipe Hanger Spacing:
   1. Metal Piping:
      a. Pipe Size: 1/2 inch (15 mm, DN) to 1-1/4 inch (32 mm, DN):
         1) Maximum Hanger Spacing: 6.5 ft (2 m).
         2) Hanger Rod Diameter: 3/8 inches (9 mm).
      b. Pipe Size: 1-1/2 inch (40 mm, DN) to 2 inch (50 mm, DN):
         1) Maximum Hanger Spacing: 10 ft (3 m).
         2) Hanger Rod Diameter: 3/8 inch (9 mm).
   2. Plastic Piping:
      a. All Sizes:
         1) Maximum Hanger Spacing: 6 ft (1.8 m).
         2) Hanger Rod Diameter: 3/8 inch (9 mm).

END OF SECTION 221005

SECTION 221006 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Drains.
B. Cleanouts.
C. Hose bibbs.
D. Hydrants.
E. Washing machine outlet boxes.
F. Ice maker outlet boxes.
G. Fixture stop-valve outlet boxes.
H. Backwater valves.
I. Water hammer arrestors.
J. Mixing valves.
K. Relief valves.
L. Air vents.
M. Floor drain trap seals.
N. Electronic trap-seal primers.
O. Exterior penetration accessories.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Manhole bottoms.
B. Section 221005 - Plumbing Piping.
C. Section 223000 - Plumbing Equipment.
D. Section 224000 - Plumbing Fixtures.

1.03 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor Drains; 2022.
B. ASME A112.6.4 - Roof, Deck, and Balcony Drains; 2022.
C. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2023.
D. ASSE 1017 - Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems; 2023.
E. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2011 (Reaffirmed 2016).
F. ASSE 1069 - Performance Requirements for Automatic Temperature Control Mixing Valves; 2020.
G. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.

H. NSF 61 - Drinking Water System Components - Health Effects; 2023.

I. NSF 372 - Drinking Water System Components - Lead Content; 2022.

J. PDI-WH 201 - Water Hammer Arresters; 2017.

1.04 SUBMITTALS

A. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

B. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

C. Manufacturer's qualification statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

A. Floor Drains:

B. Floor Drain:

1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

C. Floor Drain:

1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze extra heavy duty strainer.

2.03 CLEANOUTS

A. Cleanouts at Exterior Surfaced Areas:

1. Round cast nickel bronze access frame and non-skid cover.

B. Cleanouts at Exterior Unsurfaced Areas:

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.

C. Cleanouts at Interior Finished Floor Areas:

1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

D. Cleanouts at Interior Unfinished Accessible Areas: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.04 HOSE BIBBS

A. Interior Hose Bibbs:
   1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome-plated where exposed with handwheel, integral vacuum breaker in compliance with ASSE 1011.

2.05 HYDRANTS

A. Wall Hydrants:
   1. ASSE 1019; freeze resistant, self-draining type with chrome-plated wall plate hose thread spout, handwheel, and integral vacuum breaker.

2.06 WASHING MACHINE OUTLET BOXES

A. Description: Plastic preformed rough-in box with brass quarter-turn ball valves or single lever-handle valves, socket for 2 inch (50 mm) waste, and slip-in finishing cover.

B. Provide fire-rated outlet-box assembly for installation in 1- and 2-hour rated walls.

C. Accessories:
   1. Water-hammer arrestors.
   2. Support brackets for installation between framing studs.

2.07 ICE MAKER OUTLET BOXES

A. Description: Plastic preformed square or round rough-in box with brass quarter-turn ball valve, and slip-in finishing cover.

B. Provide fire-rated outlet-box assembly for installation in 1- and 2-hour rated walls.

C. Accessories:
   1. Water-hammer arrestors.
   2. Support brackets for installation between framing studs.

2.08 FIXTURE STOP-VALVE OUTLET BOXES

A. Description: Preformed plastic rough-in plate with round mini-box and single chrome-plated brass quarter-turn ball valve.

B. Provide fire-rated outlet-fitting assembly for installation in 1- and 2-hour rated walls.

C. Accessories:
   1. Support brackets for installation between framing studs.
   2. Water-supply piping tailpiece.
   3. Escutcheon in white primer or polished chrome finish.

2.09 BACKWATER VALVES

A. Cast Iron Backwater Valves: ASME A112.6.4; lacquered cast iron body and cover, brass valve, extension sleeve, and access cover.

B. Plastic Backwater Valves: ABS body and valve, extension sleeve, and access cover.

2.10 WATER HAMMER ARRESTORS

A. Water Hammer Arrestors:
   1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F (minus 73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

2.11 MIXING VALVES

A. Thermostatic Master Mixing Valves:
   1. Valve: ASSE 1017, bronze or brass body; thermostatic element; corrosion- and lime-resistant internal components; integral locking temperature adjustment.
   2. Capacity: As indicated on drawings.
   3. Mixed-Water Temperature Setting: As indicated on drawings.
   4. Finish: Rough bronze.
   5. Accessories:
      a. Strainer stop checks on inlets.
      b. Shut-off valve on outlet.

B. Automatic Temperature Control Mixing Valves:
   1. Valve: ASSE 1069, bronze or brass body; thermostatic element; corrosion- and lime-resistant internal components; integral locking temperature adjustment; integral check valves with strainer screens on inlets.
   2. Finish: Rough bronze.
   3. Accessories:
      a. Shut-off valve on outlet.

C. Water Temperature Limiting Valves:
   1. Valve: ASSE 1070, bronze or brass body; thermostatic element; corrosion- and lime-resistant internal components; integral locking temperature adjustment with high-temperature limit stop; integral check valves with strainer screens on inlets.

2.12 RELIEF VALVES

A. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

2.13 AIR VENTS

A. Manual Type: Short vertical sections of 2 inch (50 mm) diameter pipe to form air chamber, with 1/8 inch (3 mm) brass needle valve at top of chamber.

B. Float Type:
   1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

C. Washer Type:
   1. Brass with hygroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring loaded ball check valve.

2.14 FLOOR DRAIN TRAP SEALS

A. Description: Push-fit EPDM or silicone fitting with a one-way membrane.

2.15 ELECTRONIC TRAP-SEAL PRIMERS

A. Description: Enclosed electronic trap seal primer system with timer.

2.16 EXTERIOR PENETRATION ACCESSORIES

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

B. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for piping, cables, and roofing system to be installed; designed to accommodate existing penetrations where applicable.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

F. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks or washing machine outlets.

G. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch (20 mm) minimum, and minimum 18 inches (450 mm) long.

END OF SECTION 221006

SECTION 221123 - DOMESTIC WATER PUMPS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Circulators.

1.02 REFERENCE STANDARDS

A. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. NSF 61 - Drinking Water System Components - Health Effects; 2023.

PART 2 - PRODUCTS

2.01 CIRCULATORS

A. Casing: Bronze with bronze cast impeller, and stainless steel rotor assembly.

B. Shaft: Alloy steel with integral thrust collar and two oil-lubricated bronze sleeve bearings.

C. Mechanical Seal: Carbon rotating against a stationary ceramic seat.

D. Performance: As indicated on drawings.

E. Pipe-End Connection: Union connection.

F. Maximum Discharge Pressure: 145 psi (1000 kPa).

G. Motor: 1,750 rpm, ECM duty with flexible coupling.

H. Service Temperature Range: Minus 30 to 250 degrees F (Minus 34.4 to 121.1 degrees C).

I. Controls: Provide aquastat set for high-temp cutoff, electric plug, hand switch, illuminated hand switch, and thermostat set for high-temp cutoff.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products with related fittings, and accessories according to manufacturer instructions.

B. Potable and Drinking Water Service: Provide NSF 61 certified; comply with ICC (IPC).

C. Hot Water Service: Ensure that small pressure-temperature gauges are installed on both upstream and downstream ends.

D. Factory-Provided Pump Controls: Factory provided, tested for use.

E. Cycle Duty Controlled Pumps: Set manually to ON for continuous operation.

F. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

3.02 FIELD QUALITY CONTROL

A. Operational Tests: Upon completion and sterilization of plumbing systems, conduct operating tests to demonstrate satisfactory, functional, and operating efficiency.

3.03 PROTECTION

A. Protect installed products from damage due from subsequent construction operations.

B. Repair or replace products damaged before Date of Substantial Completion.

END OF SECTION 221123

SECTION 223000 - PLUMBING EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Commercial electric water heaters.

B. Point-of-use water filters.

C. In-line circulator pumps.

D. Condensate removal pumps.

1.02 RELATED REQUIREMENTS

A. Section 221123 - Domestic Water Pumps.

B. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data:
   1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Provide electrical characteristics and connection requirements.

B. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

C. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

D. Project Record Documents: Record actual locations of components.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Certifications:
   1. Water Heaters: NSF approved.
   2. Electric Water Heaters: UL listed and labeled to UL 174.
   3. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.07 WARRANTY

A. Manufacturer Warranty: Provide 5-year manufacturer warranty for domestic water heaters. Complete forms in Owner's name and register with manufacturer.

PART 2 - PRODUCTS

2.01 WATER HEATERS

A. Commercial Electric Water Heaters:
   1. Type: Factory-assembled and wired, electric, vertical storage.
   2. Minimum Efficiency Required: ASHRAE Std 90.1 I-P.
   3. Performance: As indicated on drawings.
      a. Maximum Working Pressure: 150 psig (1000 kPa).
   4. Electrical Characteristics: As indicated on drawings.
   5. Tank: Glass lined welded steel; 4 inch (100 mm) diameter inspection port, thermally insulated with minimum 2 inches (50 mm) glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.
   6. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F (16 to 82 degrees C), flanged or screw-in nichrome elements, high temperature limit thermostat.
   7. Accessories:
      a. Water Connections: Brass.
      b. Drain valve.
      c. Anode: Extruded high density.
      d. Temperature and Pressure Relief Valve: ASME labeled.
   8. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 W/sq in (11.6 W/sq m).

2.02 POINT-OF-USE WATER FILTERS

A. Point-of-Use Application: Provide for faucets, ice makers, and sinks.

B. Type: Disposable, side positioned, line or tap installed cartridge, canister, or showerhead filter.

C. Construction: Polymer based material housing with built-in female threaded connections, and internal specific or composite filtering media such as activated carbon, sand, gravel, calcite, limestone, or other mineral media suitable to reduce intended contaminants.

D. Internal Filter Media: Chemical-free, pH-resilient materials proven to reduce bacteria, chlorine, odors, sediment, and trace metals down to the 0.2 micron particle size.

E. Maximum Service Requirements: 100 psi (689.4 kPa) and 130 degrees F (54.4 degrees C).

2.03 IN-LINE CIRCULATOR PUMPS

A. Casing: Bronze, rated for 125 psig (860 kPa) working pressure, with stainless steel rotor assembly.

B. Impeller: Bronze.

C. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.

D. Seal: Carbon rotating against a stationary ceramic seat.

E. Drive: Flexible coupling.

2.04 CONDENSATE REMOVAL PUMPS

A. Construction: Commercial grade, nonferrous pump with stainless steel shaft, integral discharge check valve, integral float switch, safety switch, thermoplastic reservoir, motor assembly, and power cord with ground.

B. Safety: UL 778.

C. Performance: As indicated on drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions required for applicable certifications.

B. Electrical Work: Provide automatic control and protective devices with associated wiring to interconnect related interfaced devices required for specified operation.

C. Coordinate system, equipment, and piping work with applicable electrical, fuel, gas, vent, drain, and waste support interconnections as included or provided by other trades.

D. Pumps:

1. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION 223000

SECTION 224000 - PLUMBING FIXTURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Tank type water closets.

B. Wall hung urinals.

C. Lavatories.

D. Sinks.

E. Under-lavatory pipe supply covers.

F. Shower receptors.

G. Showers.

H. Bi-level, electric water coolers.

I. Mop sinks.

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008 (Reaffirmed 2013).

C. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).

D. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.

E. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2022).

F. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2018, with Errata.

G. ASME A112.19.3 - Stainless Steel Plumbing Fixtures; 2022.

H. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2022.

I. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.

J. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

K. NSF 61 - Drinking Water System Components - Health Effects; 2023.

L. NSF 372 - Drinking Water System Components - Lead Content; 2022.

M. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

B. Manufacturer's Instructions: Indicate installation methods and procedures.

C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on-site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.06 WARRANTY

A. Provide five year manufacturer warranty for electric water cooler.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Maximum Fixture or Faucet Supply Pressure: 60 psi (4.1 bar) unless stated otherwise.

2.02 REGULATORY REQUIREMENTS

A. Comply with applicable codes for installation of plumbing systems.

B. Comply with UL (DIR) requirements.

C. Perform work in accordance with local health department regulations.

D. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of installation.

2.03 TANK TYPE WATER CLOSETS

A. Floor-Mounted Bowl:
   1. ASME A112.19.2; siphon jet, vitreous china, close-coupled closet combination with elongated rim, insulated vitreous china closet tank with fittings and lever flushing valve, bolt caps, vandalproof cover locking device.
   2. Water Consumption: 1.28 gal (4.8 L) per flush, maximum.
   3. Handle Height: 44 inches (1117 mm) or less.
   4. Trapway Outlet: 4 inch (100 mm, DN).

B. Toilet Seats:
   1. Plastic: Solid, white, elongated, open front, hinged seat cover, extended back with self-sustaining hinges, and brass bolts with covers.

2.04 WALL HUNG URINALS

A. Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.
   1. Consumption Volume: 0.125 gal (0.47 L) per flush, maximum.
   2. Flush Valve: Exposed (top spud).
   3. Flush Operation: Manual, oscillating handle.
   4. Trapway Outlet: Integral.

5. Supply Size: 3/4 inch (19 mm).

B. Flush Valves:
   1. Manual Operated:
      a. Type: ASME A112.18.1 or ASME A112.19.5; diaphragm type, complete with vacuum breaker stops, and accessories.
      b. Supplied Volume Capacity: 0.125 gal (0.47 L) per flush.

C. Urinal Carriers:
   1. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.05 LAVATORIES

A. Wall-Hung Basin:
   1. Vitreous China: ASME A112.19.2; white, oval basin with splash lip, front overflow, soap depression, and hanger. Size as indicated on drawings with 4-inch (100 mm) centerset spacing.
   2. Carrier:
      a. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.

B. Supply Faucet:
   1. ASME A112.18.1; chrome plated combination supply fitting with pop-up waste, water economy aerator with maximum flow of 2.2 gpm (8.3 L/min), indexed handles.
   2. Single-Lever Handle, Supply Faucet: ASME A112.18.1; deck-mount, ceramic cartridge disc valve, and maximum flow of 0.5 gpm, low-flow (1.9 L/min, low-flow).

C. Thermostatic Mixing Valve:
   1. ASSE 1070 listed with combination stop, strainer, and check valves, and flexible stainless steel connectors.

D. Accessories:
   1. Chrome-plated 17 gauge, 0.0538 inch (1.37 mm) brass P-trap with clean-out plug and arm with escutcheon.

E. Lavatory Carrier:
   1. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.

2.06 SINKS

A. Single Compartment Bowl
   1. ASME A112.19.3; 18 gauge, 0.050 inch (1.27 mm) thick, type 304 stainless steel, self-rimming and undercoated, with ledge back drilled for trim.
   2. Drain: 3-1/2 inch (90 mm) crumb cup and tailpiece.

B. Double Compartment Bowl:
   1. ASME A112.19.3; 18 gauge, 0.050 inch (1.27 mm) thick, type 304 stainless steel, self- rimming and undercoated, with ledge back drilled for trim.
   2. Drain: 3-1/2 inch (90 mm) crumb cup and tailpiece.

C. Undermount-Installed Single Compartment Bowl:
   1. Undercoated bottom sound deadening pads.
   2. Drain: 3-1/2 inch (90 mm), stainless steel with strainer, crumb cup, and tailpiece.

D. Undermount-Installed Double Compartment Bowl:
   1. ASME A112.19.3, stainless steel, 18 gauge, 0.050 inch (1.27 mm), type 304 stainless steel.
   2. Undercoated with bottom sound deadening pads.
   3. Bowl Proportion: Equally sized.
   4. Drain: 3-1/2 inch (90 mm), stainless steel with strainer, crumb cup, and tailpiece.

E. Kitchen Faucets:
   1. Single Handle Faucet:
      a. Type: Deck-mount, low-arc, swivel faucet with mounting plate.
      b. Spray Type: Full stream spray at 1.8 gpm (6.8 L/min), maximum.
      c. ASME A112.18.1, ADA Standards, and NSF 61 compliant assembly.
      d. Materials: Ceramic disc-cartridge valve on brass body with polished chrome finish.
   2. Single Handle Faucet with Side Spray:
      a. Type: Deck-mount, low-arc, swivel spout faucet with mounting plate.
      b. Spray Type: Full stream spray at 1.8 gpm (6.8 L/min), maximum.
      c. ASME A112.18.1, ADA Standards, and NSF 61 compliant assembly.
      d. Materials: Ceramic disc-cartridge valve on brass body with polished chrome finish.

2.07 UNDER-LAVATORY PIPE SUPPLY COVERS

A. General:
   1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
   2. Adhesives, sewing threads and two ply laminated materials are prohibited.
   3. Construction: 1/8 inch (3.2 mm) PVC with antimicrobial, antifungal and UV resistant properties.
      a. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
      b. Comply with ICC A117.1.
   4. Color: High gloss white.

2.08 SHOWER RECEPTORS

A. Drain Trim: Removable chrome-plated strainer and tail piece.

2.09 SHOWERS

A. Wall Mounted Shower Valve:
   1. Comply with ASME A112.18.1.
   2. Provide two-way, in-wall diverter valve body with integral thermostatic mixing valve to supply 1.5 gpm (5.6 L/min).

B. Low-Flow Shower Head:
   1. ASME A112.18.1; chrome-plated vandal-proof institutional head with integral wall bracket, built-in 1.5 gpm (0.094 L/s) flow control.

C. Thermostatic Mixing Valve:
   1. ASSE 1070 listed with combination stop, strainer, and check valves, and flexible stainless steel connectors.

2.10 BI-LEVEL, ELECTRIC WATER COOLERS

A. Water Cooler: Bi-level, electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.
   1. Capacity: 8 gph (30.3 Lph) of 50 degrees F (10 degrees C) water with inlet at 80 degrees F (27 degrees C) and room temperature of 90 degrees F (32 degrees C), when tested in accordance with ASHRAE Std 18.
   2. Electrical: 115 VAC, 60 Hertz compressor, 6 foot (2 m) cord and plug for connection to electric wiring system including grounding connector.

B. Bottle Filler: Materials to match fountain.

2.11 MOP SINKS

A. Material: Molded high density composite basin.

B. Type: Rectilinear.

C. Tiling Flange Construction: Galvanized steel.

D. Grid Strainer: Stainless steel; integral; removable.

E. Dimensions: As indicated on drawings.

F. Accessories:
   1. 5 feet (1.5 m) of 1/2 inch (13 mm) diameter plain end reinforced plastic hose.
   2. Hose clamp hanger.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Install components level and plumb.

C. Install and secure fixtures in place with wall carriers and bolts.

D. Solidly attach water closets to floor with lag screws. Lead flashing is not intended to hold fixture in place.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

A. Clean plumbing fixtures and equipment.

3.07 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 224000

SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pipe sleeves.

B. Pipe-sleeve seals.

1.02 RELATED REQUIREMENTS

A. Section 230553 - Identification for HVAC Piping and Equipment: Piping identification.

B. Section 230719 - HVAC Piping Insulation.

1.03 REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2022a.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified this section.

1. Minimum three years experience.

C. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.06 WARRANTY

A. Correct defective Work within a ___year period after Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PIPE SLEEVES

A. Vertical Piping:

1. Sleeve Length: 12 inch (304 mm) above finished floor.
2. Provide sealant for watertight joint.
3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.

B. Plastic, Sheet Metal, or Moisture-Resistant Fiber: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

C. Pipe Passing Through Below Grade Exterior Walls:

1. Zinc coated or cast iron pipe.
2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

D. Clearances:
1. Provide allowance for insulated piping.
2. Wall, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external pipe diameter.
3. All Rated Openings: Caulked tight with fire stopping material in compliance with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.02 PIPE-SLEEVE SEALS

A. Modular Mechanical Sleeve-Seal:
1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
3. Size and select seal component materials in accordance with service requirements.
4. Glass-reinforced plastic pressure end plates.

PART 3 EXECUTION

3.01 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Inserts:
1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

E. Provide sleeves when penetrating footings, floors, walls, partitions, and _____. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
2. Aboveground Piping:
a. Pack solid using mineral fiber in compliance with ASTM C592.
b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.

3. All Rated Openings: Caulk tight with fire stopping material in compliance with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

F. Manufactured Sleeve-Seal Systems:
1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
3. Locate piping in center of sleeve or penetration.
4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
5. Tighten bolting for a water-tight seal.
6. Install in accordance with manufacturer's recommendations.

G. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.02 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION 230517

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 230548 - Vibration and Seismic Controls for HVAC.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

I. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

K. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

L. FM (AG) - FM Approval Guide; Current Edition.

M. MFMA-4 - Metal Framing Standards Publication; 2004.

N. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

O. UL (DIR) - Online Certifications Directory; Current Edition.

P. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

B. Installer's Qualifications: Include evidence of compliance with specified requirements.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

A. Comply with applicable building code.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 2X. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.

5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
    c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Prefabricated Trapeze-Framed Metal Strut Systems:
1. MFMA-4 compliant, prefabricated, side-loading continuous-slot metal strut channel bracket with associated tracks, fittings, and related accessories.
2. Strut Channel or Bracket Material:
    a. Indoor Dry Locations: Use zinc-plated steel or galvanized steel.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
3. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
4. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

C. Strut Channels:
1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.

D. Channel Nuts:
1. Provide carbon steel channel nut with epoxy copper, galvanized steel, or stainless steel finish and long, regular, or short spring.

E. Hanger Rods:
1. Threaded zinc-plated steel unless otherwise indicated.
2. Minimum Size, Unless Otherwise Indicated or Required:
    a. Equipment Supports: 1/2 inch (13 mm) diameter.
    b. Piping up to 1 inch (25 mm, DN): 1/4 inch (6 mm) diameter.
    c. Piping larger than 1 inch (25 mm, DN): 3/8 inch (10 mm) diameter.
    d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) diameter.

F. Thermal Insulated Pipe Supports:
1. General Requirements:
    a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
    b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
    c. Pipe supports to be provided for nominally sized, 1/2 to 30 inch (15 to 750 mm, DN) iron pipes.

d. Insulation inserts to consist of rigid polyisocyanurate (urethane) insulation surrounded by a 360 degree, PVC jacketing.

2. PVC Jacket:
   a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
   b. Maximum Service Temperature: 180 degrees F (82 degrees C).
   c. Moisture Vapor Transmission: 0.0071 perm inch (0.0092 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
   d. Thickness: 60 mil (1.524 mm).
3. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.

G. Pipe Supports:
1. Material: ASTM A36/A36M carbon steel, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
2. Liquid Temperatures Up To 122 degrees F (50 degrees C):
   a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
   b. Support From Below: MSS SP-58 Types 35 through 38.

H. Beam Clamps:
1. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.
2. Beam C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.
3. Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish. For inverted usage provide manufacturer listed size(s).
4. Wide Mouth Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish.
5. Center load Beam Clamp with Extension Piece: MSS SP-58 type 30, malleable iron with plain finish.
6. FM (AG) and UL (DIR) Approved Beam Clamp: MSS SP-58 type 19, plain finish,
7. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
8. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

I. Riser Clamps:
1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
3. Medium Split Horizontal Pipe Clamp: MSS SP-58 type 4, carbon steel or stainless steel with epoxy plated, plain, stainless steel, or zinc plated finish.
4. Copper Tube Pipe Clamp: MSS SP-58 type 8, epoxy plated copper.
5. UL (DIR) listed: Pipe sizes 1/2 to 8 inch (15 to 200 mm, DN).

J. U-Bolts:
1. MSS SP-58 Type 24, carbon steel u-bolt for pipe support or anchoring.

K. Offset Pipe Clamps: Double-leg design two-piece pipe clamp.

L. Strut Clamps:
   1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.
   2. Cushioned Pipe or Tubing Strut Clamp: Provide strut clamp with thermoplastic elastomer cushion having dielectric strength of 670 V/mil (26,398,000 V/m).

M. Insulation Clamps:
   1. Two bolt-type clamps designed for installation under insulation.
   2. Material: Carbon steel with epoxy copper, stainless steel, or zinc finish.

N. Pipe Hangers:
   1. Swivel Ring Hangers, Adjustable:
      a. MSS SP-58 Type 10, epoxy-painted, zinc-colored.
      b. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
      c. FM (AG) and UL (DIR) listed for specific pipe size runs and loads.
   2. Clevis Hangers, Adjustable:
      a. Copper Tube: MSS SP-58 Type 1, epoxy-plated copper.
      b. Standard-Duty: MSS SP-58 Type 1, zinc-colored, epoxy plated.
      c. UL (DIR) listed: Pipe sizes 2-1/2 to 8 inch (65 to 200 mm, DN).
      d. FM (AG) listed: Pipe sizes 2-1/2 to 8 inch (65 to 200 mm, DN).

O. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

P. Pipe Shields for Insulated Piping:
   1. General Construction and Requirements:
      a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
      b. Shields Material: UV-resistant polypropylene with glass fill.
      c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch (321 mm).
      d. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
      e. Maximum Service Temperature: 178 degrees F (81 degrees C).
      f. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

Q. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
   2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
   3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
   4. Hollow Masonry: Use toggle bolts.
   5. Hollow Stud Walls: Use toggle bolts.
   6. Steel: Use beam-ceiling clamps, beam clamps, machine bolts, or welded threaded studs.

7. Beam Ceiling Flanges: ASTM A47/A47M Grade 32510, malleable iron or stainless steel with copper, plain, stainless steel, or zinc finish.
8. Sheet Metal: Use sheet metal screws.
9. Plastic and lead anchors are not permitted.
10. Powder-actuated fasteners are not permitted.
11. Hammer-driven anchors and fasteners are not permitted.
12. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    a. Comply with MFMA-4.
    b. Channel Material: Use galvanized steel.
    c. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm) minimum base metal thickness.
    d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
13. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

R. Pipe Installation Accessories:
1. Thermal Insulated, Surface-Mounted Pipe Supports:
    a. Material: Carbon steel with epoxy copper or zinc finish.
    b. Weather and UV light resistant foam, plastic, or rubber material with built-in strut. Maximum Load: 50 lb (22.7 kg) for single pipe or multiple landed on top strut.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

H. Equipment Support and Attachment:

1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

J. Secure fasteners according to manufacturer's recommended torque settings.

K. Remove temporary supports.

END OF SECTION 230529

SECTION 230548 - VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Vibration isolation requirements.

B. Vibration-isolated equipment support bases.

C. Vibration isolators.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

C. Manufacturer’s detailed field testing and inspection procedures.

D. Field quality control test reports.

1.06 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing HVAC equipment and/or HVAC connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
   1. Select vibration isolators to provide required static deflection.
   2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.

D. Equipment Isolation: As indicated on drawings.

2.02 VIBRATION ISOLATORS

A. General Requirements:
   1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
   2. Spring Elements for Spring Isolators:
      a. Color code or otherwise identify springs to indicate load capacity.
      b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
      c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
      d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
      e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
      f. Selected to function without undue stress or overloading.

B. Vibration Isolators for Nonseismic Applications:
   1. Resilient Material Isolator Pads:
      a. Description: Single or multiple layer pads utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material.
      b. Pad Thickness: As required for specified minimum static deflection; minimum 0.25 inch (6 mm) thickness.
      c. Multiple Layer Pads: Provide bonded, galvanized sheet metal separation plate between each layer.
   2. Resilient Material Isolator Mounts, Nonseismic:
      a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material; fail-safe type.

3. Open (Unhoused) Spring Isolators:
    a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) without a housing.
    b. Bottom Load Plate: Nonskid, molded, elastomeric isolator material or steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.
    c. Furnished with integral leveling device for positioning and securing supported equipment.
4. Housed Spring Isolators:
    a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing.
    b. Furnished with integral elastomeric snubbing elements, nonadjustable type, for limiting equipment movement and preventing metal-to-metal contact between housing elements.
    c. Bottom Load Plate: Steel with nonskid, elastomeric isolator pad with provisions for bolting to supporting structure as required.
    d. Furnished with integral leveling device for positioning and securing supported equipment.
5. Resilient Material Isolator Hangers, Nonseismic:
    a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the lower hanger rod connection.
6. Spring Isolator Hangers, Nonseismic:
    a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.
    b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Vibration Isolation Systems:
    1. Spring Isolators:
        a. Position equipment at operating height; provide temporary blocking as required.
        b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
        c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
    2. Isolator Hangers:
        a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
        b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
    3. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
    4. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
    5. Adjust isolators to be free of isolation short circuits during normal operation.
    6. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

3.03 FIELD QUALITY CONTROL

A. Inspect vibration isolation and/or seismic control components for damage and defects.

B. Vibration Isolation Systems:
    1. Verify isolator static deflections.
    2. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

C. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

END OF SECTION 230548

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Adhesive-backed duct markers.

D. Pipe markers.

E. Ceiling tacks.

1.02 REFERENCE STANDARDS

A. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

PART 2 - PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Control Panels: Nameplates.

C. Dampers: Ceiling tacks, where located above lay-in ceiling.

D. Ductwork: Nameplates.

E. Major Control Components: Nameplates.

F. Piping: Tags.

G. Pumps: Nameplates.

H. Small-sized Equipment: Tags.

I. Thermostats: Nameplates.

2.02 NAMEPLATES

A. Letter Color: White.

B. Letter Height: 1/4 inch (6 mm).

C. Background Color: Black.

D. Plastic: Comply with ASTM D709.

2.03 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

2.04 ADHESIVE-BACKED DUCT MARKERS

A. Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch (0.76 mm); printed with UV and chemical resistant inks.

B. Style: Individual Label.

C. Color: Yellow/Black.

2.05 PIPE MARKERS

A. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

2.06 CEILING TACKS

A. Description: Steel with 3/4 inch (20 mm) diameter color coded head.

B. Color code as follows:
   1. HVAC Equipment: Yellow.
   2. Fire Dampers and Smoke Dampers: Red.

PART 3 - EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install plastic pipe markers in accordance with manufacturer's instructions.

C. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

D. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
   1. Identify service, flow direction, and pressure.
   2. Install in clear view and align with axis of piping.
   3. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

E. Install ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

F. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

1.02 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).

C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.03 SUBMITTALS

A. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Submit six weeks prior to starting the testing, adjusting, and balancing work.
   2. Include certification that the plan developer has reviewed Contract Documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.
   3. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      d. Final test report forms to be used.
      e. Detailed step-by-step procedures for TAB work for each system and issue, including:
         1) Diffuser proportioning.
         2) Branch/submain proportioning.
         3) Total flow calculations.
         4) Rechecking.
         5) Diversity issues.
      f. Details of how TOTAL flow will be determined; for example:
         1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
      g. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.

h. Confirmation of understanding of the outside air ventilation criteria under all conditions.
i. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
j. Method of checking building static and exhaust fan and/or relief damper capacity.
k. Time schedule for deferred or seasonal TAB work, if specified.
l. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
m. Procedures for formal deficiency reports, including scope, frequency and distribution.

B. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
1. Revise TAB plan to reflect actual procedures and submit as part of final report.
2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
5. Units of Measure: Report data in I-P (inch-pound) units only.
6. Include the following on the title page of each report:
a. Name of Testing, Adjusting, and Balancing Agency.
b. Address of Testing, Adjusting, and Balancing Agency.
c. Telephone number of Testing, Adjusting, and Balancing Agency.
d. Project location.
e. Project Engineer.
f. Project Contractor.
g. Report date.

C. Project Record Documents: Record actual locations of flow measuring stations.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
1. AABC (NSTSB), AABC National Standards for Total System Balance.
2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
3. SMACNA (TAB).

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.
   3. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
      b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
      c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire and volume dampers are in place and open.
   8. Air coil fins are cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.
   11. Duct system leakage is minimized.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
   1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

3.04 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
   1. Running log of events and issues.
   2. Discrepancies, deficient or uncompleted work by others.
   3. Contract interpretation requests.
   4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.06 MINIMUM DATA TO BE REPORTED

A. Electric Motors:
   1. Manufacturer.
   2. Model/Frame.
   3. HP/BHP.
   4. Phase, voltage, amperage; nameplate, actual, no load.
   5. RPM.

B. Air Cooled Condensers:
   1. Identification/number.
   2. Location.
   3. Manufacturer.
   4. Model number.
   5. Serial number.
   6. Entering DB air temperature, design and actual.
   7. Leaving DB air temperature, design and actual.
   8. Number of compressors.

C. Air Moving Equipment:
   1. Location.
   2. Manufacturer.
   3. Model number.
   4. Serial number.
   5. Arrangement/Class/Discharge.
   6. Air flow, specified and actual.
   7. Return air flow, specified and actual.
   8. Outside air flow, specified and actual.
   9. Total static pressure (total external), specified and actual.

10. Inlet pressure.
11. Discharge pressure.
12. Fan RPM.

D. Return Air/Outside Air:
1. Identification/location.
2. Design air flow.
3. Actual air flow.
4. Design return air flow.
5. Actual return air flow.
6. Design outside air flow.
7. Actual outside air flow.
8. Return air temperature.
9. Outside air temperature.

E. Exhaust Fans:
1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Air flow, specified and actual.
6. Total static pressure (total external), specified and actual.
7. Inlet pressure.
8. Discharge pressure.
9. Fan RPM.

F. Duct Leak Tests:
1. Description of ductwork under test.
2. Duct design operating pressure.
3. Duct design test static pressure.
4. Duct capacity, air flow.
5. Maximum allowable leakage duct capacity times leak factor.
6. Test apparatus:
    a. Blower.
    b. Orifice, tube size.
    c. Orifice size.
    d. Calibrated.
7. Test static pressure.
8. Test orifice differential pressure.
9. Leakage.

G. Flow Measuring Stations:
1. Identification/number.
2. Location.
3. Size.
4. Manufacturer.
5. Model number.

6. Serial number.
7. Design Flow rate.
8. Design pressure drop.
9. Actual/final pressure drop.
10. Actual/final flow rate.
11. Station calibrated setting.

H. Air Distribution Tests:
1. Air terminal number.
2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Area factor.
6. Design velocity.
7. Design air flow.
8. Test (final) velocity.
9. Test (final) air flow.
10. Percent of design air flow.

END OF SECTION 230593

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

A. Section 230553 - Identification for HVAC Piping and Equipment.

B. Section 233100 - HVAC Ducts and Casings: Glass fiber ducts.

1.03 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

E. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2019 (Reapproved 2022).

F. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers; 2015 (Reapproved 2022).

G. ASTM C1423 - Standard Guide for Selecting Jacketing Materials for Thermal Insulation; 2021.

H. ASTM C1775 - Standard Specification for Laminate Protective Jacket and Tape for Use Over Thermal Insulation for Outdoor Applications; 2022.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

J. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

K. SAE AMS3779 - Tape, Adhesive, Pressure-Sensitive Thermal Radiation Resistant, Aluminum Coated Glass Cloth; 2016b.

L. UL 181A - Closure Systems for Use with Rigid Air Ducts; Current Edition, Including All Revisions.

M. UL 181B - Closure Systems for Use with Flexible Air Ducts and Air Connectors; Current Edition, Including All Revisions.

N. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

B. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

PART 2 - PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. K (Ksi) value: 0.31 at 75 degrees F (0.045 at 24 degrees C), when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 450 degrees F (232 degrees C).
   3. Maximum Water Vapor Absorption: 5.0 percent by weight.

B. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.

C. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

D. Indoor Vapor Barrier Mastic:
   1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

E. Outdoor Vapor Barrier Mastic:
   1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

F. Tie Wire: Annealed steel, 16 gauge, 0.0508 inch diameter (1.29 mm diameter).

2.03 GLASS FIBER, RIGID

A. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. K (Ksi) Value: 0.24 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 450 degrees F (232 degrees C).

3. Maximum Water Vapor Absorption: 5.0 percent.
4. Maximum Density: 8.0 pcf (128 kg/cu m).

B. Vapor Barrier Jacket:
1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.

C. Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

2.04 JACKETING AND ACCESSORIES

A. Mineral Fiber (Outdoor) Jacket: Asphalt impregnated and coated sheet, 50 lb/square (2.45 kg/sq m).

B. Aluminum Jacket:
1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch (0.41 mm) with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
4. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.

C. Aluminum-Foil Laminate Jacket:
1. Factory-applied, pressure sensitive adhesive jacketing on paper release liner.
2. Finish: Aluminum smooth.
3. Comply with ASTM C1775.

D. Aluminum-Foil Laminate Jacket:
1. Factory-applied, pressure sensitive adhesive jacketing to comply with ASTM C1775.

E. Flexible Weather-Proofing Outdoor Jacket: Self-healing, field-applied outdoor cladding.
1. Material: Aluminum foil/polymer laminate with rubberized asphalt layer and acrylic adhesive.
2. Thickness: 34 mil, 0.034 inch (0.86 mm).
3. Finish: Embossed.
4. Color: Silver.
5. Water Vapor Transmission: 0.002 perm inch (0.0029 ng/(Pa s m)), maximum, when tested in accordance with ASTM E96/E96M.
6. Mold Resistance: Pass when tested in accordance with ASTM C1338.
7. Emissivity: 0.30 when tested in accordance with ASTM C1371.

F. Reinforced Tape:
1. FSK tape suitable for sealing seams between insulation, insulated elbows, and fittings resulting in a tight, smooth surface without wrinkles.
2. Comply with UL 723 or ASTM E84.

3. Moisture Vapor Permeability: 0.00 perm inch (0.00 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
4. Finish: Match insulation.

G. Plain Foil Tape:
1. Aluminum foil with pressure-sensitive adhesive on paper release liner.
2. Finish: Plain foil.

H. UL181 Tape for Rigid and Flexible Ductwork:
1. Comply with UL 181A for rigid ductwork.
2. Comply with UL 181B for flexible ductwork.
3. Aluminum foil coated with pressure-sensitive adhesive on paper release liner.
4. Foil tape suitable for sealing seams between insulation, insulated elbows, and fittings resulting in a tight, smooth surface without wrinkles.
5. Finish: Printed with UL Listing for identification.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Insulated Ducts Conveying Air Below Ambient Temperature:
1. Finish with tape and vapor barrier jacket.
2. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
3. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

C. Insulated Ducts Conveying Air Above Ambient Temperature:
1. Provide with or without standard vapor barrier jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

D. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with canvas jacket sized for finish painting or aluminum jacket.

E. External Duct Insulation Application:
1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
2. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
3. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
4. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

END OF SECTION 230713

SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jacketing and accessories.

C. Engineered wall outlet seals and refrigerant piping insulation protection.

1.02 RELATED REQUIREMENTS

A. Section 232300 - Refrigerant Piping: Placement of inserts.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

B. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.

C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

D. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2019).

E. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2019).

F. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

G. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.

H. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2022.

I. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

J. ASTM D610 - Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces; 2008 (Reapproved 2019).

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

M. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

N. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

O. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

P. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

Q. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013 (Reapproved 2021).

R. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

B. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 - PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, RIGID

A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
   2. Maximum Service Temperature: 850 degrees F (454 degrees C).
   3. Maximum Moisture Absorption: 0.2 percent by volume.

B. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
   1. Maximum Service Temperature: 650 degrees F (343 degrees C).
   2. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/(Pa s m)).

D. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

E. Vapor Barrier Lap Adhesive: Compatible with insulation.

F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

G. Indoor Vapor Barrier Finish:
   1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight.
   2. Vinyl emulsion type acrylic, compatible with insulation, white color.

H. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, white color.

I. Insulating Cement: ASTM C449.

2.03 CELLULAR GLASS

A. Pipe and Tubing Insulation: ASTM C552, Type II, Grade 6.
   1. K (Ksi) Value: 0.35 (0.050) at 100 degrees F (38 degrees C).
   2. Service Temperature Range: From 250 degrees F (121 degrees C) to 800 degrees F (427 degrees C).
   3. Water Vapor Permeability: 0.005 perm inch (0.007 ng/(Pa s m)) maximum per inch.
   4. Water Absorption: 0.5 percent by volume, maximum.
   5. Density: A minimum of 6.12 pcf (98 kg/cu m).

B. Block Insulation: ASTM C552, Type I, Grade 6.
   1. K (Ksi) Value: 0.35 (0.050) at 100 degrees F (38 degrees C).
   2. Service Temperature: 800 degrees F (427 degrees C), maximum.
   3. Water Vapor Permeability: 0.005 perm inch (0.007 ng/(Pa s m)) maximum per inch.
   4. Water Absorption: 0.5 percent by volume, maximum.

2.04 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
   1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
   2. Maximum Service Temperature: 180 degrees F (82 degrees C).
   3. Connection: Waterproof vapor barrier adhesive.

B. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.05 JACKETING AND ACCESSORIES

A. PVC Plastic.
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F (minus 18 degrees C).
      b. Maximum Service Temperature: 150 degrees F (66 degrees C).
      c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/(Pa s m)), maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil, 0.010 inch (0.25 mm).
      e. Connections: Brush on welding adhesive.
   2. Covering Adhesive Mastic: Compatible with insulation.

B. Stainless Steel Jacket: ASTM A666, Type 304 stainless steel.

1. Thickness: 0.010 inch (0.25 mm).
2. Finish: Smooth.
3. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.010 inch (0.25 mm) thick stainless steel.

2.06 ENGINEERED WALL OUTLET SEALS AND REFRIGERANT PIPING INSULATION PROTECTION

A. Pipe Penetration Wall Seal: Seals HVAC piping wall penetrations with compression gasket wall mounted rigid plastic outlet cover.
   1. Wall Outlet Size, Stucco and Masonry Applications: 7-1/2 inch wide by 10 inch high (190.5 mm wide by 254 mm high).
      a. Elastomeric Sleeve Diameter: 1-11/16 inch (43 mm).
   2. Outlet Cover Color: White.
   3. Water Penetration: Comply with ASTM E331.
   4. Air Leakage: Comply with ASTM E283.
   5. Air Permeance: Comply with ASTM E2178.

B. Insulation Protection System: Refrigerant piping insulation PVC protective cover.
   1. PVC Insulation Cover Color: White with full-length velcro fastener.
   2. Weatherization and Ultraviolet Exposure Protection: Comply with ASTM G153.
   3. Water/Vapor Permeability: Comply with ASTM E96/E96M.
   4. Anti-Fungal and Anti-Microbial Resistance: Comply with ASTM G21.
   5. Flame Spread and Smoke Development Rating of 24/450: Comply with ASTM E84 or UL 723.

2.07 ACCESSORIES

A. General Requirements:
   1. Provide required accessories in accordance with and subject to the recommendations of the insulation manufacturer.
   2. Furnish compatible materials which do not contribute to corrosion, soften, or otherwise attack surfaces to which applied, in either the wet or dry state.
   3. Comply with ASTM C795 requirements for materials to be used on stainless steel surfaces.
   4. Supply materials that are asbestos free.

B. Corrosion Inhibitors:
   1. Corrosion Control Gel:
      a. Corrosion Protection: Comply with ASTM B117 and ASTM D610.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulated Pipes Conveying Fluids Below Ambient Temperature:
   1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

D. Glass Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

E. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.

F. Glass Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied, or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

G. Inserts and Shields:
   1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.

H. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with PVC jacket and fitting covers.

I. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV resistant finish for flexible elastomeric cellular insulation without jacketing.

3.03 SCHEDULE

A. Cooling Systems:
   1. Condensate Drains from Cooling Coils:
   2. Refrigerant Suction:
   3. Refrigerant Hot Gas:

END OF SECTION 230719

SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Piping.

B. Engineered wall seals and insulation protection.

C. Exterior penetration accessories.

1.02 RELATED REQUIREMENTS

A. Section 230719 - HVAC Piping Insulation.

B. Section 236213 - Packaged Air-Cooled Refrigerant Compressor and Condenser Units.

C. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2022, with Errata (2023).

B. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

D. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2022.

E. ASME B31.9 - Building Services Piping; 2020.

F. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2023.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

I. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

J. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

K. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

L. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

M. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013 (Reapproved 2021).

N. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

O. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.04 SUBMITTALS

A. Product Data: Provide general assembly of specialties, including manufacturer's catalogue information. Provide manufacturer's catalog data including load capacity.

B. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.

C. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.

D. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.

2.02 REGULATORY REQUIREMENTS

A. Comply with ASME B31.9 for installation of piping system.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

C. Welders Certification: In accordance with ASME BPVC-IX.

D. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

2.03 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn.
   1. Fittings: ASME B16.22 wrought copper.
   2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.

B. Pipe Supports and Anchors:
   1. Provide hangers and supports that comply with MSS SP-58.
      a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch (13 to 38 mm): Malleable iron adjustable swivel, split ring.
   3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   4. Wall Support for Pipe Sizes to 3 Inches (75 mm): Cast iron hook.
   5. Vertical Support: Steel riser clamp.
   6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
   7. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
   8. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.04 ENGINEERED WALL SEALS AND INSULATION PROTECTION

A. Pipe Penetration Wall Seal: Seals HVAC piping wall penetrations with compression gasket wall mounted rigid plastic outlet cover.
   1. Wall Outlet Size, Stucco and Masonry Applications: 7-1/2 inch wide by 10 inch high (190.5 mm wide by 254 mm high).
      a. Elastomeric Sleeve Diameter: 1-11/16 inch (43 mm).
   2. Outlet Cover Color: Gray.
   3. Water Penetration: Comply with ASTM E331.
   4. Air Leakage: Comply with ASTM E283/E283M.
   5. Air Permeance: Comply with ASTM E2178.

B. Insulation Protection System: Mechanical line insulation and PVC cover.
   1. PVC Insulation Cover Color: White with full-length velcro fastener.
   2. Weatherization and Ultraviolet Exposure Protection: Comply with ASTM G153.
   3. Water/Vapor Permeability: Comply with ASTM E96/E96M.
   4. Anti-Fungal and Anti-Microbial Resistance: Comply with ASTM G21.
   5. Flame Spread and Smoke Development Rating of 25/450: Comply with ASTM E84.

2.05 EXTERIOR PENETRATION ACCESSORIES

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

PART 3 - EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

E. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.5.
   2. Support horizontal piping as indicated.
   3. Install hangers to provide minimum 1/2 inch (13 mm) space between finished covering and adjacent work.
   4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
   5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
   6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   7. Provide copper plated hangers and supports for copper piping.

F. Provide clearance for installation of insulation and access to valves and fittings.

G. Flood piping system with nitrogen when brazing.

H. Insulate piping.

I. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

J. Fully charge completed system with refrigerant after testing.

K. Provide electrical connection to solenoid valves. See Section 260583.

3.03 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME B31.5.

B. Pressure test system with dry nitrogen to 200 psi (1380 kPa). Perform final tests at 27 inches (92 kPa) vacuum and 200 psi (1380 kPa) using halide torch. Test and repair piping until no leakage.

END OF SECTION 232300

SECTION 233100 - HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Metal ducts.

B. Flexible ducts.

C. Air plenums and casings.

1.02 RELATED REQUIREMENTS

A. Section 230548 - Vibration and Seismic Controls for HVAC.

B. Section 230713 - Duct Insulation: External insulation and duct liner.

C. Section 233300 - Air Duct Accessories.

D. Section 233700 - Air Outlets and Inlets: Fabric air distribution devices.

1.03 REFERENCE STANDARDS

A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

F. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).

G. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).

H. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).

I. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

J. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.

K. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

L. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; 2012.

M. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data:

1. Schedules of duct systems, materials and selected SMACNA construction alternatives for joints, sealing, gage and reinforcement.
2. Sealants and gaskets.
3. Access doors.
4. Volume dampers, back draft dampers.
5. Upper hanger attachments.
6. Fire dampers, fire doors, and smoke dampers with installation instructions.
7. Flexible ducts and clamps, with manufacturer's installation instructions.
8. Flexible connections.
9. Instrument test fittings.
10. Details and design analysis of alternate or optional duct systems.

B. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate per appropriate seal class, following SMACNA (LEAK).

C. Manufacturer's Installation Instructions: Indicate special procedures for glass fiber ducts.

D. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

1.06 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.

B. Provide metal duct unless otherwise indicated. Fibrous glass duct can be substituted at the Contractor's option.

C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance.

D. Duct Shape and Material in accordance with Allowed Static Pressure Range:
1. Round: Plus or minus 2 in-wc (500 Pa) of galvanized steel.
2. Rectangular: Plus or minus 2 in-wc (500 Pa) of galvanized steel.

E. Duct Sealing and Leakage in accordance with Static Pressure Class:

1. Duct Pressure Class and Material for Common Mechanical Ventilation Applications:
    a. Supply Air: 1 in-wc (250 Pa) pressure class, galvanized steel.
    b. Outside Air Intake: 1/2 in-wc (125 Pa) pressure class, aluminum or stainless steel.
    c. Return and Relief Air: 1 in-wc (250 Pa) pressure class, galvanized steel.
    d. General Exhaust Air: 1 in-wc (250 Pa) pressure class, aluminum or stainless steel.
2. Low Pressure Service: Up to 2 in-wc (500 Pa):
    a. Seal: Class C, apply to seal off transverse joints.
    b. Leakage:
        1) Rectangular: Class 24 or 24 cfm/100 sq ft (680 Lpm/9.3 sq m).
        2) Round: Class 12 or 12 cfm/100 sq ft (340 Lpm/9.3 sq m).

F. Duct Fabrication Requirements:
1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
2. Size round duct installed in place of rectangular ducts in accordance with ASHRAE (FUND) Handbook - Fundamentals.
3. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
4. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.
5. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
6. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
7. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
8. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

G. Outside Air Intake: 1/2 inch wg (125 Pa) pressure class, aluminum or stainless steel.

2.02 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.

B. Aluminum for Ducts: ASTM B209 (ASTM B209M); aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.

C. Stainless Steel for Ducts: ASTM A666, Type 304.

D. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
3. For Use with Flexible Ducts: UL labeled.

E. Gasket Tape: Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle rings connections.

F. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

G. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
5. Other Types: As required.

2.03 METAL DUCTS

A. Material Requirements:
1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Rectangular Metal Duct:
1. Rectangular Double Wall Insulated: Rectangular spiral lock seam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with the solid inner wall.
a. Insulation:
1) Thickness: 1 inch (25 mm).
2) Material: Fiberglass.

C. Round Metal Ducts:
1. Round Single Wall Duct: Round lock seam duct with outer wall.
2. Round Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).

D. Round Spiral Duct:
1. Round spiral lock seam duct with outer wall.

E. Connectors, Fittings, Sealants, and Miscellaneous:
1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
2. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
3. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
b. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
c. For Use with Flexible Ducts: UL labeled.

4. Gasket Tape:
   a. Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle ring connections.
5. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
6. Hanger Fasteners: Attach hangers to structure using appropriate fasteners as follows:
   a. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
   b. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
   c. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
   d. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
   e. Other Types: As required.

2.04 FLEXIBLE DUCTS

A. Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form spiral helix.
   1. Insulation: R6 insulation with polyethylene vapor barrier film.
   2. Pressure Rating: 10 in-wc (2.50 kPa) positive and 5 in-wc (1.25 kPa) negative.
   3. Maximum Velocity: 5500 fpm (27.9 m/sec).
   4. Temperature Range: Minus 20 degrees F to 250 degrees F (Minus 28 degrees C to 121 degrees C).

2.05 FLEXIBLE DUCT CONNECTIONS

A. Where duct connections are made to fans, air terminal units, and air handling units, install a non-combustible flexible connection of 822 g (29 ounce) neoprene coated fiberglass fabric approximately 150 mm (6 inches) wide. For connections exposed to sun and weather provide hypalon coating in lieu of neoprene. Burning characteristics shall conform to NFPA 90A. Securely fasten flexible connections to round ducts with stainless steel or zinc-coated iron draw bands with worm gear fastener. For rectangular connections, crimp fabric to sheet metal and fasten sheet metal to ducts by screws 50 mm (2 inches) on center. Fabric shall not be stressed other than by air pressure. Allow at least 25 mm (one inch) slack to ensure that no vibration is transmitted.

2.06 AIR PLENUMS AND CASINGS

A. Fabricate in accordance with SMACNA (DCS) for indicated operating pressures indicated.

B. Minimum Fabrication Requirements:
   1. Fabricate acoustic plenum or casing with reinforcing turned inward.

2. Provide 16-gauge, 0.059-inch (1.52 mm) sheet steel back facing and 22-gauge, 0.029-inch (0.76 mm) perforated sheet steel front facing with 3/32 inch (2.4 mm) diameter holes on 5/32 inch (4 mm) centers.
3. Construct panels 3 inches (75 mm) thick, packed with 4.5 pcf (72 kg/cu m) minimum glass fiber insulation media, on inverted channel of 16-gauge, 0.059-inch (1.52 mm) sheet steel.
4. Mount floor-mounted plenum or casings on 4-inch (100 mm) high concrete curbs. At floor, rivet panels on 8-inch (200 mm) centers to angles. Where floors are acoustically insulated, provide liner of galvanized 18-gauge, 0.052-inch (1.31 mm) expanded metal mesh supported at 12-inch (300 mm) centers, turned up 12 inches (300 mm) at sides with sheet metal shields.

C. Access Doors:
1. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.
2. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles.
3. Provide clear wire glass observation ports, minimum 6 by 6 inch (150 by 150 mm) size.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install products following the manufacturer's instructions.

C. Comply with safety standards NFPA 90A and NFPA 90B.

D. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.

E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

F. Flexible Ducts: Connect to metal ducts with adhesive plus sheet metal screws.

G. Duct sizes indicated are precise inside dimensions. For lined ducts, maintain sizes inside lining.

H. Provide openings in ductwork as indicated to accommodate thermometers and controllers. Provide pilot tube openings as indicated for testing of systems, complete with metal can with spring device or screw to insure against air leakage. For openings, insulate ductwork and install insulation material inside a metal ring.

I. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

J. Connect terminal units to supply ducts directly or with one foot (300 mm) maximum length of flexible duct. Do not use flexible duct to change direction.

K. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet (1.5 m) maximum length of flexible duct held in place with strap or clamp.

L. Set plenum doors at 6 to 12 inches (150 to 300 mm) above floor. Arrange door swings so that fan static pressure holds door in closed position.

M. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

N. Louver Fit-out:
   1. Provide blank-out panels sealing available area of wall-mounted exterior-faced louver when connected ductwork is smaller than actual louver free area, and duct outlet is smaller than the louver frame.
   2. Use the same duct material painted black on the exterior side, then seal louver frame and duct.

3.02 CLEANING

A. Clean duct systems with high-power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters or bypass during cleaning. Provide adequate access to the ductwork for cleaning purposes.

END OF SECTION 233100

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Air turning devices/extractors.

B. Backdraft dampers - metal.

C. Duct access doors.

D. Duct test holes.

E. Fire dampers.

F. Flexible duct connectors.

G. Volume control dampers.

H. Low leakage (Class 1A) control dampers.

I. Miscellaneous products:
   1. Damper operators.
   2. Damper position switch.
   3. Duct opening closure film.

1.02 RELATED REQUIREMENTS

A. Section 230548 - Vibration and Seismic Controls for HVAC.

B. Section 233100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.

B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

D. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.

E. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Current Edition, Including All Revisions.

F. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.

G. UL 555C - Standard for Safety Ceiling Dampers; Current Edition, Including All Revisions.

H. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide for shop fabricated assemblies including volume control dampers and duct access doors. Include electrical characteristics and connection requirements.

B. Manufacturer's Installation Instructions: Provide instructions for fire dampers.

C. Project Record Drawings: Record actual locations of access doors and test holes.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Fusible Links: One of each type and size.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 - PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

A. Multi-blade device with radius blades attached to pivoting frame and bracket, steel construction, with push-pull operator strap.

2.02 BACKDRAFT DAMPERS - METAL

A. Gravity Backdraft Dampers, Size 18 by 18 inches (450 by 450 mm) or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.03 DUCT ACCESS DOORS

A. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch (25 mm) thick insulation with sheet metal cover.
   1. Less Than 12 inches (300 mm) Square: Secure with sash locks.
   2. Up to 18 inches (450 mm) Square: Provide two hinges and two sash locks.
   3. Up to 24 by 48 inches (600 by 1200 mm): Three hinges and two compression latches with outside and inside handles.

2.04 DUCT TEST HOLES

A. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.05 FIRE DAMPERS

A. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

B. Ceiling (Radiation) Dampers: Galvanized steel, 22 gauge, 0.0299 inch (0.76 mm) frame and 16 gauge, 0.0598 inch (1.52 mm) flap, two layers 0.125 inch (3.2 mm) ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.
   1. Boot Fitting: Factory-provided as indicated on drawings. Include field-provided collar.
   2. Rated for one hour service in compliance with UL 555C.

C. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1.0 inch (250 Pa) pressure class ducts up to 12 inches (300 mm) in height.

D. Fusible Links: UL 33, separate at 160 degrees F (71 degrees C) with adjustable link straps for combination fire/balancing dampers.

2.06 FLEXIBLE DUCT CONNECTORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd (1.0 kg/sq m).

C. Maximum Installed Length: 14 inch (356 mm).

2.07 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Splitter Dampers:
   1. Material: Same gauge as duct to 24 inches (600 mm) size in either direction, and two gauges heavier for sizes over 24 inches (600 mm).
   2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
   3. Operator: Minimum 1/4 inch (6 mm) diameter rod in self aligning, universal joint action, flanged bushing with set screw.

C. Single Blade Dampers:
   1. Fabricate for duct sizes up to 6 by 30 inch (150 by 760 mm).
   2. Blade: 24 gauge, 0.0239 inch (0.61 mm), minimum.

D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch (200 by 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
   1. Blade: 18 gauge, 0.0478 inch (1.21 mm), minimum.

E. End Bearings: Except in round ducts 12 inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

F. Quadrants:
   1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
   2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
   3. Where rod lengths exceed 30 inches (750 mm) provide regulator at both ends.

G. Constant Airflow Regulators:
   1. General Requirements:
      a. Provide bi-directional, air balancing regulator for pressure independent air volume control.
      b. Complies with UL 2043 for heat and smoke release.
      c. Complies with AMCA 500-D for the allowable leakage rates.

2. Construction:
    a. Nominal Diameter: 4 inch (104 mm).
    b. Frame: Thermoplastic resin in compliance with UL 94.
    c. Blade: Thermoplastic resin in compliance with UL 94.
    d. Bearings: Hydraulic blade dampener.
    e. Outer Seal: Removable rubber gasket-type around circumference of damper.
    f. Spring: Stainless steel leaf-type.

2.08 LOW LEAKAGE (CLASS 1A) CONTROL DAMPERS

A. Maximum Leakage Allowed: 3 cfm/sf at 1 inch wg (15.2 lps/sm at 0.25 kPa).

B. Frame:
    1. Material: 12 gauge galvanized steel.
    2. Free-area: Single cross section.
    3. Blanked-off: Split frame into two free-area sections to allow a smaller free-area to be used for a minimum airflow intake or exhaust application and secondary free-area fully blanked-off.

C. Blade:
    1. Type: Single-blade rectangle shape.
    2. Operation: Opposed type.
    3. Maximum Individual Blade Height: 8 inches (203 mm).
    4. Material: 12 gauge galvanized steel.
    5. Authority: Opposed type, 5 to 50 percent (typically 10 percent).

D. Insulation: Water-resistant sound absorbing material.

E. Temperature Service Range: Minus 25 to 185 degrees F (minus 32 to 85 degrees C).

F. Other Requirements:
    1. Paint Finish: Standard.
    2. Rust Inhibitor Coating: Moisture and salt water-resistant.
    3. Sleeve or Flange: Factory-mounted standard.
    4. Duct Transition Fitting: Round.
    5. Custom: Include bird screen and insect screen.

2.09 MISCELLANEOUS PRODUCTS

A. Damper manual and electric operators furnished per Section 253513.

B. Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.
    1. Thickness: 2 mils (0.6 mm).
    2. High tack water based adhesive.
    3. UV stable light blue color.
    4. Elongation Before Break: 325 percent, minimum.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 233100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 by 8 inch (200 by 200 mm) size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch (100 by 100 mm) for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

F. Demonstrate re-setting of fire dampers to Owner's representative.

G. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

H. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

I. For fans developing static pressures of 5.0 inches (1250 Pa) and over, cover flexible connections with leaded vinyl sheet, held in place with metal straps.

J. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

K. Use splitter dampers only where indicated.

L. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION 233300

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ceiling exhaust fans.

B. Inline centrifugal fans and blowers.

1.02 RELATED REQUIREMENTS

A. Section 230548 - Vibration and Seismic Controls for HVAC.

B. Section 233100 - HVAC Ducts and Casings.

C. Section 233300 - Air Duct Accessories: Backdraft dampers.

1.03 REFERENCE STANDARDS

A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.

B. AMCA 99 - Standards Handbook; 2016.

C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2020.

D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016, with Errata (2018).

E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.

F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.

G. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequencing: Ensure that utility connections are completed in an orderly and expeditious manner.

1.05 SUBMITTALS

A. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.

B. Manufacturer's Instructions: Indicate installation instructions.

C. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.07 FIELD CONDITIONS

A. Request Owner permission to use permanent ventilator(s) for ventilation during construction.

PART 2 PRODUCTS

2.01 POWER VENTILATORS - GENERAL

A. Static and Dynamically Balanced: Comply with AMCA 204.

B. Performance Ratings: Comply with AMCA 210, bearing certified rating seal.

C. Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.

D. Fabrication: Comply with AMCA 99.

E. UL Compliance: UL 705, listed, labeled, designed, manufactured, and tested.

F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.02 CEILING EXHAUST FANS

A. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resiliently mounted motor, gravity backdraft damper in discharge.

B. Grille: Molded white plastic.

C. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is reached with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

D. Performance Ratings: As indicated on drawings.

2.03 INLINE CENTRIFUGAL FANS AND BLOWERS

A. Centrifugal Fan Unit: V-belt or direct driven, with galvanized steel housing lined with acoustic insulation, resiliently-mounted motor, gravity backdraft damper in discharge.

B. Forward Curved Blower:

1. Direct-driven, resiliently mounted motor, heavy-duty ball bearings, galvanized steel housing for indoor or outdoor service, and removable service panels.
2. Accessories: Provide filter section, intake hood with bird screen, and MERV- __ filters.

C. Backward Inclined Blower:

1. Direct-driven, resiliently mounted motor, heavy-duty ball bearings, powder-coated steel housing for outdoor service, and removable service panels.
2. Accessories: Provide external vibration isolator spring, filter section, and MERV-__ filters.

D. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm gets reached with sheaves set at mid-position; fan shaft with self-aligning prelubricated ball bearings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install backdraft dampers on inlet to roof and wall exhausters.

C. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

END OF SECTION 233423

SECTION 233700 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Diffusers:
   1. Perforated ceiling diffusers.
   2. Rectangular ceiling diffusers.

B. Registers/grilles:
   1. Floor-mounted, linear supply register/grilles.
   2. Floor-mounted, supply register/grilles.
   3. Ceiling-mounted, egg crate exhaust and return register/grilles.
   4. Ceiling-mounted, exhaust and return register/grilles.
   5. Ceiling-mounted, linear exhaust and return register/grilles.
   6. Ceiling-mounted, supply register/grilles.
   7. Wall-mounted, supply register/grilles.
   8. Wall-mounted, exhaust and return register/grilles.

C. Duct-mounted supply and return registers/louvers.

D. Ceiling gypsum board access panels with return air grilles.

E. Fabric air distribution devices.

F. Door grilles.

G. Louvers:
   1. Air measuring station louvers.
   2. Combination louvers.
   3. Industrial fiberglass louvers.

1.02 REFERENCE STANDARDS

A. AHRI 880 (I-P) - Performance Rating of Air Terminals; 2017 (Reaffirmed 2023).

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2023.

C. AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices; 2021, with Editorial Revision (2022).

D. AMCA 550 - Test Method for High Velocity Wind Driven Rain Resistant Louvers; 2022.

E. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets; 2023.

F. ASHRAE Std 130 - Laboratory Methods of Testing Air Terminal Units; 2016.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

I. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

J. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.

K. FLA (PAD) - Florida Building Code Online - Product Approval Directory; Current Edition.

L. ISO 14644-1 - Cleanrooms and Associated Controlled Environments - Part 1: Classification of Air Cleanliness by Particle Concentration; 2015.

M. Miami (APD) - Approved Products Directory; Miami-Dade County; Current Edition.

N. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

O. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.03 SUBMITTALS

A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

B. Project Record Documents: Record actual locations of air outlets and inlets.

1.04 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Test and rate louver performance in accordance with AMCA 500-L.

C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 RECTANGULAR CEILING DIFFUSERS

A. Type: Provide rectangular and square formed adjustable, backpan stamped, core removable, and multi-louvered ceiling diffusers constructed to maintain 360 degree discharge air pattern.

B. Connections: As indicated on drawings.

C. Frame: Provide surface mount, snap-in, inverted T-bar, and spline type. In plaster ceilings, provide plaster frame and ceiling frame.

D. Fabrication: Aluminum with baked enamel finish.

E. Color: As selected by Architect from manufacturer's standard range.

F. Accessories: Provide radial opposed blade volume control damper; equalizing grid and gaskets for surface mounted diffusers with damper adjustable from diffuser face.

2.02 PERFORATED FACE CEILING DIFFUSERS

A. Type: Perforated face with fully adjustable pattern and removable face.

B. Frame: Surface mount type. In plaster ceilings, provide plaster frame and ceiling frame.

C. Fabrication: Steel with steel frame and baked enamel finish.

D. Fabrication: Stainless steel.

E. Color: As selected by Architect from manufacturer's standard range.

F. Accessories: Radial opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.03 DUCT-MOUNTED SUPPLY AND RETURN REGISTERS/LOUVERS

A. Type: Duct-mounted, rectangular register for round-spiral duct with adjustable pivot-ended blades, end caps, built-in volume damper, and dual cover flanges to lay flush on duct surface regardless of diameter. Performance to match manufacturer's catalog data.

B. Color: As selected by Architect from manufacturer's standard range.

2.04 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing, with blades set at 45 degrees, vertical face.

B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting.

C. Fabrication: Steel with 20 gauge, 0.0359 inch (0.91 mm) minimum frames and 22 gauge, 0.0299 inch (0.76 mm) minimum blades, steel and aluminum with 20 gauge, 0.0359 inch (0.91 mm) minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Fabrication: Stainless steel with 20 gauge, 0.0359 inch (0.91 mm) minimum frames and 22 gauge, 0.0299 inch (0.76 mm) minimum blades, steel and aluminum with 20 gauge, 0.0359 inch (0.91 mm) minimum frame.

E. Color: To be selected by Architect from manufacturer's standard range.

F. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

2.05 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing with spring or other device to set blades, vertical face, double deflection.

B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting and gasket.

C. Fabrication: Aluminum with 20 gauge, 0.0359 inch (0.91 mm) minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Color: To be selected by Architect from manufacturer's standard range.

E. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

F. Gymnasiums: Provide front pivoted or welded in place blades, securely fastened to be immobile.

2.06 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing, with spring or other device to set blades, horizontal face.

B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting.

C. Fabrication: Steel frames and blades, with factory baked enamel finish.

D. Color: To be selected by Architect from manufacturer's standard range.

E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.07 CEILING GYPSUM BOARD ACCESS PANELS WITH RETURN AIR GRILLES

A. Description: Return air grille with full service access. Louvers to be fitted into frameless door flush with drywall surface. Return air grille can be integrated with manufacturer's suggested access panel or installed directly in drywall surface.

B. Gypsum Board Access Panels: Provide rectangular access panel with recessed and gasketed aluminum perimeter frame that acts as finishing edge and having concealed mechanical touch-latch with safety cable.
   1. Panel Frame Size: 24 by 24 inch (610 by 610 mm) set within 1/2 inch (12.7 mm) thick gypsum board.
   2. Panel Style: Standard style.
   3. Panel Frame: 1 inch (25.4 mm) margin with concealed countersunk screw mounting.

2.08 LOUVERS

A. Type: 5 inch (127 mm) deep frame with drainable brades, heavy channel frame, 1/2 inch (13 mm) square mesh screen over intake or exhaust end.

B. Fabrication: 12 gauge, 0.1046 inch (2.66 mm) thick extruded aluminum thick galvanized steel welded assembly, with factory prime coat finish.

C. Color: To be selected by Architect from manufacturer's standard range.

D. Mounting: Furnish with interior flat flange for installation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.

C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

D. Install diffusers to ductwork with air tight connection.

E. Provide balancing dampers on duct take-off to diffusers and grilles and registers, despite whether dampers are specified as part of diffuser, or grille and register assembly.

3.02 PROTECTION

A. Protect installed products until completion of project.

B. Replace, repair, or touch-up damaged products before Substantial Completion.

END OF SECTION 233700

SECTION 233813 - COMMERCIAL-KITCHEN HOODS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

B. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations 2021.

C. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines 2001.

PART 2 PRODUCTS

2.01 HOOD CONSTRUCTION

A. Provide products that comply with NFPA 96, the requirements and recommendations of SMACNA (KVS), and the requirements of the Authorities Having Jurisdiction.

B. Construction: Materials, inside and out, are stainless steel complying with ASTM A666, Type 304, stretcher leveled; unless otherwise indicated.
   1. Sheet Thickness: 18 gauge, 0.048 inch (1.22 mm), minimum.
   2. Fabrication: Fabricate each individual hood in one piece, with all welds ground and finished to match (inside and out); fabricate flat surfaces exposed to view as double-pan formed panels with internal stiffener members.
   3. Finish on Surfaces Exposed to View: No.4 (brushed directional); provide stainless steel faces on all sides exposed to view.
   4. Finish on Concealed Surfaces: No.4 or No.2B (dull, matte).
   5. Duct Collars: For exhaust and make-up air openings, provide duct collar welded to hood unit; minimum of 8 inches (200 mm) extension from top or back face of unit, with minimum one inch (25 mm) 90 degree flange, unless otherwise indicated.
   6. Access Panels: Provide removable or hinged access panels sufficient for maintenance and replacement of operating components inside unit; maximum width of 40 inches (1000 mm).
   7. Supports: Stainless steel mounting brackets, struts, and threaded hanger rods.
      a. Hanger Rods: 3/8 inch (9 mm) diameter, minimum.
      b. Hanger Spacing: 48 inches (1220 mm) on center, maximum.
      c. Attachment to Structure: Mechanical fittings or inserts, stainless steel.

2.02 HOOD ACCESSORIES

A. Controls:
   1. Fans: Provide manual push button controls for starting and stopping fans and labeled indicator lights showing fan status.
   2. Fans: Provide controls for fan operation by time clock, programmable by the week, capable of maintaining time cycle after operation of manual push buttons.

B. Control Panels: Factory assembled and pre-wired, ready for utility connections.
   1. UL listed for use with specific hood.
   2. Provide a single control panel combining all control functions for a particular

hood, unless otherwise indicated.

3. Provide a single control panel for each group of hoods served by a single exhaust fan.
4. Enclosures: Flush-mounted; stainless steel, to match hood.
5. Provide indicator lights on control panel door showing status of fans and power supply.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions and NFPA 96.

B. Install hoods level and plumb, securely fastened, with seismic restraints as specified, and free of vibration during normal operation.

C. Weld hood duct collars to ductwork, liquid-tight.

D. Connect to utilities.

3.02 SYSTEM STARTUP

A. Obtain the services of the manufacturer's representative experienced in the installation, adjustment, and operation of the equipment to supervise the starting and adjusting of equipment.

B. Prepare equipment for startup, start and operate equipment for sufficient period to verify proper operation; correct equipment not operating correctly.

C. Demonstrate operation to Owner's designated personnel.

D. Report deficiencies in writing to Architect.

3.03 CLEANING

A. Clean surfaces of equipment.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 233813

SECTION 236213 - PACKAGED AIR-COOLED REFRIGERANT COMPRESSOR AND CONDENSER UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Condensing unit package.

B. Charge of refrigerant and oil.

C. Controls and control connections.

D. Refrigerant piping connections.

E. Motor starters.

F. Electrical power connections.

1.02 RELATED REQUIREMENTS

A. Section 230548 - Vibration and Seismic Controls for HVAC: Placement of vibration isolators.

B. Section 232300 - Refrigerant Piping.

C. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.

B. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.

C. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

1.04 SUBMITTALS

A. Product Data: Provide rated capacities, weights specialties and accessories, electrical nameplate data, and wiring diagrams. To ensure capacities are complementary, include equipment served by condensing units in submittal or submit at the same time.

B. Design Data: Indicate pipe and equipment sizing.

C. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

1.07 WARRANTY

A. Provide a five year warranty to include coverage for refrigerant compressors.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

A. Units: Self-contained, packaged, factory-assembled and pre-wired units suitable for outdoor use consisting of cabinet, compressors, condensing coil and fans, integral subcooling coil, controls, liquid receiver, wind deflector, and screens.

B. Construction and Ratings: In accordance with AHRI 210/240. Test in accordance with ASHRAE Std 23.

C. Performance Ratings: Energy Efficiency Rating (EER) and Coefficient of Performance (COP) not less than prescribed by ASHRAE Std 90.1.

2.02 CASING

A. House components in welded steel frame with galvanized steel panels with weather resistant, baked enamel finish.

B. Mount starters, disconnects, and controls in weatherproof panel provided with full opening access doors. Provide mechanical interlock to disconnect power when door is opened.

C. Provide removable access doors or panels with quick fasteners and piano hinges.

2.03 CONDENSER COILS

A. Coils: Aluminum fins mechanically bonded to seamless copper tubing. Provide subcooling circuits. Air test under water to 425 psig (2900 kPa), and dehydrate. Seal with holding charge of refrigerant.

B. Coil Guard: Expanded metal with lint screens.

2.04 FAN REQUIREMENTS

A. Vertical discharge, direct-driven propeller-type condenser fans with fan guard on discharge. Equip with roller or ball bearings with grease fittings extended to outside of casing.

B. Horizontal discharge, double width, double inlet forward curved centrifugal type condenser fans, equipped with roller or ball bearings with grease fittings extended to outside of casing, V-belt drive with belt guard.

2.05 COMPRESSORS

A. Compressor: As indicated on drawings.

B. Mounting: Statically and dynamically balance rotating parts and mount on spring vibration isolators.

C. Lubrication System: Reversible, positive displacement oil pump with oil charging valve, oil level sight glass, and magnetic plug or strainer.

D. Motor: Constant speed 1800 rpm suction gas cooled with electronic sensor and winding over temperature protection, designed for across-the-line starting.

E. Capacity Reduction Equipment: Suction valve unloaders, with lifting mechanism operated by electrically actuated solenoid valve, with unloaded compressor start; controlled from suction pressure.

F. Sump Oil Heater: Evaporates refrigerant returning to sump during shut down. Energizes heater continuously when compressor is not operating.

2.06 CONTROLS

A. On unit, mount weatherproof steel control panel, NEMA 250, containing power and control wiring, molded case disconnect switch, factory wired with single point power connection.

B. For each compressor, provide part winding starter, nonrecycling compressor overload, starter relay, and control power transformer or terminal for controls power. Provide manual reset current overload protection. For each condenser fan, provide across-the-line starter with starter relay.

C. Provide safety controls arranged so any one will shut down machine:
   1. High discharge pressure switch (manual reset) for each compressor.
   2. Low suction pressure switch (automatic reset) for each compressor.
   3. Oil Pressure switch (manual reset).

D. Provide the following operating controls:

E. Provide controls to permit operation down to 0 degrees F (minus 18 degrees C) ambient temperature.

F. Gauges: Prepiped for suction and discharge refrigerant pressures and oil pressure for each compressor.

G. Provide electric solid state microcomputer based room thermostat, located as indicated.
   1. Incorporate:
      a. Automatic switching from heating to cooling.
      b. Short cycle protection.
   2. Display shall include:
      a. Actual room temperature.
      b. Programmed temperature.
      c. Duration of timed override.
      d. Day of week.
      e. System Mode Indication: Heating, cooling, auto, off, fan auto, fan on.
      f. Stage (heating or cooling) operation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's installation instructions.

B. Complete structural, mechanical, and electrical connections in accordance with manufacturer's installation instructions.

C. Provide for connection to electrical service. See Section 260583.

D. Install units on vibration isolation. See Section 230548.

3.02 SYSTEM STARTUP

A. Supply initial charge of refrigerant and oil for each refrigeration system. Replace losses of oil or refrigerant prior to end of correction period.

B. Charge system with refrigerant and test entire system for leaks after completion of installation. Repair leaks, put system into operation, and test equipment performance.

C. Provide cooling season start-up, and winter season shut down for first year of operation.

END OF SECTION 236213

SECTION 238126.13 - SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air-source heat pumps.

B. Air cooled condensing units.

C. Indoor air handling (fan and coil) units for ducted systems.

D. Indoor air handling (fan and coil) units for ductless systems.

E. Controls.

1.02 RELATED REQUIREMENTS

A. Section 233100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.

B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2022, with Errata (2023).

D. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.

E. NEMA MG 1 - Motors and Generators; 2021.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.

H. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

B. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

D. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

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

1.06 WARRANTY

A. Provide five year manufacturers warranty for condensing units and compressors.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
   1. Heating and Cooling: Air-source electric heat pump located in outdoor unit with evaporator.
   2. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

B. Performance Requirements: See Drawings for additional requirements.

2.02 INDOOR AIR HANDLING UNITS FOR DUCTED SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.
   1. Air Flow Configuration: Upflow.
   2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.

B. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
   1. Motor: NEMA MG 1; 1750 rpm multiple speed, permanently lubricated, hinge mounted.
   2. Motor Electrical Characteristics:

C. Air Filters: 4-inch thick pleated, glass fiber, disposable type arranged for easy replacement.

D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
   1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
   2. Manufacturers: System manufacturer.

2.03 INDOOR AIR HANDLING UNITS FOR DUCTLESS SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.
   1. Location: High-wall.
   2. Fan: Line-flow fan direct driven by a single motor.
   3. Filter return air with washable, antioxidant pre-filter and a pleated anti-allergy enzyme filter.

B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
   1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
   2. Manufacturer: System manufacturer.

2.04 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
   1. Comply with AHRI 210/240.
   2. Refrigerant: R-410A.
   3. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL 207.

B. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
   1. Condenser Fans: Direct-drive propeller type.
   2. Condenser Fan Motor: Enclosed, 1-phase type, permanently lubricated.

C. Coil: Air-cooled, aluminum fins bonded to copper tubes.

D. Accessories: Filter drier, high-pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).
   1. Provide thermostatic expansion valves.

E. Operating Controls:
   1. Control by room thermostat to maintain room temperature setting.

F. Mounting Pad: Precast concrete parking bumpers, minimum 4 inches (100 mm) square; minimum of two located under cabinet feet.

2.05 ACCESSORY EQUIPMENT

A. Room Thermostat: Wall-mounted, electric solid state microcomputer based room thermostat with remote sensor to maintain temperature setting; low-voltage; with following features:
   1. System selector switch (heat-off-cool) and fan control switch (auto-on).
   2. Automatic switching from heating to cooling.
   3. Preferential rate control to minimize overshoot and deviation from setpoint.
   4. Instant override of setpoint for continuous or timed period from one hour to 31 days.
   5. Short cycle protection.
   6. Selection features including degree F or degree C display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on-auto.
   7. Thermostat Display:
      a. Time of day.
      b. Actual room temperature.
      c. Programmed temperature.
      d. System Mode Indication: Heating, Cooling, Fan Auto, Off, and On, Auto or On, Off.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and in correct location.

C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install in accordance with NFPA 90A and NFPA 90B.

C. Install refrigeration systems in accordance with ASHRAE Std 15.

D. Pipe drain from cooling coils to nearest floor drain.

END OF SECTION 238126.13

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Metal-clad cable.

C. Wiring connectors.

D. Electrical tape.

E. Oxide inhibiting compound.

F. Wire pulling lubricant.

G. Cable ties.

H. Firestop sleeves.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.

F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

H. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.

I. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

J. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

M. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

N. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.

O. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

P. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

Q. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

R. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

S. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

B. Sustainable Design Documentation: Submit manufacturer's product data on conductor and cable showing compliance with specified lead content requirements.

C. Manufactured Wiring System Shop Drawings: Provide plan views indicating proposed system layout with components identified; indicate branch circuit connections.

D. Wire Pulling Lubricant: Certification of compatibility with conductors/cables.

E. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.

F. Field Quality Control Test Reports.

G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

H. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Nonmetallic-sheathed cable is not permitted.

D. Service entrance cable is not permitted.

E. Armored cable is not permitted.

F. Metal-clad cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
         1) Maximum Length: 6 feet (1.8 m).
      b. Where concealed in hollow stud walls and above accessible ceilings for branch circuits up to 20 A.
         1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
   2. In addition to other applicable restrictions, may not be used:
      a. Where exposed to damage.
      b. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductors for Grounding and Bonding: Also comply with Section 260526.

H. Conductor Material:
   1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   3. Tinned Copper Conductors: Comply with ASTM B33.

I. Minimum Conductor Size:
   1. Branch Circuits: 12 AWG. Refer to detail on drawings for upsizing conductors due to voltage drop.

J. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

K. Conductor Color Coding:
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. Color Coding Method: Integrally colored insulation.
      a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
   3. Color Code:
      a. 208Y/120 V, 3 Phase, 4 Wire System:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
         4) Neutral/Grounded: White.
      b. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
   1. Copper Building Wire:
      a. Cerro Wire LLC: www.cerrowire.com/#sle.
      b. Encore Wire Corporation: www.encorewire.com/#sle.

c. General Cable Technologies Corporation: www.generalcable.com/#sle.
d. Service Wire Co: www.servicewire.com/#sle.
e. Southwire Company: www.southwire.com/#sle.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:
1. Feeders and Branch Circuits:
a. Size 10 AWG and Smaller: Solid.
b. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
a. Installed Underground: Type XHHW-2.

2.04 METAL-CLAD CABLE

A. Manufacturers:
1. AFC Cable Systems Inc: www.afcweb.com/#sle.
2. Encore Wire Corporation: www.encorewire.com/#sle.
3. Service Wire Co: www.servicewire.com/#sle.
4. Southwire Company: www.southwire.com/#sle.

B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:
1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

F. Grounding: Full-size integral equipment grounding conductor.
1. Provide additional isolated/insulated grounding conductor.

G. Armor: Aluminum or steel, interlocked tape.

H. Provide PVC jacket applied over cable armor.

2.05 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 260526.

C. Wiring Connectors for Splices and Taps:
1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:
   1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
   2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
   3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
   4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
   5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.

E. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

F. Mechanical Connectors: Provide bolted type or set-screw type.

G. Compression Connectors: Provide circumferential type or hex type crimp configuration.

2.06 ACCESSORIES

A. Electrical Tape:
   1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
   2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
   3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.

B. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

C. Wire Pulling Lubricant:
   1. Listed and labeled as complying with UL 267.
   2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
   3. Suitable for use at installation temperature.

D. Cable Ties: Material and tensile strength rating suitable for application.

E. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.

F. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:
   1. Unless dimensioned, circuit routing indicated is diagrammatic.
   2. When circuit destination is indicated without specific routing, determine exact routing required.
   3. Arrange circuiting to minimize splices.
   4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
   5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
   6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
   7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
      a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
      b. Size raceways, boxes, etc. to accommodate conductors.
   8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install metal-clad cable (Type MC) in accordance with NECA 120.

E. Installation in Raceway:
   1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
   2. Pull all conductors and cables together into raceway at same time.
   3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
   4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

H. Terminate cables using suitable fittings.
   1. Metal-Clad Cable (Type MC):
      a. Use listed fittings.
      b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
      c. Do not use direct-bearing set-screw type fittings for cables with aluminum armor.

I. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.

J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

L. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
   3. Do not remove conductor strands to facilitate insertion into connector.
   4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
   5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

N. Insulate ends of spare conductors using vinyl insulating electrical tape.

O. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

C. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

C. Section 264113 - Lightning Protection for Structures.

D. Section 265600 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.03 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2017.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 99 - Health Care Facilities Code; 2018.

G. NFPA 780 - Standard for the Installation of Lightning Protection Systems; 2020.

H. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify exact locations of underground metal water service pipe entrances to building.
2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

B. Field quality control test reports.

C. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
   2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
   3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

E. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.

b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.

2. Metal Underground Water Pipe(s):
   a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet (3.0 m) at an accessible location not more than 5 feet (1.5 m) from the point of entrance to the building.
   b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
   c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
3. Concrete-Encased Electrode:
   a. Provide connection to concrete-encased electrode consisting of not less than 20 feet (6.0 m) of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
4. Ground Rod Electrode(s):
   a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
   b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
   c. Where location is not indicated, locate electrode(s) at least 5 feet (1.5 m) outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
5. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
6. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
   a. Ground Bar Size: Size as indicated on the plans
   b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
   c. Ground Bar Mounting Height: 18 inches (450 mm) above finished floor unless otherwise indicated.

F. Separately Derived System Grounding:
1. Separately derived systems include, but are not limited to:
   a. Transformers (except autotransformers such as buck-boost transformers).
2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived

system. Make connection at same location as grounding electrode conductor connection.

4. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
5. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

G. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
    a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
    b. Metal gas piping.
8. Provide redundant grounding and bonding for patient care areas of health care facilities in accordance with NFPA 70 and NFPA 99.

H. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
    a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
    b. Raceway Size: 3/4 inch (21 mm) trade size unless otherwise indicated or required.
    c. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.

d. Ground Bar Mounting Height: 18 inches (450 mm) above finished floor unless otherwise indicated.

I. Lightning Protection Systems, in Addition to Requirements of Section 264113:
   1. Do not use grounding electrode dedicated for lightning protection system for component of building grounding electrode system provided under this section.
   2. Provide bonding of building grounding electrode system provided under this section and lightning protection grounding electrode system in accordance with NFPA 70 and NFPA 780.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
   1. Provide products listed, classified, and labeled as suitable for the purpose intended.
   2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
   1. Use insulated copper conductors unless otherwise indicated.
      a. Exceptions:
         1) Use bare copper conductors where installed underground in direct contact with earth.
         2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
   1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
   2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
   3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
   4. Manufacturers - Mechanical and Compression Connectors:
      a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
      b. Burndy LLC: www.burndy.com/#sle.
      c. Harger Lightning & Grounding: www.harger.com/#sle.
      d. Thomas & Betts Corporation: www.tnb.com/#sle.
   5. Manufacturers - Exothermic Welded Connections:
      a. Burndy LLC: www.burndy.com/#sle.
      b. Cadweld, a brand of Erico International Corporation: www.erico.com/#sle.
      c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC : www.thermoweld.com/#sle.

D. Ground Bars:
   1. Description: Copper rectangular ground bars with mounting brackets and insulators.
   2. Size: As indicated.
   3. Holes for Connections: As indicated or as required for connections to be made.

4. Manufacturers:
    a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
    b. Erico International Corporation: www.erico.com/#sle.
    c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC : www.thermoweld.com/#sle.

E. Ground Rod Electrodes:
    1. Comply with NEMA GR 1.
    2. Material: Copper-bonded (copper-clad) steel.
    3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.
    4. Manufacturers:
        a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
        b. Erico International Corporation: www.erico.com/#sle.
        c. Galvan Industries, Inc: www.galvanelectrical.com/#sle.
        d. Harger Lightning & Grounding: www.harger.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
    1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches (150 mm) below finished grade.

D. Make grounding and bonding connections using specified connectors.
    1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
    2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
    3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
    4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
    5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.13.

C. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

D. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

C. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

D. Section 265100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

E. Section 265600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
2. Coordinate the work with other trades to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.

1.06 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 5. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.
   3. Manufacturers:
      a. Cooper Crouse-Hinds, a division of Eaton Corporation : www.cooperindustries.com/#sle.
      b. Erico International Corporation: www.erico.com/#sle.

c. HoldRite, a brand of Reliance Worldwide Corporation : www.holdrite.com/#sle.
d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
e. Thomas & Betts Corporation: www.tnb.com/#sle.

C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
1. Manufacturers:
a. Cooper Crouse-Hinds, a division of Eaton Corporation : www.cooperindustries.com/#sle.
b. Erico International Corporation: www.erico.com/#sle.
c. HoldRite, a brand of Reliance Worldwide Corporation : www.holdrite.com/#sle.
d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
e. Thomas & Betts Corporation: www.tnb.com/#sle.

D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
1. Comply with MFMA-4.
2. Channel Material:
a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
3. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
4. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.
5. Manufacturers:
a. Cooper B-Line, a division of Eaton Corporation : www.cooperindustries.com/#sle.
b. Thomas & Betts Corporation: www.tnb.com/#sle.
c. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.

E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
a. Equipment Supports: 1/2 inch (13 mm) diameter.
b. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch (6 mm) diameter.
c. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch (10 mm) diameter.
d. Trapeze Support for Multiple Conduits: 3/8 inch (10 mm) diameter.
e. Outlet Boxes: 1/4 inch (6 mm) diameter.
f. Luminaires: 1/4 inch (6 mm) diameter.

F. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.

6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.
9. Plastic and lead anchors are not permitted.
10. Powder-actuated fasteners are not permitted.
11. Hammer-driven anchors and fasteners are not permitted.
12. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    a. Comply with MFMA-4.
    b. Channel Material: Use galvanized steel.
    c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
    1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
    2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
    3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
    4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Conduit Support and Attachment: Also comply with Section 260533.13.

I. Box Support and Attachment: Also comply with Section 260533.16.

J. Interior Luminaire Support and Attachment: Also comply with Section 265100.

K. Exterior Luminaire Support and Attachment: Also comply with Section 265600.

L. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

M. Secure fasteners according to manufacturer's recommended torque settings.

N. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. Inspect support and attachment components for damage and defects.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 260529

SECTION 260533.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Intermediate metal conduit (IMC).

C. Electrical metallic tubing (EMT).

D. Rigid polyvinyl chloride (PVC) conduit.

E. Conduit fittings.

F. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete encasement of conduits.

B. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Metal clad cable (Type MC), armored cable (Type AC), and manufactured wiring systems, including uses permitted.

C. Section 260526 - Grounding and Bonding for Electrical Systems.

D. Section 260529 - Hangers and Supports for Electrical Systems.

E. Section 260533.16 - Boxes for Electrical Systems.

F. Section 271000 - Structured Cabling: Additional requirements for communications systems conduits.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2015.

C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2018.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.

F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

G. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

H. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2016.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

K. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

L. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

M. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

N. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
   4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

2.02 CONDUIT REQUIREMENTS

A. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
   1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
   1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.05 ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use compression (gland) or set-screw type.
      a. Do not use indenter type connectors and couplings.

2.06 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

B. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.07 ACCESSORIES

A. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

B. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force (890 N).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install intermediate metal conduit (IMC) in accordance with NECA 101.

E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

F. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated without specific routing, determine exact routing required.
   3. Conceal all conduits unless specifically indicated to be exposed.
   4. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Mechanical equipment rooms.
      c. Within joists in areas with no ceiling.
   5. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
   6. Arrange conduit to maintain adequate headroom, clearances, and access.
   7. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
   8. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
   9. Route conduits above water and drain piping where possible.
   10. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
   11. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
   12. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
      a. Heaters.
      b. Hot water piping.
      c. Flues.
   13. Group parallel conduits in the same area together on a common rack.

G. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.

H. Connections and Terminations:
   1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
   2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
   3. Use suitable adapters where required to transition from one type of conduit to another.
   4. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
   5. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
   6. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

I. Penetrations:
   1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
   2. Make penetrations perpendicular to surfaces unless otherwise indicated.
   3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
   4. Conceal bends for conduit risers emerging above ground.
   5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
   6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
   7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
   8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

J. Underground Installation:
   1. Minimum Cover, Unless Otherwise Indicated or Required:
      a. Underground, Exterior: 24 inches (610 mm).
      b. Under Slab on Grade: 12 inches (300 mm) to bottom of slab.

K. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 033000 with minimum concrete cover of 3 inches (76 mm) on all sides unless otherwise indicated.

L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
   1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
   2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
   3. Where conduits are subject to earth movement by settlement or frost.

M. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
   1. Where conduits pass from outdoors into conditioned interior spaces.
   2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

N. Provide grounding and bonding in accordance with Section 260526.

3.03 FIELD QUALITY CONTROL

A. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

B. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION 260533

SECTION 260533.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

C. Floor boxes.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 083100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260533.13 - Conduit for Electrical Systems:
   1. Conduit bodies and other fittings.
   2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

E. Section 262726 - Wiring Devices:
   1. Wall plates.
   2. Floor box service fittings.

F. Section 271000 - Structured Cabling: Additional requirements for communications systems outlet boxes.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

I. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled as suitable for the purpose intended.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:

1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.

2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use suitable concrete type boxes where flush-mounted in concrete.
4. Use suitable masonry type boxes where flush-mounted in masonry walls.
5. Use raised covers suitable for the type of wall construction and device configuration where required.
6. Use shallow boxes where required by the type of wall construction.
7. Do not use "through-wall" boxes designed for access from both sides of wall.
8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
12. Wall Plates: Comply with Section 262726.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

D. Floor Boxes:
1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 262726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
2. Manufacturer: Same as manufacturer of floor box service fittings.

2.02 ACCESSORIES

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:
   1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.
   2. Unless dimensioned, box locations indicated are approximate.
   3. Locate boxes as required for devices installed under other sections or by others.
   4. Locate boxes so that wall plates do not span different building finishes.
   5. Locate boxes so that wall plates do not cross masonry joints.
   6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
   7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
   8. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.

I. Box Supports:
   1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

J. Install boxes plumb and level.

K. Flush-Mounted Boxes:
   1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.

2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.

L. Install boxes as required to preserve insulation integrity.

M. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

N. Install firestopping to preserve fire resistance rating of partitions and other elements.

O. Close unused box openings.

P. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

Q. Provide grounding and bonding in accordance with Section 260526.

3.03 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION 260533.16

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Voltage markers.

D. Underground warning tape.

E. Floor marking tape.

F. Warning signs and labels.

1.02 RELATED REQUIREMENTS

A. Section 099100 - Painting.

B. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

C. Section 260573 - Power System Studies: Arc flash hazard warning labels.

D. Section 262726 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

E. Section 271000 - Structured Cabling: Identification for communications cabling and devices.

1.03 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011 (Reaffirmed 2017).

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011 (Reaffirmed 2017).

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

E. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
2. Do not install identification products until final surface finishes and painting are complete.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
      a. Panelboards:
         1) Identify power source and circuit number. Include location when not within sight of equipment.
         2) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
         3) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
      b. Enclosed switches, circuit breakers, and motor controllers:
      c. Transfer Switches:
         1) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.
      d. Electricity Meters:
   2. Service Equipment:
      a. Use identification nameplate to identify each service disconnecting means.
   3. Emergency System Equipment:
      a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
      b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
   4. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
   5. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
      a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches (76 mm) wide, painted in accordance with Section 099100.
   6. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
      a. Service equipment.
   7. Arc Flash Hazard Warning Labels: Comply with Section 260573.

B. Identification for Conductors and Cables:

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

C. Identification for Boxes:
1. Use voltage markers or color coded boxes to identify systems other than normal power system.
   a. Color-Coded Boxes: Field-painted in accordance with Section 099100 per the same color code used for raceways.
      1) Emergency Power System: Red.

D. Identification for Devices:
1. Identification for Communications Devices: Comply with Section 271000.
2. Wiring Device and Wallplate Finishes: Comply with Section 262726.
3. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
   a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
1. Materials:
   a. Indoor Clean, Dry Locations: Use plastic nameplates.
   b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

B. Identification Labels:
1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
2. Legend:
   a. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height:
    a. Equipment Designation: 1/2 inch (13 mm).
5. Color:
    a. Normal Power System: White text on black background.
    b. Emergency Power System: White text on red background.

D. Format for General Information and Operating Instructions:
1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/4 inch (6 mm).
5. Color: Black text on white background unless otherwise indicated.

E. Format for Caution and Warning Messages:
1. Minimum Size: 2 inches (51 mm) by 4 inches (100 mm).
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/2 inch (13 mm).
5. Color: Black text on yellow background unless otherwise indicated.

F. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
2. Legend: Power source and circuit number or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Black text on clear background.

2.03 VOLTAGE MARKERS

A. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

B. Minimum Size:
1. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches (29 by 110 mm).
2. Markers for Junction Boxes: 1/2 by 2 1/4 inches (13 by 57 mm).

C. Legend:
1. Markers for System Identification:
    a. Emergency Power System: Text "EMERGENCY".

D. Color: Black text on orange background unless otherwise indicated.

2.04 UNDERGROUND WARNING TAPE

A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).

C. Legend: Type of service, continuously repeated over full length of tape.

D. Color:

2.05 FLOOR MARKING TAPE

A. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminate, 3 inches (76 mm) wide, with alternating black and white stripes.

2.06 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:
   1. Materials:
   2. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.

C. Warning Labels:
   1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
   2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
   3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Surface-Mounted Equipment: Enclosure front.
   2. Flush-Mounted Equipment: Inside of equipment door.
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Branch Devices: Adjacent to device.
   6. Interior Components: Legible from the point of access.
   7. Boxes: Outside face of cover.
   8. Conductors and Cables: Legible from the point of access.
   9. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.

G. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION 260553

SECTION 260573 - POWER SYSTEM STUDIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Short-circuit study.

B. Protective device coordination study.

C. Arc flash and shock risk assessment.
   1. Includes arc flash hazard warning labels.

D. Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

1.02 RELATED REQUIREMENTS

A. Section 260553 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.

B. Section 262100 - Low-Voltage Electrical Service Entrance.

C. Section 262416 - Panelboards.

D. Section 262816.13 - Enclosed Circuit Breakers.

E. Section 262816.16 - Enclosed Switches.

1.03 REFERENCE STANDARDS

A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011 (Reaffirmed 2017).

B. IEEE 141 - IEEE Recommended Practice for Electric Power Distribution for Industrial Plants; 1993 (Reaffirmed 1999).

C. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata (2003).

D. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.

E. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems; 2006.

F. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations; 2018, with Errata (2019).

G. NEMA MG 1 - Motors and Generators; 2021.

H. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.
2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Submit study reports prior to or concurrent with product submittals.
2. Do not order equipment until matching study reports and product submittals have both been evaluated by Architect.

1.05 SUBMITTALS

A. Study reports, stamped or sealed and signed by study preparer.

B. Arc Flash Hazard Warning Label Samples: One of each type specified.

1.06 POWER SYSTEM STUDIES

A. Scope of Studies:
1. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).
2. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.

B. General Study Requirements:
1. Comply with NFPA 70.
2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.

C. Data Collection:
1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.
a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.
1) Obtain up-to-date information from Utility Company.
b. Generators: Include manufacturer/model, kW and voltage ratings, and impedance.
c. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 1 code letter designation.
d. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.
e. Protective Devices:
1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating,

interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).

2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).

f. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.

D. Short-Circuit Study:
1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.
2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:
   a. Maximum utility fault currents.
   b. Maximum motor contribution.
   c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.

E. Protective Device Coordination Study:
1. Comply with applicable portions of IEEE 242 and IEEE 399.
2. Analyze alternate scenarios considering known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

F. Arc Flash and Shock Risk Assessment:
1. Comply with NFPA 70E.
2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.
3. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:
   a. Maximum and minimum utility fault currents.
   b. Maximum and minimum motor contribution.
   c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

G. Study Reports:
1. General Requirements:
   a. Identify date of study and study preparer.
   b. Identify study methodology and software product(s) used.
   c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.
   d. Identify base used for per unit values.
   e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.
   f. Include conclusions and recommendations.

2. Short-Circuit Study:
    a. For each scenario, identify at each bus location:
        1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).
        2) Fault point X/R ratio.
        3) Associated equipment short circuit current ratings.
    b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.
3. Protective Device Coordination Study:
    a. For each scenario, include time-current coordination curves plotted on log-log scale graphs.
    b. For each graph include (where applicable):
        1) Partial single-line diagram identifying the portion of the system illustrated.
        2) Protective Devices: Time-current curves with applicable tolerance bands for each protective device in series back to the source, plotted up to the maximum available fault current at the associated bus.
        3) Conductors: Damage curves.
        4) Transformers: Inrush points and damage curves.
        5) Generators: Full load current, overload curves, decrement curves, and short circuit withstand points.
        6) Motors: Full load current, starting curves, and damage curves.
        7) Capacitors: Full load current and damage curves.
    c. For each protective device, identify fixed and adjustable characteristics with available ranges and recommended settings.
        1) Circuit Breakers: Include long time pickup and delay, short time pickup and delay, and instantaneous pickup.
        2) Include ground fault pickup and delay.
        3) Include fuse ratings.
        4) Protective Relays: Include current/potential transformer ratios, tap, time dial, and instantaneous pickup.
    d. Identify cases where either full selective coordination or adequate protection is not achieved, along with recommendations.
4. Arc Flash and Shock Risk Assessment:
    a. For the worst case for each scenario, identify at each bus location:
        1) Calculated incident energy and associated working distance.
        2) Calculated arc flash boundary.
        3) Bolted fault current.
        4) Arcing fault current.
        5) Clearing time.
        6) Arc gap distance.
    b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.

1.07 QUALITY ASSURANCE

A. Study Preparer Qualifications: Professional electrical engineer licensed in the State in which the Project is located and with minimum five years experience in the preparation of studies of similar type and complexity using specified computer software.

B. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.

PART 2 PRODUCTS

2.01 ARC FLASH HAZARD WARNING LABELS

A. Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.
   1. Materials: Comply with Section 260553.
   2. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.
      a. Include the following information:
         1) Arc flash boundary.
         2) Available incident energy and corresponding working distance.
         3) Site-specific PPE (personnel protective equipment) requirements.
         4) Nominal system voltage.
         5) Limited approach boundary.
         6) Restricted approach boundary.
         7) Equipment identification.
         8) Date calculations were performed.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install arc flash warning labels in accordance with Section 260553.

3.02 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Adjust equipment and protective devices for compliance with studies and recommended settings.

C. Notify Architect of any conflicts with or deviations from studies. Obtain direction before proceeding.

3.03 CLOSEOUT ACTIVITIES

A. Training: Include as part of the base bid training for Owner's personnel on electrical safety pertaining to arc flash and shock hazards.
   1. Use site-specific arc flash and shock risk assessment report as training reference, supplemented with additional training materials as required.

END OF SECTION 260573

SECTION 260583 - WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 260533.13 - Conduit for Electrical Systems.

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 262726 - Wiring Devices.

E. Section 262816.16 - Enclosed Switches.

1.03 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
2. Determine connection locations and requirements.

B. Sequencing:

1. Install rough-in of electrical connections before installation of equipment is required.
2. Make electrical connections before required start-up of equipment.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Disconnect Switches: As specified in Section 262816.16 and in individual equipment sections.

B. Wiring Devices: As specified in Section 262726.

C. Wire and Cable: As specified in Section 260519.

D. Boxes: As specified in Section 260533.16.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquid tight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION 260583

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Occupancy sensors.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 262726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.

E. Section 265100 - Interior Lighting.

F. Section 265600 - Exterior Lighting.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2016.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install lighting control devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

B. Field Quality Control Reports.

C. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Operation and Maintenance Data: Include detailed information on device programming and setup.

E. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 WARRANTY

A. Provide five year manufacturer warranty for all occupancy sensors.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 OCCUPANCY SENSORS

A. All Occupancy Sensors:
   1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
   2. Sensor Technology:
      a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
   3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
   4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
   5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
   6. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.

7. Sensitivity: Field adjustable.
8. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.

B. Wall Switch Occupancy Sensors:
   1. All Wall Switch Occupancy Sensors:
      a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
      b. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
   2. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq m).

C. Ceiling Mounted Occupancy Sensors:
   1. All Ceiling Mounted Occupancy Sensors:
      a. Description: Low profile occupancy sensors designed for ceiling installation.
   2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:

D. Power Packs for Low Voltage Occupancy Sensors:
   1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
   2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
   3. Input Supply Voltage: Dual rated for 120/277 V ac.
   4. Load Rating: As required to control the load indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of lighting control devices provided under this section.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 262726.

G. Provide required supports in accordance with Section 260529.

H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

I. Occupancy Sensor Locations:

1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
2. Locate dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

3.04 FIELD QUALITY CONTROL

A. Inspect each lighting control device for damage and defects.

B. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

C. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.

C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on dual technology occupancy sensor lenses to block undesired motion detection.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.
3. Location: At project site.

END OF SECTION 260923

SECTION 262100 - LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical service requirements.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Materials and installation requirements for cast-in-place concrete equipment pads.

B. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

C. Section 260526 - Grounding and Bonding for Electrical Systems.

D. Section 260529 - Hangers and Supports for Electrical Systems.

E. Section 260533.13 - Conduit for Electrical Systems.

F. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

G. Section 262416 - Panelboards: Service entrance equipment.

H. Section 262816.16 - Enclosed Switches: Service entrance equipment.

I. Section 263213 - Engine Generators: Emergency/standby power systems for interconnection with normal utility electrical supply.

J. Section 263600 - Transfer Switches: Service entrance equipment.

K. Section 264300 - Surge Protective Devices: Service entrance surge protective devices.

1.03 PRICE AND PAYMENT PROCEDURES

A. Allowances:

1. Include cash allowance for Utility Company charges associated with providing service.

1.04 DEFINITIONS

A. Service Point: The point of connection between the facilities of the serving utility and the premises wiring as defined in NFPA 70, and as designated by the Utility Company.

1.05 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code; 2017.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.06 ADMINISTRATIVE REQUIREMENTS

A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.

B. Coordination:

1. Verify the following with Utility Company representative:
   a. Utility Company requirements, including division of responsibility.

b. Exact location and details of utility point of connection.
c. Utility easement requirements.
d. Utility Company charges associated with providing service.

2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
4. Coordinate the work with other installers to provide communication lines required for Utility Company meters.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.

D. Utility Company charges associated with providing permanent service to be paid by Owner.

E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.

F. Scheduling:
1. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.07 QUALITY ASSURANCE

A. Comply with the following:
1. IEEE C2 (National Electrical Safety Code).
2. NFPA 70 (National Electrical Code).
3. The requirements of the Utility Company.
4. The requirements of the local authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 ELECTRICAL SERVICE REQUIREMENTS

A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.

B. Electrical Service Characteristics:
   1. Service Type: Underground.
   2. Service Voltage: 208Y/120 V, 3 phase, 60 Hz.

C. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions and Utility Company requirements.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required support and attachment components in accordance with Section 260529.

E. Provide grounding and bonding for service entrance equipment in accordance with Section 260526.

F. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 260553.

3.03 PROTECTION

A. Protect installed equipment from subsequent construction operations.

END OF SECTION 262100

SECTION 262416 – PANELBOARDS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 260573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

E. Section 264300 - Surge Protective Devices.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

E. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

F. NEMA PB 1 - Panelboards; 2011.

G. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000 Volts or Less; 2023.

H. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

K. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

L. UL 67 - Panelboards; Current Edition, Including All Revisions.

M. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

N. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
   4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:
   1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

PART 2 - PRODUCTS

2.01 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
      b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 264300, list and label panelboards as a complete assembly including surge protective device.

L. Load centers are not acceptable.

2.02 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase and Neutral Bus Material: Copper.
   2. Ground Bus Material: Copper.

D. Circuit Breakers:
   1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.

E. Enclosures:
   1. Provide surface-mounted enclosures unless otherwise indicated.

2.03 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
   2. Phase and Neutral Bus Material: Copper.
   3. Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
   1. Provide surface-mounted or flush-mounted enclosures as indicated.
   2. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
   1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
   2. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:

b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

3. Conductor Terminations:
   a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

2.05 SOURCE QUALITY CONTROL

A. Factory test panelboards according to NEMA PB 1.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 260529.

F. Install panelboards plumb.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.

I. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling.

J. Provide grounding and bonding in accordance with Section 260526.

K. Install all field-installed branch devices, components, and accessories.

L. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 260573.

M. Provide filler plates to cover unused spaces in panelboards.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.

C. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.05 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Wall plates.

E. Floor box service fittings.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 260583 - Wiring Connections: Cords and plugs for equipment.

F. Section 260923 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors.

G. Section 271000 - Structured Cabling: Voice and data jacks.

1.03 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h, with Amendments (2017).

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2014g, with Amendment (2017).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

L. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

M. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
   3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
   4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

C. Operation and Maintenance Data:
   1. Wall Dimmers: Include information on operation and setting of presets.
   2. GFCI Receptacles: Include information on status indicators.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 - PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

C. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.

D. Provide GFCI protection for receptacles installed in kitchens.

E. Provide GFCI protection for receptacles serving electric drinking fountains.

2.02 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate.

C. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.

D. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.

2.03 WALL SWITCHES

A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.04 WALL DIMMERS

A. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

2.05 RECEPTACLES

A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.

B. Convenience Receptacles:
   1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
   2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

C. GFCI Receptacles:
   1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
   2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

2.06 WALL PLATES

A. Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Standard.
   3. Screws: Metal with slotted heads finished to match wall plate finish.

B. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

D. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.07 FLOOR BOX SERVICE FITTINGS

A. Description: Service fittings compatible with floor boxes provided under Section 260533.16 with components, adapters, and trims required for complete installation.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that floor boxes are adjusted properly.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

G. Verify that openings in access floor are in proper locations.

H. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Install wiring devices plumb and level with mounting yoke held rigidly in place.

I. Install wall switches with OFF position down.

J. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

K. Do not share neutral conductor on branch circuits utilizing wall dimmers.

L. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

M. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

N. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

3.04 FIELD QUALITY CONTROL

A. Inspect each wiring device for damage and defects.

B. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

C. Test each receptacle to verify operation and proper polarity.

D. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

E. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 262726

SECTION 262816.13 - ENCLOSED CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Enclosed circuit breakers.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 260573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed circuit breaker internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed circuit breakers.

PART 2 - PRODUCTS

2.01 ENCLOSED CIRCUIT BREAKERS

A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

D. Short Circuit Current Rating:
   1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.

E. Conductor Terminations: Suitable for use with the conductors to be installed.

F. Provide thermal magnetic circuit breakers unless otherwise indicated.

G. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

I. Provide externally operable handle with means for locking in the OFF position.

2.02 MOLDED CASE CIRCUIT BREAKERS

A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

B. Interrupting Capacity:
   1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
   2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

C. Conductor Terminations:
   1. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

D. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

E. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed circuit breakers.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 260529.

E. Install enclosed circuit breakers plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 260526.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with manufacturer's instructions and NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for circuit breakers used for service entrance. Tests listed as optional are not required.

C. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from circuit breaker enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 262816.13

SECTION 262816.16 - ENCLOSED SWITCHES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260573 - Power System Studies: Additional criteria for the selection of equipment and associated protective devices specified in this section.

D. Section 263600 - Transfer Switches: Automatic and non-automatic switches listed for use as transfer switch equipment.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed switches.

PART 2 - PRODUCTS

2.01 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:
   1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.

G. Provide with switch blade contact position that is visible when the cover is open.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

J. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

K. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

L. Heavy Duty Switches:
   1. Comply with NEMA KS 1.
   2. Conductor Terminations:
      a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 260529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 260526.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

C. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 262816.16

SECTION 263213 - ENGINE GENERATORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Packaged engine generator system and associated components and accessories:
   1. Engine and engine accessory equipment.
   2. Alternator (generator).
   3. Generator set control system.
   4. Generator set enclosure.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 263600 - Transfer Switches.

1.03 REFERENCE STANDARDS

A. ASTM D975 - Standard Specification for Diesel Fuel; 2023a.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA/EGSA 404 - Standard for Installing Generator Sets; 2014.

D. NEMA MG 1 - Motors and Generators; 2021.

E. NFPA 30 - Flammable and Combustible Liquids Code; 2024.

F. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines; 2021.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 99 - Health Care Facilities Code; 2018.

I. NFPA 110 - Standard for Emergency and Standby Power Systems; 2022.

J. UL 142 - Steel Aboveground Tanks for Flammable and Combustible Liquids; Current Edition, Including All Revisions.

K. UL 1236 - Battery Chargers for Charging Engine-Starter Batteries; Current Edition, Including All Revisions.

L. UL 2085 - Protected Aboveground Tanks for Flammable and Combustible Liquids; Current Edition, Including All Revisions.

M. UL 2200 - Stationary Engine Generator Assemblies; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate compatibility of generator sets to be installed with work provided under other sections or by others.
2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.
3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
4. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week before starting work of this section; require attendance of all affected installers.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.

B. Manufacturer's factory emissions certification.

C. Source quality control test reports.

D. Provide NFPA 110 required documentation from manufacturer where requested by authorities having jurisdiction, including but not limited to:
1. Certified prototype tests.
2. Torsional vibration compatibility certification.
3. NFPA 110 compliance certification.
4. Certified rated load test at rated power factor.

E. Field quality control test reports.

F. Maintenance contracts.

1.06 QUALITY ASSURANCE

A. Comply with the following:
1. NFPA 70 (National Electrical Code).
2. NFPA 110 (Standard for Emergency and Standby Power Systems).
3. NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).
4. NFPA 30 (Flammable and Combustible Liquids Code).

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store generator sets in accordance with manufacturer's instructions and NECA/EGSA 404.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to generator set components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 - PRODUCTS

2.01 PACKAGED ENGINE GENERATOR SYSTEM

A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. System Description:
   1. Application: Emergency/standby.
   2. Configuration: Single packaged engine generator set operated independently (not in parallel).

D. Packaged Engine Generator Set:
   1. Type: Diesel (compression ignition).
   2. Power Rating: 100 kW, standby.
   3. Voltage: As indicated on drawings.
   4. Main Line Circuit Breaker:
      a. Type: Thermal magnetic.
      b. Trip Rating: Select according to generator set rating.

E. Generator Set General Requirements:
   1. Prototype tested in accordance with NFPA 110 for Level 1 systems.
   2. Factory-assembled, with components mounted on suitable base.
   3. List and label engine generator assembly as complying with UL 2200.
   4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.
   5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.
   6. Main Line Circuit Breakers: Provide factory-installed line side connections with suitable lugs for load side connections.

F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.

G. Starting and Load Acceptance Requirements:
   1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.
   2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate over crank alarm condition and lock-out generator set from further cranking until manually reset.
   3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).
   4. Maximum Load Step: Supports 100 percent of rated load in one step.

H. Exhaust Emissions Requirements:
   1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.
   2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.

2.02 ENGINE AND ENGINE ACCESSORY EQUIPMENT

A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.

B. Engine Fuel System - Diesel (Compression Ignition):
   1. Fuel Source: Diesel, ASTM D975 No. 2-D or approved cold weather diesel blends.
   2. Fuel Storage: Sub-base fuel tank.
   3. Engine Fuel Supply: Provide engine-driven, positive displacement fuel pump with replaceable fuel filter(s), water separator, check valve to secure prime, manual fuel priming pump, and relief-bypass valve. Provide fuel cooler where recommended by manufacturer.
   4. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.
   5. Sub-Base Fuel Tank:
      a. Provide sub-base mounted, double-wall fuel tank with secondary containment; listed and labeled as complying with UL 142.
      b. Tank Capacity: Size for minimum of 24 hours of continuous engine generator operation at 100 percent rated load, but not larger than permissible by applicable codes.
      c. Features:
         1) Direct reading fuel level gauge.
         2) Normal atmospheric vent.
         3) Emergency pressure relief vent.
         4) Fuel fill opening with lockable cap.
         5) Dedicated electrical conduit stub-up area.

C. Engine Starting System:
   1. System Type: Electric, with DC solenoid-activated starting motor(s).
   2. Battery(s):

a. Battery Type: Lead-acid.
b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.
c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.

3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.
4. Battery Charger:
   a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.
   b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours, as required by NFPA 110 for Level 1 applications while carrying normal loads.
   c. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.
   d. Provide integral DC output ammeter and voltmeter with five percent accuracy.
   e. Provide alarm output contacts as necessary for alarm indications.

D. Engine Speed Control System (Governor):
1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.
2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.

E. Engine Lubrication System:
1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.

F. Engine Cooling System:
1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.
2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.

G. Engine Air Intake and Exhaust System:
1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.
2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.
3. Exhaust Silencer: Provide critical grade or better exhaust silencer with sound attenuation not less than basis of design; select according to manufacturer's recommendations to meet sound performance requirements, where specified.

2.03 ALTERNATOR (GENERATOR)

A. Alternator: 3-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 1; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.

B. Exciter:
   1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.
   2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.
   3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.

C. Temperature Rise: Comply with UL 2200.

D. Insulation System: NEMA MG 1, Class H; suitable for alternator temperature rise.

E. Enclosure: NEMA MG 1, drip-proof.

F. Total Harmonic Distortion: Not greater than five percent.

2.04 GENERATOR SET CONTROL SYSTEM

A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.

B. Control Panel:
   1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.
   2. Generator Set Control Functions:
      a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).
      b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.
      c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.
      d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.
      e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.
      f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).
      g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.
   3. Generator Set Status Indications:
      a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
      b. Current (Amps): For each phase.
      c. Frequency (Hz).
      d. Real power (W/kW).
      e. Reactive power (VAR/kVAR).
      f. Apparent power (VA/kVA).
      g. Power factor.
      h. Duty Level: Actual load as percentage of rated power.

i. Engine speed (RPM).
j. Battery voltage (Volts DC).
k. Engine oil pressure.
l. Engine coolant temperature.
m. Engine run time.
n. Generator powering load (position signal from transfer switch).

4. Generator Set Protection and Warning/Shutdown Indications:
   a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:
      1) Overcrank (shutdown).
      2) Low coolant temperature (warning).
      3) High coolant temperature (warning).
      4) High coolant temperature (shutdown).
      5) Low oil pressure (shutdown).
      6) Overspeed (shutdown).
      7) Low fuel level (warning).
      8) Low coolant level (warning/shutdown).
      9) Generator control not in automatic mode (warning).
      10) High battery voltage (warning).
      11) Low cranking voltage (warning).
      12) Low battery voltage (warning).
      13) Battery charger failure (warning).
   b. In addition to NFPA 110 requirements, provide the following protections/indications:
      1) High AC voltage (shutdown).
      2) Low AC voltage (shutdown).
      3) High frequency (shutdown).
      4) Low frequency (shutdown).
      5) Overcurrent (shutdown).
   c. Provide contacts for local and remote common alarm.
   d. Provide lamp test function that illuminates all indicator lamps.
5. Other Control Panel Features:
   a. Event log.
   b. Remote monitoring capability via PC.

C. Remote Emergency Stop: Provide approved red, mushroom style remote emergency stop button where indicated or required by authorities having jurisdiction.

2.05 GENERATOR SET ENCLOSURE

A. Enclosure Type: sound attenuating, hurricane rated.

B. Enclosure Material: Steel or aluminum.

C. Hardware Material: Stainless steel.

D. Color: Manufacturer's standard.

E. Access Doors: Lockable, with all locks keyed alike.

F. Openings: Designed to prevent bird/rodent entry.

G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.

H. Sound Attenuating Enclosures: Line enclosure with non-hydroscopic, self-extinguishing sound-attenuating material.

I. Exhaust Silencers: Where exhaust silencers are mounted within enclosure in main engine compartment, insulate silencer to minimize heat dissipation as necessary for operation at rated load under worst case ambient temperature.

2.06 SOURCE QUALITY CONTROL

A. Perform production tests on generator sets at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

B. Generator Set production testing to include, at a minimum:
   1. Operation at rated load and rated power factor.
   2. Single step load pick-up.
   3. Transient and steady state voltage and frequency performance.
   4. Operation of safety shutdowns.

C. Diesel Fuel Storage Tanks: Perform pressurized leak test prior to shipment.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of generator sets and auxiliary equipment are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive equipment.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.

D. Arrange equipment to provide minimum clearances and required maintenance access.

E. Unless otherwise indicated, mount generator set on properly sized, minimum 6 inch (150 mm) high concrete pad constructed in accordance with Section 033000.

F. Provide required support and attachment in accordance with Section 260529.

G. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.

H. Provide diesel fuel piping and venting where not factory installed.

I. Provide engine exhaust piping where not factory installed.

1. Include piping expansion joints, piping insulation, thimble, condensation trap/drain, rain cap, hangers/supports, etc. as indicated or as required.
2. Do not exceed manufacturer's maximum back pressure requirements.

J. Provide grounding and bonding in accordance with Section 260526.

K. Identify system wiring and components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.

B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.

D. Preliminary inspection and testing to include, at a minimum:
1. Inspect each system component for damage and defects.
2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.
3. Check for proper oil and coolant levels.

E. Prepare and start system in accordance with manufacturer's instructions.

F. Perform acceptance test in accordance with NFPA 110.

G. Inspection and testing to include, at a minimum:
1. Verify compliance with starting and load acceptance requirements.
2. Verify voltage and frequency; make required adjustments as necessary.
3. Verify phase sequence.
4. Verify control system operation, including safety shutdowns.
5. Verify operation of auxiliary equipment and accessories (e.g. battery charger, heaters, etc.).
6. Perform load tests in accordance with NFPA 110 (1.5 hour building load test followed by 2 hour full load test).

H. Provide field emissions testing where necessary for certification.

I. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

J. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of four hours of training.
3. Instructor: Manufacturer's authorized representative.
4. Location: At project site.

C. After successful acceptance test and just prior to Substantial Completion, replace air, oil, and fuel filters and fill fuel storage tank.

3.06 PROTECTION

A. Protect installed engine generator system from subsequent construction operations.

3.07 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of engine generator system for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

END OF SECTION 263213

SECTION 263600 - TRANSFER SWITCHES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Transfer switches for low-voltage (600 V and less) applications and associated accessories:
   1. Automatic transfer switches.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 260573 - Power System Studies: Additional criteria for the selection of equipment specified in this section.

F. Section 262100 - Low-Voltage Electrical Service Entrance.

G. Section 262816.16 - Enclosed Switches: Safety switches not listed for use as transfer switch equipment.

H. Section 263213 - Engine Generators: For interface with transfer switches.
   1. Includes code requirements applicable to work of this section.
   2. Includes additional testing requirements.
   3. Includes related demonstration and training requirements.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

C. NEMA ICS 10 Part 1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment; 2020.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 110 - Standard for Emergency and Standby Power Systems; 2022.

G. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

H. UL 1008 - Transfer Switch Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate compatibility of transfer switches to be installed with work provided under other sections or by others.
2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
4. Coordinate the work with placement of supports, anchors, etc. required for mounting.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.

B. Maintenance contracts.

1.06 QUALITY ASSURANCE

A. Comply with the following:
1. NFPA 70 (National Electrical Code).
2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for system Level specified in Section 263213.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store transfer switches in accordance with manufacturer's instructions.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to transfer switch components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

PART 2 - PRODUCTS

2.01 TRANSFER SWITCHES

A. Provide complete power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Construction Type: Either "contactor type" (open contact) or "breaker type" (enclosed contact) transfer switches complying with specified requirements are acceptable.

D. Comply with NEMA ICS 10 Part 1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).

E. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.

F. Load Classification: Classified for total system load (any combination of motor, electric discharge lamp, resistive, and tungsten lamp loads with tungsten lamp loads not exceeding 30 percent of the continuous current rating) unless otherwise indicated or required.

G. Switching Methods:
   1. Open Transition:
      a. Provide break-before-make transfer without a neutral position that is not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.
   2. Obtain control power for transfer operation from line side of source to which the load is to be transferred.

H. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.

I. Enclosures:
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1 or Type 12.
      b. Outdoor Locations: Type 3R or Type 4.
   2. Provide lockable door(s) for outdoor locations.
   3. Finish: Manufacturer's standard unless otherwise indicated.

J. Short Circuit Current Rating:
   1. Withstand and Closing Rating: Provide transfer switches, when protected by the supply side overcurrent protective devices to be installed, with listed withstand and closing rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.

K. Automatic Transfer Switches:
   1. Description: Transfer switches with automatically initiated transfer between sources; electrically operated and mechanically held.
   2. Control Functions:
      a. Automatic mode.
      b. Test Mode: Simulates failure of primary/normal source.
      c. Voltage and Frequency Sensing:
         1) Undervoltage sensing for each phase of primary/normal source; adjustable dropout/pickup settings.
         2) Undervoltage sensing for alternate/emergency source; adjustable dropout/pickup settings.

3) Underfrequency sensing for alternate/emergency source; adjustable dropout/pickup settings.

d. Outputs:
   1) Contacts for engine start/shutdown (except where direct generator communication interface is provided).
   2) Auxiliary contacts; one set(s) for each switch position.

e. Adjustable Time Delays:
   1) Engine generator start time delay; delays engine start signal to override momentary primary/normal source failures.
   2) Transfer to alternate/emergency source time delay.
   3) Retransfer to primary/normal source time delay.
   4) Engine generator cooldown time delay; delays engine shutdown following retransfer to primary/normal source to permit generator to run unloaded for cooldown period.

f. In-Phase Monitor (Open Transition Transfer Switches): Monitors phase angle difference between sources for initiating in-phase transfer.

g. Engine Exerciser: Provides programmable scheduled exercising of engine generator selectable with or without transfer to load; provides memory retention during power outage.

3. Status Indications:
   a. Connected to alternate/emergency source.
   b. Connected to primary/normal source.
   c. Alternate/emergency source available.

4. Automatic Sequence of Operations:
   a. Upon failure of primary/normal source for a programmable time period (engine generator start time delay), initiate starting of engine generator where applicable.
   b. When alternate/emergency source is available, transfer load to alternate/emergency source after programmable time delay.
   c. When primary/normal source has been restored, retransfer to primary/normal source after a programmable time delay. Bypass time delay if alternate/emergency source fails and primary/normal source is available.
   d. Where applicable, initiate shutdown of engine generator after programmable engine cooldown time delay.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of transfer switches are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive transfer switches.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required support and attachment in accordance with Section 260529.

E. Install transfer switches plumb and level.

F. Unless otherwise indicated, mount floor-mounted transfer switches on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.

G. Provide grounding and bonding in accordance with Section 260526.

H. Identify transfer switches and associated system wiring in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. Prepare and start system in accordance with manufacturer's instructions.

B. Automatic Transfer Switches:
   1. Inspect and test in accordance with NETA ATS, except Section 4.
   2. Perform inspections and tests listed in NETA ATS, Section 7.22.3. The insulation-resistance tests listed as optional are not required.
      a. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

C. Provide additional inspection and testing as required for completion of associated engine generator testing as specified in Section 263213.

D. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of transfer switches to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of transfer switches.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of four hours of training.
   3. Location: At project site.

C. Coordinate with related generator demonstration and training as specified in Section 263213.

3.06 PROTECTION

A. Protect installed transfer switches from subsequent construction operations.

3.07 MAINTENANCE

A. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of transfer switches for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

B. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within 4 hours of notification.
   2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
   3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

END OF SECTION 263600

SECTION 264113 - LIGHTNING PROTECTION FOR STRUCTURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Strike (air) terminals and interconnecting conductors.

B. Grounding and bonding for lightning protection.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems: Electrical system grounds.

1.03 REFERENCE STANDARDS

A. NFPA 780 - Standard for the Installation of Lightning Protection Systems; 2020.

B. UL 96 - Lightning Protection Components; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination with Concrete Work: Coordinate the embedding of lightning protection components in concrete.

B. Coordination with Roofing Work: Ensure adequate attachment of strike terminals and conductors without damage to roofing.

C. Preinstallation Meeting: Convene a meeting at least at least two weeks prior to commencement of any work affected by lightning protection system requirements to discuss prerequisites and coordination required by other installers; require attendance by representatives of installers whose work will be affected.

1.05 SUBMITTALS

A. Shop Drawings: Indicate location and layout of air terminals, grounding electrodes, and bonding connections to structure and other metal objects. Include terminal, electrode, and conductor sizes, and connection and termination details.

B. Product Data: Provide dimensions and materials of each component, indication of testing agency listing, and installation instructions.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Project Record Documents: Record actual locations of air terminals, grounding electrodes, bonding connections, and routing of system conductors in project record documents.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Person or entity, employed by installer, who specializes in lightning protection system design with minimum three years documented experience.

B. Installer Qualifications: Capable of providing the specified certification of the installed system.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.01 LIGHTNING PROTECTION SYSTEM

A. Lightning Protection System: Provide complete system complying with NFPA 780, including air terminals, bonding, interconnecting conductors and grounding electrodes.
   1. Provide system that protects:
      a. The entire structure.
      b. Open air areas within 100 feet (30 meters) of exterior walls at grade level.
      c. Open air areas within building footprint.
   2. Coordinate with other grounding and bonding systems specified.
   3. Provide copper, bronze, or stainless steel components, as applicable; no aluminum.

2.02 COMPONENTS

A. All Components: Complying with applicable requirements of UL 96.

B. Strike (Air) Terminals: Copper, solid, with adhesive bases for single-ply roof installations.

C. Grounding Rods: Solid copper.

D. Ground Plate: Copper.

E. Conductors: Copper cable.

F. Connectors and Splicers: Bronze.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Coordinate work with installation of roofing and exterior and interior finishes.

3.02 INSTALLATION

A. Install in accordance with referenced system standards and as required for specified certification.

B. Connect conductors using mechanical connectors or exothermic welding process; protect adjacent construction elements and finishes from damage.

C. Connect conductors using mechanical connectors.

D. Connect conductors using exothermic welding process; protect adjacent construction elements and finishes from damage.

3.03 FIELD QUALITY CONTROL

A. Perform visual inspection as specified in NFPA 780 as if this were a periodic follow-up inspection.

B. Perform continuity testing as specified in NFPA 780 as if this were testing for periodic maintenance.

C. Obtain the services of the specified certification agency to provide inspection and certification of the lightning protection system, including performance of any other testing required by that agency.

END OF SECTION 264113

SECTION 264300 - SURGE PROTECTIVE DEVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Surge protective devices for service entrance locations.

B. Surge protective devices for distribution locations.

C. Surge protective devices for branch panelboard locations.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 262416 - Panelboards.

C. Section 271000 - Structured Cabling: Protectors for communications service entrance.

1.03 ABBREVIATIONS AND ACRONYMS

A. EMI/RFI: Electromagnetic Interference/Radio Frequency Interference.

B. SPD: Surge Protective Device.

1.04 REFERENCE STANDARDS

A. MIL-STD-220 - Method of Insertion Loss Measurement; 2009c (Validated 2014).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to ordering equipment.

1.06 SUBMITTALS

A. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.

1.07 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.08 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.09 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

PART 2 - PRODUCTS

2.01 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

B. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mounted SPDs.

C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

D. Protected Modes:
   1. Wye Systems: L-N, L-G, N-G, L-L.

E. UL 1449 Voltage Protection Ratings (VPRs):
   1. 208Y/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.

F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.

G. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   1. Indoor clean, dry locations: Type 1.
   2. Outdoor locations: Type 3R.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.

C. Verify system grounding and bonding is in accordance with Section 260526, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

C. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 260526 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

3.04 CLEANING

A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 264300

SECTION 265100 - INTERIOR LIGHTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Drivers.

1.02 RELATED REQUIREMENTS

A. Section 260529 - Hangers and Supports for Electrical Systems.

B. Section 260533.16 - Boxes for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 260923 - Lighting Control Devices.

1. Includes automatic controls for lighting including occupancy sensors, outdoor motion sensors, time switches, outdoor photo controls, and daylighting controls.

E. Section 262726 - Wiring Devices: Manual wall switches and wall dimmers.

F. Section 265600 - Exterior Lighting.

1.03 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.

B. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 2013 (Corrigendum 2019).

C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

D. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019.

E. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.

F. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

H. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems; 2006.

I. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

J. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2016.

K. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012 (Reaffirmed 2018).

L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

N. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

O. UL 1598 - Luminaires; Current Edition, Including All Revisions.

P. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
   2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
   3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
   4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. Shop Drawings:
   1. Provide photometric calculations where luminaires are proposed for substitution upon request.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. Provide three year manufacturer warranty for LED luminaires, including drivers.

B. Provide five year pro-rata warranty for batteries for emergency lighting units.

C. Provide ten year pro-rata warranty for batteries for self-powered exit signs.

PART 2 - PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

E. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

F. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

C. Battery:
   1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

F. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

G. Accessories:
   1. Provide compatible accessory mounting brackets where indicated or required to complete installation.
   2. Where indicated, provide emergency remote heads that are compatible with the emergency lighting unit they are connected to and suitable for the installed location.

2.04 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single- or double-face as indicated or as required for installed location.
   2. Directional Arrows: As indicated or as required for installed location.

B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.
   1. Self-Powered Exit Signs:
      a. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
      b. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
      c. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.05 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

B. Dimmable LED Drivers:
   1. Dimming Range: Continuous dimming from 100 percent to ten percent relative light output unless dimming capability to lower level is indicated, without flicker.
   2. Control Compatibility: Fully compatible with the dimming controls to be installed.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 260529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Ceiling Mounted Luminaires:
   1. Do not use ceiling tiles to bear weight of luminaires.
   2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
   3. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
   4. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

G. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.
   2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
   3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

H. Suspended Luminaires:
   1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
   2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.

3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet (1.2 m) between supports.
4. Unless otherwise indicated, support pendants from swivel hangers.

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

J. Install accessories furnished with each luminaire.

K. Bond products and metal accessories to branch circuit equipment grounding conductor.

L. Emergency Lighting Units:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
2. Install lock-on device on branch circuit breaker serving units.

M. Exit Signs:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
2. Install lock-on device on branch circuit breaker serving units.

3.04 FIELD QUALITY CONTROL

A. Inspect each product for damage and defects.

B. Operate each luminaire after installation and connection to verify proper operation.

C. Test self-powered exit signs, emergency lighting units, and lighting fixtures with integral emergency batteries to verify proper operation upon loss of normal power supply.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect/Engineer. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect/Engineer or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.06 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 265100

SECTION 265600 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

B. Ballasts.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 260923 - Lighting Control Devices.

E. Section 262726 - Wiring Devices: Receptacles for installation in poles.

F. Section 265100 - Interior Lighting.

1.03 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code; 2017.

B. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

C. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.

D. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.

G. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2016.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 1598 - Luminaires; Current Edition, Including All Revisions.

J. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. Shop Drawings:

1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

PART 2 - PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

2.03 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 260529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

G. Install accessories furnished with each luminaire.

H. Bond products and metal accessories to branch circuit equipment grounding conductor.

I. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. Inspect each product for damage and defects.

B. Operate each luminaire after installation and connection to verify proper operation.

C. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.06 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 265600

SECTION 270529 - HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other communications work.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 271000 - Structured Cabling.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition; 2022.

E. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

F. MFMA-4 - Metal Framing Standards Publication; 2004.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).

J. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
2. Coordinate work to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.

5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 033000.

1.05 QUALITY ASSURANCE

A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with the following. Where requirements differ, comply with most stringent.
      a. TIA-569.
      b. NFPA 70.
      c. Requirements of authorities having jurisdiction.
   2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of communications work.
   3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
   4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
   5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
      a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit Supports: Straps and clamps suitable for conduit to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Cable Supports: Suitable for cables to be supported, including but not limited to J-hooks, bridle rings, drive rings, and flexible harnesses/slings.
   1. Applications:
      a. Do not exceed 5 feet (1.5 m) between cable supports.

b. Maximum Number of Cables per Cable Support:
1) J-Hooks: 50, regardless of capacity.
c. Allowable Cable Types:
1) J-Hooks: Category 3, Category 5e, and Category 6.
2. Comply with TIA-569.
3. Cable Supports Installed in Spaces Used for Environmental Air: Plenum rated; listed and labeled as complying with UL 2043, suitable for use in air-handling spaces.
4. J-Hooks: Noncontinuous cabling support with removable top retainer clip.
a. Material: Use galvanized steel, factory-painted steel, or stainless steel.
b. Provide support surfaces with smooth, beveled edges and radius not less than minimum allowable bend radius of cables supported.
c. Provide multitiered J-hooks where required to support multiple cabling systems.

D. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

E. Metal Channel/Strut Framing Systems:
1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
2. Comply with MFMA-4.

F. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

G. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
    1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
    2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
    3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
    4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Secure fasteners in accordance with manufacturer's recommended torque settings.

I. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. Inspect support and attachment components for damage and defects.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 270529

SECTION 271000 - STRUCTURED CABLING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Communications system design requirements.

B. Communications pathways.

C. Copper cable and terminations.

D. Communications equipment room fittings.

E. Communications outlets.

F. Communications grounding and bonding.

G. Communications identification.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260533.16 - Boxes for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products.

D. Section 262726 - Wiring Devices.

E. Section 270529 - Hangers and Supports for Communications Systems.

1.03 REFERENCE STANDARDS

A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; 2005e.

C. FM (AG) - FM Approval Guide; Current Edition.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2020.

F. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2018d, with Addenda (2020).

G. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).

H. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.

I. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2019d, with Addendum (2021).

J. UL 444 - Communications Cables; Current Edition, Including All Revisions.

K. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

L. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
   2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
   3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

B. Sustainable Design Documentation: Submit manufacturer's product data on cable and cable insulation showing compliance with specified lead content requirements.

C. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

D. Evidence of qualifications for installer.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

F. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.

G. Field Test Reports.

H. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
   1. Record actual locations of outlet boxes and distribution frames.
   2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
   3. Identify distribution frames and equipment rooms by room number on drawings.

I. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.06 QUALITY ASSURANCE

A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

B. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.

C. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
   1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
   2. Supervisors and installers factory certified by manufacturers of products to be installed.

D. Products: Listed, classified, and labeled as suitable for the purpose intended.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep stored products clean and dry.

1.08 WARRANTY

A. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
   1. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
   2. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
   3. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
   1. Locate main distribution frame as indicated on the drawings.

C. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.02 IDENTIFICATION PRODUCTS

A. Comply with TIA-606.

END OF SECTION 271000

Appendix A
Construction Drawings

GCEC HURRICANE SAFE ROOM

722 WEST HIGHWAY 22
WEWAHITCHKA, FL 32465

100% DESIGN

2.6.24



ARCHITECTURAL

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CIVIL

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MEP

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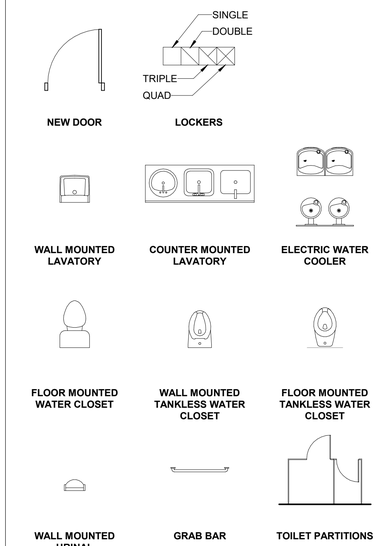
STATE OF FLORIDA
ZULAY N. MARTI-LARA
AR94996
REGISTERED ARCHITECT

Dewberry®

STANDARD ABBREVIATIONS

AB	ANCHOR BOLT	FLR	FLOOR	PTR	PAPER TOWEL RECEPTACLE
ACST	ACOUSTIC(AL)	FRP	FIBER REINFORCED PLASTIC	PVC	POLYVINYL CHLORIDE
ADDL	ADDITIONAL	FTG	FOOTING	PVG	PAVING
ADDN	ADDITION	FURG C	FURRING CHANNEL		
ADH	ADHESIVE	FURN	FURNACE	R	RISER, RADIUS, THERMAL RESISTANCE (R-VALUE)
ADJ	ADJACENT, ADJOINING, ADJUSTABLE	FWC	FABRIC WALLCOVERING	RB	RESILIENT BASE
AED	AUTOMATED EXTERNAL DEFIBRILLATOR	GA	GAGE, GAUGE	RCP	REFLECTED CEILING PLAN
		GALV	GALVANIZED	RD	ROOF DRAIN, ROAD
AFF	ABOVE FINISH FLOOR	GB	GRAB BAR	REF	REFERENCE, REFRIGERATOR
ALT	ALTERNATE	GFRC	GLASS-FIBER REINFORCED CONCRETE	REINF	REINFORCE
ALUM	ALUMINUM			REQD	REQUIRED
ANCH	ANCHOR	GL	GLASS	RF	RESILIENT FLOORING
ANOD	ANODIZE(D)	GL BLK	GLASS BLOCK	RFG	ROOFING
AP	ACCESS PANEL	GLZ CMU	GLAZED CONCRETE MASONRY UNIT	RFM	REMOVABLE FLOOR MAT
APC	ACOUSTICAL PANEL CEILING	GRFG	GLASS-FIBER REINFORCED GYPSUM	RH	RIGHT HAND
APPROX	APPROXIMATE	GT	GROUT	RO	ROUGH OPENING
ASPH	ASPHALT	GWH	GAS FIRED WATER HEATER	RSF	RESINOUS FLOORING
AUTO	AUTOMATIC	GYP BD	GYPSUM WALL BOARD	RST	REINFORCING STEEL
AVE	AVERAGE			RTF	RESILIENT TILE FLOORING
AWT	ACOUSTICAL WALL TREATMENT	H	HIGH, HATCH (ROOF)	RTU	ROOF TOP UNIT
		HB	HOSE BIB	RV	ROOF VENT, ROOF VENTILATOR
BAL SHT	BALANCE SHEET	HDNR	HARDENER		
BC	BRICK COLOR	HDW	HARDWARE	SC	SEALED CONCRETE
BCS	BABY CHANGING STATION	HDWD	HARDWOOD	SCHED	SCHEDULE
BD	BOARD	HM	HOLLOW METAL	SCR	SHOWER CURTAIN ROD
BG	BUMPER GUARD	HORIZ	HORIZONTAL	SCWD	SOLID CORE WOOD DOOR
BITUM	BITUMINOUS	HR	HANDRAIL	SD	SOAD DISPENSER
BLDG	BUILDING	HT	HEIGHT	SECT	SECTION
BLKG	BLOCKING (WOOD)	HTG	HEATING	SF	STOREFRONT
BOT	BOTTOM	HVAC	HEATING, VENTILATING, AND AIR CONDITIONING	SH	SHINGLES, SINGLE HUNG (WINDOW)
BRDG	BRIDGING			SHT	SHEET
BRG	BEARING			SHTHG	SHEATHING
BRK PV	BRICK PAVERS	ID	INSIDE DIAMETER, INSIDE DIMENSION	SHV	SHELVING
BRKT	BRACKET			SLNT	SEALANT
BSMT	BASEMENT	IF	INSIDE FACE	SND	SANITARY NAPKIN DISPENSER
BTWN	BETWEEN	INCL	INCLUDED	SNDU	SANITARY NAPKIN DISPOSAL UNIT
BUR	BUILT UP ROOFING	INSUL	INSULATION	SOG	SLAB ON GRADE
		INT	INTERIOR	SPCG	SPACING
CAB	CABINET	INV	INVERT	SPEC	SPECIFICATION
CB	CHALKBOARD			SPKR	SPEAKER
CC	CUBICLE CURTAIN	JT	JOINT	SQ	SQUARE
CCT	CUBICLE CURTAIN TRACK			SS	SERVICE SINK , SOLID SURFACING
CFCI	CONTRACTOR FURNISHED CONTRACTOR INSTALLED	KD	KNOCKED DOWN	SST	STAINLESS STEEL, SHOWER SEAT
		KOP	KNOCK OUT PANEL	STD	STANDARD
CFMF	COLD-FORMED METAL FRAMING			STL	STEEL
CG	CORNER GUARD	L	LONG, ANGLE	STL JST	STEEL JOIST
CH	COAT HOOK	LAM	LAMINATE(D)	STL LNTL	STEEL LINTEL
CIP CONC	CAST-IN-PLACE CONCRETE	LAV	LAVATORY	STL PL	STEEL PLATE
CJ	CONTROL JOING, CONSTRUCTION JOINT	LH	LEFT HAND	STL RF DK	STEEL ROOF DECK
		LINO	LINOLEUM	STL TR	STEEL TRUSS
CLG	CEILING	LKR	LOCKER	STN	STAIN
CLR	CLEAR	LL	LIVE LOAD, LOW LEVEL	STRUCT	STRUCTURAL
CMU	CONCRETE MASONRY UNIT	LLH	LONG LEG HORIZONTAL	SUSP	SUSPEND
CNTR	COUNTER	LLV	LONG LEG VERTICAL	SV	SHEET VINYL
CO	CLEAN OUT, CASED OPENING	LT	LIGHT	SWP	SHEET WALL PROTECTION
COL	COLUMN	LVL	LEVEL	SYMM	SYMMETRICAL
COMB	COMBINATION, COMBINED	LVR	LOUVER	SYNTH	SYNTHETIC
COMP	COMPRESSIBLE				
COMPT	COMPARTMENT	MAS	MASONRY	T	TILE, TREAD
CONC	CONCRETE	MATL	MATERIAL	T&G	TONGUE AND GROOVE
CONC CTG	CONCRETE COATING	MAX	MAXIMUM	T/S	TUB/SHOWER
COND	CONDITION	MB	MARKERBOARD	TB	TOWEL BAR, TACKBOARD
CONT	CONTINUOUS	MBH	MOB/BROOM HOLDER	TC	TOILET COMPARTMENT
CONTR	CONTRACTOR	MECH	MECHANICAL	TD	TRENCH DRAIN
CORR	CORRIDOR	MED	MEDIUM	TER	TERRAZZO
CPRS	COMPRESSIBLE	MEZZ	MEZZANINE	THK	THICK
CPT	CARPET	MFR	MANUFACTURER	TOB	TOP OF BEAM
CR	CLOSET ROD	MH	MANHOLE	TOC	TOP OF CONCRETE, TOP OF CURB
CRL	CRASH RAIL	MI	MIRROR	TOF	TOP OF FOOTING
CRS	COLD-ROLLED STEEL	MIN	MINIMUM, MINUTE	TOM	TOP OF MASONRY
CTR	CENTER(S)	MISC	MISCELLANEOUS	TOS	TOP OF SLAB, TOP OF STEEL
CUH	CABINET UNIT HEATER	MO	MASONRY OPENING	TOW	TOP OF WALL
CUV	CABINET UNIT VENTILATOR	MOD	MODEL, MODULE, MODULAR	TPH	TOILET PAPER HOLDER
CW	CURTAINWALL	MSB	MOP SERVICE BASIN	TR	TOWEL RACK
		MT	MOUNT	TS	TUBE STEEL, TRANSITION STRIP
D	DEEP, DEPTH, PENNY NAIL	MTL	METAL		
DC	DISPLAY CASE			UNO	UNLESS NOTED OTHERWISE
DET	DETAIL	NDU	NEEDLE DISPOSAL UNIT		
DETN	DETENTION	NIC	NOT IN CONTRACT, NOISE ISOLATION	VCT	VINYL COMPOSITION TILE
DF	DRINKING FOUNTAIN		CLASS	VERT	VERTICAL
DIA	DIAMETER	NO	NUMBER	VIF	VERIFY IN FIELD
DIM	DIMENSION	NOM	NOMINAL	VWC	VINYL WALL COVERING
DN	DOWN	NTS	NOT TO SCALE		
DP	DECORATIVE PANEL			W	WIDE, WEST
DR	DOOR	OA	OVERALL	WC	WALL COVERING
DS	DOWNSPOUT	OC	ON CENTER	WD	WOOD, WOOD DOOR
DWG	DRAWING(S)	OD	OUTSIDE DIAMETER, OUTSIDE DIMENSION	WDW	WINDOW
				WP	WALL PATTERN, WATERPROOFING
EHD	ELECTRIC HAND DRYER	OF	OUTSIDE FACE	WT	WEIGHT, WINDOW TREATMENT
EJ	EXPANSION JOINT	OFCI	OWNER FURNISHED CONTRACTOR INSTALLED	WWF	WELDED WIRE FABRIC
EL	ELEVATION				
ELEC	ELECTRIC, ELECTRICAL	OFD	OVERFLOW DRAIN		
ELEV	ELEVATOR	OFOI	OWNER FURNISHED OWNER INSTALLED		
EMBED	EMBEDMENT				
EMER	EMERGENCY	OH	OVERHEAD		
EPDM	ETHYLENE PROPYLENE DIENE MONOMER	OH DR	OVERHEAD DOOR		
		OP	OPERABLE PARTITION		
EQ	EQUAL	OPH	OPPOSITE HAND		
EQUIP	EQUIPMENT	OPNG	OPENING		
ES	EXPOSED STRUCTURE	OPP	OPPOSITE		
ETR	EXISTING TO REMAIN	OS	OVERFLOW SCUPPER		
EW	EACH WAY				
EWC	ELECTRIC WATER COOLER	PC	PORTLAND CEMENT, POINT OF CURVE, POLYCARBONATE		
EWH	ELECTRIC WATER HEATER				
EXIST	EXISTING	PCC	PRECAST CONCRETE		
EXP	EXPANSION	PERIM	PERIMETER		
EXT	EXTERIOR	PJ	PROJECTOR		
		PL	PLATE, PLASTIC LAMINATE		
FAB	FABRIC	PLAS	PLASTER		
FD	FLOOR DRAIN	PLBG	PLUMBING		
FDTN	FOUNDATION	PLYWD	PLYWOOD		
FE	FIRE EXTINGUISHER	PS	PROJECTION SCREEN		
FEC	FIRE EXTINGUISHER CABINET	PSF	POUNDS PER SQUARE FOOT		
FF	FINISH FLOOR	PT	PAINT		
FHC	FIRE HOSE CABINET	PTD	PAPER TOWEL DISPENSER		
FIN	FINISH	PTDR	PAPER TOWEL DISPENSER & RECEPTACLE		
FLASH	FLASHING				
FLP	FLOOR PATTERN	PTN	PARTITION		

STANDARD DRAFTING SYMBOLS



PROJECT DATA

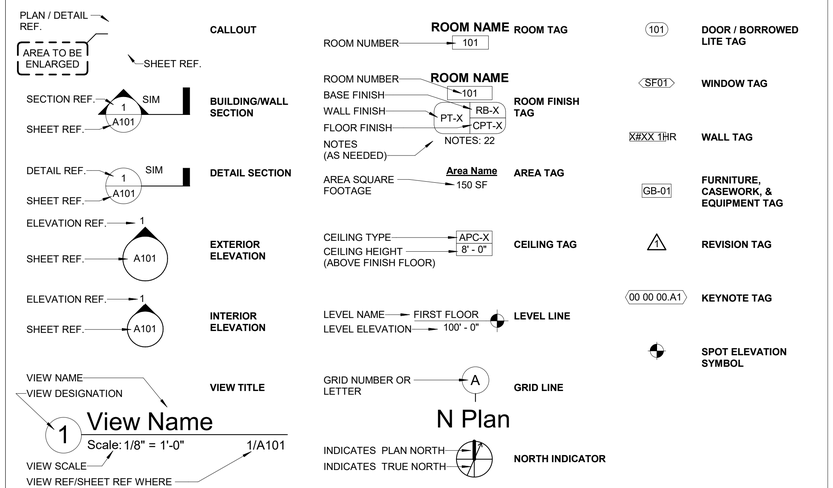
PROJECT: GCEC SAFE ROOM

OWNER: GULF COAST ELECTRIC COOPERATIVE

APPLICABLE CODES:
2020 FLORIDA BUILDING CODE - BUILDING, PLUMBING, MECHANICAL, ENERGY CONSERVATION
2020 FLORIDA ACCESSIBILITY CODE
2012 NFPA 1 FIRE CODE
2018 NFPA 101 LIFE SAFETY CODE
2017 FLORIDA FIRE PREVENTION CODE
2015 FEMA P361 GUIDELINES
2014 ICC 500 STANDARDS

REFER TO DISCIPLINE SPECIFIC GENERAL NOTES SHEETS FOR ADDITIONAL APPLICABLE CODES AND STANDARDS.

STANDARD DETAILING SYMBOLS



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Dewberry

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GCEC HURRICANE SAFE ROOM

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100% DESIGN

SEAL

STATE OF FLORIDA · JULIAN W. MARTINEZ · REGISTERED ARCHITECT · AR94996

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SCALE

REVISIONS

NO.	DESCRIPTION	DATE

DRAWN BY	AC
APPROVED BY	ZM
CHECKED BY	AC
DATE	2.6.24

TITLE

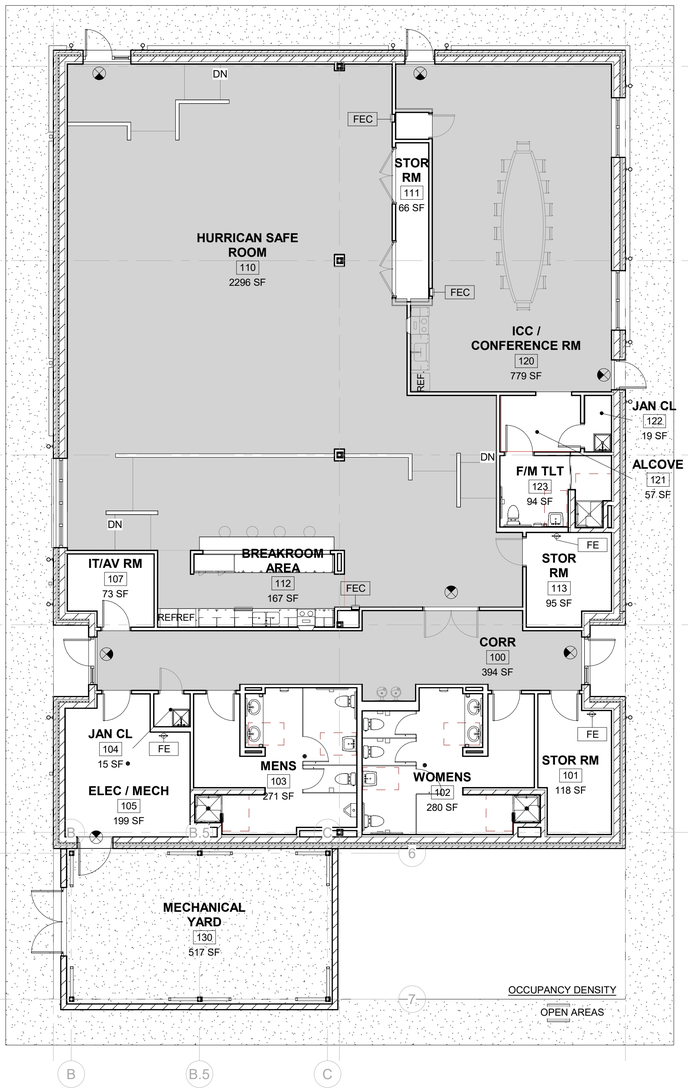
INDEX

PROJECT NO. 50150343

G-001

SHEET NO.

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A1 LIFE SAFTEY FLOOR PLAN (BASED ON FEMA P-361)

Scale: 1/8" = 1'-0"

N Plan

0' 48" 96" 192"

SCALE: 1/8" = 1' - 0"

CODE ANALYSIS - NEW CONSTRUCTION — FEMA P-361

NEW BUILDING REQUIREMENTS

OCCUPANCY CLASSIFICATION : ASSEMBLY (A-3)

TYPES OF CONSTRUCTION:	IIB
PROTECTED:	NO
SPRINKLERED:	NO

OCCUPANT LOAD (FEMA TABEL B5.1)

MAXIMUM EXPECTED OCCUPANCY (NUMBER OF PEOPLE)	1/20 S.F.	3,654/ 20 = 183 MAXIMUM EXPECTED OCCUPANCY
TOTAL MAXIMUM EXPECTED OCCUPANCY		**183 OCCUPANTS**
NET AVAILABLE SQUARE FOOTAGE (OPEN AREAS)		3,654 S.F.
NET AVAILABLE SQUARE FOOTAGE (RESTROOMS, KITCHENS, STORAGE AREAS, ETC)		1,283 S.F.
INTERIOR WALLS AND COLUMNS AREAS		246 S.F.
TOTAL BUILDING AREA	INCLUDING EXTR. WALLS GROSS	5,654 S.F.
	EXCLUDING EXTR. WALLS NET	5,183 S.F.

PLUMBING — FEMA (B7.2.3) AND ICC 500, TABLE 703.2

FIXTURE PER PERSON	REQUIRED			PROVIDED		
	MEN	WOMEN	UNISEX	MEN	WOMEN	UNISEX
WATER CLOSETS - 1/50 occupants	2	2	-	2	3	1
URINALS - NOT REQUIRED	-	-	-	1	-	-
LAVATORIES - 1/100 occupants	1	1	-	3	3	1
SHOWERS - NOT REQUIRED	-			1	1	1
UTILITY SINK, MOP SINK - NOT REQUIRED	-			2 SERVICE SINK		
WATER FOUNTAIN - 1 PER 500	-			(1) HI / LO = 1		

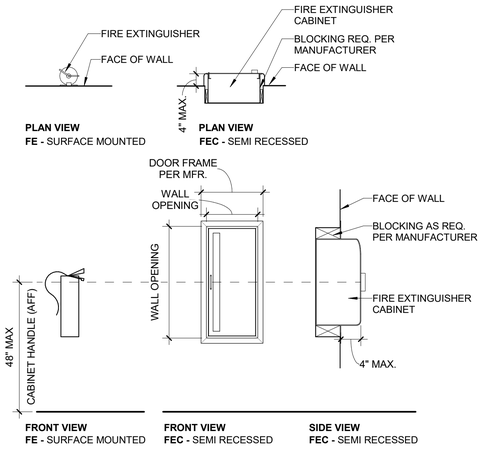
PROJECT DATA

PROJECT: GCEC SAFE ROOM

OWNER: GULF COAST ELECTRIC COOPERATIVE

APPLICABLE CODES:
2020 FLORIDA BUILDING CODE - BUILDING, PLUMBING, MECHANICAL, ENERGY CONSERVATION
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2017 FLORIDA FIRE PREVENTION CODE
2015 FEMA P361 GUIDELINES
2014 ICC 500 STANDARDS

REFER TO DISCIPLINE SPECIFIC GENERAL NOTES SHEETS FOR ADDITIONAL APPLICABLE CODES AND STANDARDS.



NOTE: FIRE EXTINGUISHER CABINET SHALL BE RATED TO THE SAME LEVEL AS THE WALL IN WHICH IT IS INSTALLED

A4 FIRE EXTINGUISHER DETAIL

Scale: 3/4" = 1'-0"

Dewberry

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WEWAHITCHKA, FL 32465
100% DESIGN

SEAL

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CHECKED BY	AC
DATE	2.6.24

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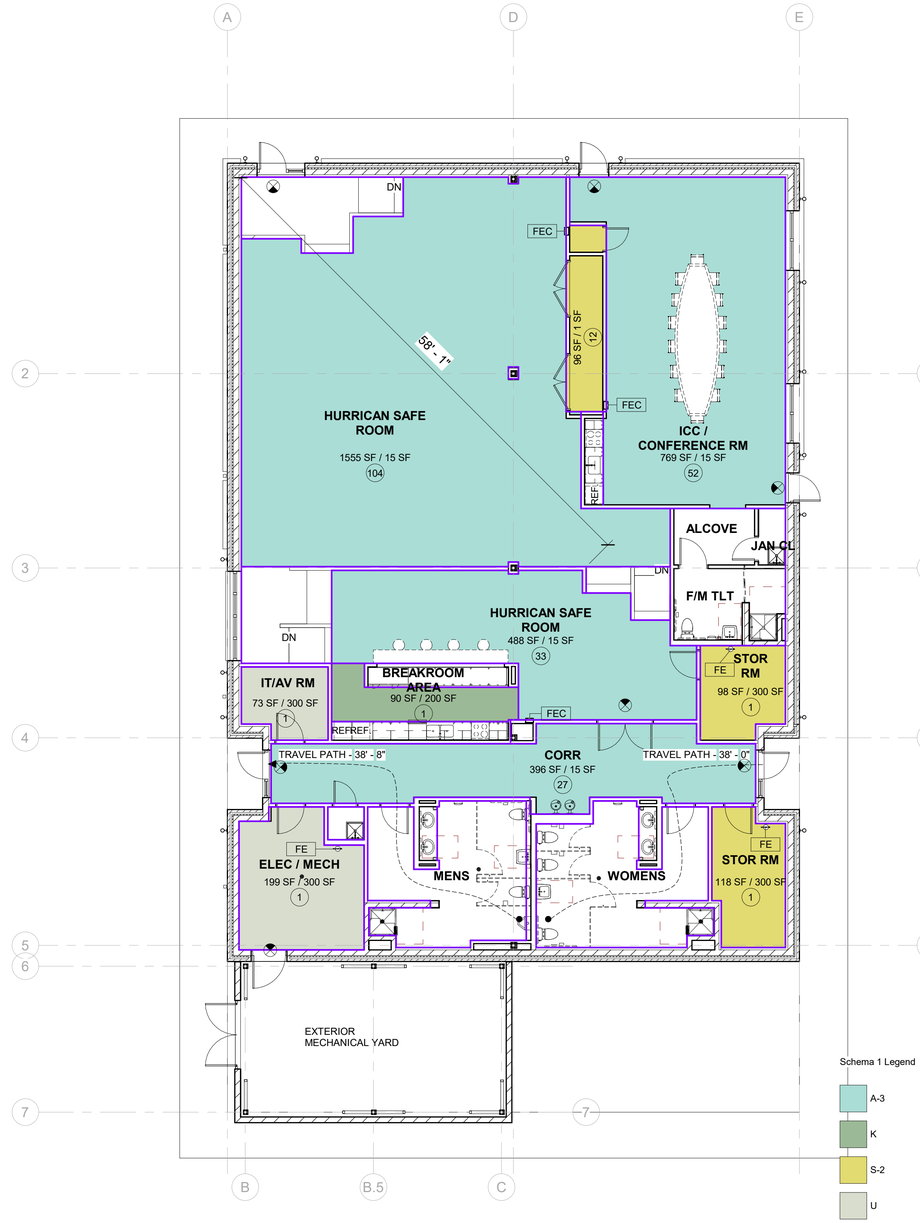
FEMA INFORMATION

PROJECT NO. 50150343

G-100

SHEET NO.

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CODE ANALYSIS - NEW CONSTRUCTION — FLORIDA BUILDING CODE 2022

NEW BUILDING REQUIREMENTS

OCCUPANCY CLASSIFICATION : ASSEMBLY (A-3)

TYPES OF CONSTRUCTION:		IIB
PROTECTED:		NO
SPRINKLERED:		NO
	ALLOWED PER SECTION 504.3 FBC 2020	PROVIDED
BUILDING HEIGHT - TABLE 504.3	75' (FEET)	16' (FEET)
HEIGHT INCREASE	N/A	
NUMBER OF STORIES (A-3) - TABLE 504.4	3 (THREE)	1 (ONE)
TOTAL BUILDING AREA ALLOWED FOR (A-3)	38,000 S.F.	5,492 S.F.

OCCUPANT LOAT (FBC 2017, TABLE 1004.1.2)

ASSEMBLY (A-3)		3,215 S.F./ 15 =	215 OCCUPANTS
ACCESSORY STORAGE (S-2 AND U)		557 S.F./ 300 =	2 OCCUPANTS
ACCESSORY KITCHEN (K)		90 S.F./ 200 =	1 OCCUPANT
TOTAL OCCUPANT LOAD			**218 OCCUPANTS**

EGRESS REQUIREMENTS (FBC 2017, PER CHAPTER 10) :

OCC.	TABLE 1017.2	TABLE 1006.2.1	SEC 1020.4	TABLES 1005.3.1 & 1005.3.2		TABLE 1020.2	TABLE 1010		SEC. 1011.2
	MAX. TRAVEL TO AN EXIT	COMMON PATH OF TRAVEL	MAX. DEAD END CORRIDOR	EGRESS WIDTH INCHES/ OCC.		MIN. CORRIDOR WIDTH	MIN. OPENING WIDTH		MIN. STAIR WIDTH
				LEVEL	STAIRS		REQ'D.	PROV'D	
A-3	250 FT.	75 FT.	20 FT.	0.2	-	44 IN.	32 IN.	32/36 IN.	-

EXIT ACCESS ARRANGEMENT (PER SEC 1007.1.1 EXCEPTION 2) — **38' - 10" > 1/3 DIAGONAL DISTANCE (30' - 0")**

MINIMUM NUMBER OF EXITS (PER SEC 1006.3.1) - MINIMUM 2 (TWO) REQUIRED — **4 (FOUR) PROVIDED**

FIRE PROTECTION REQUIREMENTS :

	REQUIRED (A-3)	REQUIRED (S-2)	PROVIDED
FIRE WALLS - AREA SEPARATION - SEC. 508.2, 508.4	2 HOUR	NON RATED	**NON SEPARATED OCCUPANCY**
INTERIOR BEARING WALLS, COLUMNS, BEAMS, GIRDERS	NON RATED	NON RATED	**NON RATED**
TRUSSES, FLOOR CONSTRUCTION, EXTERIOR BEARING WALLS	NON RATED	NON RATED	**NON RATED**
CORRIDOR	NON RATED	NON RATED	**NON RATED**
VERTICAL SHAFTS/ ENCLOSURES	1 HOUR	1 HOUR	N/A

PLUMBING — FBC 2017, TABLE 2902.1

FIXTURE PER PERSON	REQUIRED MEN	REQUIRED WOMEN	REQUIRED UNISEX	PROVIDED MEN	PROVIDED WOMEN	PROVIDED UNISEX
WATER CLOSETS - 1/125 MALE, 1/65 FEMALE	1	2	-	2	3	1
URINALS - NOT REQUIRED	-	-	-	1	-	-
LAVATORIES - 1/125 MALE/FEMALE	1	1	0	3	3	1
SHOWERS - NOT REQUIRED		-		1	1	1
UTILITY SINK, MOP SINK - 1 SERVICE SINK		1 SERVICE SINK			2 SERVICE SINK	
WATER FOUNTAIN - 1 PER 500		(1) HI / LO = 1			(1) HI / LO = 1	

CODE PLAN LEGEND

- Area Name / 150 SF / 150 SF / 101 — OCCUPANCY USE TYPE; AREA OF SPACE/AREA PER OCCUPANT; OCCUPANT LOAD
- 100 / 999 — NUMBER OF OCCUPANTS GOING THRU AN EGRESS DOOR OR THRU AN EGRESS STAIR; MAX. NUMBER OF OCCUPANTS ALLOWED PER CODE THRU AN EGRESS DOOR / EGRESS STAIR
- 1—1 — 1-HR FIRE RATED WALL
- 2—2 — 2-HR FIRE WALL
- SB—SB — SMOKE PARTITIONS
- PATH — TRAVEL DISTANCE (SEE EGRESS PATH SCHEDULE)
- FEC — FIRE EXTINGUISHER CABINET - SEMI RECESSED
- FE — FIRE EXTINGUISHER - WALL MOUNTED

A1 LIFE SAFTEY FLOOR PLAN (BASED ON FLORIDA BUILDING CODE)

Scale: 1/8" = 1'-0"

N Plan

0' 48" 96" 192"

SCALE: 1/8" = 1' - 0"

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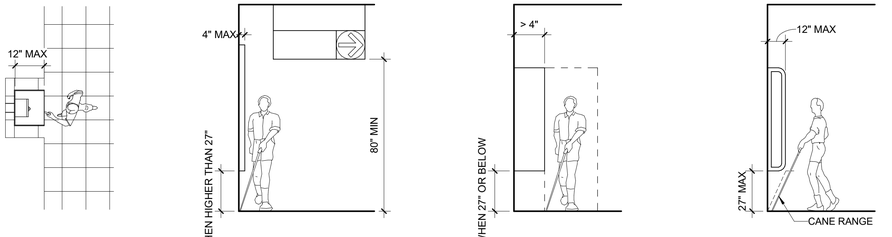
FLORIDA BUILDING CODE & LIFE SAFETY INFORMATION

PROJECT NO. 50150343

G-101

SHEET NO.

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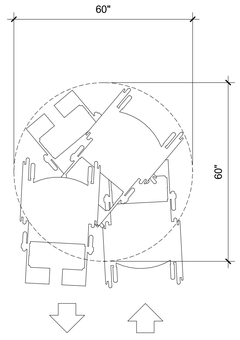


PLAN | WALKING PARALLEL TO WALL | WALKING PARALLEL TO WALL | WALKING PERPENDICULAR TO WALL

REF: 11B-307.2 ADA 4.4, FIG.8 & 9

G112-1209

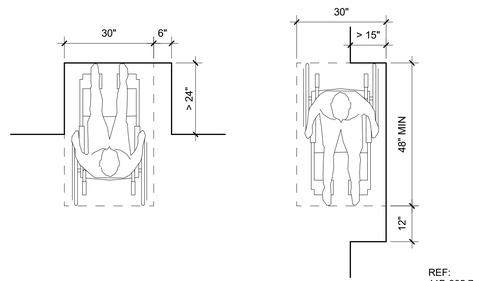
PROTRUDING OBJECTS



A. SPACE REQUIRED FOR WHEELCHAIR TO MAKE 180 TURN

REF: ADA 4.2.3

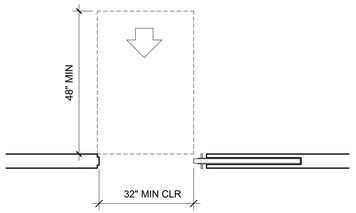
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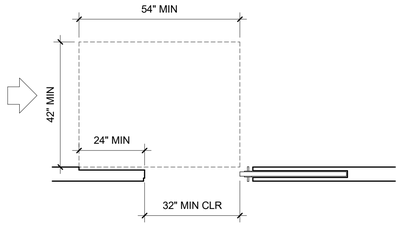
A. FORWARD APPROACH | B. SIDE APPROACH

REF: 11B-305.7.1 ADA 4.3, FIG 4

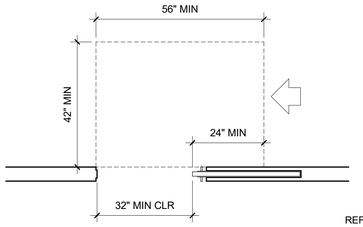
G112-1204



A. FRONT APPROACH



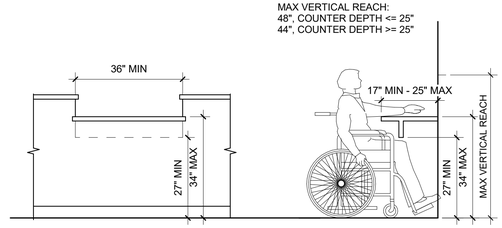
B. SIDE APPROACH



C. LATCH SIDE APPROACH

REF: 11B-404.2.4.2 ADA 4.13, FIG 25

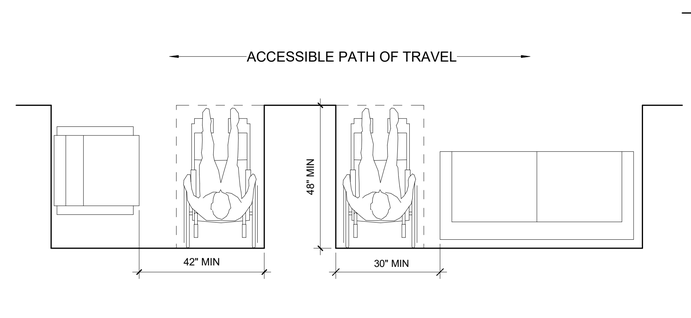
G112-1206



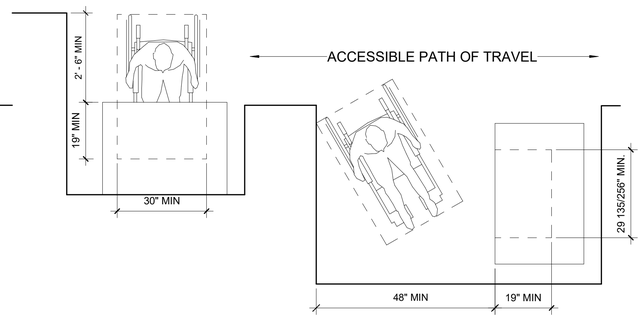
C. CLEARANCES FOR COUNTERS/FORWARD REACH

REF : CBC 11B-904.3.2

G113-1605



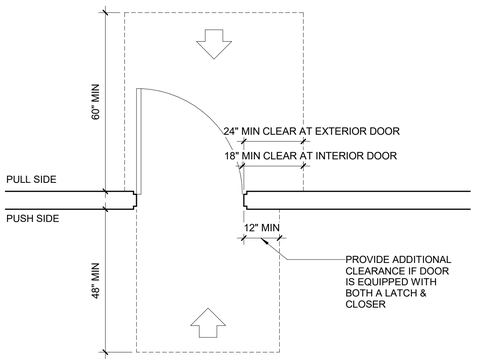
A. CLEARANCES FOR SEATING



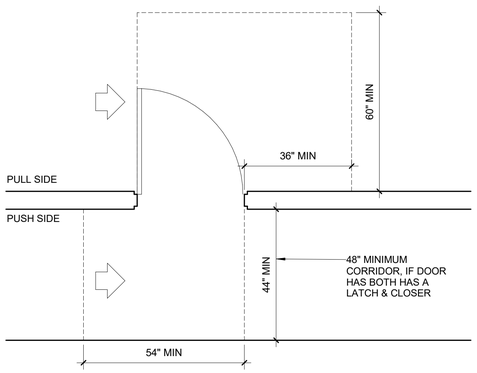
B. CLEARANCES FOR TABLES

REF : CBC FIG 11A-1K

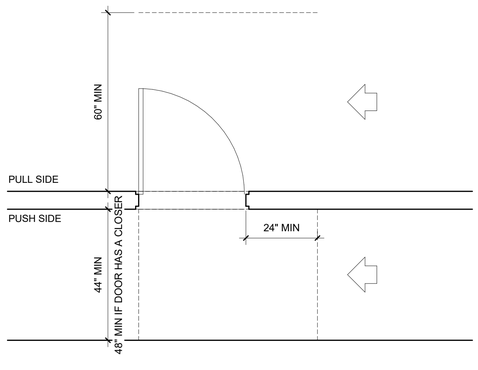
G113-1603



A. FRONT APPROACH



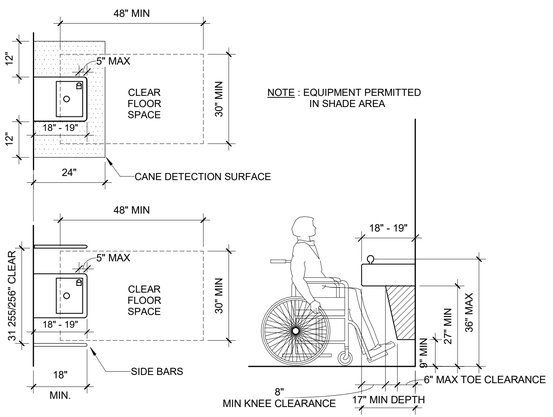
A. HINGE APPROACH



C. LATCH SIDE APPROACH

REF: ADA 4.13, FIG 25

G112-1205

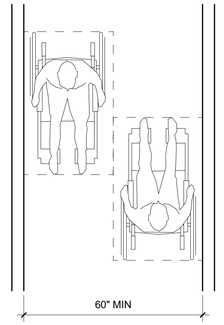


NOTE : EQUIPMENT PERMITTED IN SHADE AREA

A. PLAN | B. SIDE ELEVATION

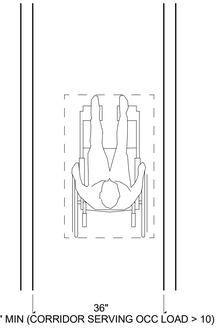
REF: 11B-602 FIG 11B-602.5 ADA: 602.1

G113-1604



NOTE: MINIMUM WIDTH FOR CORRIDORS OVER 200FT [2001 CBC SECTION 11B-403.5.3]

A. MINIMUM CLEAR WIDTH FOR TWO WHEELCHAIRS



B. MINIMUM CLEAR WIDTH FOR SINGLE WHEELCHAIR

REF: 11B-403.5 11B-403.5.3

G112-1202

Dewberry

DEWBERRY ARCHITECTS, INC.
800 North Magnolia Avenue
Suite 1000
Orlando, FL 32803
407.843.5120

GULF COAST ELECTRICAL CO-OP

GCEC HURRICANE SAFE ROOM

722 WEST HIGHWAY 22
WEWAHITCHKA, FL 32465
100% DESIGN

SEAL

STATE OF FLORIDA · JULIAN W. MARTINEZ · REGISTERED ARCHITECT · AR94996

FOR REVIEW ONLY

SCALE

REVISIONS

NO.	DESCRIPTION	DATE

DRAWN BY	AC
APPROVED BY	ZM
CHECKED BY	AC
DATE	2.6.24

TITLE

ACCESSIBILITY DIAGRAMS

PROJECT NO. 50150343

G-102

SHEET NO.

2/9/2024 12:39:52 PM

PERMIT DOCUMENTS FOR:

GULF COAST ELECTRIC COOPERATIVE SAFE ROOM

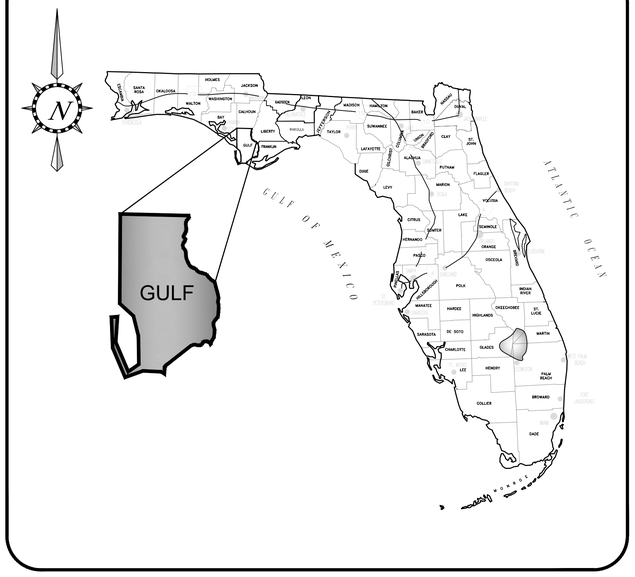
PREPARED FOR:

GULF COAST ELECTRIC COOPERATIVE

811 Know what's below. Call before you dig.

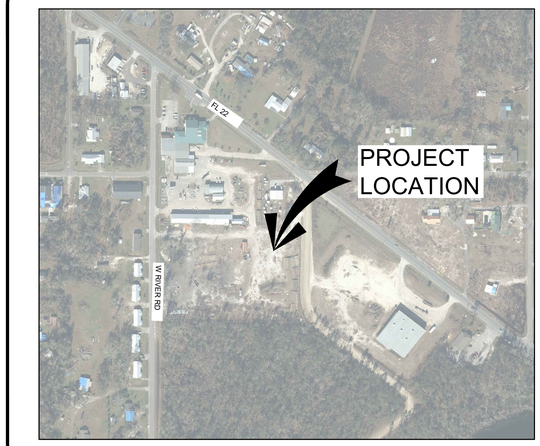
sunshine state ONE CALL of florida

VICINITY MAP



SHEET	DESCRIPTION:
C0.0	CIVIL INDEX AND INFORMATION
C0.1	GENERAL NOTES & S.W.P.P. PLAN
C1	DEMOLITION & EROSION CONTROL PLAN
C2	SITE PLAN
C3	GRADING PLAN
C4	UTILITY PLAN
C5	FDOT UTILITY PLAN
CD1	DETAILS
CD2	DETAILS
CD3	DETAILS
CD4	DETAILS

LOCATION MAP



OWNER, DEVELOPER, AGENT

OWNER/DEVELOPER: GULF COAST ELECTRIC COOPERATIVE INC.
722 FL-22
WEWAHITCHKA, FL 32465

ENGINEER/AGENT: DEWBERRY ENGINEERS INC.
324 MARINA DRIVE
PORT ST. JOE, FL 32456
850.227.7200

SITE LOCATION: 722 FL-22
WEWAHITCHKA, FL 32465

PROJECT NUMBER: 50150343

JUNE 2026

PREPARED BY:

Dewberry

324 Marina Drive
Port St. Joe, FL 32456
850.227.7200
EB 0008794

ERRORS AND OMISSIONS, IF ANY, IN THESE CONSTRUCTION DOCUMENTS SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE ENGINEER FOR RESOLUTION. GENERAL CONTRACTOR TO THOROUGHLY INSPECT EXISTING CONDITIONS PRIOR TO SUBMITTING BIDS.

GENERAL CONTRACTOR TO THOROUGHLY INSPECT EXISTING CONDITIONS PRIOR TO SUBMITTING BIDS. ANY DISCREPANCIES BETWEEN PLANS AND FIELD CONDITIONS SHALL BE NOTED AT ONCE AND CALLED TO THE ENGINEER'S ATTENTION 48 HOURS PRIOR TO SUBMITTING BIDS.

ALL CORRESPONDENCE IN REGARDS TO THESE CONSTRUCTION/BID DOCUMENTS SHALL BE DIRECTED TO JOSUA BRYAN BAXLEY AT DEWBERRY ENGINEERS INC., 324 MARINA DRIVE, PORT ST. JOE, FL 32456. PHONE: (850) 227.7200.

GOVERNING STANDARDS AND SPECIFICATIONS: FLORIDA DEPARTMENT OF TRANSPORTATION, DESIGN STANDARDS CURRENT EDITION, AND STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION CURRENT EDITION, AS AMENDED BY CONTRACT DOCUMENTS. FOR DESIGN STANDARDS CLICK ON "DESIGN STANDARDS" AT THE FOLLOWING WEB SITE: HTTP://WWW.DOT.STATE.FL.US/RDDESIGN/

FOR THE STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION CLICK ON THE "STANDARD SPECIFICATIONS" LINK AT THE FOLLOWING WEB SITE: HTTP://WWW.DOT.STATE.FL.US/PROGRAMMANAGEMENT

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY JOSHUA BAXLEY, P.E. ON THE DATE NOTED ON THE ELECTRONIC SIGNATURE.

PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES

JOSHUA BRYAN BAXLEY, P.E. DATE:
P.E. #: 67529

1/22/2016 9:07:15 AM - K:\50150343 GCEC HEADQUARTERS SAFE ROOM\CIVIL\SDFOLDER_PROPOSED\GCEC SAFE ROOM_DSGN.DWG

DESIGN STANDARDS

1. A COURTESY COPY OF THE CONSTRUCTION PLANS SHALL BE SUBMITTED TO THE CITY OF WEWAHITCHKA (CIVIL, ARCHITECTURAL, M.E.P., & STRUCTURAL).
2. A FDEP STORMWATER PERMIT SHALL BE OBTAINED (CIVIL).
3. A GULF COUNTY BUILDING PERMIT SHALL BE OBTAINED (STRUCTURAL).
4. A LETTER FROM THE FLOOD PLAIN ADMINISTRATOR FOR THE CITY OF WEWAHITCHKA SHALL BE OBTAINED TO ENSURE THE SET FINISH FLOOR ELEVATION IS ABOVE THE 500 YR FLOOD ELEVATION. (CIVIL)
5. ALL PLANS, SPECS, REPORTS, MEMOS, ETC SHALL ADHERE TO THE LISTED STANDARDS FOR EACH RESPECTED FIELD (CIVIL, STRUCTURAL, ARCHITECTURAL, MEP, ETC): FEMA P-361, ICC-500, 2020 FLORIDA BUILDING CODE, 2010 ADA STANDARDS FOR ACCESSIBLE DESIGN, AND GCEC'S PROGRAMMATIC REQUIREMENTS.
6. DESIGN LOADS FOR EACH RESPECTED FIELD SHALL BE LISTED ON EACH RESPECTED PLAN SET, SPECS, REPORTS, MEMOS, ETC (CIVIL, STRUCTURAL, ARCHITECTURAL, MEP, ETC).

GENERAL NOTES

1. THE EXACT LOCATION AND ELEVATION OF EXISTING STRUCTURES, UTILITIES, AND PIPING SHALL BE PHYSICALLY VERIFIED IN THE FIELD BY THE CONTRACTOR BEFORE CONSTRUCTION BEGINS. THESE DRAWINGS DO NOT INTEND TO SHOW IN COMPLETE DETAIL ALL EXISTING STRUCTURES, UTILITIES, OR PIPING. THE CONTRACTOR SHALL EXAMINE ALL AVAILABLE RECORDS AND MAKE ALL EXPLORATIONS AND EXCAVATIONS AS REQUIRED TO DETERMINE THE LOCATION OF EXISTING STRUCTURES, UTILITIES, AND PIPING, WHENEVER NECESSARY. THE OWNER RESERVES THE RIGHT TO CHANGE LOCATION OF LINES TO AVOID CONFLICT WITH EXISTING STRUCTURES, UTILITIES, OR PIPING. THE LOCATIONS OF UNDERGROUND UTILITIES HAVE NOT BEEN PHYSICALLY LOCATED BY THEIR OWNER OR ENGINEER.
2. THE CONTRACTOR SHALL CHECK PLANS FOR CONFLICTS AND DISCREPANCIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE OWNER OR OWNER'S ENGINEER OF ANY CONFLICT BEFORE PERFORMING ANY WORK IN THE AFFECTED AREA.
3. THE CONTRACTOR SHALL EXERCISE EXTREME CAUTION IN AREAS OF BURIED UTILITIES AND SHALL PROVIDE AT LEAST 48 HOURS NOTICE TO THE VARIOUS UTILITY COMPANIES IN ORDER TO PERMIT MARKING THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES IN ADVANCE OF CONSTRUCTION.
4. THE CONTRACTOR IS RESPONSIBLE FOR REPAIRING ANY DAMAGE TO EXISTING FACILITIES ABOVE OR BELOW GROUND THAT MAY OCCUR AS A RESULT OF WORK CALLED FOR IN THESE CONTRACT DOCUMENTS.
5. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO LEARN, KNOW, AND COMPLY WITH THE REGULATIONS, ORDINANCES, PERMIT AND INSPECTION REQUIREMENTS OF THE VARIOUS GOVERNMENTAL AGENCIES HAVING JURISDICTION. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO REVIEW AND COMPLY WITH THE CONDITIONS OF THE VARIOUS PERMITS OF THE GOVERNMENTAL AGENCIES. THE CONTRACTOR SHALL SCHEDULE THE REQUIRED INSPECTIONS AND APPROVALS IN ACCORDANCE WITH THE REQUIREMENTS OF THE PERMIT CONDITIONS. THE CONTRACTOR SHALL NOTIFY THE NECESSARY AGENCIES OF CONSTRUCTION COMMENCEMENT.
6. ALL SPECIFICATIONS AND DOCUMENTS REFERRED TO SHALL BE OF LATEST ISSUE AND SHALL BE CONSIDERED A PART OF THESE DOCUMENTS AS THOUGH INCLUDED.
7. IT SHALL BE THE CONTRACTOR'S SOLE RESPONSIBILITY TO MAINTAIN ADEQUATE TRAFFIC CONTROL AND TO PROVIDE DETOURS AROUND CONSTRUCTION ACTIVITIES. NO STREET SHALL REMAIN CLOSED TO TRAFFIC OVERNIGHT. IN ADDITION, THE CONTRACTOR SHALL COOPERATE WITH LOCAL RESIDENTS IN GAINING ACCESS TO THEIR HOMES AND BUSINESSES DURING WORKING HOURS AND SHALL ASSIST AT ALL TIMES WHEN VEHICLES EXPERIENCE TROUBLE DUE TO CONSTRUCTION ACTIVITIES.
8. PRIOR TO COMMENCING CONSTRUCTION, CONTRACTOR SHALL INSTALL ANY REQUIRED SILT FENCING OR BALED HAY BARRIERS (FLORIDA EROSION CONTROL MANUAL) FOR SILT/EROSION CONTROL. THERE WILL BE NO DIRECT PAYMENT FOR THIS WORK. COST SHALL BE INCLUDED IN OTHER ITEMS OF WORK. LOCATION SHALL BE AS SHOWN ON THE PLANS OR AS DIRECTED IN THE FIELD.
9. THE CONTRACTOR SHALL INSTALL ALL TRAFFIC CONTROL DEVICES REQUIRED FOR THE PROJECT IN ACCORDANCE WITH THE LATEST EDITION OF THE U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION MANUAL ON UNIFORM TRAFFIC CONTROL.
10. WHERE IT BECOMES NECESSARY TO TEMPORARILY REMOVE, REPOSITION, OR SUPPORT EXISTING FACILITIES, UTILITY POLES, ETC. THIS WORK SHALL BE PERFORMED AT THE CONTRACTOR'S EXPENSE AND IN ACCORDANCE WITH REQUIREMENTS OF THE OWNER OF THE EXISTING FACILITY, UTILITY POLE, ETC. THE CONTRACTOR SHALL GIVE PROPER NOTICE TO THE UTILITIES. THE CONTRACTOR SHALL PHYSICALLY EXAMINE THE ENTIRE PROJECT SITE AND INFORM HIMSELF FULLY IN REGARD TO ALL CONDITIONS PERTAINING TO THE PLACE WHERE THE WORK IS TO BE PERFORMED FOR PURPOSE OF DETERMINING HIS COST TO PERFORM THE WORK. THE CONTRACTOR SHOULD PAY SPECIAL ATTENTION TO AREAS INVOLVING CLEARING AND GRUBBING, EXISTING FACILITIES REMOVAL AND REPLACEMENT, SUPPORT ON RELOCATION, AND WORK INVOLVED IN WETLAND AREAS.
11. WORK ALONG STREETS MAY REQUIRE THE REMOVAL AND REPLACEMENT OF EXISTING DRAINAGE PIPE, STRUCTURES, HEADWALLS, ETC., THE COST OF THIS WORK SHALL BE INCLUDED IN THE UNIT PRICE BID FOR RELATED ITEMS OF WORK.
12. COPIES OF TEST REPORTS FOR ASPHALT, SUBGRADE, FILL, AND BACKFILL UNDER ROADWAYS AND STRUCTURES, AND UTILITY TRENCHES SHALL BE PROVIDED DIRECTLY TO THE ENGINEER FOR APPROVAL. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE TESTING AND INSURE THAT ALL APPLICABLE TESTS HAVE BEEN PERFORMED. FAILURE TO OBTAIN TEST RESULTS AT ANY POINT OF CONSTRUCTION WILL REQUIRE THE REMOVAL OF THE IMPROVEMENT AND REPLACEMENT BY THE CONTRACTOR. IT SHOULD BE NOTED THAT THE ENGINEER WILL REQUIRE COMPACTION TESTING IN ACCORDANCE WITH THE TESTING SCHEDULE FOR UTILITY TRENCH FILL AND BACKFILL.
13. ANY DISTURBED SIGNS MUST BE REINSTALLED TO EXISTING OR ACCEPTABLE CONDITION BY THE OWNER AT THE CONTRACTOR'S EXPENSE.
14. CONTRACTOR SHALL HAVE COPIES OF ALL PERMITS (CITY, COUNTY, FDOT & FDEP) IN POSSESSION AT ALL TIMES DURING CONSTRUCTION. ANY INDIVIDUAL CREW OR INDIVIDUAL PERSON WORKING ON THE INSTALLATION OF ANY PART OF THIS PROJECT SHALL HAVE A SET OF PLANS AND SPECIFICATIONS WITH THEM AT ALL TIMES.
15. TESTING REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE TESTING SCHEDULE CONTAINED WITHIN THESE PLANS. SELECTION AND CONTRACTING WITH THE TESTING FIRMS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE AND SCHEDULE ALL TESTS.
16. IT SHALL BE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE AND SCHEDULE THE ACTIVITIES OF THE UTILITY COMPANIES INCLUDING BUT NOT LIMITED TO TV, TELEPHONE, GAS, POWER, ETC., AND PROVIDE IN ACCORDANCE WITH THE UTILITY COMPANY ANY NECESSARY CONDUITS FOR CROSSINGS UNDER PAVEMENT. NO ADDITIONAL COMPENSATION SHALL BE PROVIDED FOR THIS SERVICE. ANY DAMAGE CAUSED BY THE UTILITY COMPANY TO THE IMPROVEMENTS OF THE CONTRACTOR SHALL BE REPAIRED IN ACCORDANCE WITH THESE CONTRACT DOCUMENTS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO INSURE THAT REPAIRS ARE PERFORMED, EITHER BY THE CONTRACTOR OR THE UTILITY COMPANY AT NO COST TO THE OWNER.
17. ALL CONSTRUCTION STAKING SHALL BE DONE AT CONTRACTORS EXPENSE.
18. STATIONING ON THE PLANS RELATES TO THE CENTERLINE OF ALL ROADWAYS/ RIGHT-OF-WAYS AND SHALL BE USED FOR LOCATION PURPOSES ONLY. CONTRACTOR SHALL NOT USE STATIONING WHEN CALCULATING PIPE LENGTHS.
19. THE CONTRACTOR SHALL TAKE WHATEVER PRECAUTIONS NECESSARY TO AVOID TRESPASSING AND DAMAGING PRIVATE PROPERTY.
20. ALL SPOIL MATERIAL FROM EXCAVATION SHALL BE PLACED ON THE UPLAND SIDE OF ANY SLOPED CONSTRUCTION AREA.
21. THE CONTRACTOR SHALL TAKE WHATEVER STEPS NECESSARY TO PREVENT EROSION INTO NEARBY WETLANDS WHICH INCLUDES TURBIDITY CURTAINS, HAY BAILS, AND ALL OTHER METHODS TO CONTROL EROSION AT NO ADDITIONAL COST TO OWNER AND MAY BE DIRECTED TO DO SO BY THE ENGINEER.
22. THE CONTRACTOR SHALL MAINTAIN A REASONABLE ACCESS TO ALL RESIDENCES AND BUSINESSES DURING CONSTRUCTION.
23. ALL EXISTING CONCRETE, ASPHALT, TREES, STUMPS, AND OTHER DELETERIOUS MATERIAL SHALL BE REMOVED FROM THE SITE AND DISPOSED OF IN ACCORDANCE WITH FLORIDA LAWS.
24. DEWATERING: SHOULD LOWERING OF GROUNDWATER BE NECESSARY FOR THE INSTALLATION OF CONCRETE STRUCTURES, GRAVITY SEWER, FORCEMAINS, WATERMAINS, ETC., OR TO PREVENT LATERAL MOVEMENT OF MATERIAL UNDER CONCRETE ALREADY PLACED, SUCH LOWERING SHALL BE ACCOMPLISHED BY MEANS OF A WELL POINT SYSTEM OR OTHER APPROVED MEANS, AT CONTRACTOR'S EXPENSE. COMPREHENSIVE PLANS FOR DEWATERING OPERATIONS, IF USED, SHALL BE SUBMITTED BY THE CONTRACTOR TO ENGINEER PRIOR TO INSTALLATION.
25. CONTRACTOR SHALL FURNISH "AS BUILT PLANS" INDICATING LOCATIONS OF ALL FEATURES, PIPES, PONDS, PADS, MANHOLES, FITTINGS, VALVES, AND DEAD END RUNS WITH THREE (3) PHYSICAL FEATURES (LOT CORNERS, TREES, ETC.).
26. THE CONTRACTOR SHALL REMOVE AND REPLACE, TO THEIR ORIGINAL NATURE, ALL DISTURBED MATERIALS OR OBJECTS WITHIN THE PATH OF THE NEW UTILITIES AS NECESSARY. ALL REPLACED MATERIALS SHALL BE EQUAL OR BETTER AND SHALL BE APPROVED BY THE ENGINEER. THIS INCLUDES ALL LANDSCAPING WITHIN THE RIGHT OF WAY IN THE PATH OF THE NEW UTILITIES.
27. CONTRACTOR SHALL FOLLOW ALL LOCAL, STATE, AND FEDERAL REQUIREMENTS FOR CONSTRUCTION.
28. A TWO AND ONE HALF FOOT STRIP OF SOD SHALL BE INSTALLED ON THE EDGE OF ALL ASPHALT AND ASPHALT MILLING AREAS AND AROUND ALL ABOVE GROUND CONCRETE STRUCTURES INCLUDING BUT NOT LIMITED TO VALVE PADS, BLOW OFF VAULTS, AND AIR RELEASE VAULTS. ALL OTHER DISTURBED AREAS SHALL BE RESTORED WITH SEED AND MULCH UNLESS OTHERWISE SPECIFIED IN PLANS.
29. PROPOSED SPOT ELEVATIONS REPRESENT PAVEMENT OR GROUND SURFACE GRADE UNLESS OTHERWISE NOTED ON DRAWINGS.

SPECIAL NOTES

1. CONTRACTOR SHALL BE RESPONSIBLE FOR THE COST OF COORDINATION WITH ELECTRIC COMPANY TO STABILIZE POWER POLES AS THEY ARE ENCOUNTERED THROUGHOUT THE ENTIRE PROJECT.
2. REMOVAL AND REPLACEMENT OF EXISTING DRIVEWAYS AND DRIVEWAY CULVERTS SHALL BE INCLUDED IN THE BID PRICE. NEW DRIVEWAYS SHALL MATCH EXISTING MATERIALS.
3. REMOVAL AND REPLACEMENT OF EXISTING SIGNS, MAILBOXES, SODDING, IRRIGATION, LANDSCAPING, STRUCTURES, ETC. SHALL BE INCLUDED IN THE BID PRICE.
4. COMPACTION TESTING SHALL BE PERFORMED AT THE ROADWAY CUT FOR EXCAVATION AND BACKFILL SHALL BE COMPACTED PER FDOT SPECIFICATIONS FOR ROAD RECONSTRUCTION AND SHALL BE INCLUDED IN THE BID PRICE.
5. THE LOCATIONS OF UTILITIES SHOWN ARE APPROXIMATE. THE CONTRACTOR SHALL FIELD VERIFY THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL UTILITIES INCLUDING RECONNECTING ALL WATER AND SEWER SERVICES DAMAGED/BROKEN DURING CONSTRUCTION, WITH NO ADDITIONAL COST TO THE OWNER.
6. CONTRACTOR SHALL PROVIDE THE ENGINEER WITH A MAINTENANCE OF TRAFFIC PLAN PRIOR TO COMMENCEMENT OF CONSTRUCTION. SIGNAGE SHALL BE MAINTAINED AT ALL TIMES AND SHALL BE INCLUDED IN THE BID PRICE.
7. CONTRACTOR SHALL PROVIDE ALL DE-WATERING FOR CONSTRUCTION AND SHALL BE INCLUDED IN THE BID PRICE.
8. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING THE NPDES PERMIT AND MAINTAINING THE SILT FENCE, INLET PROTECTION, AND ANY OTHER EROSION CONTROL NECESSARY IN THE NPDES PERMIT GUIDLINES.

CONSTRUCTION SEQUENCE:

1. CONTRACTOR WILL BE RESPONSIBLE FOR SCHEDULING A PRE-CONSTRUCTION CONFERENCE WITH THE OWNERS, UTILITY COMPANIES, WMD, FDOT, COUNTY, ENGINEER AND ALL OTHER PARTIES REQUIRED FOR COMMENCEMENT OF PROJECT. THIS MEETING SHALL TAKE PLACE PRIOR TO COMMENCEMENT OF ANY PROJECT RELATED ACTIVITIES. AT THIS TIME PRIOR TO ANY CONSTRUCTION THE PERMIT MUST BE POSTED WITHOUT NAILING TO ANY TREE ON SITE.
2. THE CONTRACTOR SHALL ENSURE THAT A FOREMAN OR SUPERVISOR WHO HAS BEEN CERTIFIED UNDER FLORIDA STORMWATER, EROSION, AND SEDIMENTATION CONTROL INSPECTOR TRAINING PROGRAM IS AVAILABLE IN PERSON OR BY TELEPHONE AT ALL TIMES DURING CONSTRUCTION ACTIVITIES. CONSTRUCTION SHALL NOT COMMENCE UNTIL INFORMATION (NAME AND PHONE NUMBER) OF CERTIFIED STORMWATER EROSION AND SEDIMENT CONTROL INSPECTOR HAS BEEN PROVIDED TO THE COUNTY AT THE PRE CONSTRUCTION MEETING
3. CONTRACTOR SHALL USE ENTRANCE DEPICTED ON THIS PLAN SET. CONTRACTOR WILL LIMIT THE AMOUNT OF AREA IMPACTED IN THE RIGHT OF WAY DURING CONSTRUCTION.
4. PRIOR TO CLEARING, A SILT FENCE BACKED WITH 4' HOG WIRE FENCE (TRENCHED 8 INCHES DEEP AND BACKFILLED ON THE UPHILL SIDE), SHALL BE INSTALLED AROUND THE PERIMETER OF THE SITE AS SHOWN ON THE PLANS. SILT FENCE MUST NOT BE TRENCHED WITHIN THE CPZ OF ANY TREES TO BE PROTECTED. EROSION CONTROL SHOWN ON PLANS IS REQUIRED. ADDITIONAL SEDIMENT AND EROSION CONTROL MEASURES MAY BE REQUIRED DURING ANY PHASE OF THE DEVELOPMENT, AT THE DISCRETION OF THE INSPECTOR. THE CITY INSPECTOR MAY REQUIRE ADDITIONAL MEASURES TO PREVENT ADDITIONAL EROSION. CONTRACTOR SHALL PROVIDE OUTLET PROTECTIONS FOR SEDIMENTS THAT MAY ENTER THE STORMWATER FACILITY. CONTRACTOR WILL BE RESPONSIBLE FOR CLEANING THE PROPOSED POND AFTER CONSTRUCTION OF ANY SEDIMENT THAT ENTERS THE POND. CONTRACTOR WILL BE RESPONSIBLE FOR THE CONDITION OF THE POND DURING CONSTRUCTION. CONTRACTOR CAN USE ADDITIONAL ALTERNATIVE TO PREVENT SEDIMENTS ENTERING THE POND. CONTRACTOR WILL BE RESPONSIBLE FOR ANY OFFSITE IMPACTS.
5. DURING THE CLEARING, GRUBBING AND SITE GRADING STAGES, AREAS THAT ARE DISTURBED MORE THAN 7 DAYS SHALL BE STABILIZED WITH RYE GRASS APPLIED AT MANUFACTURER'S RECOMMENDATIONS. AFTER SEEDING, EACH AREA SHALL BE MULCHED WITH 4,000 POUNDS OF STRAW PER ACRE. ALL EXPOSED SLOPES THAT ARE EQUAL TO OR GREATER THAN 5%, AN EROSION BLANKET SHALL BE UTILIZED UNTIL THE AREA ACHIEVES FINAL STABILIZATION. TO LIMIT THE AMOUNT OF EROSION ON SITE CONTRACTOR SHALL CLEAR SITE ONLY AS NEEDED DURING CONSTRUCTION. CONTRACTOR SHALL USE CARE WHEN CUTTING GRADES FOR THE WALL AND SWALE. CONTRACTOR SHALL ALSO PREPARE DIVERSION BERMS
6. CONTRACTOR SHALL EXCAVATE THE SITE SO THAT NO SEDIMENTS ENTER THE CONVEYANCE SYSTEM. CONTRACTOR SHALL ENSURE NECESSARY SAFETY MEASURES ARE TAKEN TO REMOVE SOIL FROM THE PROPOSED SITE AND OSHA REQUIREMENTS ARE MET. IF CONTRACTOR STORES SOILS ON SITE AND SHALL COORDINATE WITH OWNER ABOUT LOCATION ON SITE. THE STORAGE ON SITE AREA SHALL BE SURROUNDED BY DOUBLE ROW SILT FENCE. IF THE CONTRACTOR REMOVES SOIL AND CREATES SLOPES GREATER THAN 2:1 PRIOR TO THE WALL BEING INSTALLED NECESSARY EROSION CONTROL MEASURES SHALL BE PLACED, SUCH AS DOUBLE ROW SILT FENCES AND EROSION CONTROL BLANKETS AS NEEDED.
7. AFTER THE INITIAL SITE GRADING WORK, ALL PROPOSED INLET(S)/OUTFALLS, ONCE INSTALLED, SHALL BE PROTECTED FROM EROSION AND SEDIMENT RUNOFF BY THE USE OF FILTER FABRIC (WITH THE SAME INSTALLATION AS ABOVE). INLET GRATES MAY ALSO BE COVERED WITH FABRIC IF TRAFFIC WILL BE TRAVERSING THE INLETS. THESE COVERS SHALL BE CHECKED DAILY TO ENSURE PROPER COVER. DISTURBED PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE PERMANENTLY CEASED OR ARE TO BE LEFT IDLE FOR MORE THAN 14 DAYS SHALL BE STABILIZED WITH PERMANENT SEED OR OTHER PERMANENT STABILIZATION METHODS. SEEDING SHALL BE THE SAME AS IN TEMPORARY SEEDING.
8. TEMPORARY SEEDING SHALL BE RYE GRASS APPLIED AT MANUFACTURER'S RECOMMENDATIONS TO ANY DISTURBED AREAS THAT ARE INACTIVE MORE THAN 7 DAYS. SOD SHALL BE USED TO STABILIZE THE STORMWATER DISCHARGE SWALE. FILTER FABRIC SHALL BE PLACED UNDER STORMWATER DISCHARGE SWALE OUTFALL. SOD STRIPS IN SWALES AND WATERWAYS SHALL BE LAID PERPENDICULAR TO THE DIRECTION OF FLOW. SOD SHALL BE PEGGED OR STAPLED TO RESIST WASHOUT DURING THE ESTABLISHMENT PERIOD. CHICKEN WIRE, JUTE OR OTHER NETTING SHALL BE PEGGED OVER THE SOD FOR EXTRA PROTECTION FOR THE SWALE LOCATED ON EAST OF THE RETAINING WALL. SOD SHALL BE WATERED AND MAINTAINED AS NEEDED FOR THIS PROJECT. CONTRACTOR WILL BE RESPONSIBLE FOR PROVIDING IRRIGATION FOR ALL LANDSCAPING ON SITE.
9. CLEAR THE REMAINING PORTION OF THE SITE, INCLUDING ACCESS DRIVES, AND CREATE DIVERSION CHANNELS IF NECESSARY TO DIRECT STORM WATER FLOWS TO THE CONVEYANCE SYSTEM. CONSTRUCT HAY BALE CHECK DAMS WHERE NEEDED TO TRAP SEDIMENT BEFORE IT REACHES THE CONVEYANCE SYSTEM OR POND.
10. CARE SHALL BE TAKEN TO ASSURE THE REMOVAL OF ACCUMULATED FINE SEDIMENTS AND THAT THE EXCESSIVE COMPACTION OF SOILS BY CONSTRUCTION MACHINERY IS AVOIDED. INLET(S)/OUTFALLS SHALL BE PROTECTED WITH FILTER FABRIC AND PROPERLY INSTALLED HAY BALES (WITH THE SAME INSTALLATION AS INDICATED ABOVE).
11. ALL SEDIMENT IS TO BE CAPTURED ON THE PROJECT SITE. ANY SEDIMENT ESCAPING THE PROJECT SITE WILL BE REQUIRED TO BE REMOVED AND RESTORED INCLUDING THE TRACKING OF SOIL ON STREETS. THIS INCLUDES SEDIMENT INTO THE STORMWATER FACILITY. CONTRACTOR WILL BE RESPONSIBLE FOR ANY SEDIMENT ENTERING POND AND WILL BE RESPONSIBLE FOR ITS REMOVAL.
12. DAILY SWEEPING WILL BE REQUIRED ON THE PROPERTY AND IMMEDIATELY AFTER STORM EVENTS TO PREVENT TRACKING OF SEDIMENT ON TO STREETS AND RIGHT OF WAY.
13. WHERE NEEDED DURING CONSTRUCTION, 2' SOIL DIVERSION BERMS SHALL BE CONSTRUCTED TO INTERCEPT AND DIRECT STORM RUNOFF TO THE ON-SITE STORMWATER INLETS.
14. REMOVE ALL SEDIMENT/EROSION CONTROL DEVICES. REMOVE AND DISTRIBUTE ANY REMAINING SEDIMENT ONCE FULLY STABILIZED. ASSURE THAT DISTRIBUTED SEDIMENT WILL NOT BE REDISTRIBUTED. ANY EXCESS DIRT SHALL BE DISPOSED OFF IN A MANNER OFF SITE THAT WILL NOT CAUSE ANY EROSION OR SEDIMENT ISSUES. CONTRACTOR WILL ALSO INSPECT STRUCTURES FOR SEDIMENT. ANY SEDIMENT SHALL BE FLUSHED FROM THE CONVEYANCE SYSTEM.
15. TWO WEEKS PRIOR TO FINAL INSPECTION, THE CONTRACTOR SHALL HAVE A WALK THROUGH WITH THE ENGINEER, AND OWNER AND A PUNCH LIST SHALL BE PREPARED. ONCE ALL PUNCH LIST ITEMS ARE ADDRESSED TO SATISFY THE ENVIRONMENTAL PERMIT, THE CONTRACTOR SHALL ALSO SCHEDULE A WALK THROUGH WITH THE OWNER, AND ENGINEER UPON COMPLETION.
16. CONTRACTOR SHALL PROVIDE THE ENGINEER WITH A SIGNED AND SEALED AS-BUILT SURVEY TO VERIFY THE INSTALLATION OF ALL INFRASTRUCTURE, STORMWATER CONVEYANCES, AND LANDSCAPE IMPROVEMENTS IN ACCORDANCE WITH THE PERMIT.
17. THE ENGINEER WILL FILE A SIGNED AND SEALED RECORD DRAWINGS AND STORM WATER COMPLIANCE REPORT WITH THE PERMITTING AGENCY TWO WEEKS PRIOR TO REQUESTING A CLOSE OUT OF THE PROJECT.

TESTING SCHEDULE

ITEM	TEST	TEST IDENTIFICATION	TEST REQUIREMENT	TEST FREQUENCY
UTILITY TRENCH FILL & BACKFILL	MAXIMUM DENSITY OPTIMUM MOISTURE FIELD DENSITY	AASHTO T-180 ASTM D-1557 AASHTO T-191,T-204 ASTM D-1556, D-2937	N/A 95% OF MAXIMUM DENSITY	PER SOIL TYPE ONE PER 500 LF HORIZONTAL OR ONE PER 750 SY WITH A MINIMUM OF 3 TESTS, ALTERNATING LIFTS (12")
	GRADATION	AASHTO M-92	(15% PASSING NO. 200)	ONE PER SOIL TYPE
FILL & BACKFILL UNDER ROADWAYS AND STRUCTURES	MAXIMUM DENSITY OPTIMUM MOISTURE FIELD DENSITY	AASHTO T-180 ASTM D-1557 AASHTO T-191, T-204, T-238 ASTM D-1556, D-2937, D-2922	N/A 98% OF MAXIMUM DENSITY	PER SOIL TYPE ONE PER 500 LF HORIZONTAL OR ONE PER 750 SY WITH A MINIMUM OF 3 TESTS, ALTERNATING LIFTS (12")
	GRADATION	AASHTO M-92	(15% PASSING NO. 200)	ONE PER SOIL TYPE
LIMEROCK BASE	BEARING VALUES	LBR-FDOT	100 (MIN.)	ONE PER SITE OR AT MATERIAL CHANGES
	MAXIMUM DENSITY OPTIMUM MOISTURE	AASHTO T-180 ASTM D-1557 AASHTO T-191, T-204, T-238	N/A 98% OF MAXIMUM DENSITY	ONE PER SITE OR AT MATERIAL CHANGES
	FIELD DENSITY	ASTM D-1556, D-2937, D2922	MODIFIED PROCTOR	ONE PER 500 LF HORIZONTAL OR ONE PER 1200 SY WITH A MINIMUM OF 3 TESTS

STORM WATER POLLUTION PREVENTION PLAN:

1. SITE DESCRIPTION:
   CONSTRUCTION ACTIVITY: CONSTRUCTION OF A SAFE ROOM BUILDING AND ALL ASSOCIATED APPURTENANCES DEPICTED IN THIS PLAN SET
   PROJECT LIMITS: SEE SHEETS C2, SITE PLAN
   PROJECT DESCRIPTION: CONSTRUCTION OF A SAFE ROOM BUILDING AND ALL ASSOCIATED APPURTENANCES DEPICTED IN THIS PLAN SET
   MAJOR SOIL DISTURBING ACTIVITIES: CONSTRUCTION OF A SAFE ROOM BUILDING AND ALL ASSOCIATED APPURTENANCES DEPICTED IN THIS PLAN SET

   A. TOTAL PROJECT AREA: 2.69 AC

   B. TOTAL SOIL AREA TO BE DISTURBED: 2.69 AC

   C. FOR LOCATIONS OF DRAINAGE AREAS AND OUTFALLS: N/A
      a. NAME OF RECEIVING WATERS:N/A
      b. WETLAND AREA: NO DISTURBANCE TO NON-ISOLATED WETLANDS ARE ANTICIPATED.

2. CONTROLS: NARRATIVE - SEQUENCE OF SOIL DISTURBING ACTIVITIES AND IMPLEMENTATION OF CONTROLS.
   A. THE SOIL DISTURBING ACTIVITIES FOR THIS PROJECT ARE AS FOLLOWS: ONLY UPON PROPER PLACEMENT OF ALL EROSION CONTROLS CAN SOIL DISTURBING ACTIVITIES TAKE PLACE. HAY BALES AND SILT FENCE WILL BE USED LATERALLY AT SPECIFIED INTERVALS. HAY BALES SHALL BE USED TO PREVENT SEDIMENTATION FROM ESCAPING PROJECT LIMITS.
   B. EROSION AND SEDIMENT CONTROLS:
      a. STABILIZATION PRACTICES:
      X TEMPORARY SODDING
      X TEMPORARY GRASSING
      X PERMANENT PLANTING, SODDING, OR SEEDING
      TEMPORARY MULCHING
      ARTIFICIAL COVERING

      b. STRUCTURAL PRACTICES:
      SAND BAGGING
      X SILT FENCES
      X HAY BALES
      X BERMS
      X DIVERSION, INTERCEPTOR, OR PERIMETER DITCHES
      PIPE SLOPE DRAINS
      FLUMES
      X ROCK BEDDING AT CONSTRUCTION EXIT
      TIMBER BEDDING AT CONSTRUCTION EXIT
      DITCH LINER
      SEDIMENT TRAPS
      X RIP RAP

   C. DESCRIPTION OF STORM WATER MANAGEMENT: NO DISCHARGE WET DETENTION POND

   D. OTHER CONTROLS:
      a. WASTE DISPOSAL: NO CONSTRUCTION WASTE MATERIAL WILL BE BURIED ON SITE.
      b. OFFSITE VEHICLE TRACKING:
      HAUL ROADS DAMPENED FOR DUST CONTROL
      X LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
      X EXCESS DIRT ON ROAD REMOVED DAILY
      X STABILIZED CONSTRUCTION ENTRANCE
      c. SANITARY WASTE: N/A
      d. FERTILIZERS AND PESTICIDES: FERTILIZERS AND/OR PESTICIDES SHALL BE APPLIED ACCORDING TO MANUFACTURERS RECOMMENDATIONS BY A LICENSED OR CERTIFIED APPLICATOR AS DIRECTED BY THE PROJECT ENGINEER.
      e. NON-STORMWATER DISCHARGE (INCLUDING SPILL REPORTING): NO NON-STORMWATER DISCHARGES ARE ANTICIPATED.

   E. APPROVED STATE, LOCAL PLANS, OR STORM WATER PERMITS:

3. MAINTENANCE:
   ALL OF THE CONTROLS SHALL BE MAINTAINED AT ALL TIMES. IF A REPAIR IS NECESSARY, IT WILL BE DONE AT THE EARLIEST DATE POSSIBLE, BUT NO LATER THAN (7) CALENDAR DAYS AFTER THE SURROUNDING EXPOSED AREA HAS DRIED SUFFICIENTLY TO PREVENT FURTHER DAMAGE FROM HEAVY EQUIPMENT.

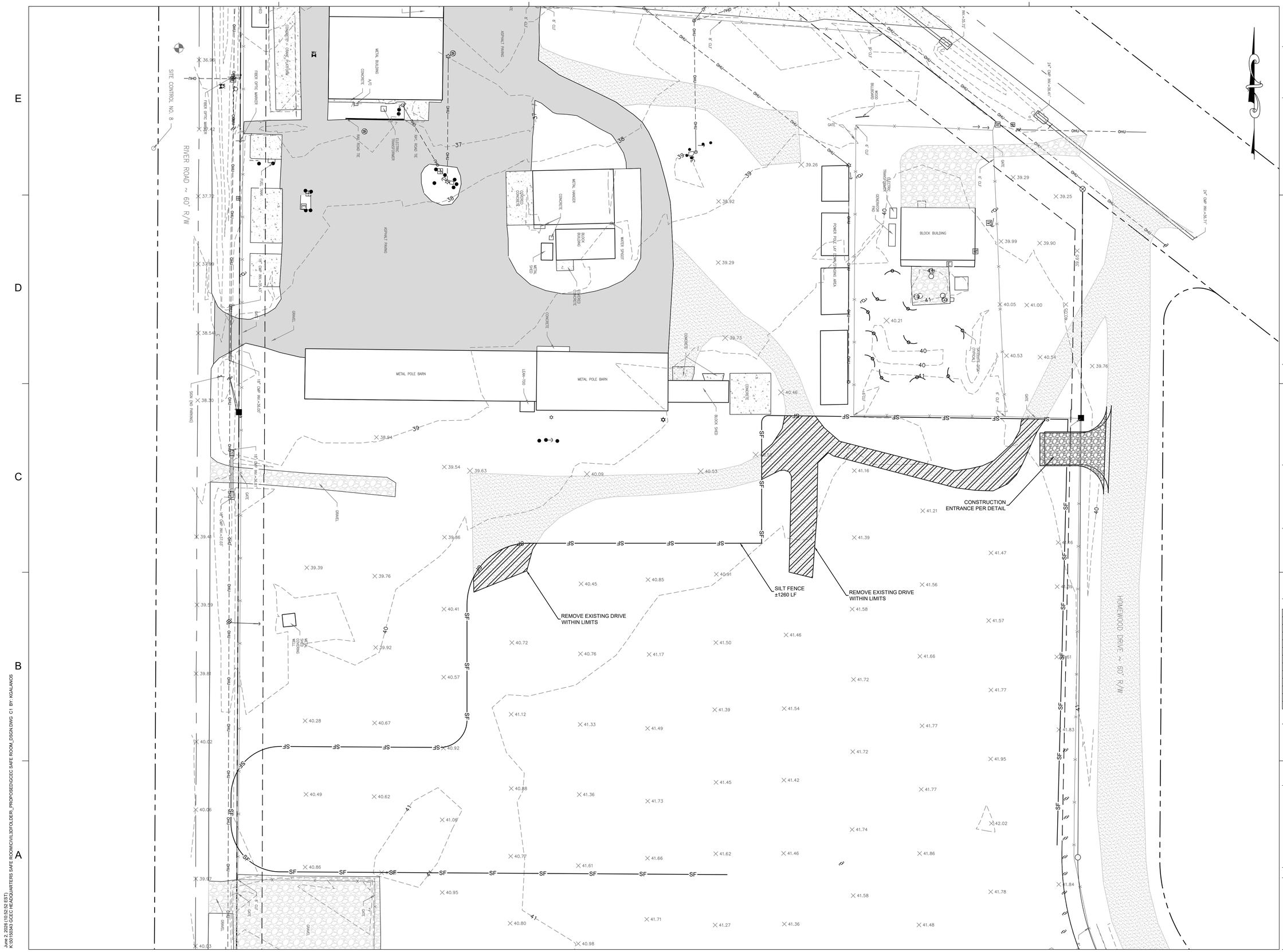
4. INSPECTION:
   A. ALL CONTROLS SHALL BE INSPECTED WEEKLY BY THE CONTRACTOR AS WELL AS AFTER 0.25' OR MORE OF RAIN. AN INSPECTION AND MAINTENANCE REPORT WILL BE MADE PER EACH INSPECTION. BASED ON INSPECTION RESULTS THE CONTROLS SHALL BE REVISED PER THE INSPECTION REPORTS.
   B. THE CONTRACTOR SHALL INITIATE REPAIRS WITHIN 24 HOURS OF INSPECTION THAT INDICATE ITEMS ARE NOT IN GOOD WORKING ORDER. TO COMPLY, THE CONTRACTOR SHALL INSTALL AND MAINTAIN RAIN GAGES AND DAILY RAINFALL RECORDS. WHERE SITES HAVE BEEN PERMANENTLY STABILIZED, INSPECTIONS SHALL BE CONDUCTED AT LEAST ONCE EVERY MONTH. THE CONTRACTOR SHALL ALSO INSPECT AND CERTIFY THAT CONTROLS INSTALLED IN THE FIELD AGREE WITH THE LATEST STORMWATER POLLUTION PREVENTION PLAN.
   C. IF INSPECTIONS INDICATE THAT THE INSTALLED STABILIZATION AND STRUCTURAL PRACTICES ARE NOT SUFFICIENT TO MINIMIZE EROSION, RETAIN SEDIMENT, AND PREVENT DISCHARGING POLLUTANTS, THE CONTRACTOR SHALL PROVIDE ADDITIONAL MEASURES, AS NEEDED.
   D. RECORDS OF THE INSPECTION AND THE CONSTRUCTION PERMIT MUST BE MAINTAINED AT THE CONSTRUCTION SITE AND BE READILY AVAILABLE FOR INSPECTION.
   5. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING COVERAGE UNDER THE GENERAL PERMIT FOR STORMWATER DISCHARGE FROM LARGE AND SMALL CONSTRUCTION ACTIVITIES PRIOR TO START OF CONSTRUCTION OR ANY DISTURBANCE OF LAND GREATER THAN ONE ACRE. THE CONTRACTOR WILL FORWARD A COPY OF THE PERMIT AND WILL PROVIDE 24 HOUR NOTIFICATION TO THE CITY OWNER PRIOR TO COMMENCEMENT OF WORK. ALL REQUIRED ELEMENTS OF THE STORMWATER POLLUTION PREVENTION PLAN MUST BE IN PLACE PRIOR TO COMMENCEMENT OF CONSTRUCTION. FAILURE TO COMPLY COULD RESULT IN CODE ENFORCEMENT ACTION AND FINES.
   6. THE CONTRACTOR IS RESPONSIBLE FOR FOLLOWING REQUIRED WASTE MANAGEMENT PRACTICES AS DEFINED IN THE GADSDEN COUNTY MUNICIPAL CODE "UNLAWFUL DISPOSAL OF WASTE, FAILURE TO DELIVER WASTE," WHICH MAKES IT UNLAWFUL FOR ANY PERSON TO DUMP, LEAVE OR BURY ANY SOLID WASTE ON PUBLIC OR PRIVATE PROPERTY.
   7. SWEEPING SHALL OCCUR DAILY OR IMMEDIATELY AFTER SUCH EVENTS THAT CAUSE TRACKING ONTO STREET.

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GULF COUNTY, FLORIDA

SEAL

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EB 0008794

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SCALE

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SCALE: 1" = 30'

REVISIONS

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CHECKED BY	J. BAXLEY
DATE	JUNE 2026

TITLE

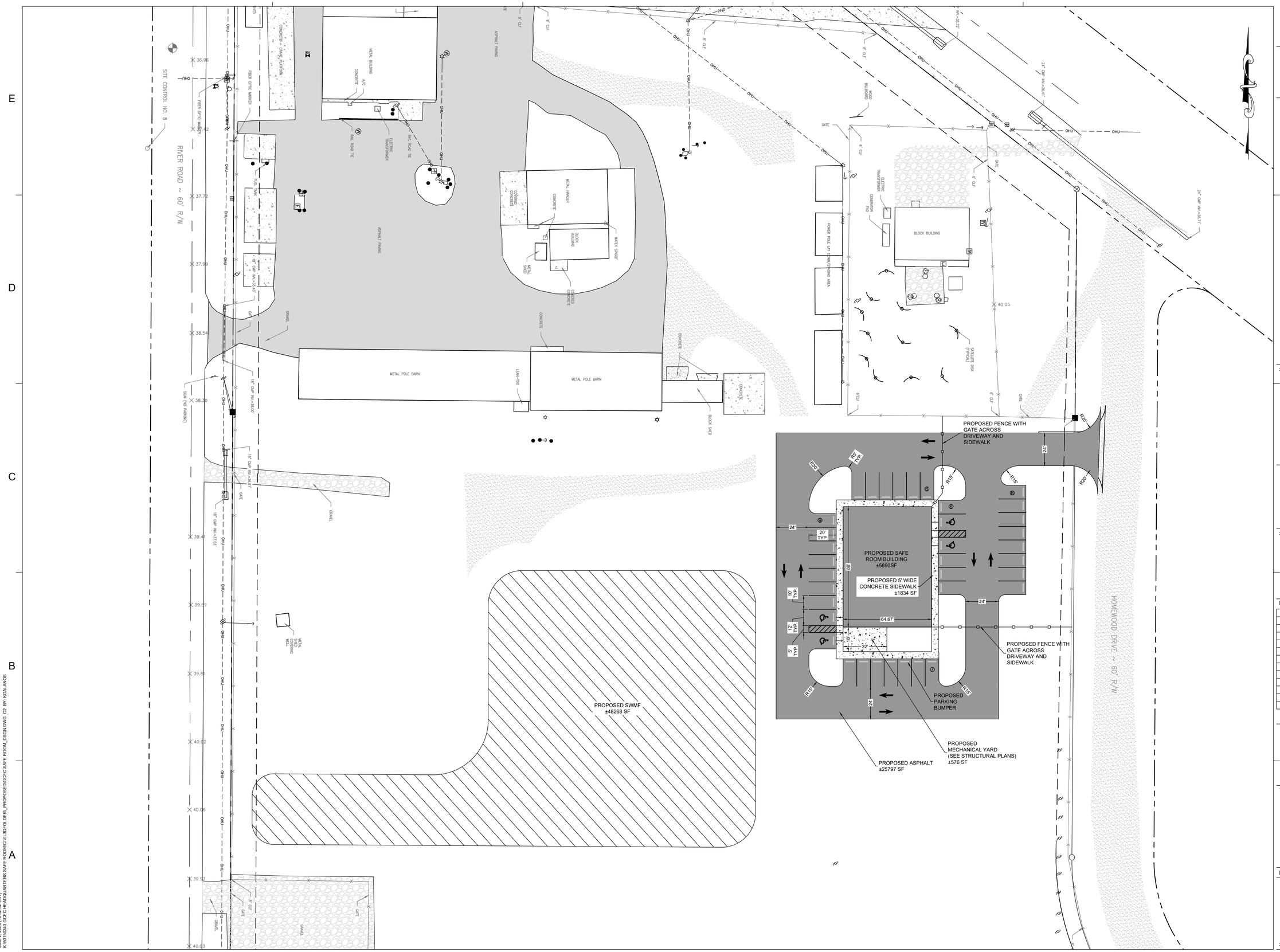
DEMOLITION & EROSION CONTROL PLAN

PROJECT NO. 50150343

C1

SHEET NO.

June 2, 2026 (10:52:42 EST)
K:\50150343.GCEC-HEADQUARTERS SAFE ROOM\CIVIL\DFOLDER_PROPOSED\DGEC SAFE ROOM_DSGN.DWG C1 BY: KGALANOS



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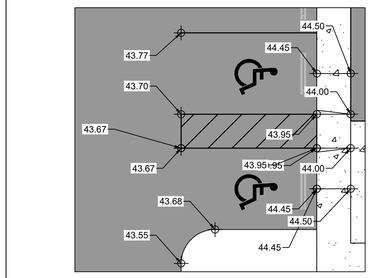
SITE PLAN

PROJECT NO. 50150343

C2

SHEET NO.

June 2, 2026 (10:52:32 EST)
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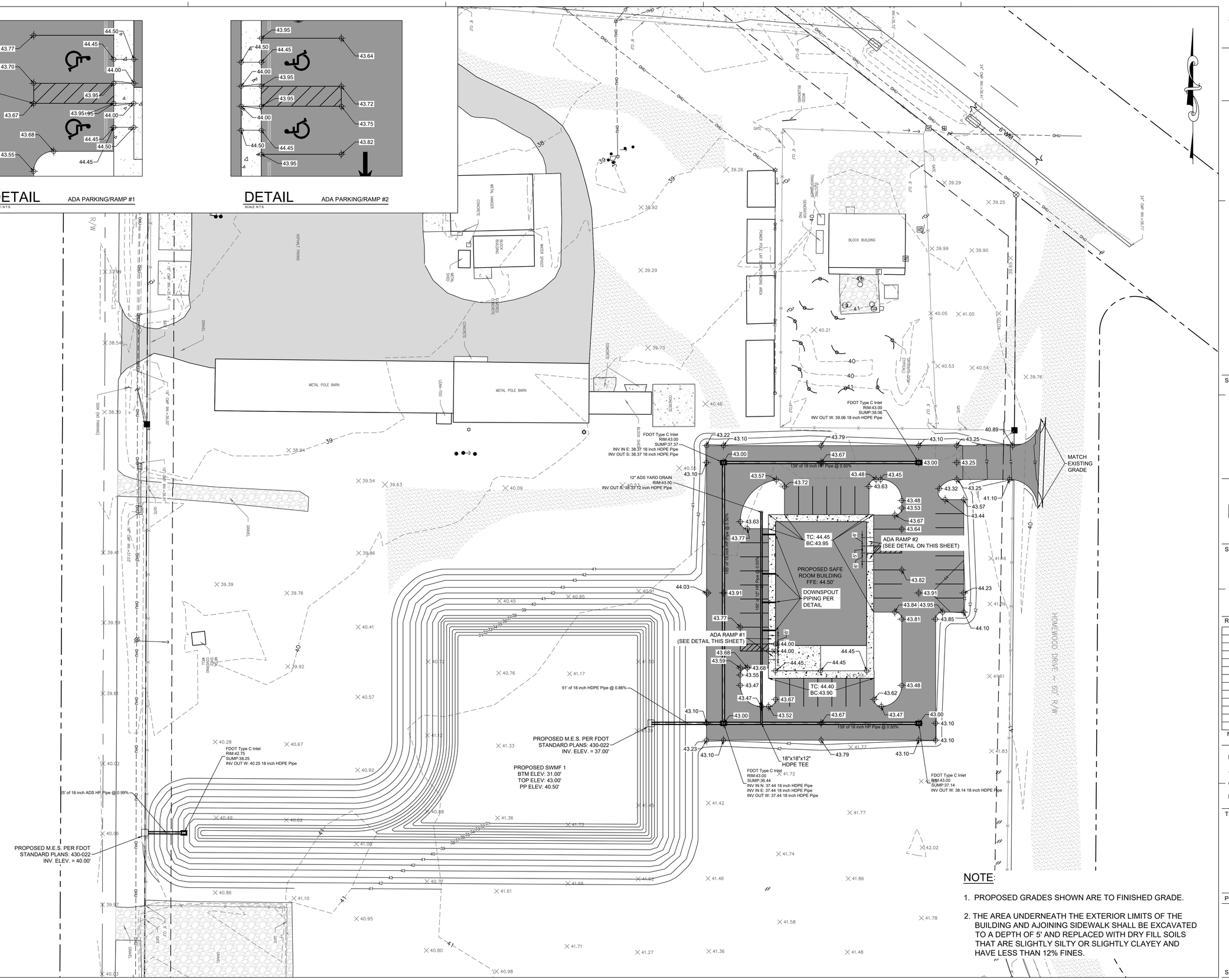


DETAIL ADA PARKING/RAMP #1

SCALE: N.T.S.

DETAIL ADA PARKING/RAMP #2

SCALE: N.T.S.



NOTE:

1. PROPOSED GRADES SHOWN ARE TO FINISHED GRADE.
2. THE AREA UNDERNEATH THE EXTERIOR LIMITS OF THE BUILDING AND AJOINING SIDEWALK SHALL BE EXCAVATED TO A DEPTH OF 5' AND REPLACED WITH DRY FILL SOILS THAT ARE SLIGHTLY SILTY OR SLIGHTLY CLAYEY AND HAVE LESS THAN 12% FINES.

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GRADING PLAN

PROJECT NO. 50150343

C3

SHEET NO.

June 2, 2026 (10:52:52 EST)
K:\50150343 GSEC HEADQUARTERS SAFE ROOM\CIVIL\DGN\FOLDER_PROPOSED\GCEC SAFE ROOM_DSGN.DWG C3 BY: KGALANOS



NOTE:

1. CONTRACTOR TO FIELD VERIFY ALL EXISTING UTILITIES.
2. WATER AND SEWER LOCATIONS ARE APPROXIMATE AND MAY BE ADJUSTED WITH APPROVAL FROM THE ENGINEER OF RECORD, GCEC, AND UTILITY OWNERS.
3. ALL PROPOSED UTILITIES SHALL HAVE A MINIMUM OF 36" (3') OF COVER PER THE DETAILS.
4. ALL WATER AND SEWER SHALL MAINTAIN A MINIMUM OF 6' OF HORIZONTAL SEPARATION PER FDEP STANDARDS.
5. THE DOUBLE WATER SERVICE IS FOR REDUNDANCY OF THE WATER SYSTEM SERVING THE FACILITY.
6. THE GRINDER STATION SHALL BE HOOKED TO BOTH REGULAR AND GENERATOR POWER.

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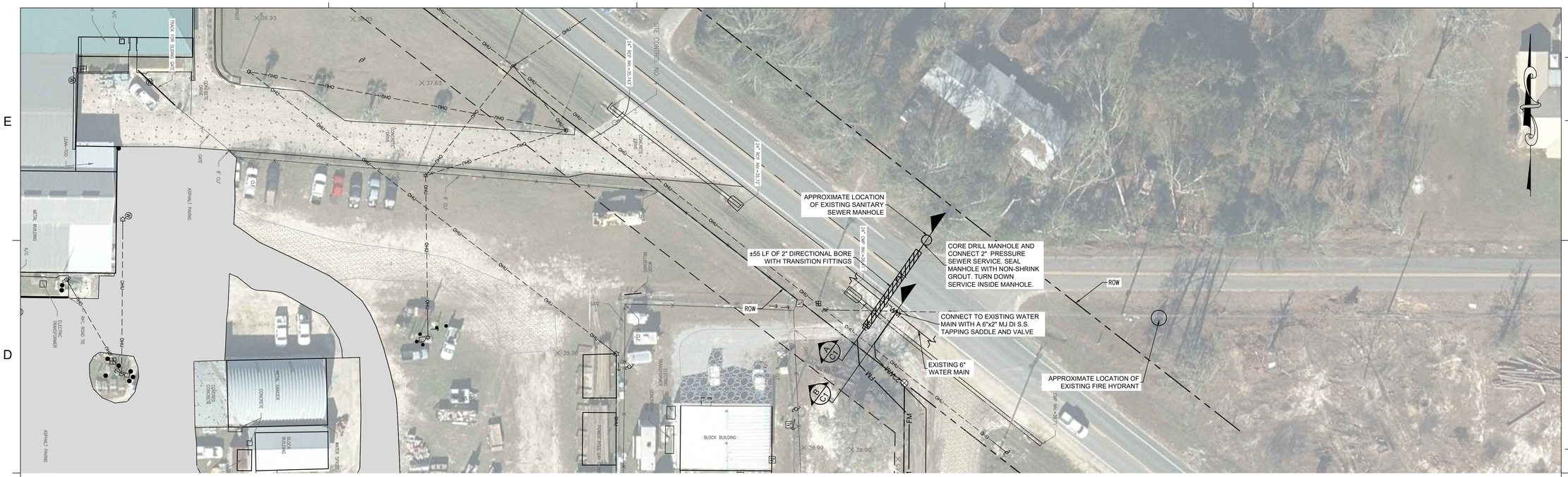
UTILITY PLAN

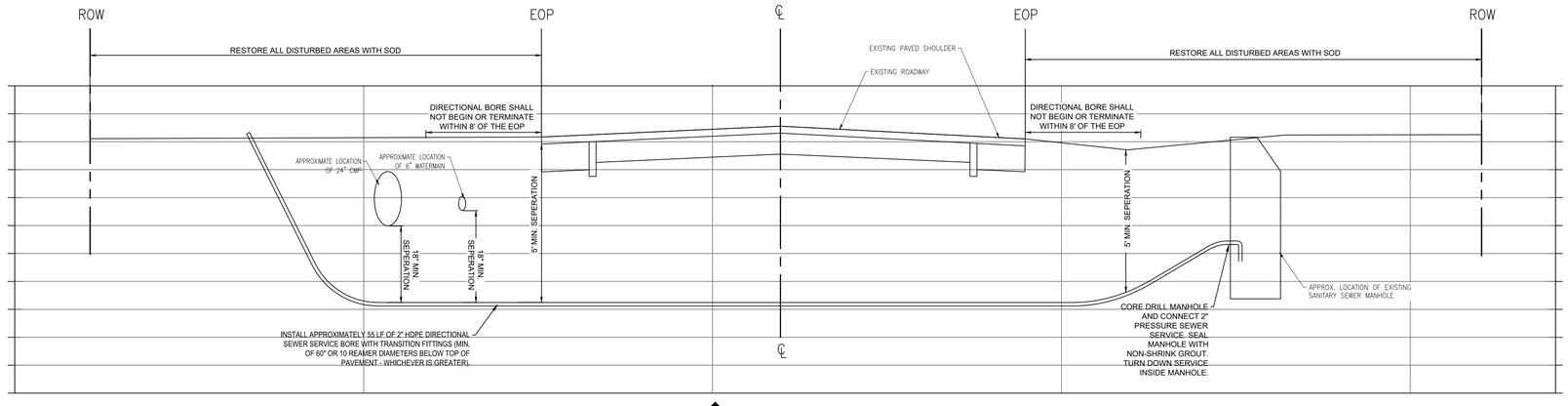
PROJECT NO. 50150343

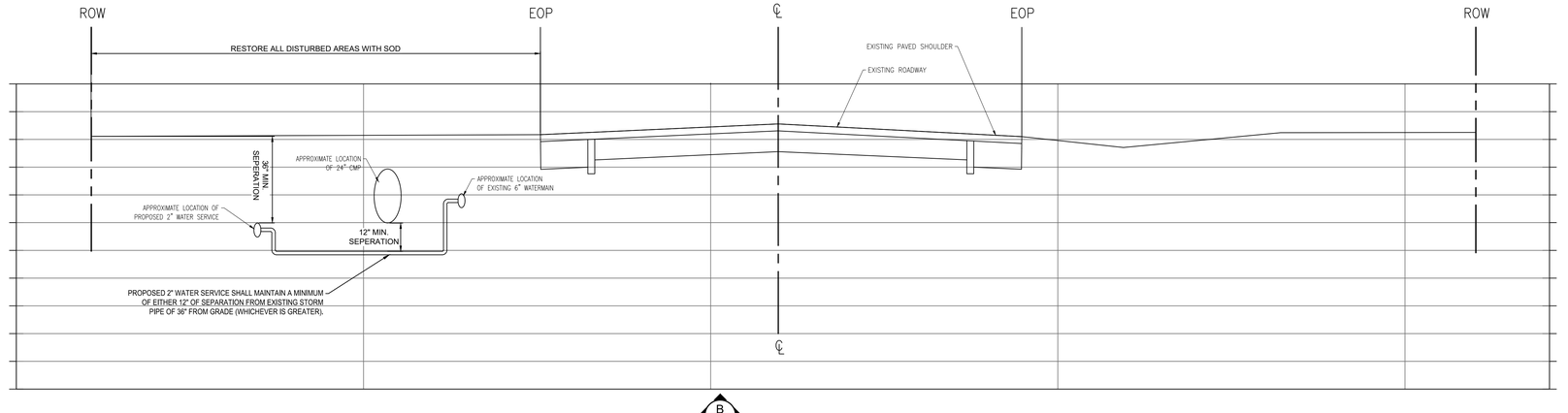
C4

SHEET NO.

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GENERAL NOTES:

1. THE LOCATIONS OF THE UTILITIES SHOWN IN THE PLANS ARE BASED ON LIMITED INVESTIGATION TECHNIQUES AND SHOULD BE CONSIDERED APPROXIMATE ONLY. EXISTING UTILITY LOCATIONS HAVE NOT BEEN FIELD VERIFIED BY DEWBERRY AND REPRESENT BEST JUDGEMENT FROM UTILITY OWNERS ONLY.
2. EXISTING UTILITIES ARE TO REMAIN IN PLACE UNLESS OTHERWISE NOTED ON PLANS.
3. THE CONTRACTOR SHALL NOTIFY UTILITY OWNERS THROUGH SUNSHINE 811 (1-800-432-4770 OR 811) TWO BUSINESS DAYS IN ADVANCE OF BEGINNING CONSTRUCTION ON THE PROJECT SITE.
4. ALL PROPOSED UTILITIES SHALL MAINTAIN A MINIMUM OF 36" OF COVER UNLESS SPECIFIED ELSE WISE.

UTILITY OWNERS:

COMPANY	CONTACT	TELEPHONE
AT&T DISTRIBUTION	DINO FARRUGGIO	561-683-2729
CITY OF WEWAHITCHKA	MICHAEL GORTMAN	850-639-2605
CONSOLIDATED COMMUNICATIONS	TRAVIS BURGE	850-229-7338
GULF COAST ELECTRIC CO-OP, INC	COLBY WIGGINS	850-639-2216
MEDIACOM	PAUL PITTS	845-913-6499

ROADWAY NOTES:

1. RECONSTRUCT FRONT SLOPE OF SWALE AT 1:3 OR FLATTER TO MATCH EXISTING
2. SOD ALL DISTURBED AREAS WITHIN FDOT ROW
3. CONTRACTOR SHALL PROVIDE MOT IN ACCORDANCE WITH FDOT STANDARD INDEX 600 SERIES

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TITLE

FDOT UTILITY PLAN

PROJECT NO.

C5

SHEET NO.

June 2, 2026 (10:52:52 EST)
K:\501760943 GCEC-HEADQUARTERS SAFE ROOM\CIVIL\SDP\FOLDER_PROPOSED\GCEC SAFE ROOM_DSGN.DWG C5 BY: KGALANOS

LOCATION OF PUBLIC WATER SYSYEM MAINS IN ACCORDANCE WITH F.A.C. RULE 62-555.314

Other Pipe	Horizontal Separation	Crossings (1)	Joint Spacing @ Crossings (Full Joint Centered)
Storm Sewer, Stormwater Force Main, Reclaimed Water (2)	Water Main 3 feet minimum	Water Main 12 inches is the minimum, except for storm sewer, then 6 inches is minimum and 12 inches is preferred.	Alternate 3 ft. minimum Water Main
Vacuum Sanitary Sewer	Water Main 10 feet preferred 3 feet minimum	Water Main 12 inches is preferred 6 inches minimum.	Alternate 3 ft. minimum Water Main
Gravity or Pressure Sanitary Sewer, Sanitary Sewer Force Main, Reclaimed Water (4)	Water Main 10 feet preferred 6 feet minimum (3)	Water Main 12 inches is the minimum, except for storm sewer, then 6 inches is minimum and 12 inches is preferred.	Alternate 6 ft. minimum Water Main
On-Site Sewage Treatment & Disposal System	10 feet minimum	----	----

(1) Water main should cross above other pipe. When water main must be below other pipe, the minimum separation is 12 inches.
(2) Reclaimed water regulated under Part III of Chapter 62-610, F.A.C.
(3) 3 ft. for gravity sanitary sewer where the bottom of the water main is laid at least 6 inches above the top of the gravity sanitary sewer.
(4) Reclaimed water not regulated uin Part III of Chapter 62-610, F.A.C.

DETAIL WATER / SEWER STANDARD SEPARATION

SCALE: N.T.S.

1.) ALL WATER MAINS SHALL BE INSTALLED ACCORDING TO ENGINEERING PLANS AND COUNTY/CITY SPECIFICATIONS.

2.) WATER MAIN SHALL BE INSTALLED ON NORTH OR EAST ROAD CENTERLINE AT A DISTANCE TO INSURE MAIN IS A MINIMUM OF 6' FROM EDGE OF PAVEMENT OR IN ACCORDANCE WITH COUNTY AND STATE RECOMMENDED GUIDELINES FOR UTILITY PLACEMENT.

3.) ALL PAVEMENT SHALL BE CUT AND PATCHED IN ACCORDANCE WITH COUNTY AND STATE SPECIFICATIONS.

4.) ALL VALVES AND MATERIALS SHALL COMPLY WITH AWWA (AMERICAN WATER WORKS ASSOCIATION) STANDARDS.

5.) MATERIALS APPROVED FOR WATER MAIN CONSTRUCTION INCLUDES:
A. PVC CLASS 900 DR 18
B. 6" THRU 16" CAST IRON, CLASS 22 (AWWA C-601), DUCTILE IRON, CLASS 50 (AWWA C-151).

6.) ALL MAIN LINE VALVES SHALL BE RESILIENT SEATED GATE VALVES.

7.) SERVICE TAPS SHALL NOT BE LESS THAN 7/8" (OPENING CUT) IN SADDLE CLAMP.

8.) WATER SERVICE TUBING SHALL BE TYPE K COPPER TUBING AND COMPLY WITH ASTM-B88-55, RATE AT 160 P.S.I.

9.) FLUSH PIPE DISCHARGE SHALL BE OPPOSITE DIRECTION OF VALVE AND AND PIPE SHALL EXTEND 20" TO 30" ABOVE GROUND LEVEL.

10.) MAINS SHALL HAVE A MINIMUM OF 36" COVER. IN DITCH BOTTOMS SERVICE LINES SHALL HAVE A MINIMUM OF 30" OF COVER.

11.) ALL WATER MAINS AND SERVICE LINES SHALL HAVE 12 GAUGE, THIN INSULATED, SOLID COPPER WIRE COILED AROUND ALL WATER MAINS AND SERVICE LINES. ALL WIRE SHALL BE JOINED BY A COMMON BOND USING "BUTT SPLICE". WHERE A SERVICE WIRE IS BEING BONDED TO A MAIN WIRE, THE BOND (CONNECTION) SHALL BE MADE WITH A "T" BUTT SPLICE. IN THE EVENT THE "T" BUTT SPLICE IS NOT AVAILABLE, THE BOND SHALL BE MADE BY TIGHTLY WRAPPING THE SERVICE LINE WIRE TO THE MAIN WIRE WITH A MINIMUM OF TEN WRAPS. WIRE SPLICES SHALL BE WRAPPED WITH SCOTCH E-Z SEAL NO. 2200 ELECTRICAL INSULATING PAD WITH VINYL BACKING. THE SERVICE LINE WIRE SHALL EXTEND 12" INTO THE METER BOX.

12.) "AS BUILT PLANS" SHALL INDICATE LOCATIONS OF ALL SERVICES WITH RESPECT TO LOT CORNERS, LOCATIONS AND TYPES OF ALL FITTINGS, LOCATION OF ALL VALVES, AND DEAD END RUNS WITH THREE (3) PHYSICAL FEATURES (LOT CORNERS, TREES, ETC.).

13.) ALL STUB-OUTS SHALL HAVE WATER EMS MARKERS INSTALLED 18" BELOW GROUND LEVEL.

14.) ALL MAINS AND SERVICE LINES SHALL BE PRESSURE TESTED AND DISINFECTED IN ACCORDANCE WITH AWWA C-601 UNDER SUPERVISION OF TEC INSPECTORS.

15.) COMPACTING REQUIREMENTS: REFERENCE COUNTY, AND STATE SPECIFICATIONS.

16.) ALL SERVICES SHALL BE INSTALLED IN THE APPROXIMATE CENTER OF EACH LOT.

17.) ALL PIPE USE IN WATER DISTRIBUTION SYSTEMS SHALL BE N.S.F. APPROVED FOR POTABLE WATER USE.

18.) THE TWO INCH STAND PIPE SHALL BE THE #77 MAINGUARD HYDRANT BY KUPFERLE FOUNDRY.

19.) A SET OF PLANS WITH TALQUIN STAMP OF APPROVAL SHALL BE LOCATED ON JOB SITE DURING CONSTRUCTION.

20.) ALL CONSTRUCTION STAKING SHALL BE DONE AT CONTRACTORS EXPENSE.

21.) BEFORE ANY CONSTRUCTION BEGINS "SHOP DRAWINGS" SHALL BE APPROVED BY TEC.

22.) CONSTRUCTION OF PIPE ALONG AN ARC SHALL BE IN ACCORDANCE WITH THE PIPE MANUFACTURER'S INSTALLATION GUIDELINES. THE PIPE SHALL BE CURVED UNIFORMLY THROUGHOUT ITS LENGTH AND NO JOINT DEFLECTION WILL BE ALLOWED. THE MAXIMUM PIPE RADIUS BASED ON J-M BLUE BRUTE AND RING TITE PIPE SHALL BE AS FOLLOWS:

12"	300 FEET
10"	250 FEET
8"	200 FEET
6"	150 FEET
4"	100 FEET
2"	25 FEET

23.) FOR FURTHER DETAILS SEE TEC SPECIFICATIONS.

COMPACTION OF BACKFILL

A. BACKFILL PLACED IN TRENCHES WHICH ARE UNDER THE PAVEMENT, OR WITHIN 4 FEET OF THE EDGE OF PAVING OR WITHIN 2 FEET OF THE BACK OF THE CURBLINES OR WITHIN 2:1 SLOPE OF THESE LIMITS, SHALL EACH BE COMPACTED IN ACCORDANCE WITH THE FOLLOWING:

1. ROADWAY BASE AND SUB-BASE TO 98% AASHTO T-180 (MODIFIED PROCTOR)

2. DEPTH BELOW SUBGRADE:
0 - 3' 100% AASHTO T-99 STANDARD PROCTOR
3' - 10' 98% AASHTO T-99 STANDARD PROCTOR
10' + 95% AASHTO T-99 STANDARD PROCTOR

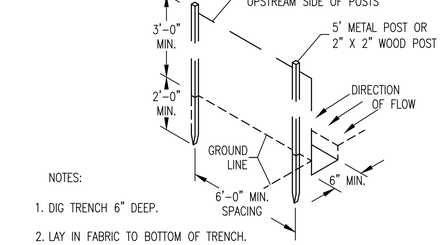
B. THE ENTIRE DEPTH OF BACKFILL PLACED IN TRENCHES THAT ARE OUTSIDE THE AREAS DESCRIBED IN THE ABOVE SCHEDULE MAY BE COMPACTED TO A DENSITY WHICH MATCHES THAT OF UNDISTURBED MATERIALS LOCATED IN IMMEDIATELY ADJACENT AREAS.

TESTING

	TEST	STANDARD	FREQUENCY
A.	PROCTOR LAB DENSITY	AASHTO T-99,T-180, ASTM D 698, ASTM D 1557	ONE PER MATERIAL TYPE
B.	DENSITY (INSITU) ALONG PIPELINE	ASTM D2922 ASTM D1556	ONE PER EVERY 12-INCH DEPTH AND 400 LF OF PIPELINE OR BETWEEN STRUCTURES
C.	DENSITY (INSITU) AT SERVICES	ASTM D2922 ASTM D1556	1 FOR EACH 12" DEPTH OF EACH SERVICE
D.	DENSITY (INSITU) AROUND	ASTM D2922 ASTM D1556	1 FOR EACH 12" DEPTH OF STRUCTURE

COMPACTION & TESTING REQUIREMENTS

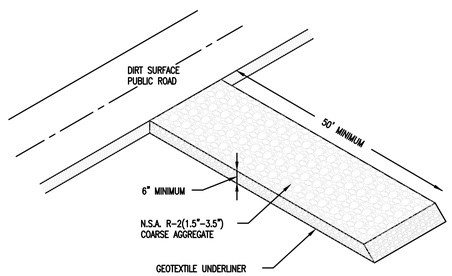
SCALE: N.T.S.



NOTES:
1. DIG TRENCH 6" DEEP.
2. LAY IN FABRIC TO BOTTOM OF TRENCH.
3. BACK TRENCH, COVERING FABRIC.

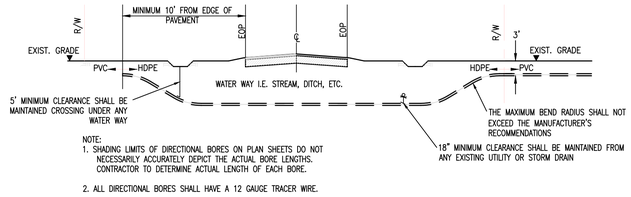
TYPE IV SILT FENCE DETAIL

N.T.S.



CONSTRUCTION ENTRANCE DETAIL

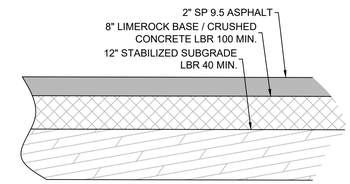
N.T.S.



NOTE:
1. SHADING LIMITS OF DIRECTIONAL BORES ON PLAN SHEETS DO NOT NECESSARILY ACCURATELY DEPICT THE ACTUAL BORE LENGTHS. CONTRACTOR TO DETERMINE ACTUAL LENGTH OF EACH BORE.
2. ALL DIRECTIONAL BORES SHALL HAVE A 12 GAUGE TRACER WIRE.

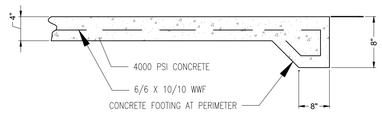
D E T A I L - DIRECTIONAL BORE ROADWAY CROSSING

SCALE: N.T.S.



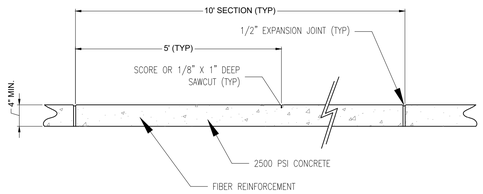
DETAIL ASPHALT SECTION

SCALE: N.T.S.



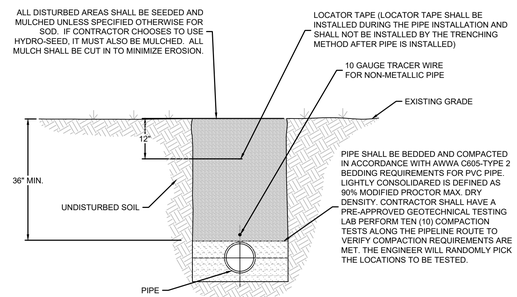
PERIMETER

SCALE: N.T.S.



DETAIL

SCALE: N.T.S.



NOTES:

1. NO TRASH, RUBBISH, ROCKS OR DEBRIS WILL BE ALLOWED IN TRENCHES.
2. ALL PIPE SHALL BE INSTALLED IN DRY TRENCHES.
3. CONTRACTOR MAY BE REQUIRED BY THE ENGINEER TO DE-WATER PIPE TRENCH, IF NECESSARY.
4. AT THE ENGINEERS DISCRETION, THE CONTRACTOR SHALL SUBSTITUTE SELECT BACKFILL IN LIEU OF NATIVE SOILS FOR A UNIT PRICE SPECIFIED IN THE CONTRACTOR'S CONCRETE SIDEWALK
5. THE CONTRACTOR WILL BE COMPENSATED FOR SELECT BACKFILL ONLY IF DIRECTED BY THE ENGINEER IN WRITING. THE ENGINEER MAY ISSUE A FIELD ORDER WITH WRITTEN CONFIRMATION WITHIN 24 HOURS.

TYPICAL PRESSURE PIPE BEDDING DETAIL

N.T.S.

Dewberry

324 Marina Drive
Port St. Joe, FL 32456
850.227.7200

GULF COAST ELECTRIC COOPERATIVE SAFE ROOM

GULF COUNTY, FLORIDA

SEAL

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY JOSHUA BAXLEY, PE. ON THE DATE NOTED ON THE ELECTRONIC SIGNATURE. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

JOSHUA BRYAN BAXLEY, P.E. 67529
EB 0008794

100% DESIGN

SCALE

NO SCALE

REVISIONS

NO.	DESCRIPTION	DATE

DRAWN BY	C. BROWN
APPROVED BY	C. BROWN
CHECKED BY	J. BAXLEY
DATE	JUNE 2026

TITLE

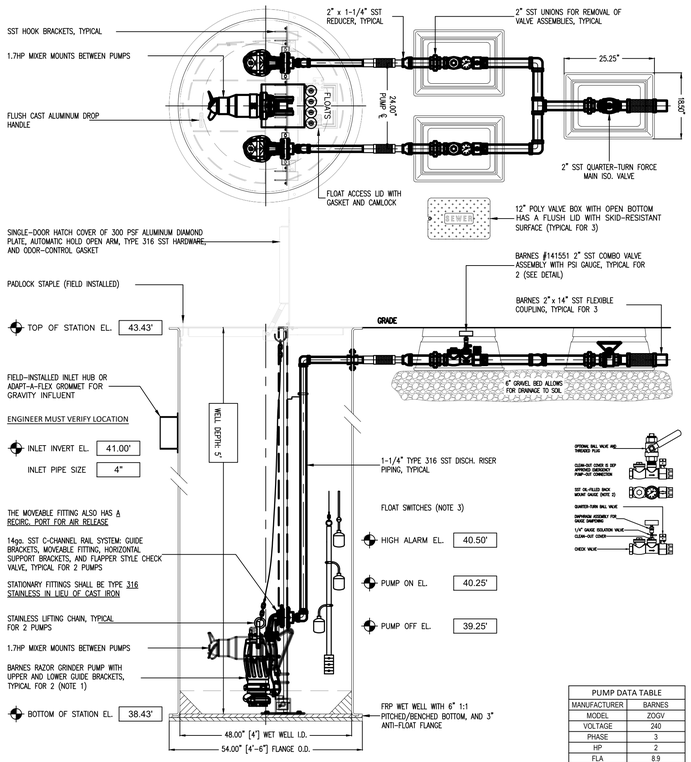
DETAILS

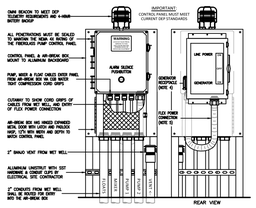
PROJECT NO. 50150343

CD1

SHEET NO.

June 2, 2026 (10:52:02 EST)
K:\50150343 GCEC\HEADQUARTERS SAFE ROOM\CIVIL\3D\FOLDER_PROPOSED\GCEC SAFE ROOM_DSGN.DWG CD1 BY: KGALANOS





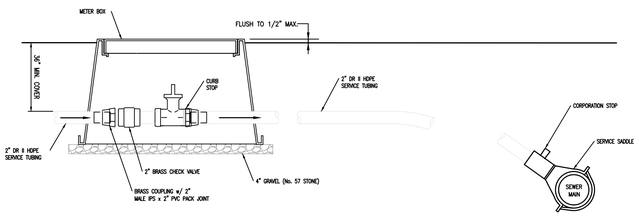
DETAIL - TYPICAL GRINDER STATION SINGLE UNIT INSTALLATION

SCALE: N.T.S.

NOTES:

1. THE PUMPS MUST HAVE A 5-YEAR 100% REPAIR PARTS & LABOR WARRANTY AS PROVIDED BY THE MANUFACTURER.
2. GAUGE SIZED TO READ NO MORE THAN 1-1/2 TIMES THE MAXIMUM PRESSURE PUMP PROVIDES AT DEAD HEAD.
3. FLOATS SHALL BE ANCHOR SCIENTIFIC MINI MERCURY SWITCHES. THE OFF, LEAD, AND LAG FLOATS CLAMP TO A WEIGHTED POLE WITH LIFTING CHAIN. THE HIGH FLOAT WITH EXTERNAL WEIGHT IS SUSPENDED SEPARATELY. FLOATS ARE ACCESSED VIA A 10" x 8" HINGED READING LID WITH GASKET AND CAMLOCK.
4. IF WHOLE-BUILDING GEN-SET IS NOT PROVIDED, THE ON-SITE ELECTRICAL CONTRACTOR SHALL INSTALL A 3-WAY SAFETY DISCONNECT SWITCH WITH HUBBELL GENERATOR RECEPTACLE. THE SWITCH AND GENERATOR RECEPTACLE SHALL BE PROVIDED BY OTHERS UNLESS NOTED IN PIPE SCOPE OF SUPPLY. THE SWITCH SHALL BE SUITABLE FOR USE AS SERVICE EQUIPMENT, AND SHALL HAVE A DOUBLE-THROW CONFIGURATION FOR LOAD TRANSFER.
5. ON-SITE ELECTRICAL CONTRACTOR SHALL PROVIDE FLEX CONDUIT AND POWER WIRE SIZED PER LOAD REQUIREMENTS. FLEX CONDUIT SHALL PASS THROUGH THE AIR-BREAK BOX, AND HAVE LIQUID-TIGHT CONNECTORS AT THE DISCONNECT SWITCH AND AT THE CONTROL PANEL. REGULAR CONDUIT FITTINGS ARE NOT WEATHER-PROOF AND ARE NOT ACCEPTABLE.
6. ALL HARDWARE MOUNTED INSIDE THE WET WELL SHALL BE TYPE 316 STAINLESS STEEL.
7. IMPORTANT: COMBO VALVE CLEAN-OUT COVERS SERVE AS DEP REQUIRED EMERGENCY PUMP-OUT CONNECTIONS.

PUMP DATA TABLE	
MANUFACTURER	BARNES
MODEL	ZOGV
VOLTAGE	240
PHASE	3
HP	2
FLA	8.9
RPM	3450
GPM	38
TDH	34'

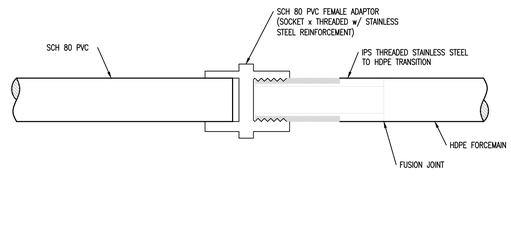


ITEM #	DESCRIPTION	MANUFACTURER
1	SERVICE SADDLE	2" ELECTROFUSION CORP SADDLE BY CENTRAL PLASTICS OR APPROVED EQUAL ON HDPE PIPE. 2" SMITH-BLAIR 317 SERVICE SADDLE OR APPROVED EQUAL ON PVC PIPE
2	CORPORATION STOP	2" FORD FB 1000
3	SERVICE TUBING	2" (SINGLE SERVICE), DR11 POLYETHELENE TUBING WITH STAINLESS STEEL INSERTS (STIFFENERS) AT EACH END
4	CURB STOP	2" FORD w/ 2" FEMALE IPS BY 2" PVC PACK JOINT
5	METER BOX	STANDARD 12" METER BOX WITH GREEN FLUSH COVER (FURNISHED BY GRINDER PUMP MANUFACTURER)

NOTE:
1. ALL SERVICE TUBING SHALL BE GREEN OR GREEN STRIPED
2. ALL PAVEMENT CROSSINGS SHALL BE DIRECTIONAL-BORED. NO OPEN CUTS WILL BE ALLOWED.

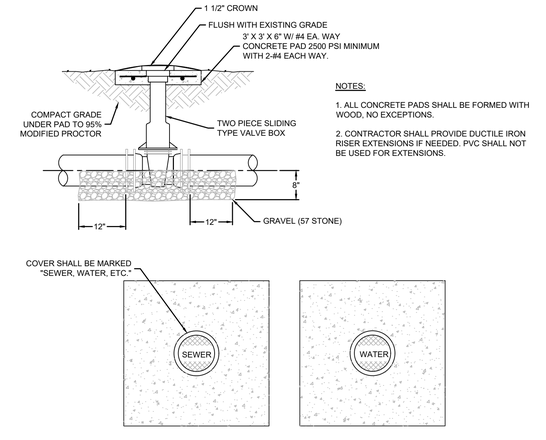
DETAIL - PRESSURE SEWER SERVICE LINE

SCALE: N.T.S.



DETAIL - HDPE TO PVC TRANSITION

SCALE: N.T.S. (3" DIAMETER AND SMALLER)

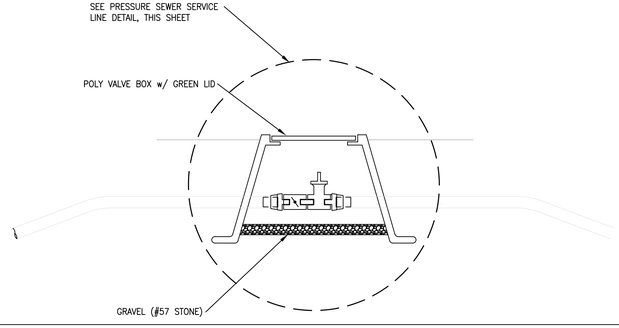


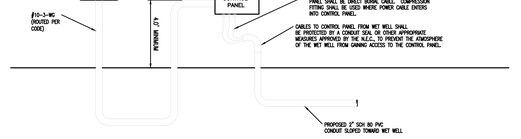
NOTES:

1. ALL CONCRETE PADS SHALL BE FORMED WITH WOOD, NO EXCEPTIONS.
2. CONTRACTOR SHALL PROVIDE DUCTILE IRON RISER EXTENSIONS IF NEEDED. PVC SHALL NOT BE USED FOR EXTENSIONS.

TYPICAL VALVE AND BOX DETAIL

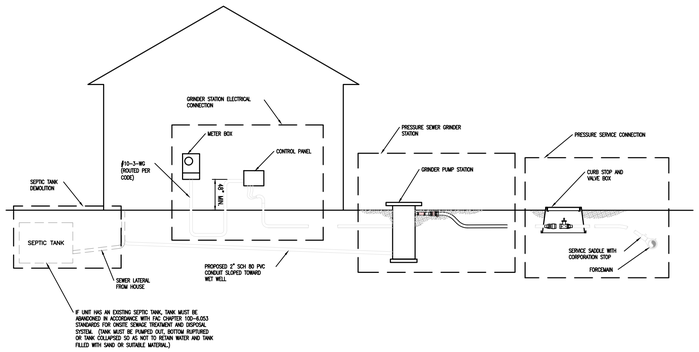
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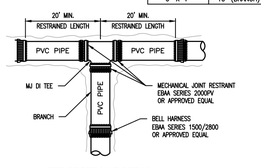
DETAIL - GRINDER STATION ELECTRICAL CONNECTION

SCALE: N.T.S.



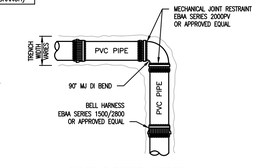
RESTRAINT LENGTH REQUIREMENTS FOR FITTINGS							
FITTING	RESTRAINT LENGTH REQUIRED 4"	RESTRAINT LENGTH REQUIRED 6"	RESTRAINT LENGTH REQUIRED 8"	RESTRAINT LENGTH REQUIRED 10"	RESTRAINT LENGTH REQUIRED 12"	RESTRAINT LENGTH REQUIRED 14"	RESTRAINT LENGTH REQUIRED 16"
11 1/4° BEND	10'	10'	10'	10'	10'	10'	10'
22 1/2° BEND	10'	10'	20'	20'	20'	20'	20'
45° BEND	20'	20'	40'	40'	40'	40'	40'
90° BEND	40'	40'	40'	40'	80'	80'	100'
REDUCER	4X3 = 35'	6X4 = 35'	8X6 = 40'	10X8 = 39'	12X10 = 50'	14X12 = 50'	16X14 = 50'
45° VERTICAL OFFSET	UPPER 30' LOWER 7'	UPPER 30' LOWER 7'	UPPER 40' LOWER 9'	UPPER 48' LOWER 11'	UPPER 68' LOWER 13'	UPPER 78' LOWER 14'	UPPER 88' LOWER 16'
DEAD END	60'	60'	80'	80'	160'	190'	210'

TEE'S	RESTRAINT LENGTH
4" X 4"	10' (BRANCH)
6" X 4"	10' (BRANCH)



TEE RESTRAINT DETAIL

SCALE: N.T.S.



90° BEND RESTRAINT DETAIL

SCALE: N.T.S.

NOTES:

RESTRAINED JOINT PIPING SHALL BE USED FOR ALL THRUST RESTRAINTS. THE ADJACENT SCHEDULE GIVES MINIMUM PIPE LENGTHS (IT) TO BE RESTRAINED ON EACH SIDE OF THE STANDARD FITTINGS.

CONCRETE THRUST BLOCKS SHALL NOT BE USED, NO EXCEPTIONS.

SOME PIPE RESTRAINT REQUIREMENTS ARE SHOWN IN THE PLANS FOR SPECIFIC CIRCUMSTANCES.

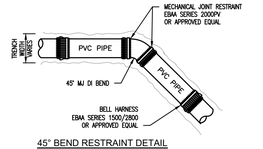
ALL 45° AND 22 1/2° COMBINATION BENDS AND 22 1/2° AND 11 1/4° COMBINATION BENDS SHALL BE TREATED AS 90° BENDS AND 45° BENDS, RESPECTIVELY, FOR RESTRAINED LENGTHS.

ALL FITTINGS AND RESTRAINED JOINTS MUST BE VISUALLY INSPECTED AND APPROVED BY THE ENGINEER BEFORE COVERED.

ALL VALVES SHALL BE RESTRAINED W/EBAA SERIES 2000 PVC. MECHANICAL JOINT RESTRAINT OR APPROVED EQUAL

BELL HARNESS RESTRAINTS SHALL BE EBAA SERIES 1500/2000 OR APPROVED EQUAL.

ALL DIRECTIONAL BORES SHALL BE RESTRAINED A MINIMUM OF 40'



45° BEND RESTRAINT DETAIL

SCALE: N.T.S.
NOTE: 22 1/2° AND 11 1/4° BENDS SHALL BE RESTRAINED THE SAME AS SHOWN ABOVE

DETAIL-THRUST RESTRAINTS

SCALE: N.T.S.

Dewberry

324 Marina Drive
Port St. Joe, FL 32456
850.227.7200

GULF COAST ELECTRIC COOPERATIVE SAFE ROOM

GULF COUNTY, FLORIDA

SEAL

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JOSHUA BRYAN BAXLEY, P.E. 67529
EB 0008794

100% DESIGN

SCALE

NO SCALE

REVISIONS

NO.	DESCRIPTION	DATE

DRAWN BY	C. BROWN
APPROVED BY	C. BROWN
CHECKED BY	J. BAXLEY
DATE	JUNE 2026

TITLE

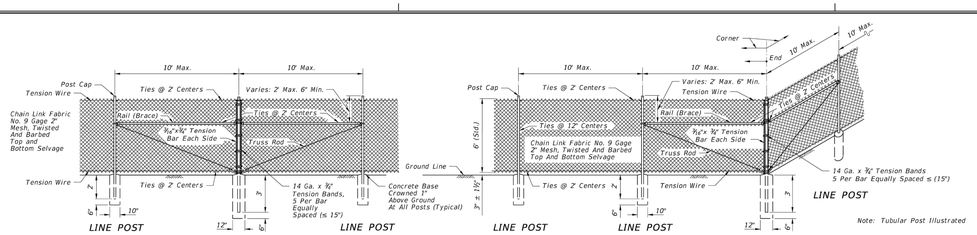
DETAILS

PROJECT NO. 50150343

CD2

SHEET NO.

June 2, 2026 (10:52:52 EST)
K:\50150343 GCEC-HEADQUARTERS SAFE ROOM\CIVIL\3DFOLDER_PROPOSED\GCEC SAFE ROOM_DSGN.DWG C02 BY: KGALANOS



GENERAL NOTES

1. This fence to be used generally in urban areas.
2. For supplemental information refer to Specification 550.
3. Chain link fabric, post, truss rods, tension wires, tie wires, stretcher bars, gates and all miscellaneous fittings and hardware shall meet the requirements of AASHTO and ASTM signify current reference.
4. Fence Component Options:
   A. Line post options:
   (1) Galvanized steel pipe, Schedule 40- 1½" nominal dia. zinc galvanized at the rate of 1.8 oz./ft².: ASTM A53 Table 2 (Grade A or B), ASTM F1083, and AASHTO M111.
   (2) Aluminum coated steel pipe: ASTM A53, Table 2 (Grade A or B); Schedule 40– 1½" nominal dia., 1.90" OD; coated at the rate 0.40 oz./ft².: AASHTO M111.
   (3) Aluminum alloy pipe– 2" nominal dia.: ASTM B241 or B221, Alloy 6063, T6.
   (4) Steel H-Beam– 1¼"x 1¼": Zinc Galv. 1.8 oz./ft.: AASHTO M111 and Detail.
   (5) Aluminum alloy H-Beam– 1¼"x 1¼" Detail.
   (6) Steel C– 1⅝"X 1⅝": Galv.: 1.8 oz/ft. zinc: AASHTO M111; OR , 0.9 oz./ft². zinc-5% aluminum-mischmetal: ASTM F1043 and Detail.
   (7) Resistance welded steel pipe; 50,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undepleted stock of discontinued A446/A446M base materials; ASTM F669 Group IV (Alternative Design); fence industry 2" OD, 1½" NPS, 1.900" dec. equiv., 0.120" min. wall thick. and min. wt. 2.28 lb./ft.; with ASTM F1043 metric equivalent internal coating Types A, B, C or D and external coating Types A, B, or C; the chromate conversion coating of external Type B shall have a thickness of 15µg/in². min. and the polymer film topcoat shall have a thickness of 0.0003" min.; internal and external coatings are not restricted to the combinations of Table 2, ASTM F1043.

   B. Corner, end, and pull post options:
   (1) Galvanized steel pipe, Schedule 40– 2" nominal dia. zinc galvanized at the rate of 1.8 oz./ft².: ASTM A53 Table X 2, ASTM F1083, and AASHTO M111.
   (2) Aluminum coated steel pipe: ASTM A53 steel, X 2 Tables Schedule 40; 2" nominal dia., 2.375" OD; coated at the rate 0.40 oz./ft².: AASHTO M111.
   (3) Aluminum alloy pipe– 2½" nominal dia.: ASTM B241 or B221, Alloy 6063;T6.
   (4) Resistance welded steel pipe; 50,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undepleted stock of discontinued A446/A446M base materials; ASTM F669 Group IV (Alternative Design); fence industry 2½" OD, 2" NPS, 2.375" dec. equiv., 0.130"min. wall thick. and min wt. 3.117 lb./ft.; with ASTM F1043 metric equivalent internal coating Types A, B, C or D and external coating Types A, B, or C; the chromate conversion coating of external Type B shall have a thickness of 15µg/in². min. and the polymer film topcoat shall have a thickness of 0.0003" min.; internal and external coatings are not restricted to the combinations of Table 2, ASTM F1043.

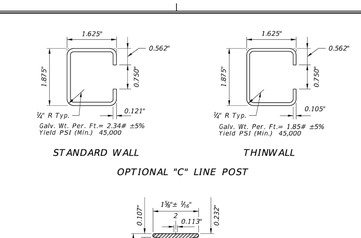
   C. Rail options:
   (1) Galvanized steel pipe, Schedule 40- 1½" nominal dia. zinc galvanized at the rate of 1.8 oz./ft².: ASTM A53 Table X 2, ASTM F1083, and AASHTO M111.
   (2) Aluminum coated steel pipe; ASTM A53 steel, X 2 Tables Schedule 40; 1¼" nominal dia., 1.660" OD; coated at the rate 0.40 oz./ft².: AASHTO M111.
   (3) Aluminum alloy pipe– 1¼" nominal dia.: ASTM B241 or B221, Alloy 6063, T6.
   (4) Resistance welded steel pipe; 50,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undepleted stock of discontinued A446/A446M base materials; ASTM F669 Group IV (Alternative Design); fence industry 1¼" OD, 1¼" NPS, 1.660" dec. equiv., 0.111" min. wall thick. and min. wt. 1.836 lb./ft.; with ASTM F1043 metric equivalent internal coating Types A, B, C or D and external coating Types A, B, or C; the chromate conversion coating of external Type B shall have a thickness of 15µg/in². min. and the polymer film topcoat shall have a thickness of 0.0003" min.; internal and external coatings are not restricted to the combinations of Table 2, ASTM F1043.

   D. Chain link fabric options (2" mesh with twisted and barbed selvage top and bottom for all options except as described in Note 10):
   (1) AASHTO M181 Type I – Zinc Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 1.8 oz/ft². (M181 Class D 2.0 oz./ft², modified to 1.8 oz./ft².).
   (2) AASHTO M181 Type II -Aluminum Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 0.40 oz./ft².
   (3) AASHTO M181 Type IV- Polyvinyl Chloride (PVC) Coated Steel, No. 9 gage (coated core wire diameter), core wire-zinc coated steel. PVC coating: M181 Class A (either extruded or extruded and bonded) or Class B (bonded). See table right. Unless the plans call for M181 standard colors medium green, dark green or black the coating color shall be soft gray matching that of No. 36622 of Federal Standard 595a.

   E. Tension wire options:
   (1) Steel wire No. 7 gage zinc galvanized at the rate of 1.2 oz./ft².: AASHTO M181.
   (2) Aluminum alloy wire with a diameter of 0.1875" or larger conforming to the requirements of ASTM B211, Alloy 5056 Temper H38, or, Alclad Alloy 5056 Temper H192.
   (3) Aluminum coated steel wire No.7 gage coated at the rate of 0.040 oz./ft².: AASHTO M181.

   F. Tie wire and hog ring options:
   (1) Steel wire No.9 gage zinc galvanized at the rate of 1.2 oz./ft².
   (2) Aluminum alloy wire with a diameter of 0.1443" or larger conforming to the requirements of ASTM B211, Alloy 5056 Temper H38, or, Alclad Alloy 5056 Temper H192.
   (3) Aluminum coated steel wire No. 7 gage coated at the rate of 0.040 oz./ft².

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GENERAL NOTES CONTINUED

5. Unless a specific material is called for in the plans the Contractor may elect to use either a single type of material or a combination of material types from the component options listed in note 4. Combinations of optional materials are restricted as follows:
   (a) Only one fabric optional material will be permitted between corner and/or end post assemblies.
   (b) Only one line post optional material will be permitted between corner and/or end post assemblies.
   (c) Pull post assemblies shall be optional materials identical to either the line post optional material or the corner and end post assembly optional material; but, pull post assemblies shall be the same optional material between any set of corner and/or end post assemblies.
6. Concrete for bases shall be Class NS concrete as specified in Specification 347 or a packaged, dry material meeting the requirements of a concrete under ASTM C-387. Materials for Class NS concrete may be proportioned by volume and/or by weight.
7. Line post shall be 8'-6" long (Standard). Line post are to be set in concrete as described above or by the following methods:
   (a) In accordance with special details and/or as specifically described in the Contract Plans and Specifications.
   (b) In accordance with ASTM F567 Subsections 5.4 through 5.10 as approved by the Engineer. Line post installed in accordance with Section 5.8 shall be 9'-6" long.
   (c) Post mounted on concrete structure or solid rock shall be mounted in accordance with the base plate detail "Fence Mounting On Concrete Endwalls And Retaining Wall", Sheet 3; or, by embedment in accordance with ASTM F567 Subsection 5.5.

   End, pull and corner post assemblies shall be in concrete as detailed above for all soil conditions other than solid rock. Post within assemblies that are located on concrete structures or solid rock shall be set by base plate or by embedment as prescribed under (b) above for line post.

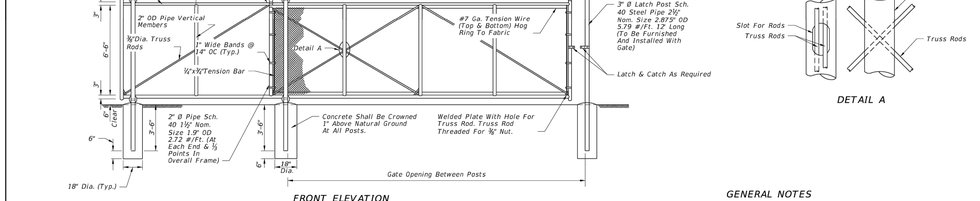
   Line and assembly posts for 6' fence which must be lengthened due to a variation in the normal ground clearance, shall be set an additional 3" in depth for each 1' of of additional ground clearance.
8. Pull post shall be used at breaks in vertical grades of 15° or more, or at approximately 350' centers except that this maximum interval may be reduced by the Engineer on curves where the curve is greater than 3°.
9. Corner post are to be installed at all horizontal breaks in fence at 15° or more and as required at vertical breaks over 15° as determined by the Engineer.
10. When fence has an installed top of fabric height less than 6' knuckled top and bottom selvages shall be used unless the plans specifically identify locations for twisted selvage fabrics.
11. Unless sliding gates or special gates are called for in the plans, all gates shall be chain link swing gates meeting the material requirements described and as approved by the Engineer. Payment shall include the gates, single or double, all necessary hardware for installation and any additional length and/or size for posts at the opening. Gates shall be paid for under the contract unit price for Fence Gates, EA.
12. For construction purposes corner post assemblies shall consist of one corner post, two braces, two truss rods, and all necessary fittings and hardware as detailed. End post assemblies shall consist of one end post, one brace, one truss rod and all necessary fittings and hardware as detailed.
13. In areas where there are physical constraints outside the right-of-way which restricts the fence construction, the fabric may be installed on the inside of the posts..

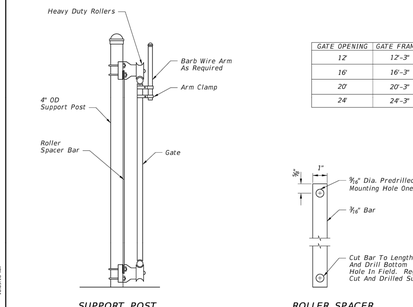
TYPE IV VINYL COATED FABRIC								
AASHTO M181 Table 4 Redefined As Follows								
Specified Diameter Of Metallic Coated Core Wire		Minimum Weight Of Zinc Coating			PVC Thickness Range			
					M181 Class A (Extruded Or Extruded And Bonded Coating)		M181 Class B (Bonded Coating)	
in.	mm	gage	oz./ft².	g/m²	in.	mm	in.	mm
0.148	3.77	9	0.30	92	0.015 to 0.025	0.38 to 0.64	0.006 to 0.010	0.15 to 0.25

DESIGN NOTE

This index details fencing that is constructed with chain link fabric 6' (nominal) in height and with specific ground clearance.
For fencing of different height or installation details, the fence shall be fully detailed in the Contract plans.

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	REVISION				550-002	2 of 3





GENERAL NOTES

1. Extruded, rolled or formed components that provide equal strength and stability may be used in lieu of the pipe components shown; and, internal rollers may be used in lieu of the external roller units shown.

   Gate components shall meet or exceed the protective coatings specified on Index 550-002.
2. Steel gate frame shall be fabricated prior to galvanizing, except that truss rods may be fabricated following frame galvanizing provided surfaces damaged during welding are galvanized in accordance with Section 24 of AASHTO M36; or, fabricated from pipe components with protective coating meeting the requirements of Index 550-002 that are tolerant of welding (low burn back), and a protective coating applied to the weld and damaged pipe surfaces that is equivalent to the protective coating of the fabricated pipe stock.
3. All fabric shall be knuckled top and bottom selvages.
4. Concrete for bases shall be either Class NS concrete in accordance with Specification 347 or a packaged, dry material meeting the requirements of a concrete under ASTM C-387. Materials for Class NS concrete may be proportioned by volume and/or by weight.
5. Cost of all gate components shall be included in the contract unit price for Sliding Fence Gate (Cantilever), EA.



DETAIL B

LAST REVISION	DESCRIPTION:	FDOT	FY 2022-23 STANDARD PLANS	CANTILEVER SLIDE GATE TYPE B FENCE	INDEX	SHEET
11/01/17	REVISION				550-003	1 of 1

Dewberry

324 Marina Drive
Port St. Joe, FL 32456
850.227.7200

GULF COAST ELECTRIC COOPERATIVE SAFE ROOM

GULF COUNTY, FLORIDA

SEAL

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JOSHUA BRYAN BAXLEY, P.E. 67529
EB 0008794

100% DESIGN

SCALE

NO SCALE

REVISIONS

NO.	DESCRIPTION	DATE

DRAWN BY C. BROWN
APPROVED BY C. BROWN
CHECKED BY J. BAXLEY
DATE JUNE 2026

TITLE

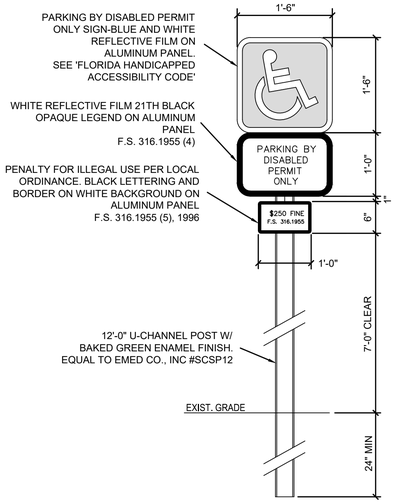
DETAILS

PROJECT NO. 50150343

CD3

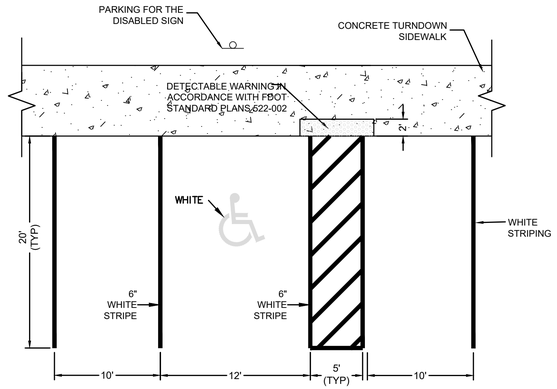
SHEET NO.

June 2, 2026 (10:52:02 EST)
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PARKING FOR THE DISABLED SIGN

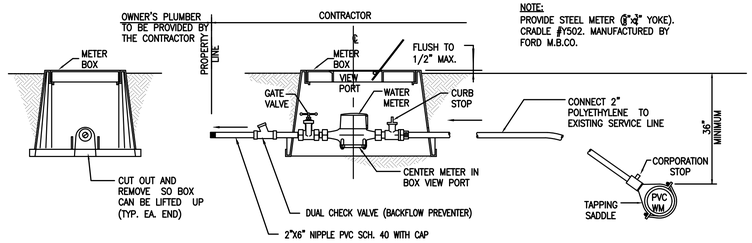
N.T.S.



NOTE:
1. ALL STANDARD SPACES SHALL HAVE WHITE STRIPING.
2. ALL HANDICAP SPACES SHALL HAVE THERMOPLASTIC STRIPING.

TYPICAL STRIPING AND PARKING DIMENSIONS FOR PERPENDICULAR PARKING

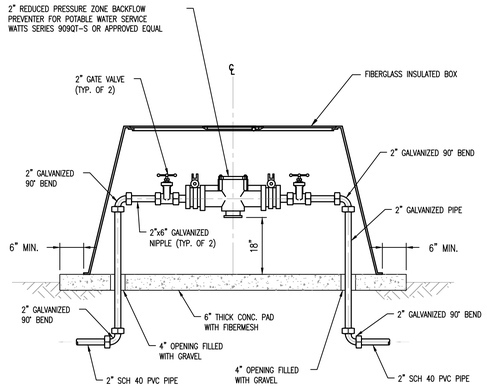
N.T.S.



NOTES:
1) ALL SERVICES BENEATH ASPHALT AND CONCRETE CROSSINGS SHALL OPEN CUT.
2) THIS DETAIL SHALL APPLY TO NEW SERVICE LINE CONNECTIONS.

DETAIL 2" SERVICE LINE SETTING

SCALE: N.T.S.



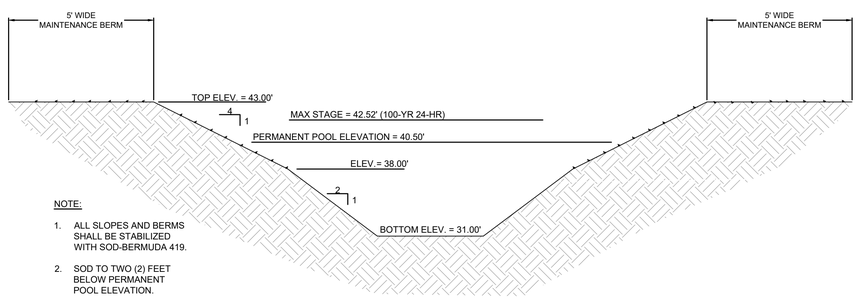
NOTE: CONCRETE PAD SHALL BE 6" LARGER THAN FOOTPRINT OF INSULATED BOX.

DETAIL-2" REDUCED PRESSURE ZONE BACKFLOW PREVENTER

SCALE: N.T.S.

DETAIL CONCRETE DISCHARGE STRUCTURE (DS-OUTFALL)

SCALE: N.T.S.

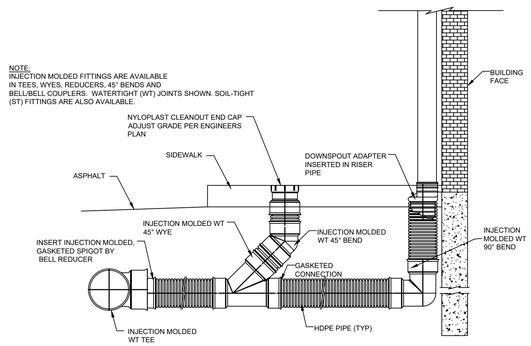


NOTE:

1. ALL SLOPES AND BERMS SHALL BE STABILIZED WITH SOD-BERMUDA 419.
2. SOD TO TWO (2) FEET BELOW PERMANENT POOL ELEVATION.

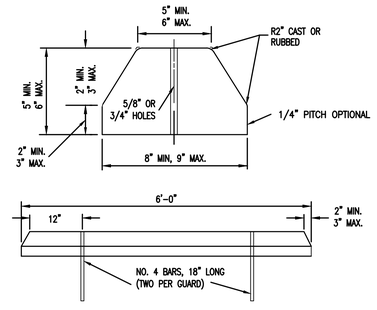
SECTION TYPICAL POND SECTION

SCALE: N.T.S.



DOWNSPOUT CONNECTION TO STORM DRAIN

N.T.S.



CONCRETE WHEELSTOP DETAIL

N.T.S.

Dewberry®
324 Marina Drive
Port St. Joe, FL 32456
850.227.7200

GULF COAST ELECTRIC COOPERATIVE SAFE ROOM

GULF COUNTY, FLORIDA

SEAL

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JOSHUA BRYAN BAXLEY, P.E. 67529
EB 0008794

100% DESIGN

SCALE

NO SCALE

REVISIONS

NO.	DESCRIPTION	DATE

DRAWN BY	C. BROWN
APPROVED BY	C. BROWN
CHECKED BY	J. BAXLEY
DATE	JUNE 2026

TITLE

DETAILS

PROJECT NO. 50150343

CD4

SHEET NO.

June 2, 2026 (10:52:52 EST)
K:\50150343 GCEC-HEADQUARTERS SAFE ROOM\CIVIL\3DFOLDER_PROPOSED\GCEC SAFE ROOM_DSGN.DWG CD4 BY: KGALANOS

GENERAL CONSTRUCTION

A. THIS PROJECT HAS BEEN DESIGNED FOR THE WEIGHTS OF MATERIALS INDICATED IN THE DESIGN DATA. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE ALLOWABLE CONSTRUCTION LOADS AND TO PROVIDE PROPER DESIGN AND CONSTRUCTION OF FALSEWORK, FORMWORK, STAGING, BRACING, SHEETING, SHORING, ETC.

B. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL VERIFY ALL STRUCTURAL ELEVATIONS AND DIMENSIONS WITH EXISTING CONDITIONS AND WITH OTHER PROJECT DRAWINGS; COORDINATE LOCATION OF SLEEVES AND OPENINGS THROUGH THE STRUCTURE, SLAB DEPRESSIONS, FLOOR DRAINS, INSERTS, AND OTHER RELATED ITEMS.

C. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE CORRECTNESS OF DIMENSIONS OR QUANTITIES AND FOR THE FITTING TO OTHER WORK; FOR WORK TO BE CONFIRMED AND CORRELATED AT THE SITE; FOR INFORMATION PERTAINING TO THE FABRICATION PROCEDURE OR TO THE MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES OF CONSTRUCTION; AND FOR THE COORDINATION OF STRUCTURAL WORK WITH THE WORK OF ALL OTHER TRADES. THE VERIFICATION OF THE PHYSICAL INTERRELATIONSHIPS OF ELEMENTS OF THE WORK FROM PLANS AND SPECIFICATIONS AND IN THE FIELD IS THE CONTRACTOR'S SOLE RESPONSIBILITY. REVIEW OF CONTRACTOR'S SUBMISSIONS DOES NOT RELIEVE CONTRACTOR FROM THESE RESPONSIBILITIES.

D. SEE ARCHITECTURAL DRAWINGS FOR EXACT DETAIL AND LOCATION OF OPENINGS OR RECESSES IN WALLS AND SLABS AND OTHER DIMENSIONS NOT SHOWN IN STRUCTURAL DRAWINGS. SEE MECHANICAL AND ELECTRICAL DRAWINGS FOR INFORMATION REGARDING SIZE AND LOCATION OF OPENINGS FOR DUCTS, PIPES, CONDUITS, MACHINE PADS, AND THE LIKE. PROPOSED OPENINGS OR RECESSES IN THE STRUCTURE WHICH ARE NOT SHOWN IN THE STRUCTURAL DRAWINGS, EITHER DIRECTLY OR BY TYPICAL DETAIL, SHALL BE SUBMITTED FOR ACCEPTANCE.

E. HOLES OF ANY SIZE SHALL NOT BE DRILLED INTO STRUCTURAL MEMBERS, EXCEPT AS SHOWN IN THE DRAWINGS, WITHOUT THE ACCEPTANCE OF THE ENGINEER.

F. IT IS INTENDED THAT ALL MEMBERS BE FABRICATED AND ERECTED FREE OF SHOP AND FIELD SPLICES. IF FIELD CONDITIONS NECESSITATE THE SPLICING OF MEMBERS SUBMIT SPLICE LOCATIONS FOR ENGINEER'S ACCEPTANCE. WHERE FIELD SPLICING IS ACCEPTED, SPLICES SHALL BE SHOWN IN THE SHOP DRAWINGS.

G. WHERE REQUIRED, FIREPROOF ALL STEEL, EXCEPT WHERE CONCRETE FIREPROOFING IS SHOWN IN THE DRAWINGS, IN ACCORDANCE WITH ARCHITECTURAL DRAWINGS.

H. ALL CONCRETE MASONRY UNITS CONTAINING MASONRY ANCHORS, DOWELS, REINFORCING STEEL AND THE LIKE SHALL BE FILLED SOLID WITH GROUT.

I. ALL STEEL BUILDING FRAMES, UNLESS OTHERWISE NOTED, ARE NON-SELF SUPPORTING STEEL FRAMES. THE CONTRACTOR SHALL PROVIDE TEMPORARY LATERAL BRACING FOR STEEL FRAMES UNTIL ALL OTHER DIAPHRAGMS AND/OR SHEAR WALLS HAVE BEEN INSTALLED.

FOUNDATIONS

A. THE STRUCTURAL FOUNDATION DESIGN IS BASED UPON RECOMMENDATIONS IN THE GEOTECHNICAL REPORT No. P22-0422 PREPARED BY SOUTHERN EARTH SCIENCES DATED 23/08/2022 SEE PROJECT SPECIFICATIONS FOR INFORMATION REGARDING THE REPORT AND/OR BORING LOGS.

B. DEWATERING SHALL BE PROVIDED AS REQUIRED SO THAT EXCAVATION, CONCRETE WORK AND BACKFILLING ARE PERFORMED IN THE DRY.

C. BEFORE PROCEEDING WITH THE WORK, THE CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH THE SCOPE OF THE FOUNDATION WORK INCLUDING SOIL AND WATER CONDITIONS. THE SOIL CONDITIONS INDICATED IN THE CONSTRUCTION DOCUMENTS ARE FOR GENERAL INFORMATION ONLY, AND ACTUAL SITE CONDITIONS MAY VARY.

D. ACTUAL SOIL CONDITIONS ENCOUNTERED DURING CONSTRUCTION MAY REQUIRE ELEVATION MODIFICATIONS FOR THE FOUNDATIONS DEPTHS AS INDICATED ON THE DESIGN DRAWINGS. SEE THE SPECIFICATIONS FOR REQUIREMENTS FOR MODIFICATION TO THE FOUNDATION DESIGN.

E. ALL FOOTINGS SHALL REST ON UNDISTURBED SOIL OR COMPACTED STRUCTURAL FILL WHICH HAS A MINIMUM ALLOWABLE BEARING CAPACITY EQUAL TO OR GREATER THAN 1500 PSF. ALL FOUNDATION EXCAVATIONS SHALL BE INSPECTED AND CERTIFIED BY A QUALIFIED SOILS TESTING FIRM.

F. BACKFILL SHALL BE PLACED EVENLY AND COMPACTED ON EACH SIDE OF ALL SUBGRADE STRUCTURAL ELEMENTS TO PRODUCE APPROXIMATELY EQUAL AND OPPOSITE LATERAL PRESSURES.

G. SUBGRADE STRUCTURAL ELEMENTS SUBJECTED TO DIFFERENTIAL LATERAL SOIL PRESSURE SHALL BE ADEQUATELY BRACED BY THE CONTRACTOR UNTIL THE STRUCTURAL SUPPORT WHICH PROVIDES LATERAL RESTRAINT HAS BEEN INSTALLED.

H. ALL FOUNDATIONS SHALL BE CENTERED ON WALL AND COLUMN CENTERLINES UNLESS OTHERWISE INDICATED BY AN OFFSET DIMENSION ON PLAN OR BY DETAIL.

I. THE FOOTING ELEVATIONS SHOWN ON THE DRAWINGS MEET THE REQUIRED DEPTHS FOR ALLOWABLE BEARING CAPACITY AND/OR FROST PROTECTION. ACTUAL FIELD CONDITIONS ENCOUNTERING UNSUITABLE SOIL MAY REQUIRE ADDITIONAL EXCAVATION AND/OR COMPACTED STRUCTURAL FILL. THE CONTRACTOR SHALL REPORT ANY OF THESE CONDITIONS BEFORE PROCEEDING WITH ANY ADDITIONAL WORK.

J. NO FOUNDATIONS SHALL BE PLACED ON OR AGAINST SUBGRADE CONTAINING FREE WATER, ICE, OR FROST.

STRUCTURAL EARTHWORK

A. THE BUILDING SITE SHOULD BE STRIPPED OF VEGETATION, ROOTS, DEBRIS, AND OTHER ORGANIC MATERIAL (2 TO 4 INCHES).

B. THE TOP FOUR TO FIVE FEET ARE VERY LOOSE AND IN A SATURATED CONDITION. REMOVE THE TOP FIVE FEET OF MATERIAL AND REPLACE WITH STRUCTURAL FILL. REFER TO THE GEOTECHNICAL REPORT FOR REMOVAL AND SELECT FILL REQUIREMENTS.

C. EXISTING MATERIAL AT BOTTOM OF EXCAVATION SHALL BE FIRM AND ABLE TO SUPPORT CONSTRUCTION LOADS WITHOUT DISPLACEMENT PRIOR TO PLACEMENT OF SELECT FILL.

D. COMPACTION SHALL BE PERFORMED USING A HEAVY PNEUMATIC TIRED ROLLER, LOADED DUMP TRUCK OR SIMILAR PIECE OF EQUIPMENT WEIGHING 25 TONS.

E. COMPACTION AND APPROVAL OF EXISTING SUBGRADE SHALL BE SUPERVISED BY AN INDEPENDENT GEOTECHNICAL ENGINEERING TESTING AGENCY.

F. SELECT FILL SHALL BE PLACED AND COMPACTED TO A DEPTH DIRECTLY BELOW THE GRAVEL LAYER BENEATH THE SLAB ON GRADE.

SELECT FILL

A. SELECT FILL SHALL CONSIST OF EITHER SANDY CLAY OR CLAYEY SAND WITH LOW PLASTICITY. REFER TO GEOTECHNICAL REPORT FOR FILL REQUIREMENTS.

B. THE MOISTURE CONTENT OF THE SELECT FILL SHALL RANGE BETWEEN TWO (2) PERCENTAGE POINT BELOW TO TWO (2) PERCENTAGE POINTS ABOVE THE OPTIMUM MOISTURE CONTENT. THESE GUIDELINES SHOULD BE ADHERED TO FOR THE EXISTING SUBGRADE PRIOR TO PLACEMENT OF SELECT FILL.

C. SELECT FILL SHALL BE PLACED IN LOOSE LIFTS NO THICKER THAN EIGHT (8) INCHES IN UNCOMPACTED THICKNESS AND COMPACTED TO NINETY FIVE (95) PERCENT OF THE STANDARD PROCTOR DENSITY. THE TOP TWO FEET SHOULD BE COMPACTED TO 100 PERCENT OF THE STANDARD PROCTOR DENSITY. ONE DENSITY TEST PER LIFT FOR EACH 5,000 SQUARE FEET OF COMPACTED AREA WITH A MINIMUM OF TWO (2) TESTS PER LIFT.

D. SELECT FILL SHALL BE UNIFORM IN MATERIAL TYPE AND MOISTURE CONTENT. CLODS AND CHUNKS OF MATERIAL SHALL BE BROKEN AND MIXED WITH FILL MATERIAL TO ACHIEVE A UNIFORM MOISTURE CONTENT.

SLAB-ON-GRADE

A. SLAB-ON-GRADE SHALL BE PLACED UPON A 15 MIL VAPOR RETARDER LOCATED ABOVE A GRAVEL BASE AND SELECT FILL PER THE "SELECT FILL" NOTES ON THIS SHEET UNLESS OTHERWISE NOTED.

B. CONTRACTION JOINTS SHALL BE 1/4 THE FLOOR SLAB DEPTH AND LOCATED WITHIN THE SLAB AS SOON AS POSSIBLE, BUT NO LATER THAN FOUR (4) HOURS IN HOT WEATHER OR TWELVE (12) HOURS IN COLD WEATHER AFTER PLACING OF CONCRETE TO AVOID PREMATURE CRACKING IN THE FLOOR SLAB.

C. CONCRETE FINISHES AND SPRAY ON CURING/SEALING COMPOUNDS SHOULD BE COORDINATED WITH ARCHITECTURAL FLOORING FINISHES FOR COMPATIBILITY.

D. ALL SLABS ON GRADE, PADS, FILLS AND TOPPINGS SHALL HAVE A MINIMUM OF 6x6-W2.9xW2.9 WWF (UNO) PLACED 1" FROM THE TOP OF THE SLAB. LAP TWO WWF PANELS AT EDGES AND ENDS AND PROVIDE ADDITIONAL REINFORCING WHERE SHOWN ON DRAWINGS.

E. IN SLABS-ON-GRADE, PROVIDE JOINTS AROUND EACH COLUMN AND BETWEEN COLUMNS AS SHOWN, OR NOT OVER 12'-0" FOR 4" SLABS IN EACH DIRECTION. PLACE CONCRETE IN A STRIP CAST MANNER, ALTERNATING STRIPS. LIMIT LENGTH OF PLACEMENT TO 120'-0" AND WIDTH OF 25'-0" MAXIMUM. COMPLETE PLACEMENT IN ONE CONTINUOUS OPERATION. FOR SLABS-ON-GRADE RECEIVING ARCHITECTURAL FINISHES, VERIFY JOINT LOCATIONS WITH ARCHITECT.

F. EPOXY JOINT FILLER SHALL BE APPLIED TO ALL EXPOSED CONTROL JOINTS.

CONCRETE

A. UNLESS OTHERWISE NOTED:
1. ALL REINFORCING STEEL SHALL BE DEFORMED BARS CONFORMING TO ASTM A615, GRADE 60.
2. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A1064.

B. PROVIDE CONCRETE WITH THE FOLLOWING PROPERTIES IN THE LOCATIONS INDICATED:

F'C (PSI)	UNIT WEIGHT	LOCATIONS
3,000	NORMAL WEIGHT	FOUNDATIONS
4,000	LIGHTWEIGHT	SLAB ON A METAL DECK

C. WATER REDUCING ADMIXTURE SHALL BE INCORPORATED INTO ALL CONCRETE AT A MINIMUM DOSAGE AS RECOMMENDED BY THE MANUFACTURER. WATER VAPOR REDUCING ADMIXTURE SHALL BE INCORPORATED INTO ALL SLAB-ON-GRADE AND ELEVATED SLABS AT A MINIMUM DOSAGE AS RECOMMENDED BY THE MANUFACTURER. ALL CONCRETE OTHER THAN FOR FOOTINGS, SHALL BE AIR-ENTRAINED TO 4 TO 6 PERCENT. EXTERIOR CONCRETE SHALL BE AIR ENTRAINED TO 5 TO 7 PERCENT. CALCIUM CHLORIDE IS NOT PERMITTED FOR USE IN CONCRETE.

D. SPLICING OF REINFORCEMENT IS PERMITTED ONLY AT LOCATIONS SHOWN IN THE CONTRACT DRAWINGS OR AS ACCEPTED BY THE ENGINEER. UNLESS OTHERWISE SHOWN OR NOTED REINFORCING STEEL SHALL BE SPLICED TO DEVELOP ITS FULL TENSILE CAPACITY IN ACCORDANCE WITH ACI 318.

E. REINFORCING BAR DEVELOPMENT LENGTHS, AS COMPUTED IN ACCORDANCE WITH ACI 318, FORM THE BASIS FOR BAR EMBEDMENT LENGTHS AND BAR SPLICED LENGTHS SHOWN IN THE DRAWINGS. APPLY APPROPRIATE MODIFICATION FACTORS FOR TOP STEEL, BAR SPACING, COVER AND THE LIKE.

F. DETAILING OF REINFORCING STEEL SHALL CONFORM TO "ACI MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES" (ACI 315).

G. MINIMUM CONCRETE COVER FOR REINFORCEMENT (SUBJECT TO TOLERANCES PERMITTED BY CODE) SHALL BE AS GIVEN IN PARAGRAPH 7.7.1 OF ACI 318, UNLESS OTHERWISE INDICATED.

H. ALL BEAM AND SLAB CONSTRUCTION, INCLUDING UPSET BEAMS, SHALL BE CAST MONOLITHICALLY WITHOUT HORIZONTAL CONSTRUCTION JOINTS, UNLESS SHOWN IN THE CONTRACT DRAWINGS.

I. LOCATION OF ALL CONSTRUCTION JOINTS ARE SUBJECT TO THE REQUIREMENTS OF THE CONTRACT DOCUMENTS, CONFORMANCE WITH ACI 318, AND ACCEPTANCE OF THE ENGINEER. DRAWINGS SHOWING LOCATION OF DETAILS OF THE PROPOSED CONSTRUCTION JOINTS SHALL BE SUBMITTED WITH REINFORCING STEEL SHOP DRAWINGS.

J. SPLICES OF WWF, AT ALL SPLICED EDGES, SHALL BE SUCH THAT THE OVERLAP MEASURED BETWEEN OUTERMOST CROSS WIRES OF EACH FABRIC SHEET IS NOT LESS THAN THE SPACING OF THE CROSS WIRE PLUS 2 INCHES, NOR LESS THAN 8".

K. WELDING OF REINFORCING BARS IS NOT PERMITTED UNLESS SPECIFICALLY CALLED FOR IN THE DRAWINGS.

L. ALL REINFORCEMENT SHALL BE SECURELY TIED IN PLACE TO PREVENT DISPLACEMENT BY CONSTRUCTION TRAFFIC OR CONCRETE. TIE WIRE SHALL BE 16 GAUGE CONFORMING TO ASTM A82.

M. REINFORCING STEEL SUPPORTED ON THE GROUND SHALL BE PLACED ON PRECAST BLOCKS PRODUCED SPECIFICALLY FOR THE INTENDED PURPOSE.

N. NON-SHRINK GROUT SHALL BE PREMIXED AND BAGGED BY MANUFACTURER. ACCEPTABLE NON-SHRINK GROUT: MASTER FLOW 713 BY BASF OR OTHER ACCEPTED BY ENGINEER.

O. ALL KEYS FOR CONSTRUCTION JOINTS SHALL BE 2"x4" (NOMINAL) UNLESS OTHERWISE SHOWN OR NOTED ON THE DRAWINGS. WHERE KEYS ARE NOT SHOWN AT CONSTRUCTION JOINTS, PROVIDE ROUGHENED SURFACES OF 1/4" AMPLITUDE, FREE OF LAITANCE AS DESCRIBED IN SECTION 11.6.9 OF ACI 318.

P. SIZE AND LOCATION OF BASES, SUPPORTS AND EMBEDDED ANCHORAGES FOR EQUIPMENT SHALL BE COORDINATED WITH EQUIPMENT SUPPLIER AND SHALL BE IN ACCORDANCE WITH APPROVED SHOP DRAWINGS.

Q. UNLESS NOTED OTHERWISE, NO CONCRETE SHALL BE POURED WITHOUT A MINIMUM REINFORCEMENT OF .002 TIMES THE CONCRETE CROSS SECTIONAL AREA IN EACH DIRECTION.

R. ALL FIELD BENDING OF REINFORCING SHALL BE DONE COLD. HEATING OF BARS SHALL NOT BE PERMITTED.

S. NO ALUMINUM OF ANY TYPE SHALL BE ALLOWED IN THE CONCRETE WORK, UNLESS COATED TO PREVENT ALUMINUM-CONCRETE REACTION.

T. NO ELECTRICAL CONDUIT SHALL BE PLACED ABOVE THE WELDED WIRE FABRIC IN SLABS ON GRADE OR CONCRETE PLACED ONTO COMPOSITE METAL DECK. MAXIMUM SIZE OF CONDUIT SHALL BE 1/3 THE SLAB THICKNESS (ABOVE DECK ON COMPOSITE SLAB) INCLUDING CROSSOVERS. CONDUIT SHALL NOT BE SPACED CLOSER THAN 3 DIAMETERS ON CENTER.

U. UNLESS SHOWN OTHERWISE, PROVIDE DOWELS IN FOOTING FOR WALLS AND COLUMNS, PIERS, PILASTERS, ETC. TO MATCH REINFORCING ABOVE.

V. CONCRETE FINISHES AND SPRAY-ON CURING/SEALING COMPOUNDS SHALL BE COORDINATED WITH ARCHITECTURAL FLOORING FINISHES FOR COMPATIBILITY.

POST-INSTALLED ANCHORS

A. ALL CONCRETE EXPANSION ANCHORS SHALL BE GALVANIZED OR ZINC PLATED.

B. GROUT ALL CMU CELLS FULL WITHIN A 12" RADIUS WHEN CONCRETE ANCHORS ARE PLACED INTO CMU WALLS.

C. UNLESS OTHERWISE INDICATED ON PLANS, POST-INSTALLED ANCHORS SHALL CONSIST OF THE FOLLOWING ANCHOR TYPES, OR APPROVED EQUAL:

	ADHESIVE ANCHOR	MECHANICAL ANCHOR
SOLID CONCRETE	HILTI HY 200 SAFE SET SYSTEM (ICC ESR-3187) A36 U.N.O.	HILTI KWIK HUS EZ (ICC ESR-3027)
GROUTED MASONRY	HILTI HY 270 (ICC ESR-2682) A36 U.N.O.	HILTI KWIK BOLT 3 (ICC ESR-1385)
HOLLOW MASONRY OR BRICK	HILTI HY 270 WITH APPROPRIATE SCREEN TUBE (ICC ESR-3342) A36 U.N.O.	HILTI HLC SLEEVE ANCHOR

D. SUBSTITUTION REQUESTS FOR ALTERNATE PRODUCTS MUST BE APPROVED IN WRITING BY THE STRUCTURAL ENGINEER OF RECORD PRIOR TO USE. CONTRACTOR SHALL PROVIDE CALCULATIONS DEMONSTRATING THAT THE SUBSTITUTED PRODUCT IS CAPABLE OF ACHIEVING THE PERFORMANCE VALUES OF THE SPECIFIED PRODUCT. SUBSTITUTIONS WILL BE EVALUATED BY THEIR HAVING AN ICC ESR SHOWING COMPLIANCE WITH THE RELEVANT BUILDING CODE.

E. INSTALL ANCHORS PER THE MANUFACTURER INSTRUCTIONS, AS INCLUDED IN THE ANCHOR PACKAGING.

F. THE CONTRACTOR SHALL ARRANGE AN ANCHOR MANUFACTURER'S REPRESENTATIVE TO PROVIDE ONSITE INSTALLATION TRAINING FOR ALL OF THEIR ANCHORING PRODUCTS SPECIFIED. THE STRUCTURAL ENGINEER OF RECORD MUST RECEIVE DOCUMENTED CONFIRMATION THAT ALL OF THE CONTRACTOR'S PERSONNEL WHO INSTALL ANCHORS ARE TRAINED PRIOR TO THE COMMENCEMENT OF INSTALLING ANCHORS.

G. ANCHOR CAPACITY IS DEPENDANT UPON SPACING BETWEEN ADJACENT ANCHORS AND PROXIMITY OF ANCHORS TO EDGE OF MATERIAL. INSTALL ANCHORS IN ACCORDANCE WITH SPACING AND EDGE CLEARANCES INDICATED ON THE DRAWINGS.

H. EXISTING REINFORCING BARS IN THE CONCRETE STRUCTURE MAY CONFLICT WITH SPECIFIC ANCHOR LOCATIONS. UNLESS NOTED ON THE DRAWINGS THAT THE BARS CAN BE CUT, THE CONTRACTOR SHALL REVIEW THE EXISTING STRUCTURAL DRAWINGS AND SHALL UNDERTAKE TO LOCATE THE POSITION OF THE REINFORCING BARS AT THE LOCATIONS OF THE CONCRETE ANCHORS.

STRUCTURAL STEEL

A. ALL STRUCTURAL STEEL SHALL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH THE FOLLOWING:

AISC "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS" THIRTEENTH EDITION - ALLOWABLE STRESS DESIGN.

B. ALL STRUCTURAL STEEL UNLESS OTHERWISE NOTED SHALL CONFORM TO THE FOLLOWING ASTM SPECIFICATIONS:

STRUCTURAL 'W' AND 'WT' SHAPES	A992 GRADE 50
STRUCTURAL CHANNEL AND ANGLES	A36
STRUCTURAL PLATE AND BARS	A36
STEEL TUBING	A500 GRADE B

C. WHERE NO REACTION IS SHOWN OR NOTED IN THE DRAWINGS, PROPORTION CONNECTIONS TO CARRY THE VERTICAL REACTION INDICATED IN REACTION TABLE SHOWN IN THE TYPICAL DETAILS, IN ACCORDANCE WITH AISC REQUIREMENTS ADDITIONALLY END REACTIONS ARE SHOWN THUS:

[V, H] INDICATES CONNECTION DETAILS MEETING AISC REQUIREMENTS PROPORTIONED FOR THE GIVEN REACTIONS, V = VERTICAL REACTION AND H = HORIZONTAL REACTION (AXIAL LOAD IN BEAM) N KIPS. IF ONLY ONE VALUE IS GIVEN, H=0.

D. IF PARTS TO BE JOINED WITH FILLET WELDS CANNOT BE BROUGHT INTO DIRECT CONTACT, THE FILLET WELD SHALL BE INCREASED IN SIZE ABOVE THAT INDICATED IN THE DRAWINGS. THE INCREASED SIZE SHALL BE EQUAL TO OR GREATER THAN THE GAP. WELDING ELECTRODES SHALL BE E70XX LOW HYDROGEN AND SHALL OBTAIN PHYSICAL PROPERTIES AFTER WELDING EQUIVALENT TO E7018 ELECTRODES.

E. UNLESS OTHERWISE SHOWN OR NOTED, CONNECTIONS FOR BEAMS OR GIRDERS SHALL BE PROPORTIONED TO DELIVER THEIR END REACTIONS TO THE CENTER OF GRAVITY OF THE MEMBERS TO WHICH THEY FRAME. CONNECTIONS FOR BEAMS AND GIRDERS FRAMED TO THE FLANGES OF COLUMNS SHALL BE PROPORTIONED TO DISTRIBUTE THEIR END REACTIONS TO THE FACE OF THE COLUMN FLANGE TO WHICH THEY FRAME.

F. REINFORCING IS TO BE PROVIDED TO BEAMS AT CONNECTIONS WHERE CUTS AND COPES HAVE REDUCED THE SHEAR OR MOMENT CAPACITY BELOW THAT REQUIRED TO SUSTAIN THE REACTION. FLANGES AND WEBS ARE TO BE REINFORCED WHERE THE LOCAL CAPACITY TO SUSTAIN LOAD IS INADEQUATE.

G. CAMBER WHERE REQUIRED IS INDICATED BY "C" IN PLANS, FOLLOWED BY THE ORDINATE IN INCHES. BEAMS SHALL BE INSTALLED WITH THEIR NATURAL CAMBER UP.

H. PROVIDE 5/16 INCH THICK SHELF ANGLES AT COLUMNS AND BEAMS AS REQUIRED TO PROVIDE END AND SIDE DECK SUPPORTS.

I. ON SHOP DRAWINGS, WELDS AND NONDESTRUCTIVE TESTS SHALL BE INDICATED BY USING THE SYMBOLS CONFORMING TO AWS A2.4, "SYMBOLS FOR WELDING AND NONDESTRUCTIVE TESTING". WHERE NECESSARY FOR CLARITY, INDICATE WELDING PROCEDURE DESIGNATION OR OTHER DATA IN THE TAIL OF THE WELDING SYMBOL.

J. STEEL FRAME SHALL BE ERECTED TRUE AND PLUMB WITHIN SPECIFIED TOLERANCES. PROVIDE TEMPORARY BRACING IN ADDITION TO MEMBERS SHOWN IN THE DRAWINGS IN ORDER TO RESIST SAFELY ALL IMPOSED LOADS APPLIED DURING CONSTRUCTION AND TO MAINTAIN CORRECT ALIGNMENT. DESIGN OF TEMPORARY SHORING, BRACING AND GUYING IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

K. ANCHOR BOLTS AND BASE PLATES SHALL BE LOCATED AND BUILT INTO CONNECTING WORK, PRESET BY TEMPLATES OR SIMILAR METHODS. DO NOT GROUT BASE PLATES UNTIL BEAMS AND GIRDERS ARE PERMANENTLY ATTACHED TO COLUMNS. STRUCTURAL MEMBERS SHALL BE PERMANENTLY ATTACHED AND MADE RIGID ONLY AFTER ALL ELEMENTS TO BE ATTACHED HAVE BEEN BROUGHT WITHIN THE SPECIFIED TOLERANCES.

L. ALL WELDED CONNECTIONS FOR STRUCTURAL STEEL SHALL CONFORM TO THE MOST CURRENT AWS "STRUCTURAL WELDING CODE," D1.1.

M. UNLESS OTHERWISE SHOWN OR NOTED ON THE DRAWINGS, ALL WELDED CONNECTIONS SHALL BE MADE WITH E70-XX ELECTRODES. SHIELDED METAL ARC WELDING PROCESS SHALL USE LOW HYDROGEN ELECTRODES. FILLER MATERIAL FOR WELDING PROCESS SHALL HAVE A YIELD STRENGTH OF 70 KSI. ALL FILLET WELDS SHALL BE 1/4" MIN U.N.O.

N. PROVIDE ALL BOLT HOLES, STUDS, ANCHORS, AND CLIP ANGLES REQUIRED TO ATTACH OTHER MATERIALS AS SHOWN ON THE DRAWINGS.

O. ANCHOR BOLTS SHALL CONFORM TO ASTM F1554 GRADE 36 (U.O.N.), AND SHALL BE PLACED WITHIN THE FOLLOWING TOLERANCES:

TOP OF ANCHOR BOLT ELEVATION	(+) 1" TO (-)3/8"
OUT OF POSITION OF ANCHOR BOLTS	(+/-)1/8"
ELEVATION OF FINISHED CONCRETE SURFACE FOR BEARING	(+/-)1/8"

P. ALL GROUT BELOW ALL COLUMN BASE PLATES AND BEARING PLATES SHALL BE NON-SHRINK, NON-METALLIC GROUT UNLESS OTHERWISE SHOWN OR NOTED. GROUT SHALL ATTAIN A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT 7 DAYS.

Q. SEE MASONRY NOTES AND ARCHITECTURAL DRAWINGS FOR COORDINATION AND REQUIREMENTS OF STEEL LINTELS IN MASONRY WALLS.

R. ALL STRUCTURAL STEEL MEMBERS EXPOSED TO WEATHER SHALL BE GALVANIZED UNLESS OTHERWISE NOTED.

S. INSTALLATION OF GROUT BELOW COLUMN AND BEAM BASE PLATES SHALL BE COMPLETED BEFORE SUPERIMPOSED LOADS ARE APPLIED TO THE PLATES.

T. ALL HEADED SHEAR STUDS SHALL BE 3/4" DIA x4" UNLESS NOTED OTHERWISE AND SHALL CONFORM TO ASTM A108.

MASONRY

A. ENGINEERED MASONRY SHALL BE FABRICATED AND CONSTRUCTED IN ACCORDANCE WITH THE FOLLOWING:

"BUILDING CODE REQUIREMENTS FOR MASONRY STRUCTURES" (ACI 530, LATEST EDITION)

"TECHNICAL NOTES ON BRICK CONSTRUCTION" BY THE BRICK INSTITUTE OF AMERICA.

B. MINIMUM COMPRESSIVE STRENGTH OF MASONRY UNITS (ASTM C90):

HOLLOW AND/OR SOLID UNITS 2600 PSI

C. MINIMUM COMPRESSIVE STRENGTH (F'c) AT 28 DAYS:

GROUT PER ASTM C109 2500 PSI

D. THE DESIGN COMPRESSIVE STRENGTH OF MASONRY (f'm) BASED ON THE COMPRESSIVE STRENGTH OF MASONRY UNITS AND MORTAR TO BE USED ARE AS FOLLOWS:

CONCRETE MASONRY	f'm = 2000 PSI
CLAY (BRICK) MASONRY	f'm = 2000 PSI

E. FOR ALL WALLS AS INDICATED ON THE STRUCTURAL DRAWINGS THE MORTAR SHALL BE TYPE S AND ONLY NORMAL WEIGHT UNITS SHALL BE USED IN BELOW GRADE APPLICATIONS.

F. MASONRY REINFORCEMENT SHALL BE AS FOLLOWS:

BOND BEAMS AND ALL VERTICAL REINFORCEMENT: DEFORMED BARS - ASTM A615 GRADE 60

BED JOINT REINFORCEMENT: PARALLEL WIRES - ASTM A82 WITH MINIMUM YIELD STRESS OF 70.0 KSI.

CONTINUOUS HORIZONTAL WIRE TIES SHALL BE PLACED SUCH THAT THE DISTANCE BETWEEN THE FACE OF THE MASONRY WALL AND THE PARALLEL WIRE IS NOT MORE THAN ONE INCH.

FOR SINGLE AND DOUBLE WYTHE BLOCK PROVIDE: (2)#9 GAGE DEFORMED WIRES,(1) AT EACH FACE SHELL, TRUSS TIED.

FOR VENEER OTHER THAN RUNNING BOND PROVIDE: (1) WIRE OF SIZE W1.7 @ 18" OC MAX

G. UNLESS OTHERWISE SHOWN OR NOTED, REINFORCING STEEL FOR MASONRY SHALL BE LAPPED 48 BAR DIAMETERS, MINIMUM.

H. UNLESS OTHERWISE INDICATED ON THE DRAWINGS BEARINGS FOR BEAMS, LINTELS, ETC., SHALL BE ON FULL-HEIGHT GROUT FILLED MASONRY UNITS.

I. ALL PRE-INSTALLED AND POST-INSTALLED ANCHORS TO BE LOCATED IN CMU WALLS SHALL BE ANCHORED INTO FULLY GROUTED CELLS WITHIN A 12" RADIUS.

J. LOCATION OF VERTICAL CONTROL JOINTS IN MASONRY WALLS ARE INDICATED ON THE ARCHITECTURAL AND/OR STRUCTURAL DRAWINGS. JOINT SPACING SHALL NOT EXCEED 24 FEET.

K. TYPICAL VERTICAL WALL REINFORCING AND SPACING SHALL BE PROVIDE AS INDICATED ON THE DRAWINGS AND/OR SCHEDULES. PROVIDE ADDITIONAL VERTICAL REINFORCING OF #5 BARS AT EACH SIDE OF CONTROL JOINTS, CORNERS, INTERSECTIONS, EDGE OF OPENINGS, AND ENDS OF WALLS. GROUT SOLID ALL CELLS WITH REINFORCING AND BOND BEAMS.

L. UNLESS OTHERWISE DETAILED ON DRAWINGS, PROVIDE MINIMUM 8" BEARING FOR BEAMS OR LINTELS WITH SPANS 4'-0" OR LARGER AND 6" BEARING ON SPANS LESS THAN 4'-0".

M. UNLESS OTHERWISE NOTED, ALL BOND BEAMS SHALL HAVE (1) #5 BAR CONTINUOUS.

N. ALL STEEL LINTELS EXPOSED TO WEATHER SHALL BE FULLY GALVANIZED UNLESS OTHERWISE SHOWN OR NOTED.

METAL DECK

A. ALL METAL DECK SHALL BE DETAILED, FABRICATED AND INSTALLED IN ACCORDANCE WITH THE STEEL DECK INSTITUTE SPECIFICATIONS.

B. ALL METAL DECK SHALL BE CONTINUOUS OVER THREE OR MORE SUPPORTS UNLESS INDICATED OTHERWISE OR APPROVED BY THE ENGINEER.

C. UNLESS OTHERWISE NOTED, THE METAL DECK SHALL BE AS FOLLOWS:
1. FLOOR DECK 2" DEEP, 20 GAUGE, COMPOSITE, GALVANIZED - ASTM A653-G60. I_p = 0.409, I_n = 0.406, S_p = 0.341, S_n = 0.346 Thickness = 0.0358, Fy = 50 ksi

D. FASTEN DECK TO SUPPORTING STEEL IN ACCORDANCE WITH THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS. STEEL DECKS SHALL BE COMPLETE WITH SUMP PANS, METAL CLOSURE STRIPS, POUR STOPS AND ALL REQUIRED STEEL AND LIGHT GAUGE METAL ACCESSORIES.

E. STEEL DECK ACTING AS A CONCRETE FORM SHALL BE TIGHT TO PREVENT LEAKAGE OF CONCRETE, PRODUCE TRUE LINES, ACCURATE ELEVATIONS AND CORRECT ALIGNMENTS.

F. UNLESS NOTED OTHERWISE, THE ANCHORAGE OF METAL DECK SHALL BE AS FOLLOWS:

1. SUPPORT FASTENERS	3/4" DIA. PUDDLE WELDS ON 36/4 PATTERN
2. END FASTENERS	3/4" DIA. PUDDLE WELDS ON 36/4 PATTERN
3. SIDELAP FASTENERS	#10 TEK SCREWS 6 PER SPAN

G. UNLESS NOTED OTHERWISE, ALL DECK SHALL BE GALVANIZED.

H. NO MECHANICAL DUCTWORK, PLUMBING OR SPRINKLER PIPING GREATER THAN 2" DIAMETER SHALL BE SUSPENDED FROM THE METAL FLOOR DECK.

REBAR SPLICE AND HOOK SCHEDULE

REBAR SPLICE AND HOOK DIMENSIONS IN REINF. CONCRETE F'c=3,000 PSI

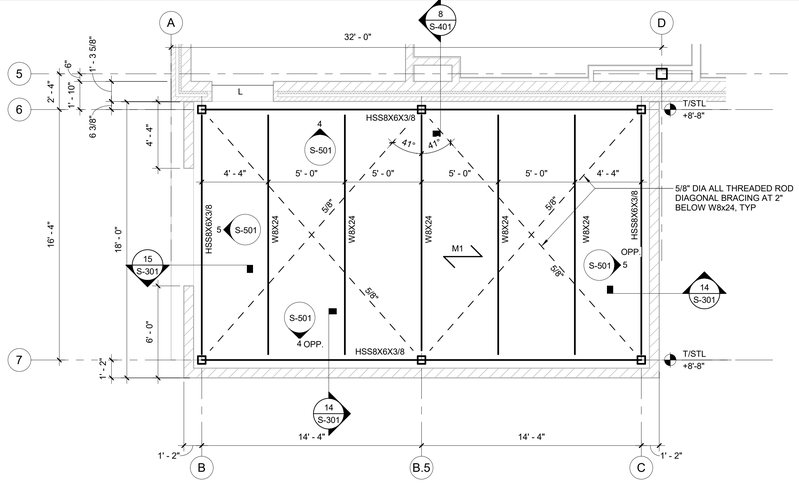
ASTM BAR SIZE	LD	CLASS B LAP	TOP BAR LAP	LDH
#3	12"	13"	15"	9"
#4	14"	18"	20"	11"
#5	17"	22"	25"	14"
#6	20"	26"	29"	17"
#7	32"	41"	47"	20"
#8	42"	54"	61"	22"

REBAR SPLICE AND HOOK DIMENSIONS IN REINF. CONCRETE F'c=4,000

ASTM BAR SIZE	LD	CLASS B LAP	TOP BAR LAP	LDH
#3	12"	12"	15"	8"
#4	12"	15"	20"	10"
#5	15"	19"	25"	12"
#6	18"	23"	29"	15"
#7	28"	36"	47"	17"
#8	36"	47"	61"	19"

NOTES:

TOP



3 SCREEN WALL FRAMING PLAN

Scale: 1/4" = 1'-0"

SCREEN WALL PLAN NOTES

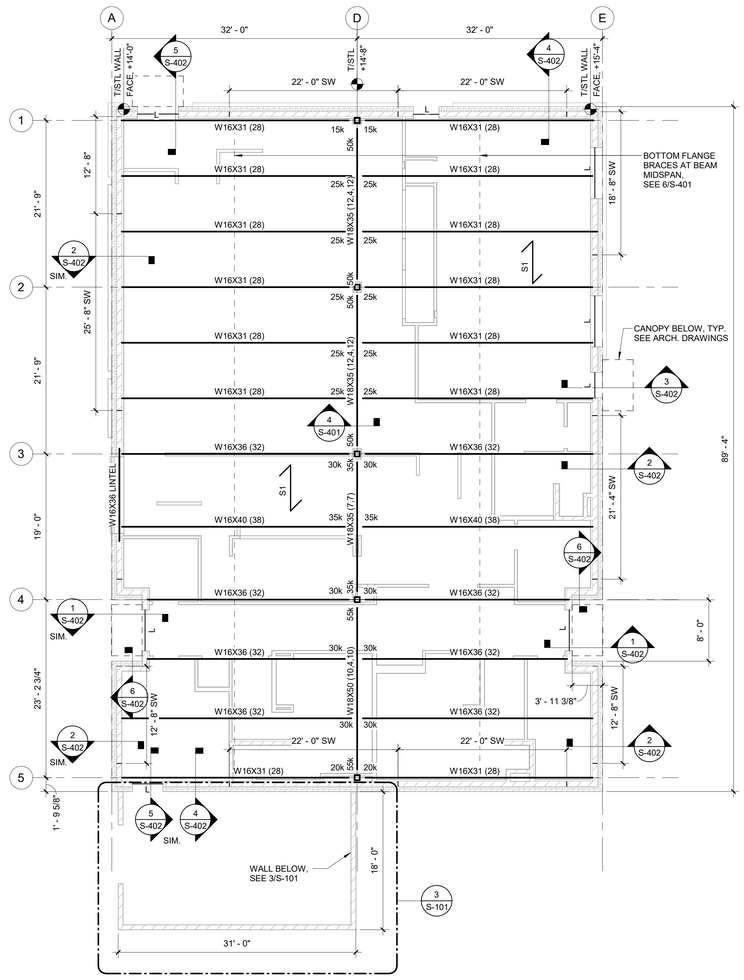
1. FOR GENERAL NOTES AND ABBREVIATIONS SEE DRAWING S-001.
2. FOR TYPICAL DETAILS SEE DRAWING S-401.
3. FOR COLUMN SCHEDULE SEE DRAWING S-501.
4. TOP OF STEEL SHALL BE AT 8'-8" ABOVE REFERENCE ELEVATION UNO.
5. "M1" INDICATES 9 GA GALV STEEL EXPANDED METAL MESH WELDED AT 7" O.C. WITH 1" LONG WELDS ALONG ENTIRE PERIMETER.

WALL FOOTING SCHEDULE

MARK	WIDTH	FOUNDATION THICKNESS	REINFORCING LONG.	REINFORCING TRANS.	DOWELS	REMARKS
WF-36	3' - 6"	1' - 2"	(4) #5	#5 @ 12"	MATCH WALL	TOP AND BOT. REINF.

SPREAD FOOTING SCHEDULE

MARK	WIDTH	LENGTH	THICKNESS	REINFORCING LONG.	REINFORCING TRANS.	REMARKS
F-30	3' - 0"	3' - 0"	1' - 2"	(4) #5	(4) #5	TOP AND BOT. REINF.
F-80	8' - 0"	8' - 0"	1' - 2"	(9) #5	(9) #5	TOP AND BOT. REINF.
F-90	9' - 0"	9' - 0"	1' - 6"	(10) #6	(10) #6	TOP AND BOT. REINF.
F-100	10' - 0"	10' - 0"	1' - 6"	(11) #6	(11) #6	TOP AND BOT. REINF.

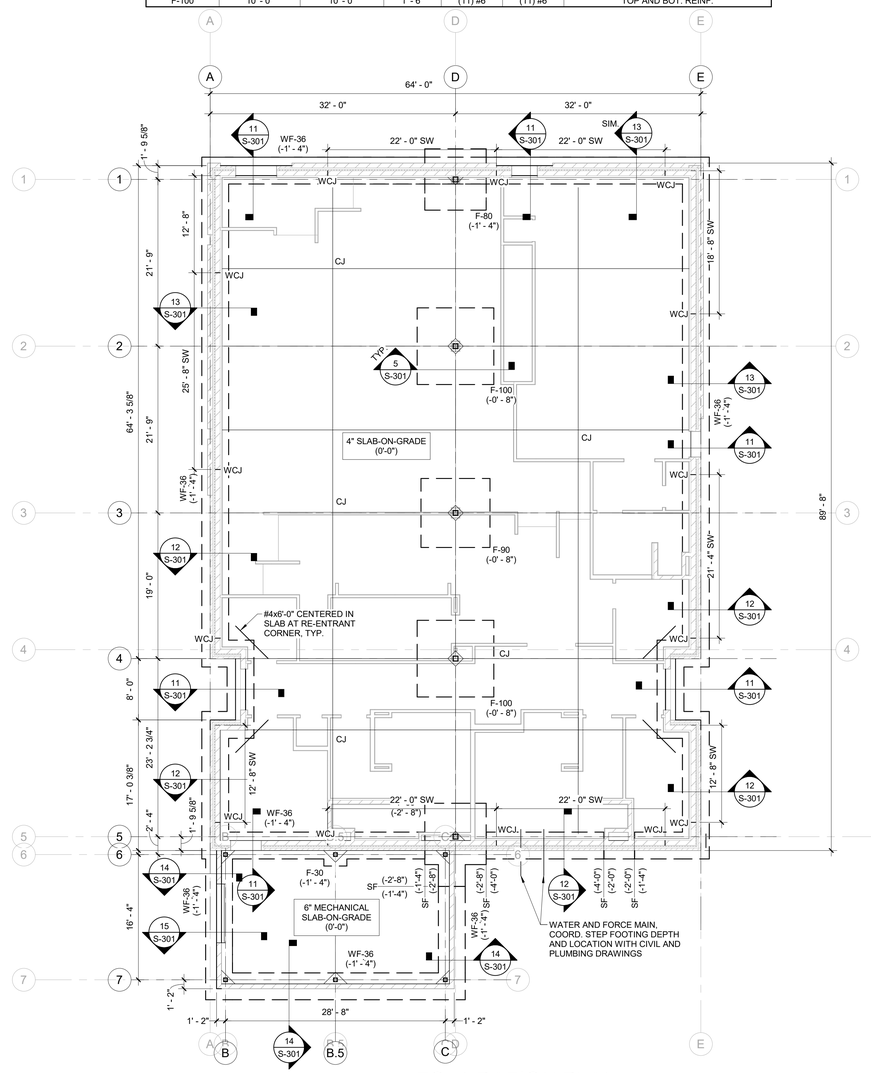


2 ROOF FRAMING PLAN

Scale: 1/8" = 1'-0"

PLAN NOTES

1. FOR GENERAL NOTES AND ABBREVIATIONS SEE DRAWING S-001.
2. FOR TYPICAL FRAMING DETAILS SEE DRAWING S-401.
3. FOR COLUMN BASE PLATE AND ANCHOR BOLT SCHEDULES, SEE DRAWING S-501.
5. SEE PLAN FOR TOP OF STEEL ELEVATION ABOVE REFERENCE ELEVATION.
6. "S1" INDICATES 3 1/4" LIGHTWEIGHT CONCRETE WITH 6X6 W2.1XW2.1 WWF ON 2"-20GA. COMPOSITE GALVANIZED METAL DECK (TOTAL THICKNESS 5-1/4"). GALVANIZED (G90) TOP AND BOTTOM. SEE GENERAL NOTES FOR DECK ANCHORAGE. T/STEEL = B/DECK. TOP OF STEEL 5 1/4" BELOW DECK.
8. ALL DECK SHALL HAVE A MINIMUM 3-SPAN CONDITION
10. SHEAR CONNECTORS SHALL BE 3/4" DIA. X 4" HEADED STUDS. QUANTITY PER BEAM INDICATED THUS: [ ] IF QUANTITY NOT INDICATED PROVIDE AT 1'-0" O.C. (MAX).
11. SLOPE BEAMS UNIFORMLY BETWEEN ELEVATIONS AS REQUIRED.
12. BEAMS SHALL BE LOCATED AS TO CREATE UNIFORM SPACING BETWEEN COLUMN CENTERLINES UNLESS DIMENSIONED NOTED.
13. * INDICATES DIMENSION TO BE COORDINATE WITH ARCHITECTURAL OR MECHANICAL DRAWINGS, OR EXISTING CONSTRUCTION PRIOR TO ANY FABRICATION.
14. "L" INDICATES LINTELS DEPICTED ON PLAN. SEE S-410 FOR CMU AND STEEL LINTEL DETAILS AND SCHEDULES.
15. SEE 12/S-410 FOR CMU BEARING PLATE SCHEDULE.
16. ALL REACTIONS SHOWN ON PLAN ARE FACTORED LOADS. MINIMUM REACTION 15K (FACTORED LOAD) U.N.O. ON PLAN.
17. ALL STEEL SHALL BE PRIME PAINTED GRAY.
18. SEE 9/S-401 FOR ROOF SCUPPER OPENING DETAIL. SEE ARCHITECTURAL DRAWINGS FOR LOCATIONS.
19. SEE 13/S-410 FOR CMU WALL PENETRATION PROTECTION DETAIL. SEE ARCHITECTURAL AND MECHANICAL DRAWINGS FOR LOCATIONS.



1 FOUNDATION PLAN

Scale: 1/8" = 1'-0"

PLAN NOTES

1. FOR GENERAL NOTES AND ABBREVIATIONS, SEE DRAWING S-001.
2. FOR TYPICAL FOUNDATION DETAILS, SEE DRAWING S-301.
3. FOR COLUMN BASE PLATE AND ANCHOR BOLT SCHEDULES, SEE DRAWING S-501.
4. REFERENCE ELEVATION SHALL BE EL 0'-0" = DATUM EL 44.50', SEE CIVIL DRAWINGS.
5. 4" CONCRETE SLAB ON GRADE WITH 6X6 W4.0 X W4.0 WWF OVER 15 MIL VAPOR BARRIER & 4" COMPACTED FILL. T/SLAB = EL 0'-0" UNLESS OTHERWISE NOTED.
6. 6" CONCRETE SLAB ON GRADE WITH #3 REINFORCING BARS AT 12" O.C. CENTERED IN SLAB. T/SLAB = EL 0'-0" UNLESS OTHERWISE NOTED. "WF-XX" INDICATES WALL FOOTING AND "F-XX" INDICATES SPREAD FOOTING. SEE SCHEDULES ON THIS SHEET.
7. TOP OF FOOTING SHALL BE 1'-4" BELOW REFERENCE ELEVATION UNLESS OTHERWISE NOTED THUS: (± X'-X").
8. SEE PLUMBING AND ARCHITECTURAL DRAWINGS FOR FLOOR DRAIN LOCATIONS AND FLOOR SLOPES.
9. APPROXIMATE LOCATIONS OF UNDERGROUND UTILITIES. GENERAL CONTRACTOR TO COORDINATE FOOTING DEPTHS, SLEEVE LOCATIONS, AND QUANTITIES WITH PLUMBING, MECHANICAL, CIVIL, AND ARCHITECTURAL DRAWINGS. SLEEVE LOCATIONS MUST BE PLACED IN THE WALL PROVIDE FRAMING AROUND OPENING PER STANDARD DETAILS.
10. "CJ" INDICATES SLAB-ON-GRADE CONTRACTION JOINT, SEE SHEET S-301.
11. "WCJ" INDICATES MASONRY WALL CONTROL JOINT, SEE SHEET S-410.
12. "SF" INDICATES STEPPED FOOTING LOCATION. SEE DETAIL 4/S-301.
13. SEE S-410 FOR TYPICAL MASONRY DETAILS.
14. "SW" INDICATES MASONRY SHEAR WALL. SEE S-410 FOR DETAILS.
15. SEE 9/S-301 FOR GENERATOR PAD DETAIL. SEE CIVIL DRAWINGS FOR GENERATOR PAD LOCATIONS.
16. SEE 10/S-301 FOR HOUSEKEEPING PAD DETAIL. SEE MECHANICAL DRAWINGS FOR HOUSEKEEPING PAD LOCATIONS.

Dewberry

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GULF COAST ELECTRICAL COMPANY

GCEC HURRICANE SAFE ROOM

722 WEST HIGHWAY 22
WEWAHITCHKA, FL 32465
100% DESIGN

SEAL

ANTHONY D. MILLER
LICENSE
No 81755
STATE OF FLORIDA
PROFESSIONAL ENGINEER

KEY PLAN

FOR REVIEW ONLY

SCALE

REVISIONS

NO.	DESCRIPTION	DATE

DRAWN BY	ADM
APPROVED BY	ADM
CHECKED BY	JAW
DATE	02.06.24

TITLE

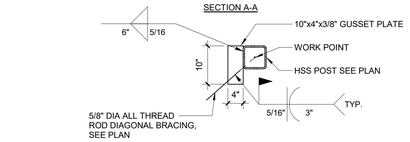
STRUCTURAL FOUNDATION AND ROOF FRAMING PLAN

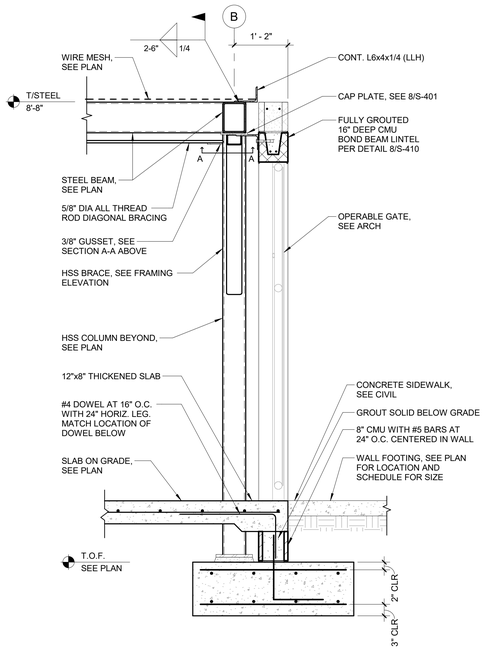
PROJECT NO. 50150343

S-101

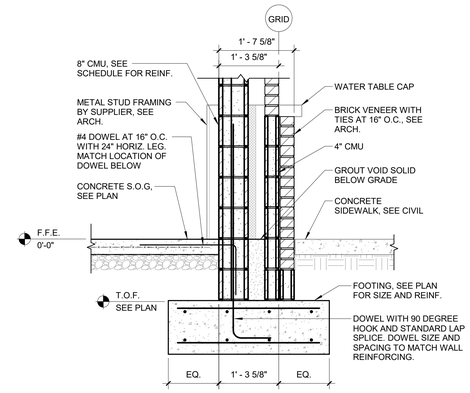
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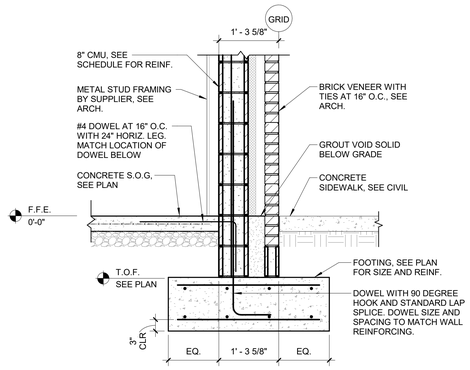




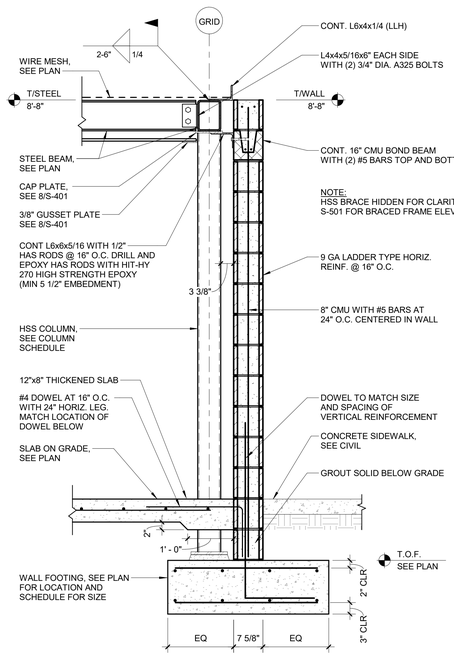
15 SCREEN WALL SECTION
Scale: 3/4" = 1'-0"



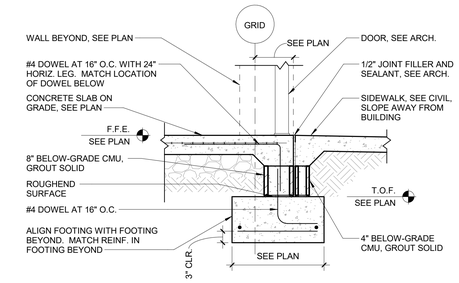
13 FOUNDATION SECTION
Scale: 3/4" = 1'-0"



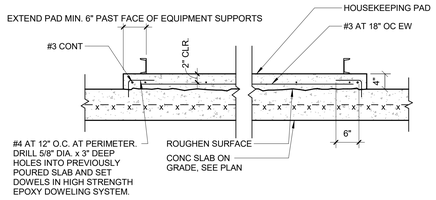
12 FOUNDATION SECTION
Scale: 3/4" = 1'-0"



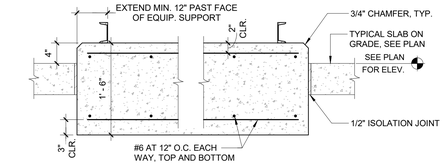
14 SCREEN WALL SECTION
Scale: 3/4" = 1'-0"



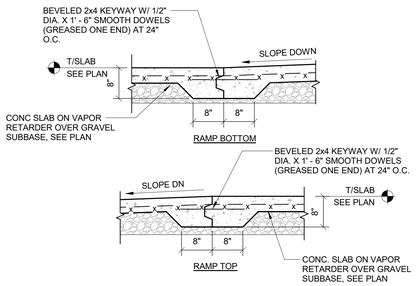
11 EXTERIOR WALL SECTION AT THRESHOLD
Scale: 3/4" = 1'-0"



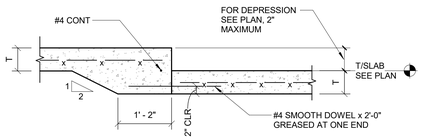
10 HOUSEKEEPING PAD
Scale: 3/4" = 1'-0"



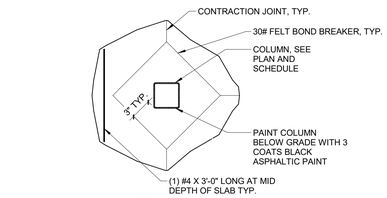
9 GENERATOR PAD
Scale: 1" = 1'-0"



8 STANDARD RAMP DETAILS
Scale: 3/4" = 1'-0"

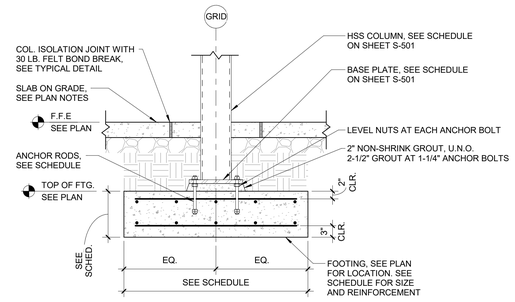


7 DEPRESSED SLAB
Scale: 3/4" = 1'-0"



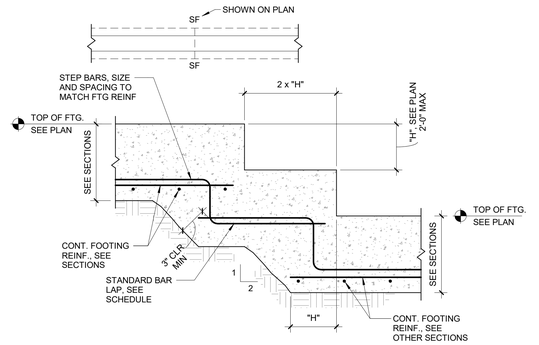
NOTE:
FOR EXPOSED CONDITION USE
FILLER AND SEALANT AT JOINT

6 TYPICAL COLUMN ISOLATION JOINT
Scale: 1/2" = 1'-0"

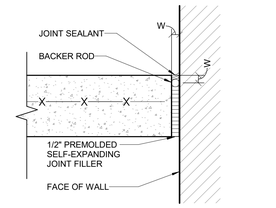


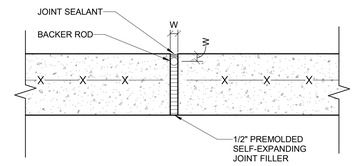
NOTES:
1. COAT BASE PLATE, ANCHOR BOLTS, AND COLUMN BELOW SLAB ON GRADE WITH 3 COATS BLACK ASPHALTIC PAINT.
2. ALIGN COLUMN AND FOOTING CENTERLINE, U.N.O.

5 TYPICAL SPREAD FOOTING
Scale: 3/4" = 1'-0"

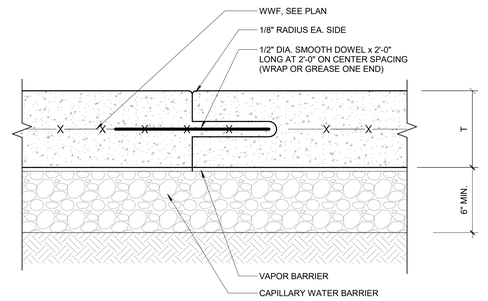


4 TYPICAL STEP FOOTING
Scale: 3/4" = 1'-0"





3 SLAB EXPANSION JOINT
Scale: 3" = 1'-0"

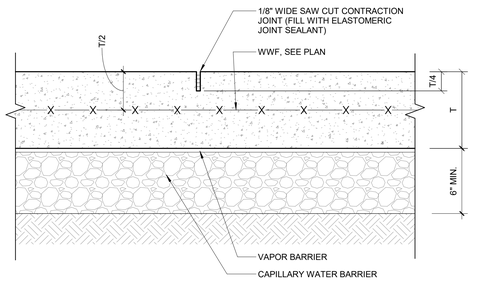


NOTE:
1. SEE FOUNDATION PLAN FOR SLAB THICKNESS, WELDED WIRE REINFORCING, VAPOR BARRIER AND CAPILLARY WATER BARRIER.

2. THIS DETAIL APPLIES ONLY AT THE INTERSECTION OF TWO SEPARATE FLOOR SLAB POURS (COLD JOINT).

3. DISCONTINUE WELDED WIRE FABRIC REINFORCING AT JOINT.

2 SLAB-ON-GRADE CONSTRUCTION JOINT
Scale: 3" = 1'-0"



NOTE:
SEE FOUNDATION PLAN FOR SLAB THICKNESS, WELDED WIRE REINFORCING, VAPOR BARRIER AND CAPILLARY WATER BARRIER

1 SLAB-ON-GRADE CONTRACTION JOINT
Scale: 3" = 1'-0"

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DATE	02.06.24

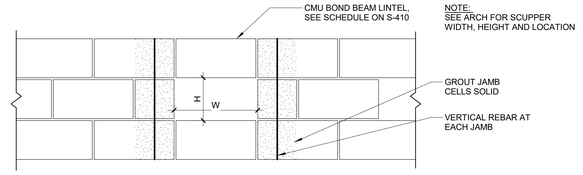
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STRUCTURAL FOUNDATION DETAILS

PROJECT NO. 50150343

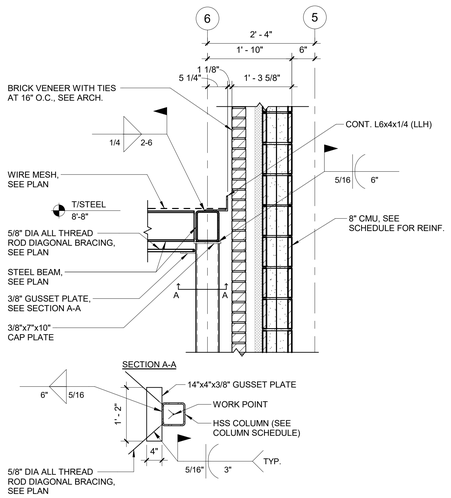
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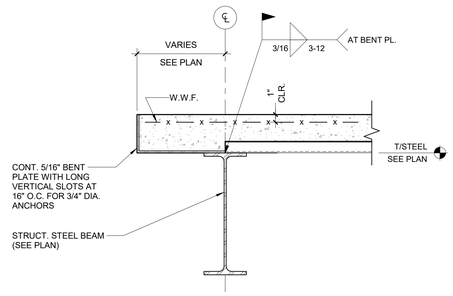
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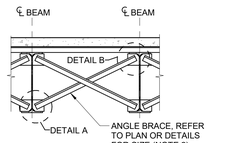
9 ROOF SCUPPER OPENING DETAIL
Scale: 1" = 1'-0"



8 SCREEN WALL SECTION
Scale: 3/4" = 1'-0"



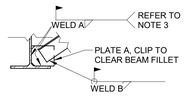
7 TYP. SLAB EDGE - DECK PERPENDICULAR TO BEAM
Scale: 1 1/2" = 1'-0"



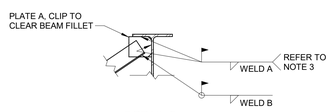
BRACE CONNECTION TO BEAM TOP FLANGE

CONNECTION SCHEDULE			
BRACE SIZE	PLATES A & B	WELDS A & B	CONNECTION ANGLE
L2x2x1/4	4x4x1/4	3/16	L3x3x1/4
L3x3x1/4	4x4x1/4	3/16	L4x4x1/4
L4x4x1/4	5x5x1/4	3/16	N/A
L5x5x1/4	6x6x3/8	1/4	N/A

NOTES:
1. REFER TO PLAN FOR LOCATIONS OF ANGLE BRACES.
2. IF NOT SHOWN ON PLAN OR DETAILS, BRACE SIZE SHALL BE L3x3x1/4.
3. FIELD WELDING OF CONNECTION PLATES SHALL BE AT FABRICATOR'S OPTION.

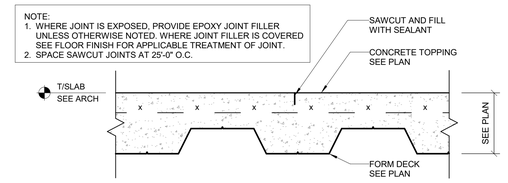


DETAIL A

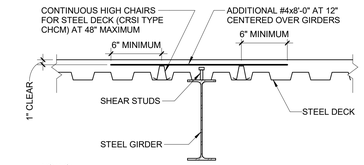


DETAIL B

6 TYPICAL BEAM BOTTOM FLANGE BRACE AT COMPOSITE DECK
Scale: 3/4" = 1'-0"

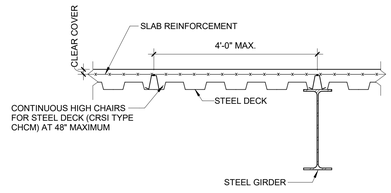


5 ELEVATED SLAB CONTRACTION JOINT DETAIL
Scale: 3" = 1'-0"



NOTES:
1. REINFORCEMENT SHOWN OVER GIRDERS IS IN ADDITION TO THE TYPICAL SLAB REINFORCEMENT SPECIFIED ON THE DRAWINGS.

4 ADDITIONAL REINFORCEMENT AT INTERIOR GIRDERS
Scale: 1" = 1'-0"

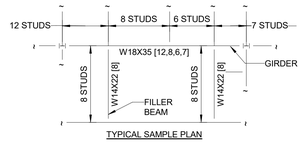


3 TYP REINF PLACEMENT FOR COMPOSITE SLABS
Scale: 1" = 1'-0"

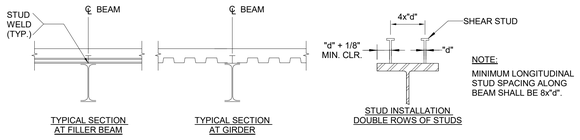
SEPARATE DECK UNITS OVER FLANGE | DECK FLUTE CONTINUOUS OVER FLANGE | NORMAL SIDE LAP ON FLANGE

HIGH-HAT ON FLANGE

2 TYPICAL COMPOSITE STEEL DECK DETAILS AT GIRDER
Scale: 1" = 1'-0"



TYPICAL SAMPLE PLAN



TYPICAL SECTION AT FILLER BEAM | TYPICAL SECTION AT GIRDER | STUD INSTALLATION DOUBLE ROWS OF STUDS

NOTE:
MINIMUM LONGITUDINAL STUD SPACING ALONG BEAM SHALL BE 8x"d".

NOTES:
1. SHEAR CONNECTORS 3/4" DIA. X 4" LONG, SEE PLAN FOR NUMBER OF SHEAR CONNECTORS.
2. DISTRIBUTE AND CONNECT SHEAR CONNECTORS TO THE TOP FLANGE OF STEEL BEAMS AS SHOWN IN FRAMING PLAN. STUDS SHALL BE EQUALLY SPACED ALONG STEEL MEMBERS OR BETWEEN FILLER BEAM CONNECTION POINTS IN THE CASE OF GIRDERS AS SHOWN BY THE NOTATION [_ _ _] DEPICTED ABOVE.
3. WHERE NUMBER OF STUDS SPECIFIED CANNOT BE INSTALLED IN A SINGLE LONGITUDINAL ROW WITHOUT VIOLATING MINIMUM SPACING REQUIREMENT STUDS SHALL BE INSTALLED IN A DOUBLE ROW AS INDICATED ABOVE.

1 TYPICAL COMPOSITE STEEL BEAM/SHEAR STUD DETAIL
Scale: 12" = 1'-0"

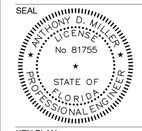
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DATE	02.06.24

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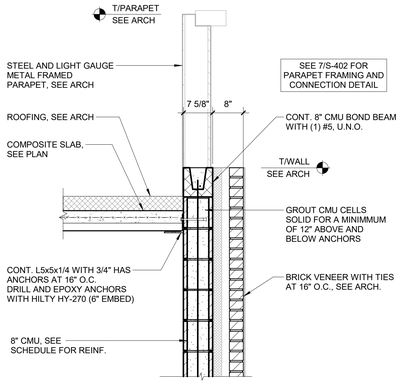
STRUCTURAL FRAMING DETAILS

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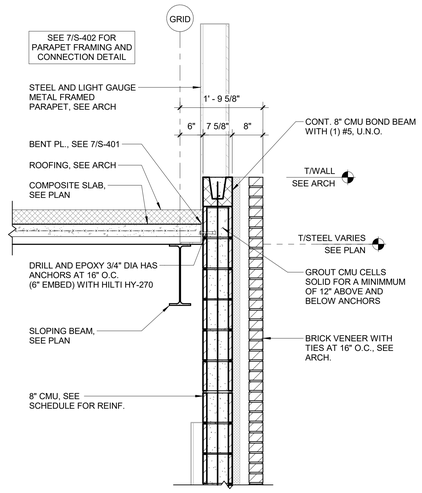
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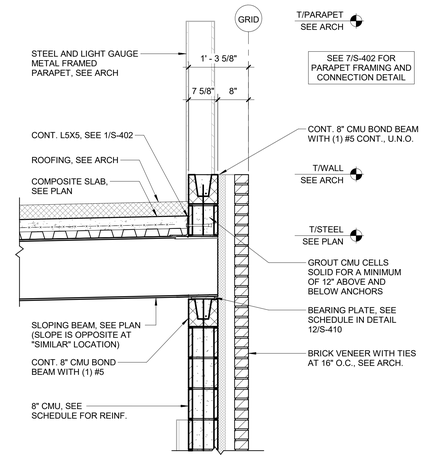
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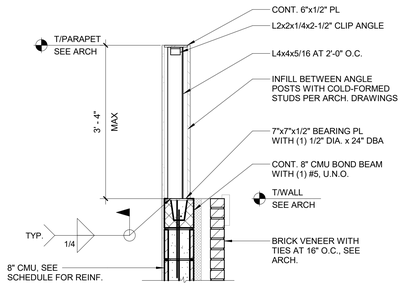
6 ROOF SECTION
Scale: 3/4" = 1'-0"



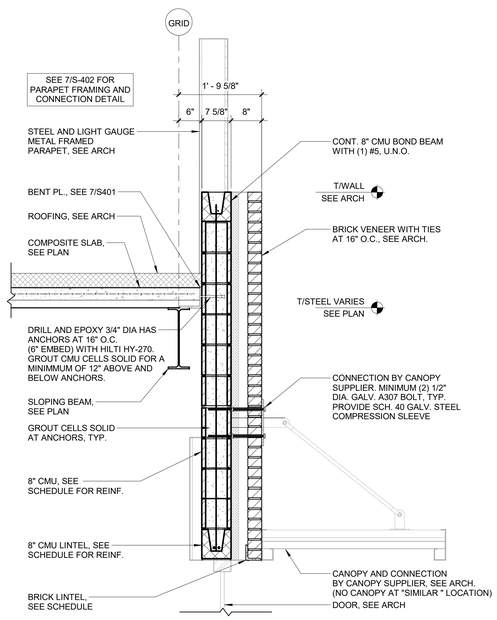
4 ROOF SECTION
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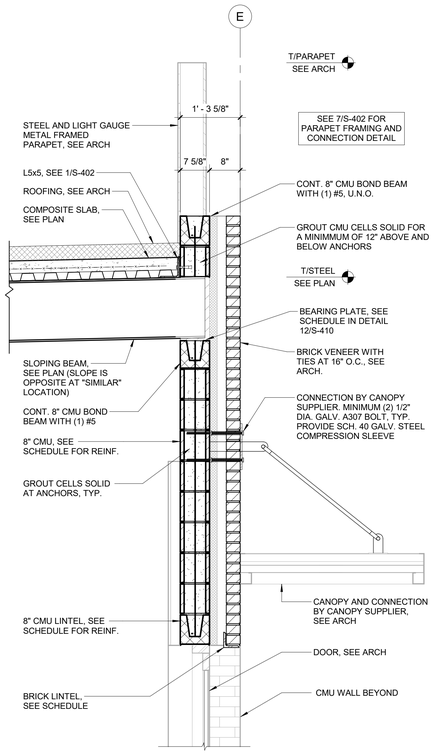
2 ROOF SECTION
Scale: 3/4" = 1'-0"



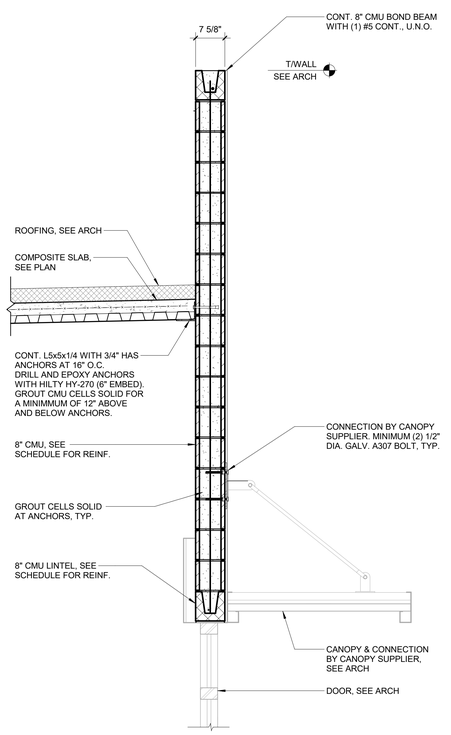
7 PARAPET SECTION
Scale: 3/4" = 1'-0"



5 ROOF SECTION
Scale: 3/4" = 1'-0"



3 ROOF SECTION
Scale: 3/4" = 1'-0"



1 ROOF SECTION
Scale: 3/4" = 1'-0"

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DRAWN BY	Author
APPROVED BY	Approver
CHECKED BY	Checker
DATE	02.06.24

TITLE

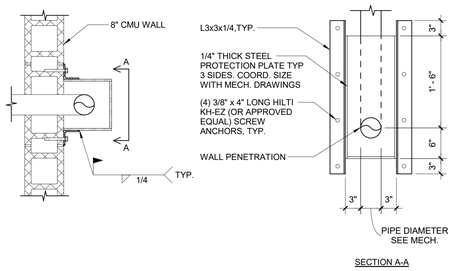
STRUCTURAL
FRAMING
DETAILS

PROJECT NO. 50150343

S-402

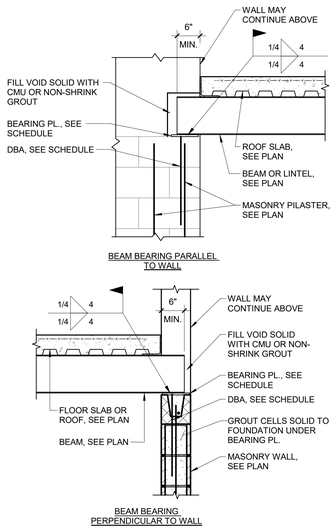
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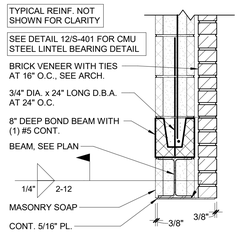


13 CMU WALL PENETRATION PROTECTION DETAIL
Scale: 1" = 1'-0"

BEARING PL. SCHEDULE				
MARK	THICKNESS	WIDTH	LENGTH	# OF 1/2" DIA. x 24" DBA
	1/2"	7"	7"	2
AT BEAMS NOT SUPPORTING OTHER BEAMS, AND LINTELS BEARING ON 8" WALLS	1/2"	7"	7"	1

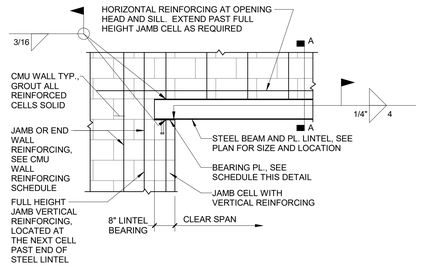


12 BEAM BEARING PL. SCHEDULE
Scale: 3/4" = 1'-0"

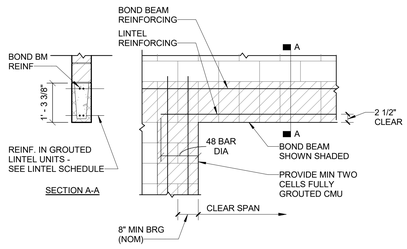


SECTION A-A
WITH BRICK VENEER

11 CMU STEEL LINTEL SECTION
Scale: 1" = 1'-0"



10 CMU STEEL LINTEL DETAIL
Scale: 1/2" = 1'-0"



9 16" CMU LINTEL AT BOND BEAM
Scale: 1/2" = 1'-0"

LINTEL SCHEDULE
UNLESS OTHERWISE NOTED ON THE DRAWINGS, USE THE FOLLOWING SCHEDULE FOR LINTELS AND HEADERS IN NEW MASONRY

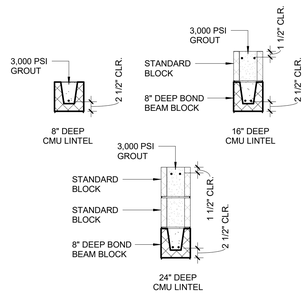
1. OPENINGS FOR ROUND DUCTS, PIPING, AND ELEC. CONDUIT ARE NOT SHOWN. SLEEVE OPENINGS BETWEEN 4 AND 12 INCHES IN DIAMETER WITH SCHEDULE 40 STEEL PIPE PER THE COORDINATION SECTION OF THE GENERAL NOTES.
2. MINIMUM BEARING FOR MASONRY LINTELS IS 8". FILL CMU CELLS BELOW BEARING WITH 3,000 PSI GROUT AND REINFORCE PER CMU WALL SCHEDULE.
3. MINIMUM BEARING FOR SINGLE STEEL ANGLE LINTELS IS 8".
4. STEEL ANGLE LOOSE LINTELS IN EXTERIOR MASONRY WALLS SHALL BE HOT-DIPPED GALVANIZED.

4" BRICK LOOSE LINTELS

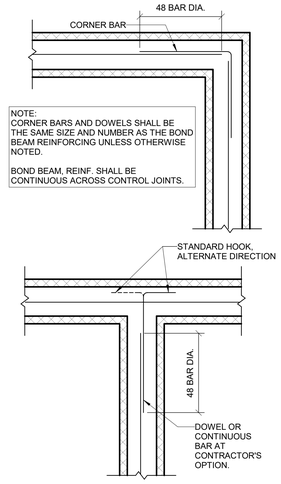
1. FOR CLEAR SPANS LESS THAN 4'-0", USE L4x4x5/16 STEEL ANGLE.
2. FOR CLEAR SPANS GREATER THAN 4'-0" AND LESS THAN OR EQUAL TO 6'-8", USE L6x4x3/8 (LLV) STEEL ANGLE.

8" CMU WALLS

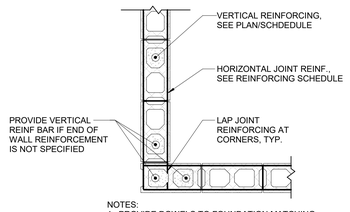
1. FOR CLEAR SPANS LESS THAN 1'-4", PROVIDE AN 8" DEEP BOND BEAM LINTEL WITH (1) #5 BAR BOTTOM.
2. FOR CLEAR SPANS GREATER THAN 1'-4" AND LESS THAN 4'-0", PROVIDE A 16" DEEP BOND BEAM LINTEL WITH (2) #5 BAR TOP AND BOTTOM.
3. FOR CLEAR SPANS GREATER THAN 4'-0" AND LESS THAN 6'-8", PROVIDE A 24" DEEP BOND BEAM LINTEL WITH (2) #5 BAR TOP AND BOTTOM.
4. FOR CLEAR SPANS GREATER THAN 6'-8" SEE 10 AND 11 S-410 FOR STEEL LINTELS.



8 LINTEL SCHEDULE
Scale: 3/4" = 1'-0"

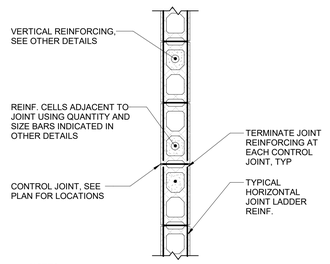


7 BOND BEAM CORNER REINF.
Scale: 3/4" = 1'-0"



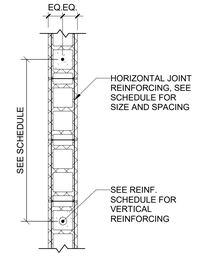
NOTES:
1. PROVIDE DOWELS TO FOUNDATION MATCHING SIZE OF VERTICAL REINFORCING, TYPICAL. SEE GENERAL NOTES FOR LAP REQUIREMENTS.

6 TYPICAL CMU CORNER
Scale: 3/4" = 1'-0"



NOTES:
1. SEE S-101 FOR SPLICE AND EMBEDMENT LENGTH SCHEDULE.
2. PROVIDE FOUNDATION DOWELS MATCHING THE SIZE AND SPACING OF VERTICAL REINFORCING.
3. ALL CONTROL JOINT LOCATIONS SHALL BE COORDINATED WITH THE ARCHITECTURAL DRAWINGS AND HAVE A RECOMMENDED MAXIMUM SPACING OF 24 FEET.

5 TYPICAL CMU CONTROL JOINT
Scale: 3/4" = 1'-0"



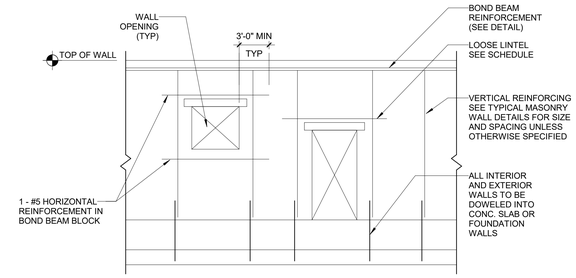
4 TYPICAL CMU WALL REINFORCING
Scale: 3/4" = 1'-0"

CMU WALL REINFORCING SCHEDULE				
	WALL HEIGHT	VERTICAL REINFORCING 8" CMU		HORIZONTAL REINFORCING
		VERTICAL REINF.	END WALL REINF.	
EXTERIOR, BEARING AND SHEARWALL	UP TO 14'-0"	#5 AT 16" OC	(1) #5 PER CELL IN END (2) CELLS OF WALL, EACH END	9 GA LADDER TYPE AT 16" OC

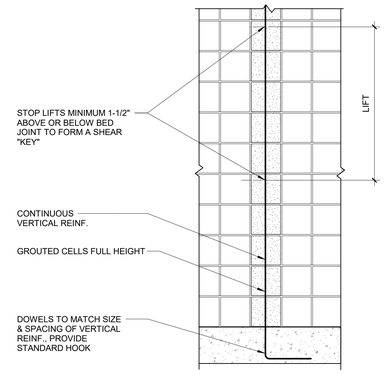
NOTES:
1. PROVIDE FOUNDATION DOWELS FOR ALL VERTICAL REINFORCING BARS. SIZE AND LOCATION OF DOWELS TO MATCH VERTICAL REINFORCING.
2. PROVIDE (1) #5 BARS IN BOND BEAM AT EACH FLOOR LEVEL AT TOPS OF WALLS AND AS INDICATED IN SECTIONS AND SCHEDULES.
3. ALL MASONRY TO BE CONSTRUCTED IN RUNNING BOND BEAM PATTERN WITH INTERLOCKING CORNERS.
4. CENTER VERTICAL REINF. IN CELLS U.N.O.
5. PROVIDE END WALL REINF. AT ENDS OF WALL AND END OF SHEAR WALLS U.N.O.
6. GROUT ALL CELLS SOLID.

VERTICAL SPANNING WALLS:
1. ALL VERTICAL SPANNING WALLS ARE TO BE ANCHORED TO STEEL STRUCTURE PER OTHER DETAILS.
2. ALL INTERIOR VERTICALLY SPANNING WALLS SHALL BE 8" CMU U.N.O.

3 CMU WALL REINFORCING SCHEDULE
Scale: 3/4" = 1'-0"



2 TYPICAL MASONRY WALL REINF.
Scale: 1" = 1'-0"



GENERAL GROUTING REQUIREMENTS:
1. GROUT ALL REINFORCED CELLS SOLID.
2. REINFORCING BARS SHALL BE IN PROPER POSITION PRIOR TO PLACEMENT OF GROUT.
3. PLACE MORTAR ON CROSS WEBS ADJACENT TO ALL GROUTED CELLS.
4. REMOVE ALL MORTART THAT PROJECTS MORE THAN 1/2" INTO CELLS THAT ARE TO BE GROUTED.
5. GROUTED CELLS SHALL BE MECHANICALLY VIBRATED DURING PLACEMENT OF GROUT. TEN MINUTES AFTER PLACING GROUT, EACH GROUTED CELL SHALL BE RECONSOLIDATED WITH A VIBRATOR.
6. EITHER LOW LIFT GROUTING OR HIGH LIFT GROUTING PROCEDURES MAY BE UTILIZED, AT THE CONTRACTOR'S OPTION.

LOW LIFT GROUTING PROCEDURE:
1. LAY WALL TO MAXIMUM OF 5'-0".
2. CLEAN MORTAR AND OTHER DEBRIS FROM CELLS TO BE GROUTED.
3. PLACE REINFORCING BARS IN PROPER POSITION.
4. PLACE GROUT UP TO LIFT HEIGHT AND VIBRATE.

HIGH LIFT GROUTING PROCEDURE:
1. CLEANOUT OPENINGS SHALL BE PROVIDED IN THE FACE SHELLS OF THE BOTTOM COURSE OF ALL CELLS TO BE GROUTED. OPENINGS SHALL BE LARGE ENOUGH TO ALLOW REMOVAL OF DEBRIS.
2. LAY WALL TO MAXIMUM POUR HEIGHT AND CLEAN DEBRIS FROM OPENINGS. PLACE REINFORCING BARS IN PROPER POSITION.
3. PLACE GROUT TO THE FOLLOWING HEIGHTS: MAXIMUM LIFT HEIGHT IS 5'-0"; MAXIMUM POUR HEIGHT IS 12'-0" UNLESS EXPRESSLY COORDINATED WITH THE STRUCTURAL ENGINEER.
4. AFTER INITIAL LIFT IS POURED AND VIBRATED, WAIT A MINIMUM OF 30 MINUTES AND A MAXIMUM OF 60 MINUTES BEFORE PLACING SUCCESSIVE LIFT. CONTINUE THIS PROCEDURE FOR FULL POUR HEIGHT.

1 TYPICAL MASONRY GROUT REQUIREMENTS
Scale: 3/4" = 1'-0"

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GCEC HURRICANE SAFE ROOM

722 WEST HIGHWAY 22
WEWAHITCHKA, FL 32465
100% DESIGN

SEAL
ANTHONY D. MILLER
LICENSE
No 81755
STATE OF FLORIDA
PROFESSIONAL ENGINEER

KEY PLAN

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SCALE

REVISIONS

NO.	DESCRIPTION	DATE

DRAWN BY	Author
APPROVED BY	Approver
CHECKED BY	Checker
DATE	02.06.24

TITLE

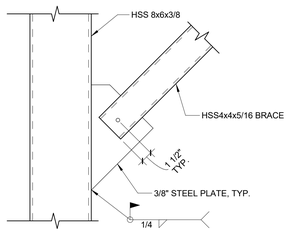
MASONRY SCHEDULES, SECTIONS AND DETAILS

PROJECT NO. 50150343

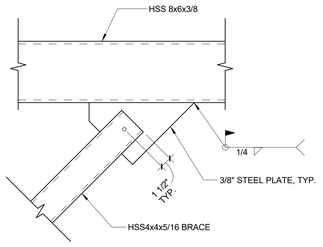
S-410

SHEET NO.

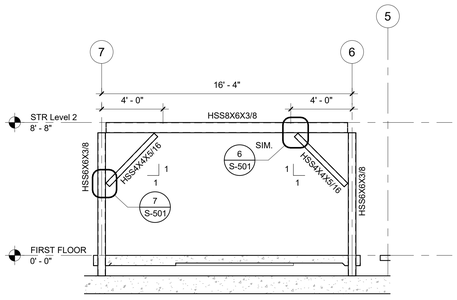
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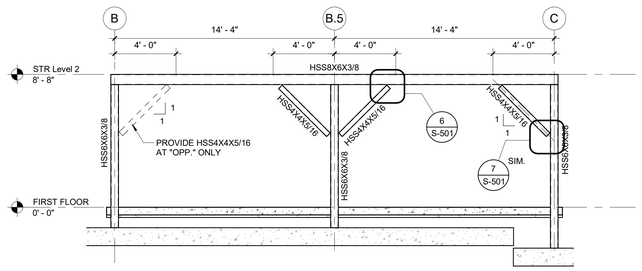
7 BRACE CONNECTION DETAIL
Scale: 1 1/2" = 1'-0"



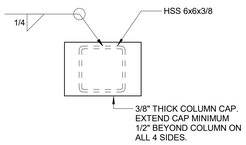
6 BRACE CONNECTION DETAIL
Scale: 1 1/2" = 1'-0"



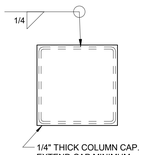
5 BRACED FRAME ELEVATION
Scale: 1/4" = 1'-0"



4 BRACED FRAME ELEVATION
Scale: 1/4" = 1'-0"

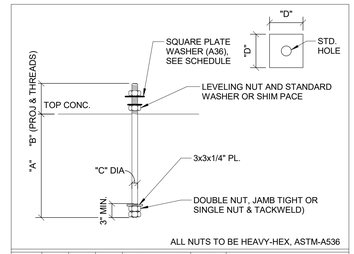


CAP TYPE 2



CAP TYPE 1

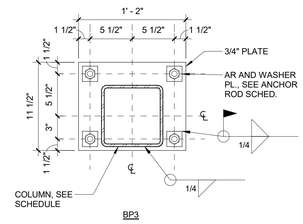
3 COLUMN CAP DETAIL
Scale: 1 1/2" = 1'-0"

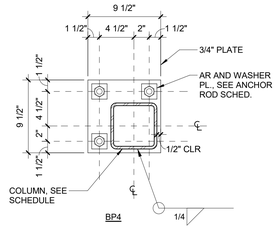


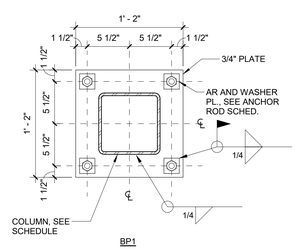
ALL NUTS TO BE HEAVY-HEX, ASTM-A536

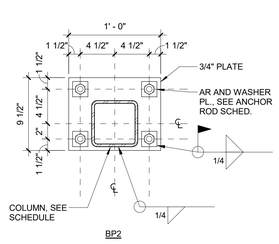
MARK	"A"	"B"	"C"	PLATE WASHER "D"	PLATE WASHER THK	ROD GRADE	REMARKS
AR1	9"	5-1/2"	3/4"	2"	1/4"	F1554, GR 36	

2 ANCHOR ROD SCHEDULE
Scale: 3/4" = 1'-0"







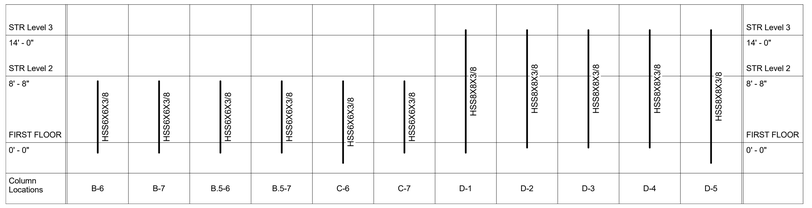


NOTE: ROTATE ALL BASE PLATES TO AVOID ADJACENT CMU WALLS.

1 BASE PLATE DETAIL
Scale: 1 1/2" = 1'-0"

BASE PLATE, ANCHOR BOLT AND CAP PLATESCHEDULE

COLUMN LOCATION	Type	ANCHOR BOLTS	BASE PLATE TYPE	CAP PLATE
D-1	HSS8X8X3/8	AR1	BP3	CP1
D-3	HSS8X8X3/8	AR1	BP1	CP1
D-2	HSS8X8X3/8	AR1	BP1	CP1
D-4	HSS8X8X3/8	AR1	BP1	CP1
D-5	HSS8X8X3/8	AR1	BP3	CP1
B-6	HSS6X6X3/8	AR1	BP4	CP2
B-7	HSS6X6X3/6	AR1	BP4	CP2
C-7	HSS6X6X3/8	AR1	BP4	CP2
C-6	HSS6X6X3/8	AR1	BP4	CP2
B.5-7	HSS6X6X3/8	AR1	BP2	CP2
B.5-6	HSS6X6X3/8	AR1	BP2	CP2



COLUMN SCHEDULE
Scale: 1/8" = 1'-0"

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GULF COAST ELECTRICAL COMPANY

GCEC HURRICANE SAFE ROOM

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WEWAHITCHKA, FL 32465
100% DESIGN

SEAL

ANTHONY D. MILLER
LICENSE
No 81755
STATE OF FLORIDA
PROFESSIONAL ENGINEER

KEY PLAN

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NO.	DESCRIPTION	DATE

DRAWN BY	ADM
APPROVED BY	ADM
CHECKED BY	JAW
DATE	02.06.24

TITLE

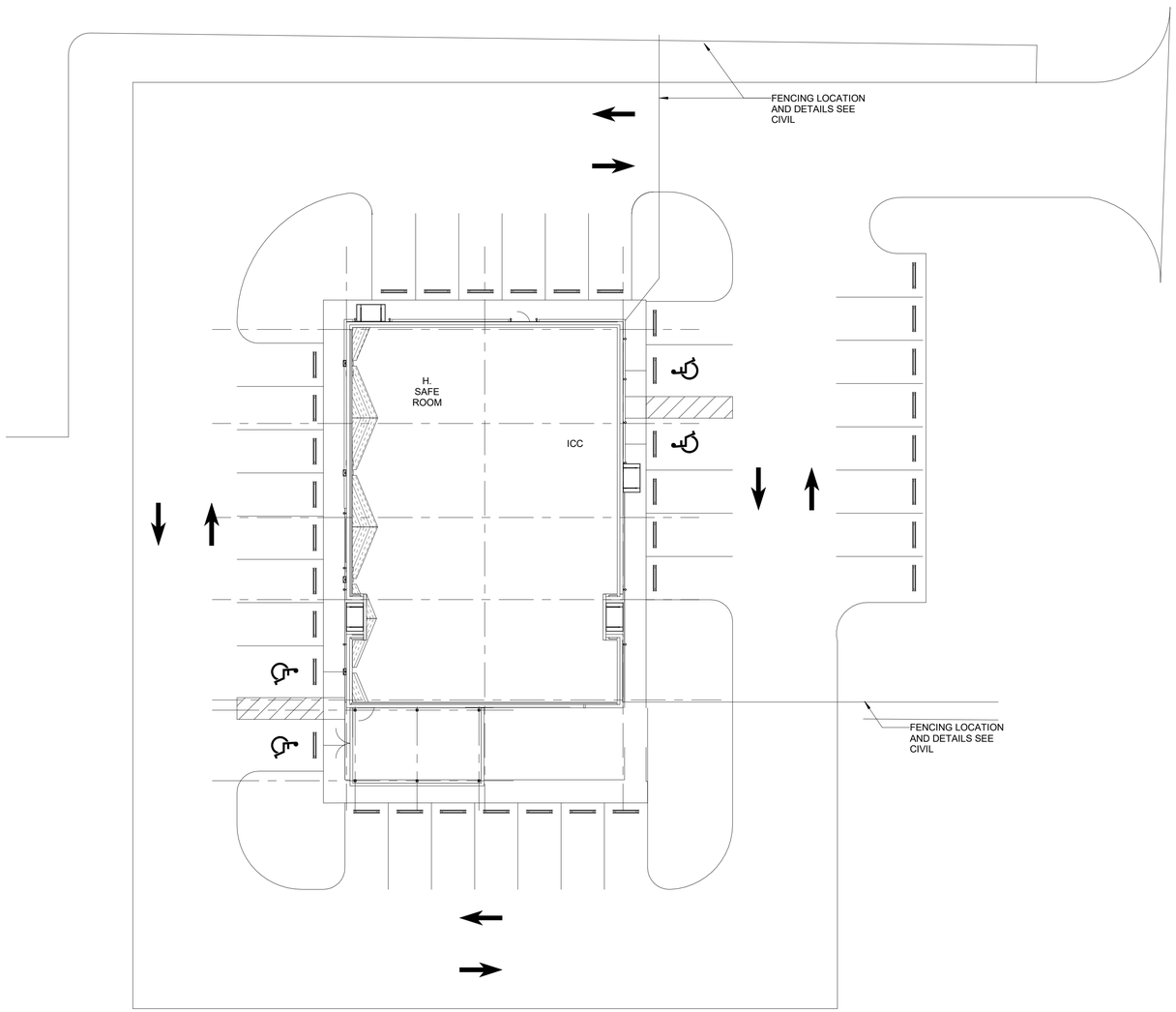
STRUCTURAL COLUMN SCHEDULE

PROJECT NO. 50150343

S-501

SHEET NO.

2/6/2024 4:46:23 PM



A1 ARCHITECTURAL SITE PLAN (REFERENCE ONLY)
Scale: 1/16" = 1'-0"

REFER TO CIVIL FOR MORE INFORMATION

0' 8' 16' 32'
SCALE: 1/16" = 1' - 0"

N Plan

2/6/2024 12:39:46 PM

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DEWBERRY ARCHITECTS, INC.
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GULF COAST ELECTRICAL CO-OP

GCEC HURRICANE SAFE ROOM

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WEWAHITCHKA, FL 32465
100% DESIGN

SEAL

STATE OF FLORIDA
JULIAN M. MARTINEZ
AR94996
REGISTERED ARCHITECT

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CHECKED BY	AC
DATE	2.6.24

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ARCHITECTURAL SITE PLAN

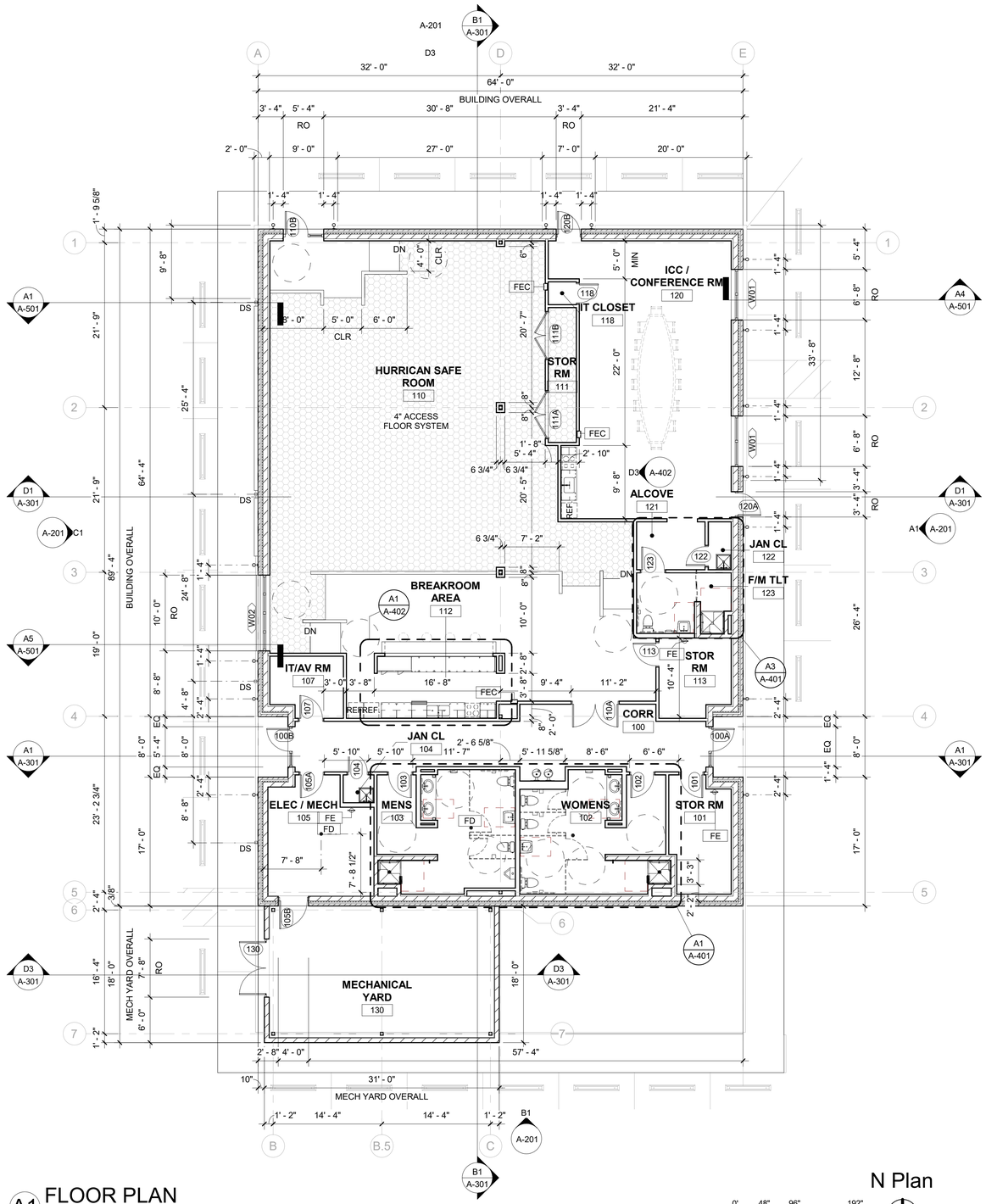
PROJECT NO. 50150343

AS-101

SHEET NO.

DIMENSION PLAN GENERAL NOTES

1. INTERIOR DIMENSIONS ARE TO FACE OF METAL STUD OR CMU UNIT AND TO CENTERLINES OF COLUMNS, U.N.O.
2. REFER TO CODE PLANS FOR GRAPHIC REPRESENTATION AND U.L. DESIGNS OF RATED WALLS AND SMOKE PARTITIONS.
3. EXTEND PARTITIONS TO UNDERSIDE OF STRUCTURE/DECK, U.N.O.
4. FINAL WALL PREP REQUIREMENTS ARE BASED ON FINISH SHOWN IN ROOM FINISH SCHEDULE AND WITH THE SPECIFICATIONS.
5. BACK-TO-BACK OUTLETS CANNOT OCCUPY SAME STUD CAVITY SPACE. IN ACOUSTICALLY TREATED WALLS, PROVIDE ACOUSTIC PUTTY PADS AROUND OUTLET BOXES.
6. REFER TO ENLARGED PLANS FOR DIMENSIONS WITHIN THESE AREAS.
7. SEE PLANS AND DETAIL PLANS FOR CHASE DIMENSIONS.
8. REFER TO DETAIL PLANS AND SECTIONS FOR FURTHER DESCRIPTION OF INTERIOR PARTITIONS.
9. REFER TO SHEET ***A-631*** FOR WALL PARTITION TYPES AND ASSEMBLIES.
10. REFER TO SHEET ***G-101*** FOR FIRE-RATED WALL ASSEMBLY NUMBERS.



A1 FLOOR PLAN
Scale: 1/8" = 1'-0"

N Plan

0' 48" 96" 192"
SCALE: 1/8" = 1' - 0"

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NO.	DESCRIPTION	DATE

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CHECKED BY	AC
DATE	2.6.24

TITLE

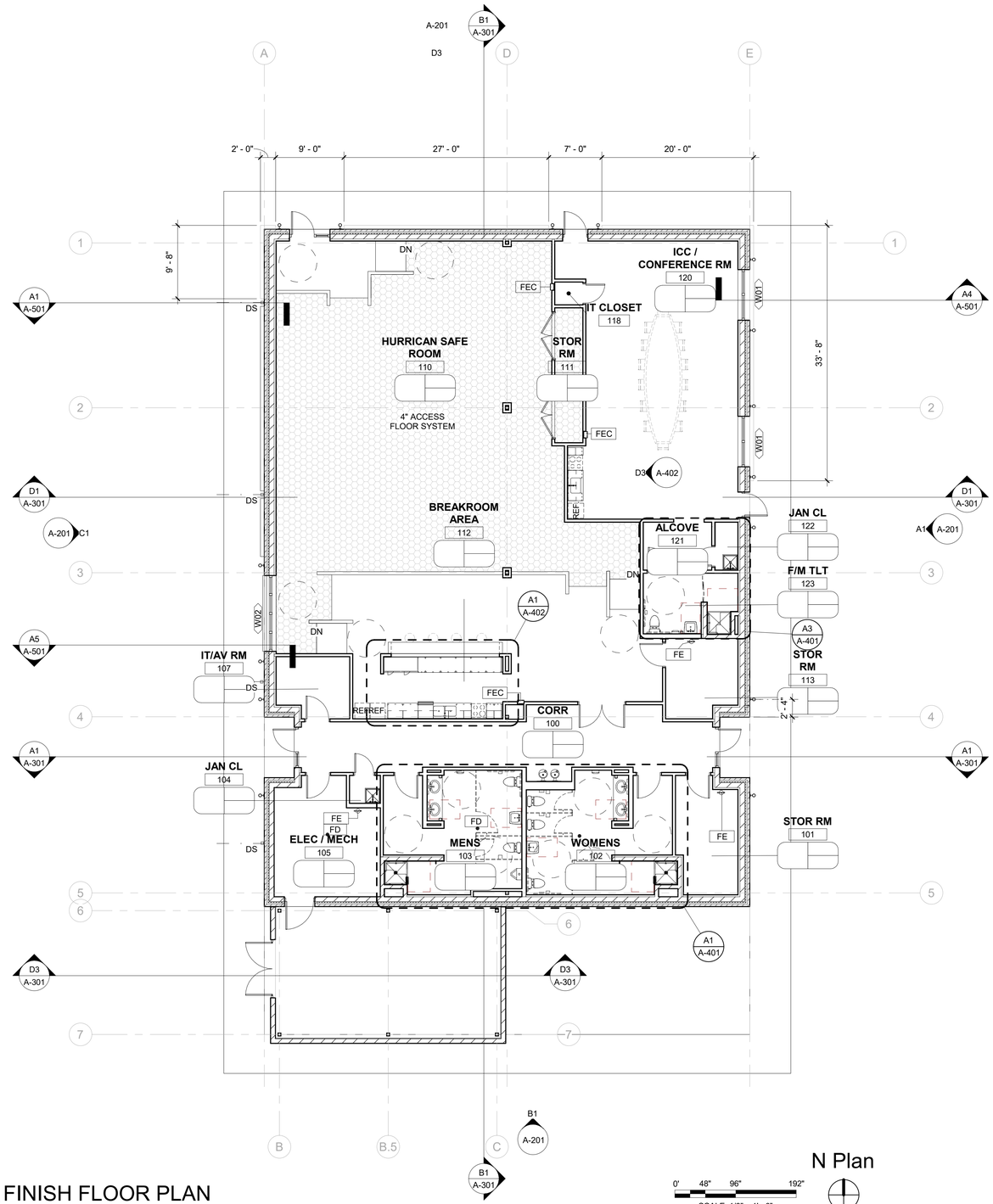
FLOOR PLAN

PROJECT NO. 50150343

A-101

SHEET NO.

2/6/2024 12:39:33 PM



A1 FINISH FLOOR PLAN
Scale: 1/8" = 1'-0"

N Plan

0' 48" 96" 192"
SCALE: 1/8" = 1' - 0"

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CHECKED BY	AC
DATE	2.6.24

TITLE

FINISH FLOOR PLAN

PROJECT NO. 50150343

A-102

SHEET NO.

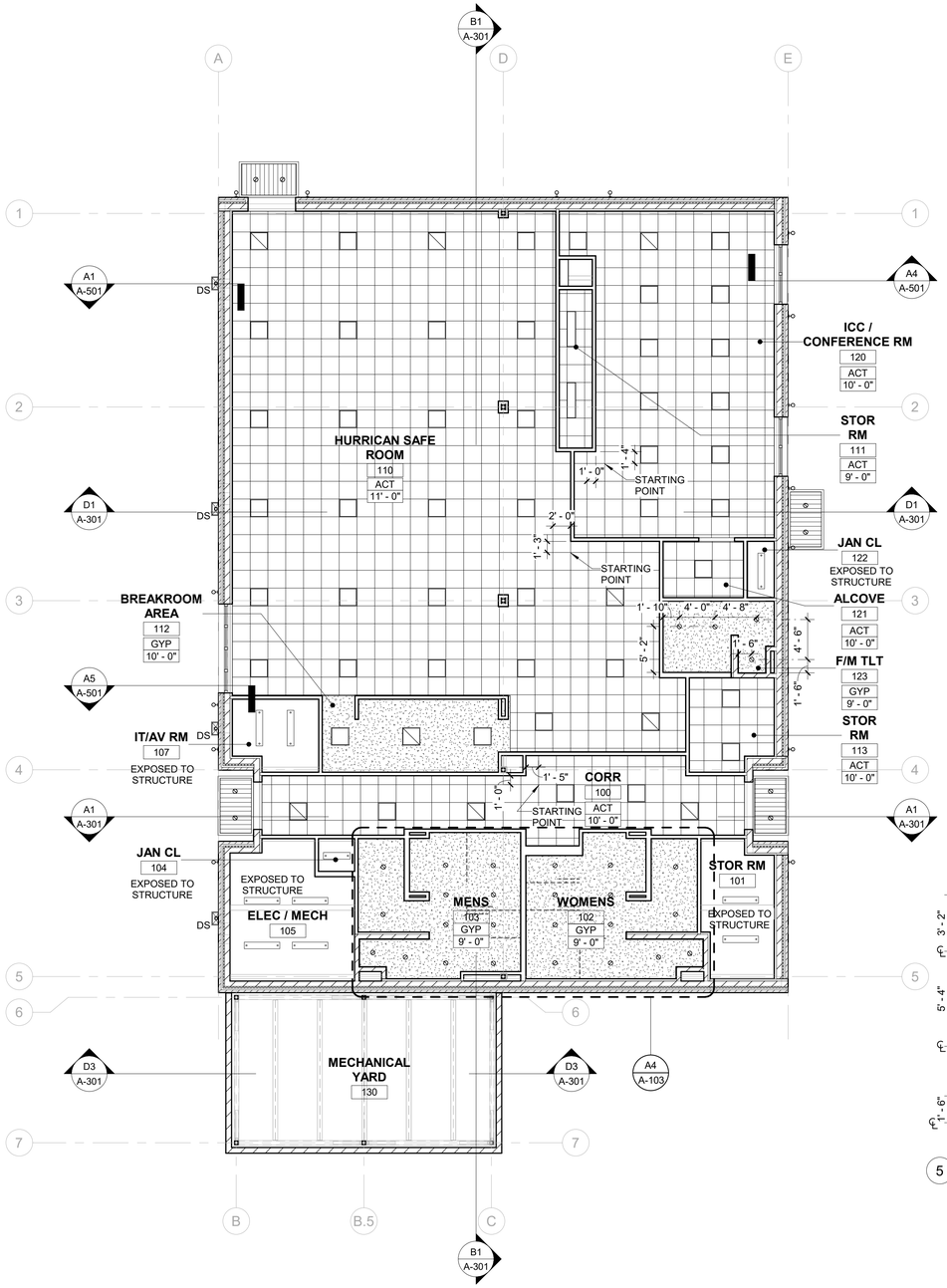
CEILING PLAN GENERAL NOTES

1. CONTROL JOINTS SHOWN IN GYPSUM BOARD SOFFITS SHALL CONTINUE ON VERTICAL SURFACE OF SAME SOFFIT. SPACE CONTROL JOINTS NO MORE THAN 25'-0" O.C. ARCHITECT TO VERIFY JOINT LOCATIONS PRIOR TO INSTALLATION.
2. SEE ENLARGED CEILING PLANS FOR ADDITIONAL SOFFIT DIMENSIONS AND CONTROL JOINT LOCATIONS.
3. ELECTRICAL, MECHANICAL, AND TECHNOLOGY FIXTURES AND DEVICES ARE SHOWN FOR REFERENCE AND TO COORDINATE PLACEMENT. REFER TO ENGINEERING DRAWINGS FOR INFORMATION REGARDING TYPE AND OTHER FIXTURE AND DEVICE INFORMATION.
4. ESTABLISH PRE-INSTALLATION MEETING WITH ARCHITECT TO REVIEW STARTING POINT OF CEILING GRID IN EACH AREA/ROOM.
5. SUBMIT A REFLECTED CEILING PLAN COORDINATION DRAWING TO ARCHITECT AFTER COORDINATING LAYOUT WITH OTHER TRADES PRIOR TO COMMENCING CEILING WORK.
6. GYPSUM CEILING TO BE PAINTED.
7. EXPOSED STRUCTURE, MECHANICAL, ELECTRICAL, AND FIRE PROTECTION COMPONENTS (EXCEPT SPRINKLER HEADS) ARE TO BE PAINTED, U.N.O.
8. SPRINKLE HEADS ARE NOT SHOWN. LOCATE SPRINKLER HEADS IN CENTER OF CEILING TILES.
9. CEILING HEIGHTS SHOWN ON REFLECTED CEILING PLANS ARE FROM FINISHED FLOOR OF PLAN SHOWN.
10. COORDINATE LOCATION OF ACCESS PANELS WITHMECHANICAL/ELECTRICAL CONTRACTORS.
11. IN ROOMS WITH EXPOSED CEILINGS, MOUNT LIGHT FIXTURES TO UNDERSIDE OF STRUCTURE. OTHER MEP/FP ITEMS TO MAINTAIN A MINIMUM CLEARANCE OF ***9'-0" A.F.F.***
12. SEE TECHNOLOGY DRAWINGS FOR SECURITY CAMERA AND MOTION DETECTOR LOCATIONS.
13. SEE ELECTRICAL LIGHTING PLANS FOR EMERGENCY LIGHT FIXTURE LOCATIONS.
14. CONTRACTOR TO COORDINATE CEILING FIXTURE LOCATIONS WITH ABOVE-CEILING WORK TO AVOID CONFLICTS.

CEILING LEGEND

REFER TO ELECTRICAL, MECHANICAL, AND DRAINAGE FOR MORE INFORMATION

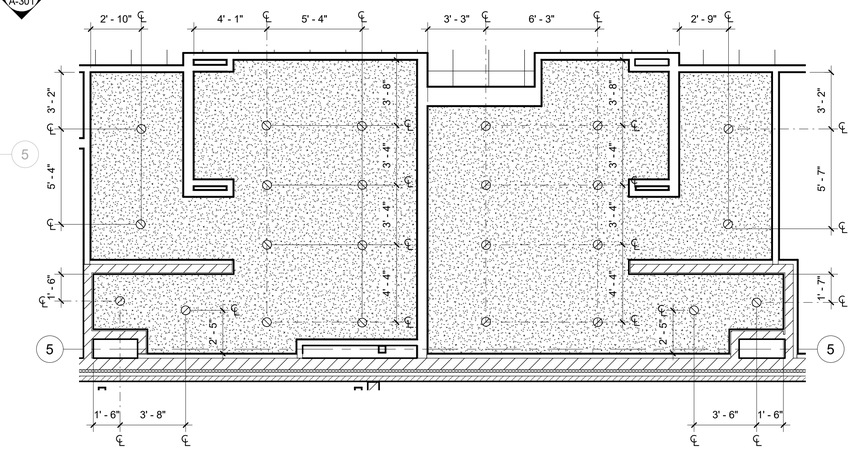
APC-X / 8' - 0"	CEILING TYPE / CEILING HEIGHT		EXIT SIGN
ES	EXPOSED STRUCTURE	S	SPEAKER
	EXTERIOR SOFFIT	A	FIRE ALARM
	2 X 2 ACT SYSTEM	SA	SPEAKER/STROBE
	GYP. CEILING		STROBE
	LED 4' UTILITY SUSPENDED FIXTURE	S	SMOKE DETECTOR
	1X4 RECESSED FIXTURE		SPRINKLER HEAD
	2X2 RECESSED FIXTURE		4" RECESSED DOWNLIGHT
	2X2 RECESSED EMERGENCY LIGHT		
	EMERGENCY LIGHT		



A1 REFLECTED CEILING PLAN
Scale: 1/8" = 1'-0"

N Plan

0' 48" 96" 192"
SCALE: 1/8" = 1' - 0"



A4 ENLARGED REFLECTED CEILING PLAN
Scale: 1/4" = 1'-0"

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Suite 1000
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407.843.5120

GULF COAST ELECTRICAL CO-OP

GCEC HURRICANE SAFE ROOM

722 WEST HIGHWAY 22
WEWAHITCHKA, FL 32465
100% DESIGN

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SCALE

REVISIONS

NO.	DESCRIPTION	DATE

DRAWN BY	AC
APPROVED BY	ZM
CHECKED BY	AC
DATE	2.6.24

TITLE

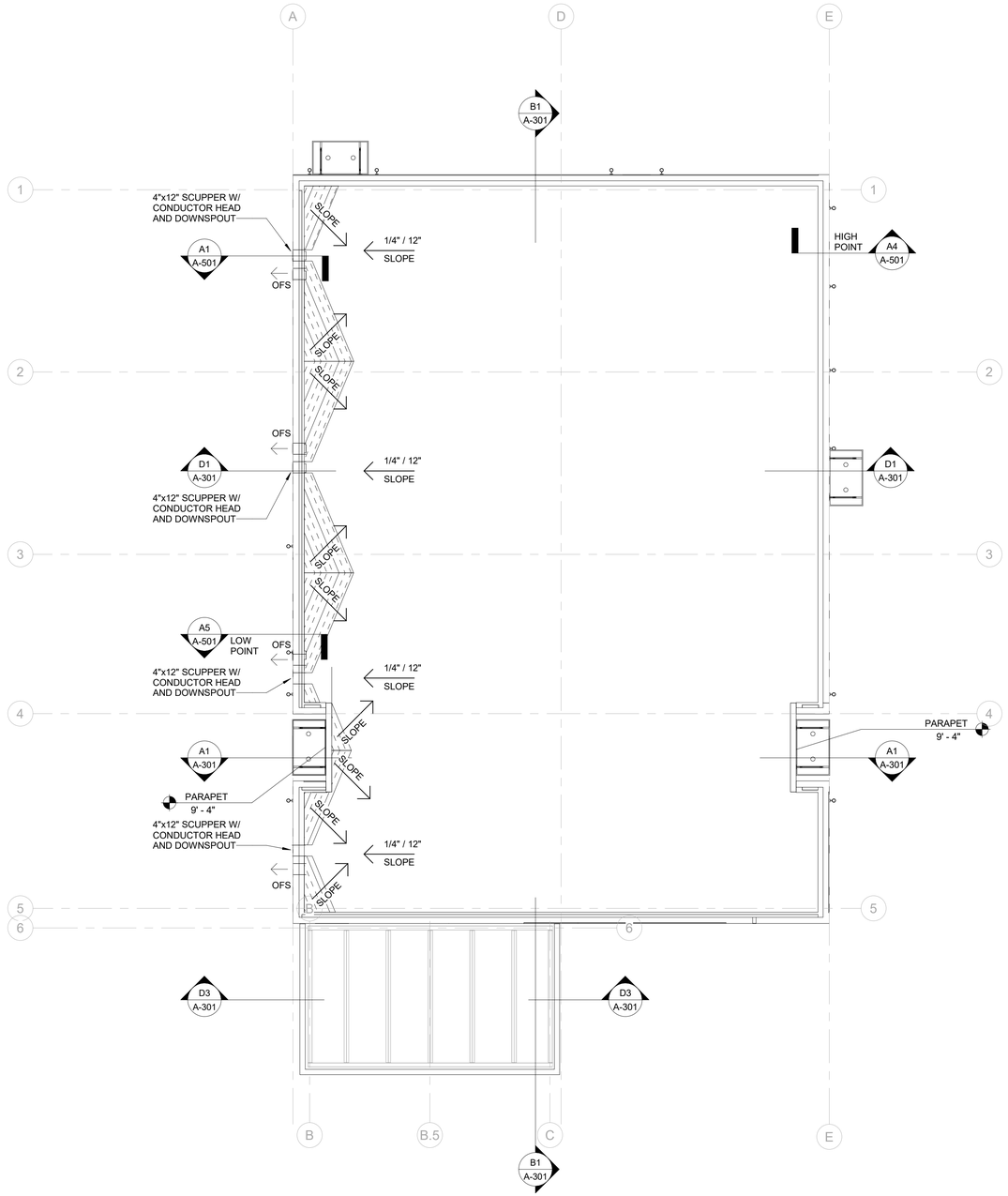
REFLECTED CEILING PLAN

PROJECT NO. 50150343

A-103

SHEET NO.

2/6/2024 12:39:35 PM



ROOF PLAN GENERAL NOTES

1. ***REFER TO DEMOLITION DRAWINGS FOR DEMOLITION AND SELECTIVE DEMOLITION OF ROOF, ROOFING SYSTEM, AND ROOF EDGE ASSEMBLY.***
2. TAPERED INSULATION (TAPERED, CRICKETS, SADDLES) TO BE 1/4" PER FOOT MINIMUM TO ROOF DRAINS OR SCUPPERS, AS INDICATED.
3. COORDINATE WITH STRUCTURAL DRAWINGS FOR SLOPED STRUCTURE.
4. SHOP DRAWING OF TAPERED INSULATION SHALL ACCOUNT FOR CAMBER IN STRUCTURE TO INSURE POSITIVE DRAINAGE.
5. AT PENETRATIONS, PROVIDE CRICKETS AS REQUIRED FOR POSITIVE DRAINAGE.
6. COORDINATE ROOF AND OVERFLOW DRAIN LOCATIONS WITH STRUCUTRAL ELEMENTS, TO AVOID LOCATING ROOF AND OVERFLOW DRAINS OVER TOP OF STEEL BEAMS AND JOISTS.
7. REFER TO EXTERIOR ELEVATIONS FOR LOCATION OF OVERFLOW SCUPPERS AND OUTFLOWS.
8. PROVIDE 24"W. x 48"L. PRECAST CONCRETE SPLASH BLOCKS ON GRADE BELOW SCUPPERS AND OUTFLOWS THAT FLOW WATER ONTO GRADE BELOW.
9. PROVIDE 24"W. x 48"L. STAINLESS STEEL SPLASHPAN ON ROOF BELOW SCUPPERS AND OUTFLOWS THAT FLOW WATER ONTO ROOFS BELOW.
10. ROOF WALKWAY PADS SHALL BE SPACED TO PROVIDE POSITIVE DRAINAGE.
11. AT ROOF LADDERS, TOP AND BOTTOM, PROVIDE 4' x 4' ROOF WALKWAY PADS.
12. ROOF FLASHING DETAILS ARE GENERIC AND WILL NEED TO BE FINALIZED DURING SHOP DRAWING SUBMITTALS BASED ON THE ROOFING MANUFACTURER'S STANDARD DETAILS

ROOF PLAN LEGEND

SLOPE X"/1'-0" MIN.	ROOF SLOPE DIRECTION
	CRICKET
VTR	VENT THROUGH ROOF,REFER TO MECHANICAL DWG'S
HP	HIGH POINT
LP	LOW POINT
DS	DOWNSPOUT
OFS	OVERFLOW SCUPPER

A1 ROOF PLAN
Scale: 1/8" = 1'-0"

N Plan

0' 48" 96" 192"
SCALE: 1/8" = 1' - 0"

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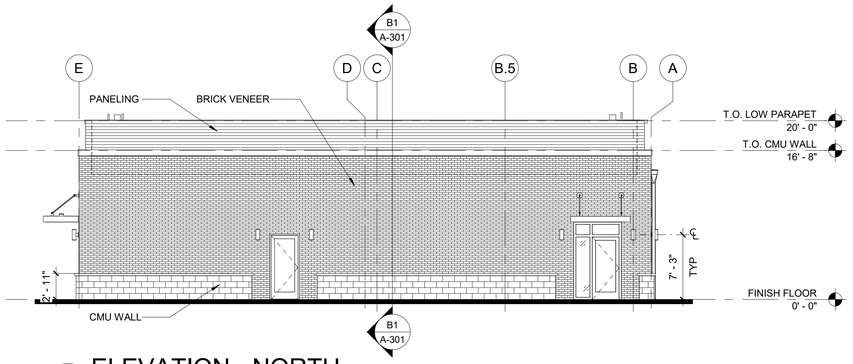
ROOF PLAN

PROJECT NO. 50150343

A-104

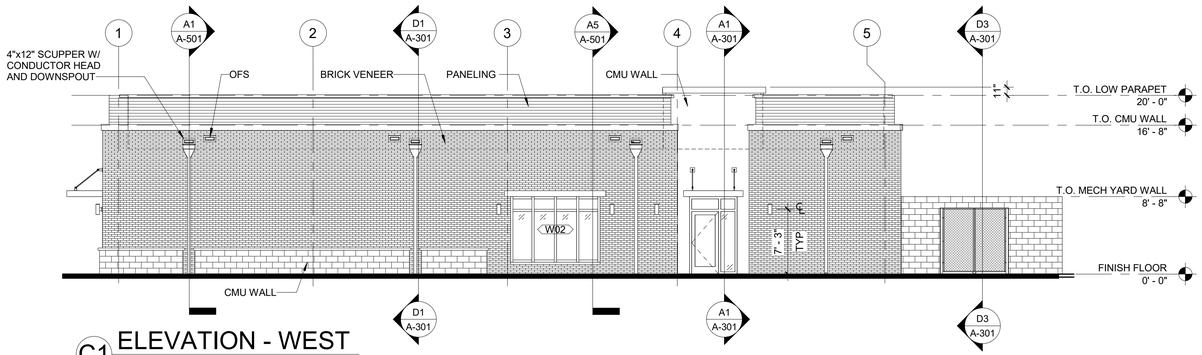
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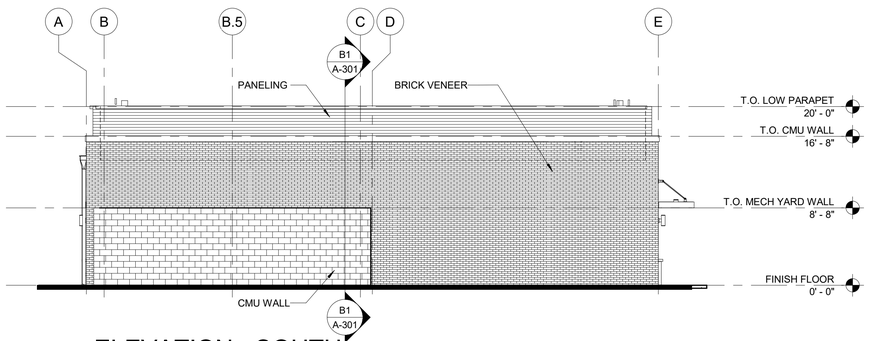
D1 ELEVATION - NORTH

Scale: 1/8" = 1'-0"



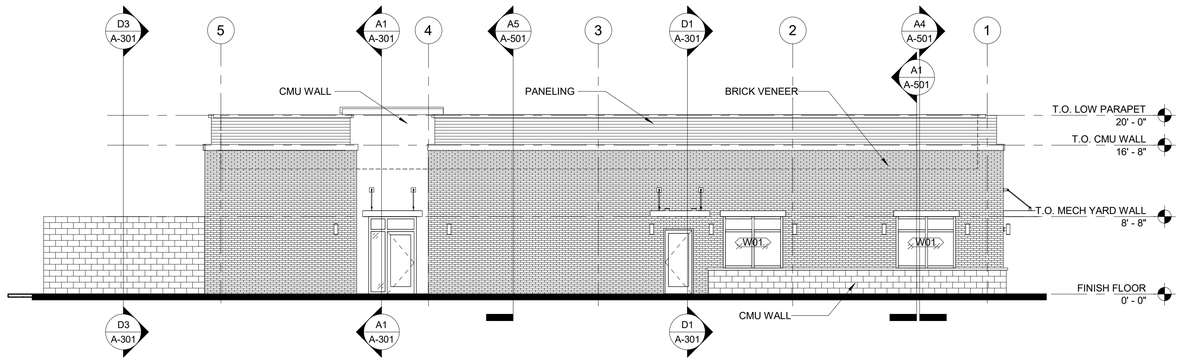
C1 ELEVATION - WEST

Scale: 1/8" = 1'-0"



B1 ELEVATION - SOUTH

Scale: 1/8" = 1'-0"



A1 ELEVATION - EAST

Scale: 1/8" = 1'-0"

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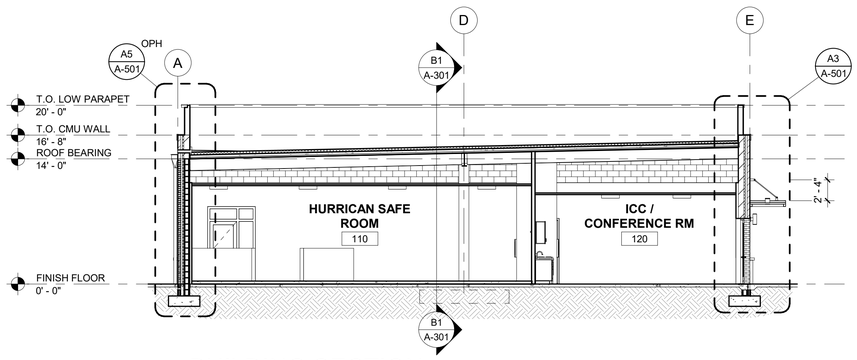
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EXTERIOR ELEVATIONS

PROJECT NO. 50150343

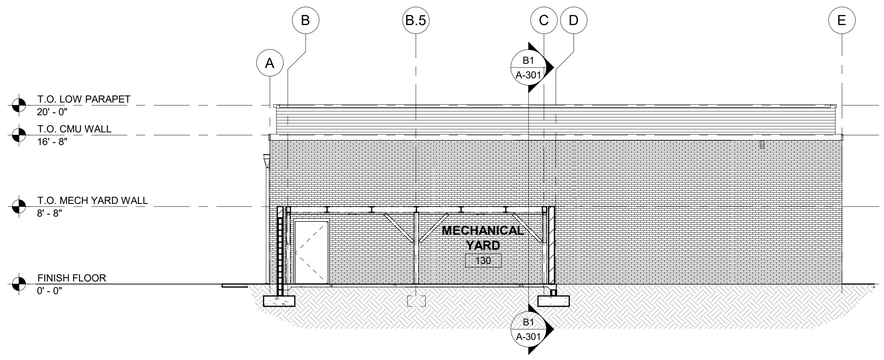
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SHEET NO.



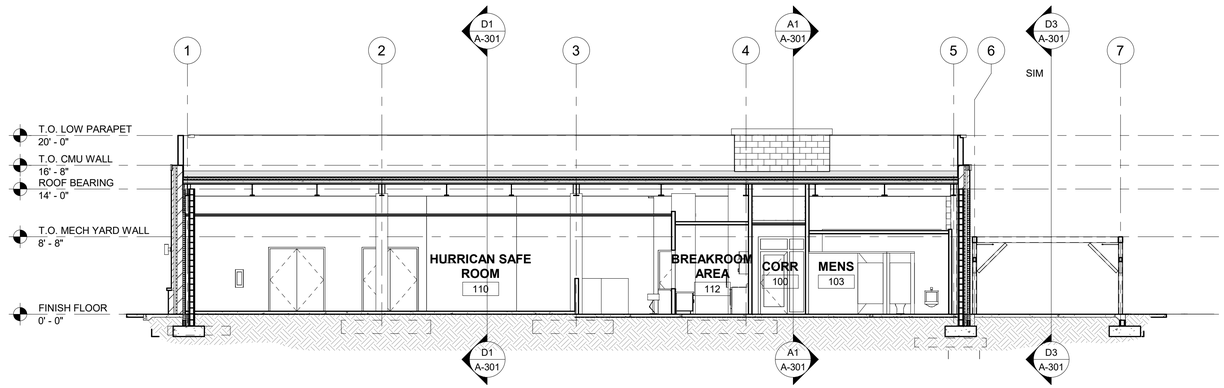
D1 BUILDING SECTION

Scale: 1/8" = 1'-0"



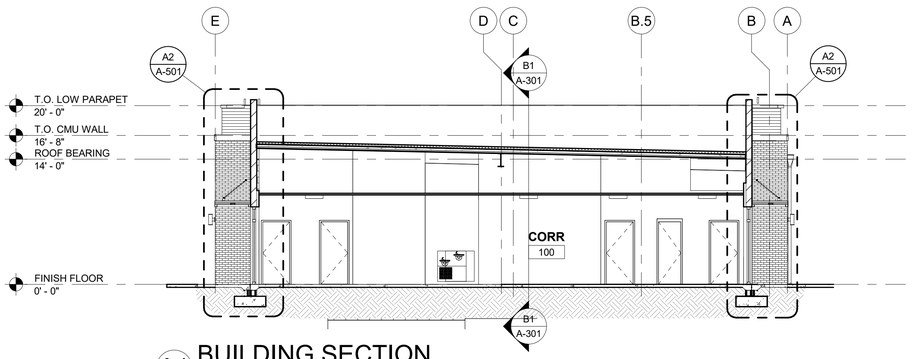
D3 BUILDING SECTION

Scale: 1/8" = 1'-0"



B1 BUILDING SECTION

Scale: 1/8" = 1'-0"



A1 BUILDING SECTION

Scale: 1/8" = 1'-0"

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KEYNOTES PER SHEET	
NOTE	DESCRIPTION

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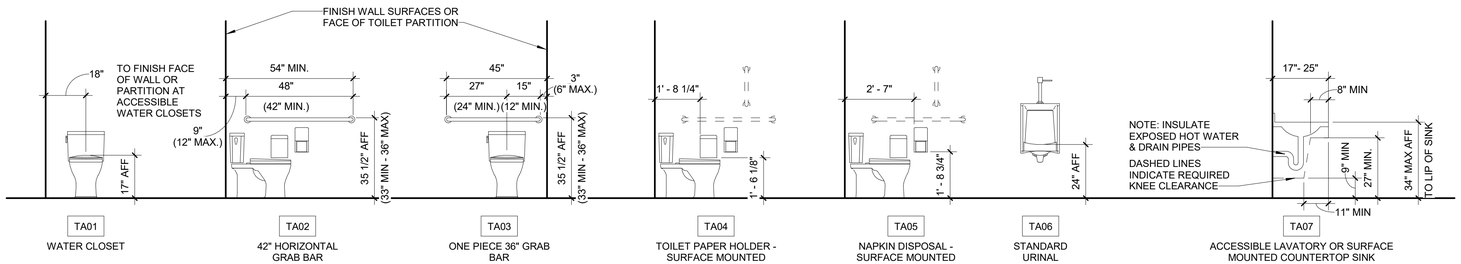
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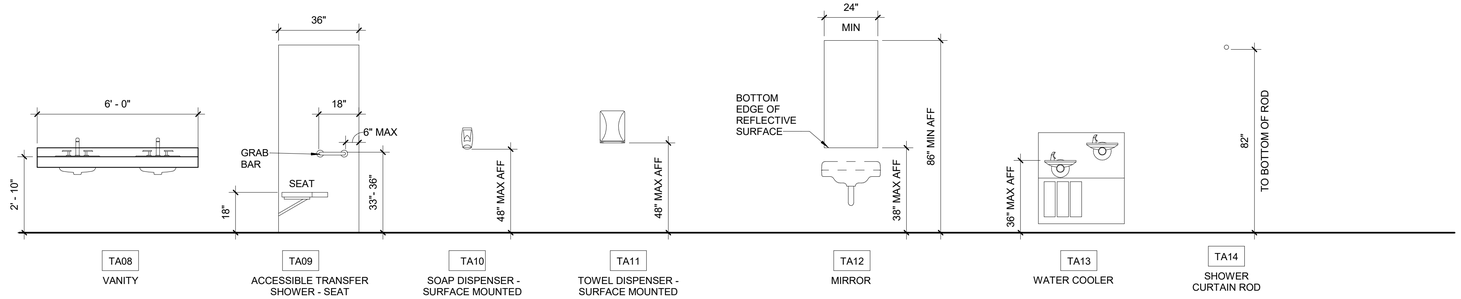
BUILDING SECTIONS

PROJECT NO. 50150343

A-301

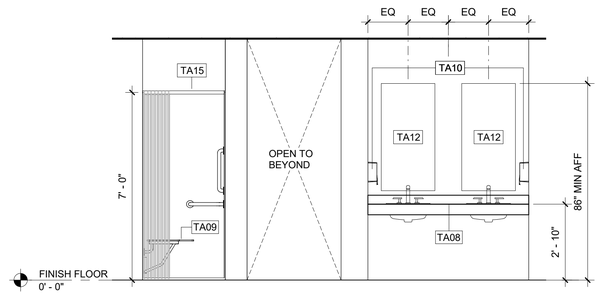
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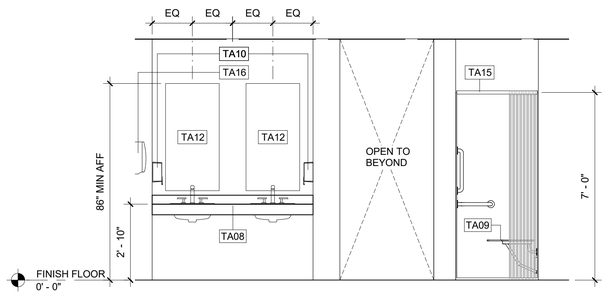


SPECIALTY EQUIP. SCHEDULE			
TYPE MARK	DESCRIPTION	MANUFACTURER	MODEL
TA01	WATER CLOSET		
TA02	42" HORIZONTAL GRAB BAR		
TA03	36" HORIZONTAL GRAB BAR		
TA04	TOILET PAPER HOLDER - SURFACE MOUNTED		
TA05	NAPKIN DISPOSAL - SURFACE MOUNTED		
TA06	STANDARD URINAL		
TA07	ACCESSIBLE LAVATORY OR SURFACE MOUNTED COUNTERTOP SINK		
TA08	VANITY		
TA09	ACCESSIBLE TRANSFER SHOWER - SEAT WALL		
TA10	SOAP DISPENSER - SURFACE MOUNTED		
TA11	TOWEL DISPENSER - SURFACE MOUNTED		
TA12	MIRROR		
TA13	WATER COOLER		
TA14	SHOWER CURTAIN ROD		

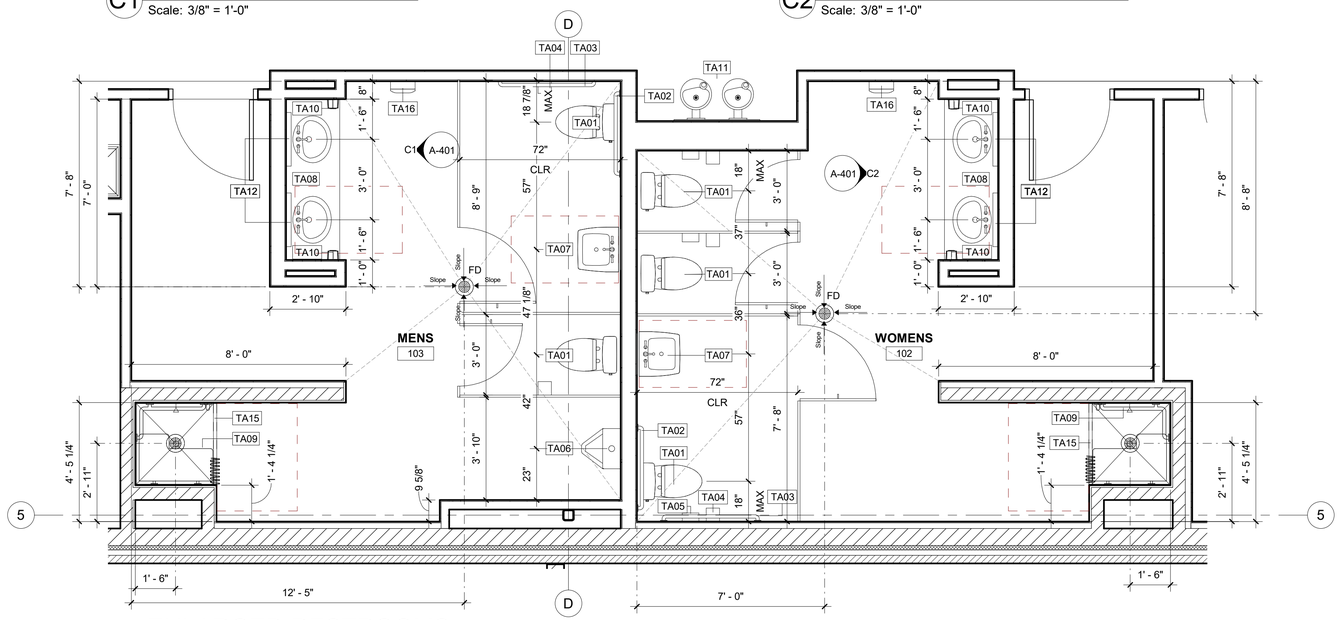
NOTE: ALL TOLIET ACCESSORIES ARE CONTRACTOR FURNISHED AND CONTRACTOR INSTALLTED.



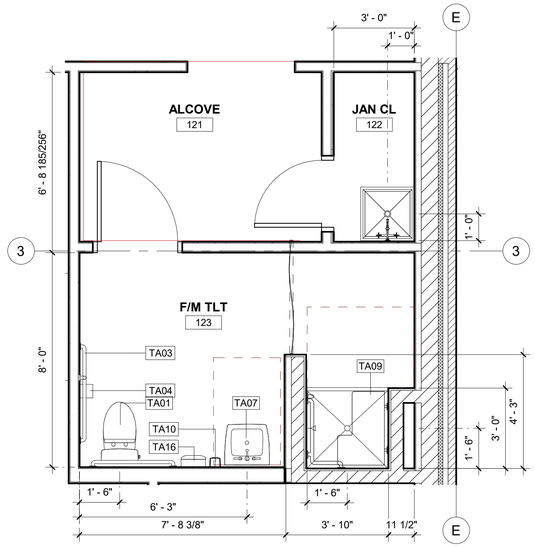
C1 MEN'S RR ELEVATION
Scale: 3/8" = 1'-0"



C2 WOMEN'S RR ELEVATION
Scale: 3/8" = 1'-0"



A1 ENLARGED RESTROOMS
Scale: 3/8" = 1'-0"



A3 ENLARGED F/M RESTROOM
Scale: 3/8" = 1'-0"

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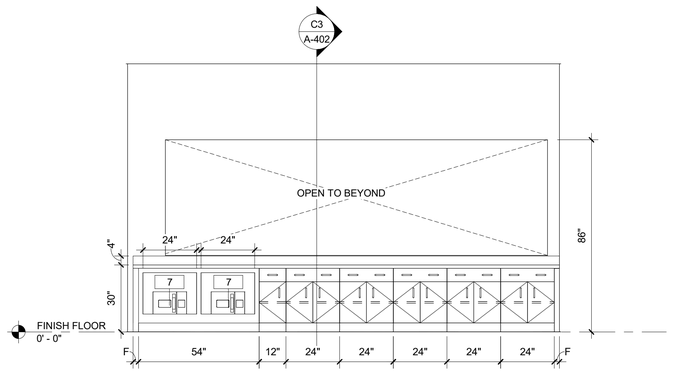
RESTROOM PLANS AND ELEVATIONS

PROJECT NO. 50150343

A-401

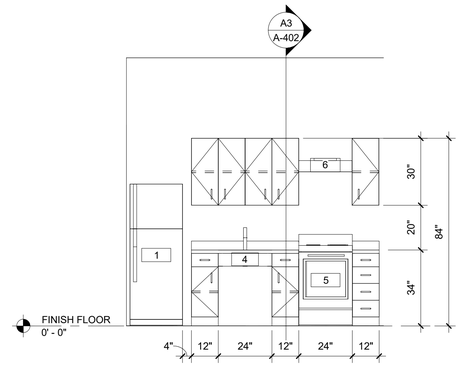
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D1 INTERIOR ELEVATION

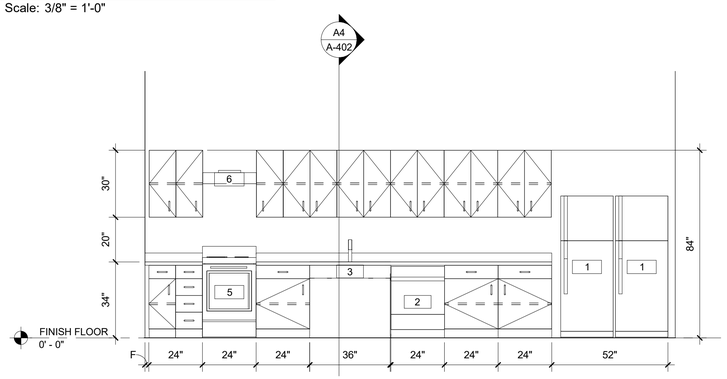
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D3 INTERIOR ELEVATION

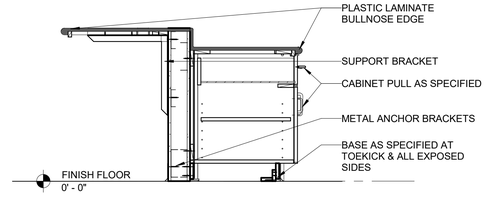
Scale: 3/8" = 1'-0"

EQUIPMENT/FURNITURE SCHEDULE		
TYPE MARK	DESCRIPTION	FURNISHED/ INSTALLED
1	REFRIGERATOR	
2	DISHWASHER	
3	UNDERMOUNT DOUBLE SINK	
4	UNDERMOUNT SINGLE SINK	
5	RANGE	
6	RANGE HOOD	
7	MICROWAVE OVEN	
8	STOOL CHAIR	
9	BRUER CHAIR	
10	BOAT CONFERENCE TABLE	



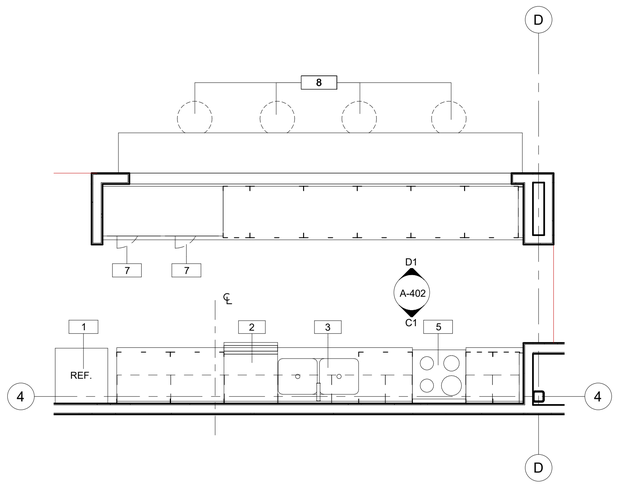
C1 INTERIOR ELEVATION

Scale: 3/8" = 1'-0"



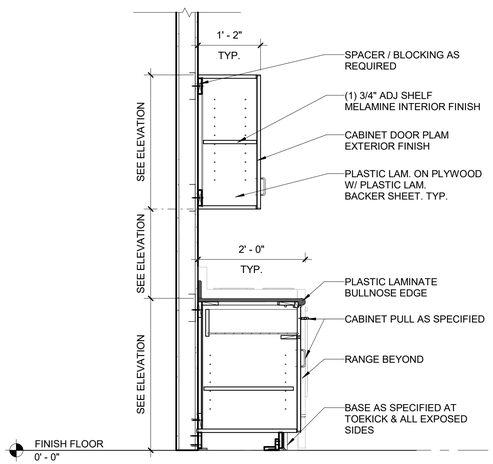
C3 BREAK ROOM MILLWORK

Scale: 3/4" = 1'-0"



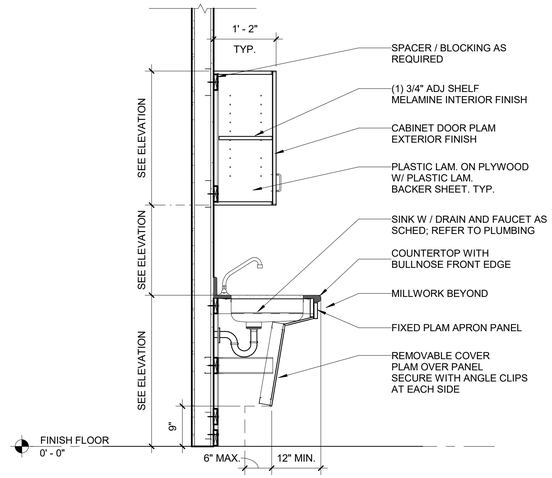
A1 ENLARGED KITCHEN

Scale: 3/8" = 1'-0"



A3 COFFEE STATION MILLWORK

Scale: 3/4" = 1'-0"



A4 BREAK ROOM MILLWORK

Scale: 3/4" = 1'-0"

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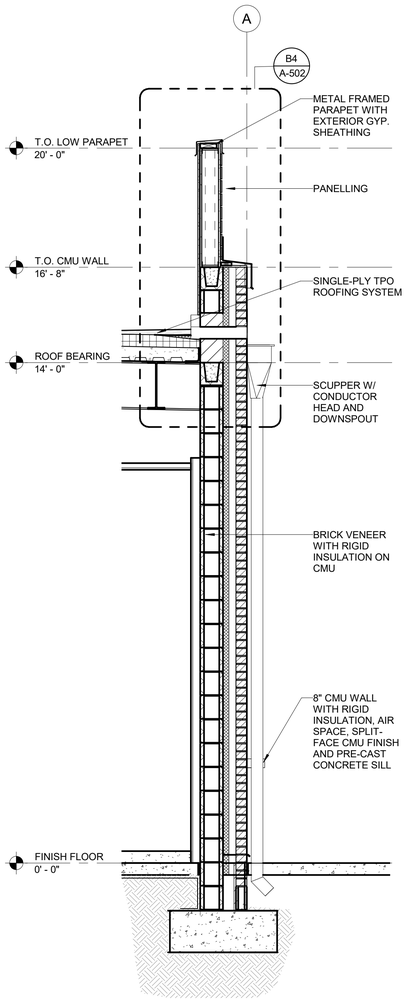
MILLWORK PLANS, ELEVATIONS, AND DETAILS

PROJECT NO. 50150343

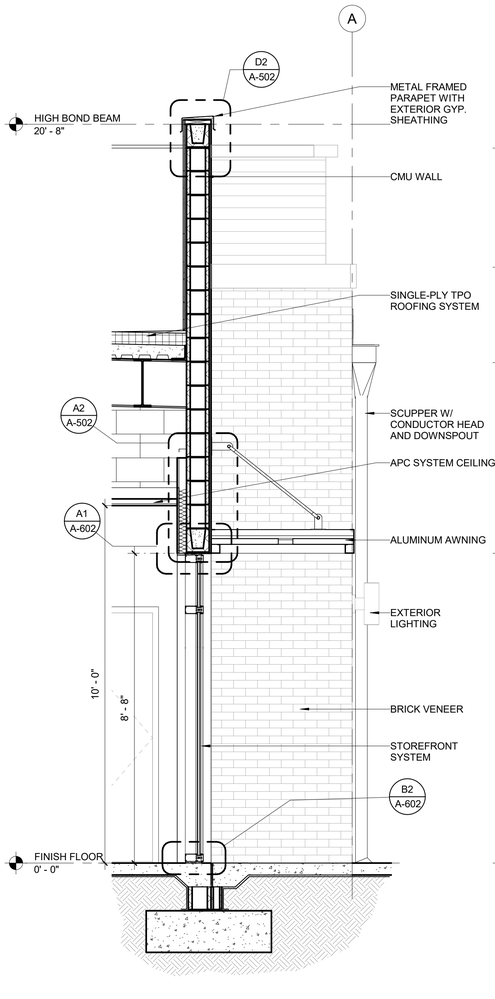
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SHEET NO.

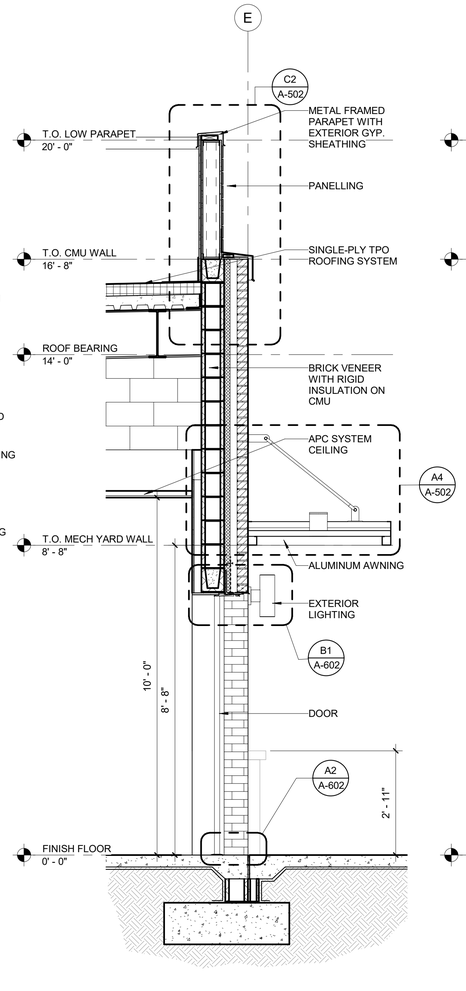
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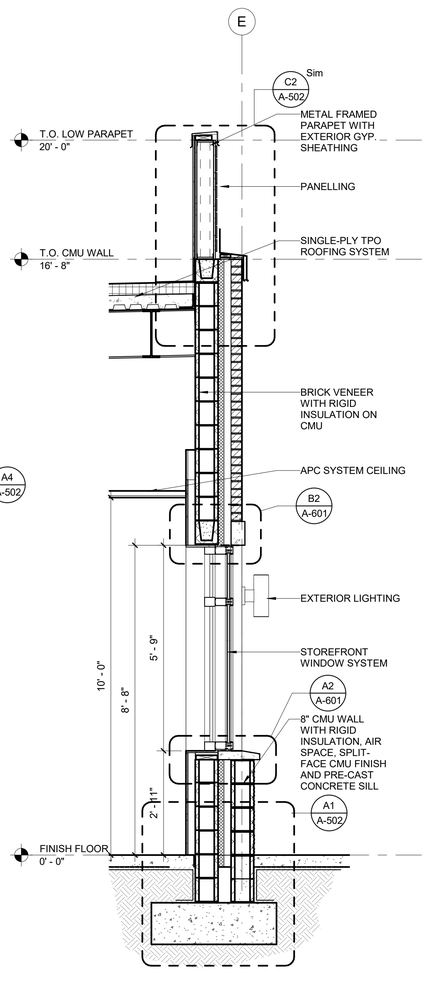
A1 WALL SECTION
Scale: 1/2" = 1'-0"



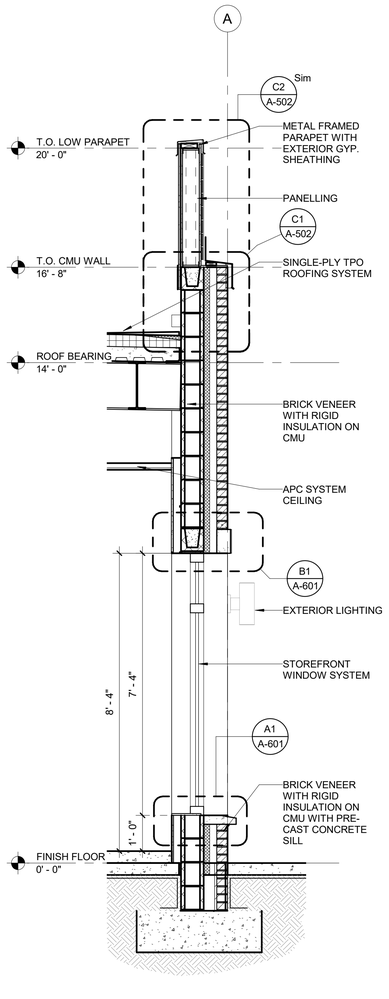
A2 WALL SECTION
Scale: 1/2" = 1'-0"



A3 WALL SECTION
Scale: 1/2" = 1'-0"



A4 WALL SECTION
Scale: 1/2" = 1'-0"



A5 WALL SECTION
Scale: 1/2" = 1'-0"

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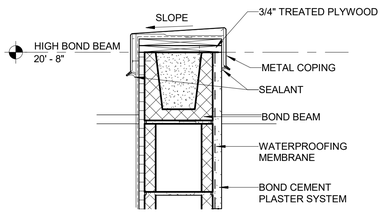
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WALL SECTIONS

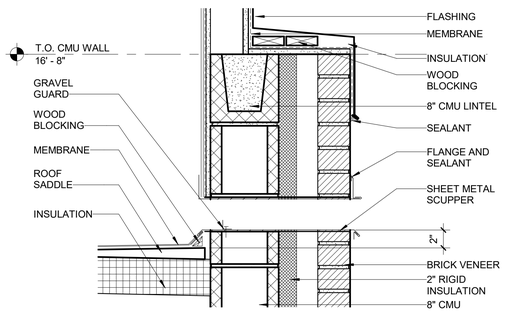
PROJECT NO. 50150343

A-501

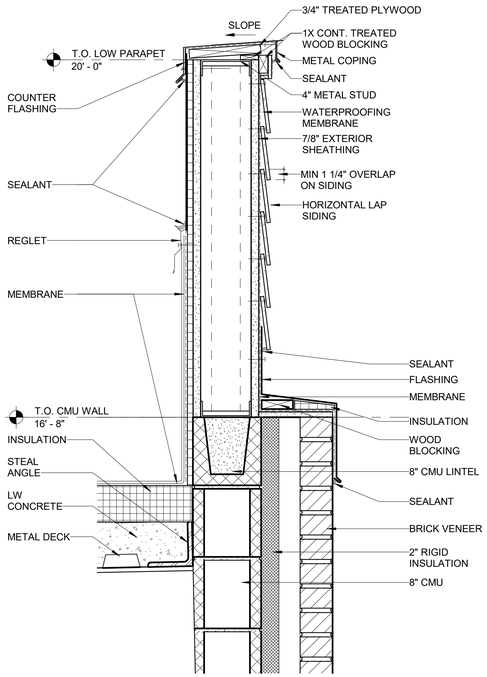
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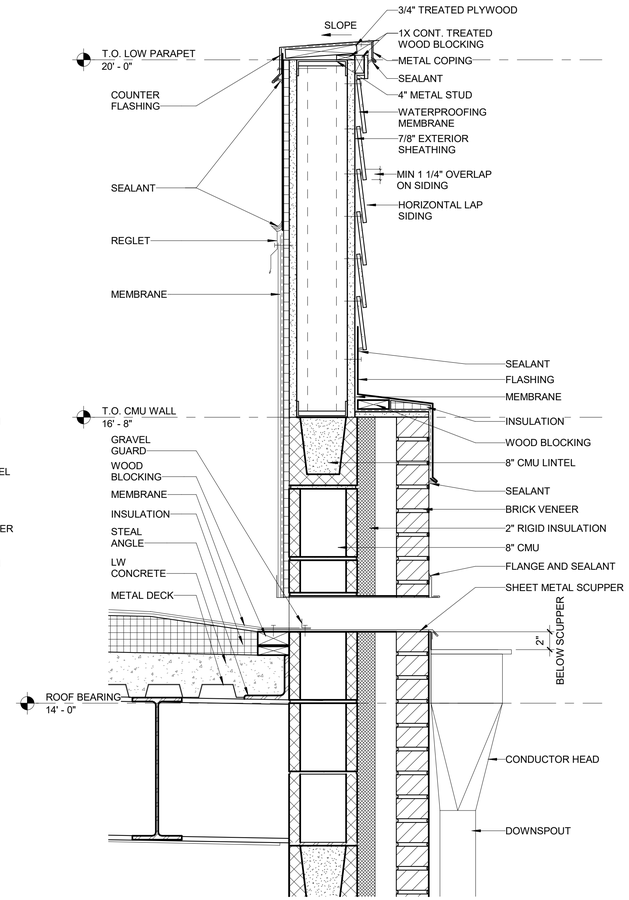
D2 PARAPET @ ENTRY
Scale: 1 1/2" = 1'-0"



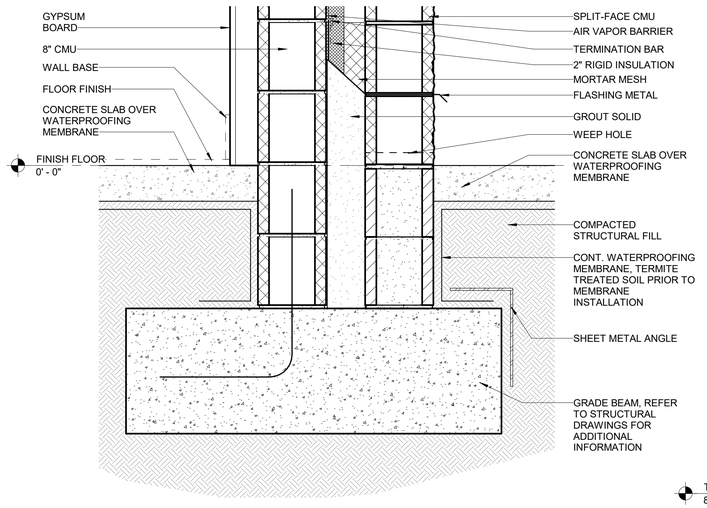
C1 OVERFLOW SCUPPER
Scale: 1 1/2" = 1'-0"



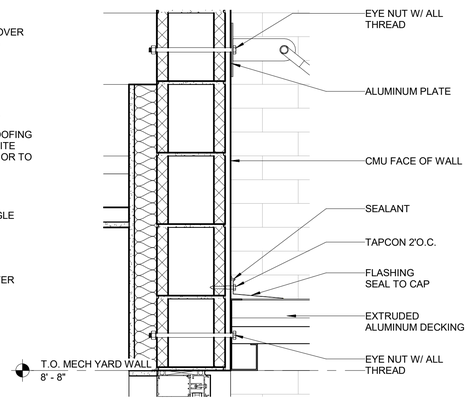
C2 PARAPET DETAIL TYP.
Scale: 1 1/2" = 1'-0"



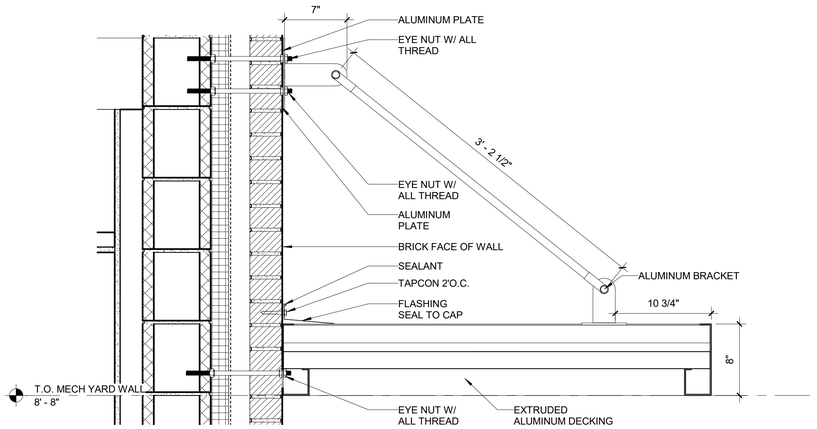
B4 PARAPET DETAIL @ SCUPPER
Scale: 1 1/2" = 1'-0"



A1 FOUNDATION @ SPLIT-FACE
Scale: 1 1/2" = 1'-0"



A2 ALT. AWNING @ STUCCO
Scale: 1 1/2" = 1'-0"



A4 AWNING @ BRICK VENEER
Scale: 1 1/2" = 1'-0"

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Suite 1000
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407.843.5120

GULF COAST ELECTRICAL CO-OP

GCEC HURRICANE SAFE ROOM

722 WEST HIGHWAY 22
WEWAHITCHKA, FL 32465
100% DESIGN

SEAL

STATE OF FLORIDA
JULIAN M. MARTINEZ
AR94996
REGISTERED ARCHITECT

FOR REVIEW ONLY

SCALE

REVISIONS

NO.	DESCRIPTION	DATE

DRAWN BY	AC
APPROVED BY	ZM
CHECKED BY	AC
DATE	2.6.24

TITLE

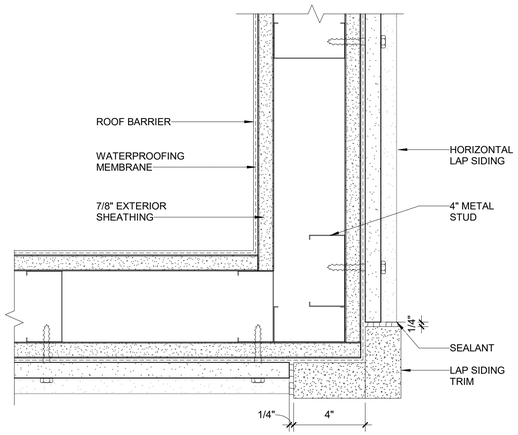
WALL DETAILS

PROJECT NO. 50150343

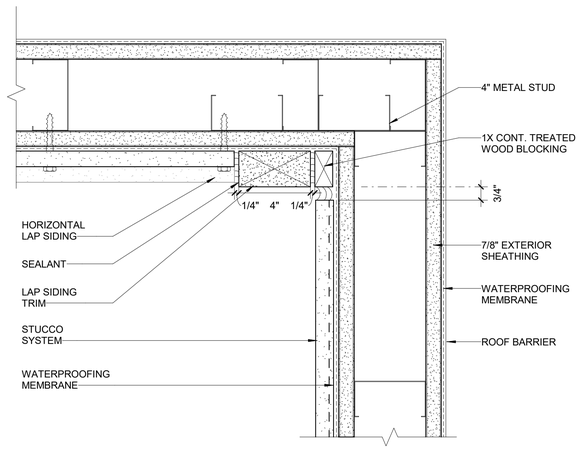
A-502

SHEET NO.

2/6/2024 12:39:43 PM



A1 OUTSIDE CORNER PLAN DETAIL
Scale: 3" = 1'-0"



A2 INSIDE CORNER PLAN DETAIL
Scale: 3" = 1'-0"

2/6/2024 12:39:44 PM

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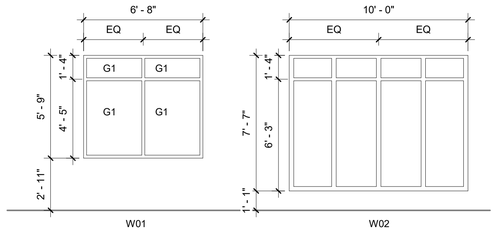
TITLE

PLAN DETAILS

PROJECT NO. 50150343

A-503

SHEET NO.



E1 WINDOW ELEVATION

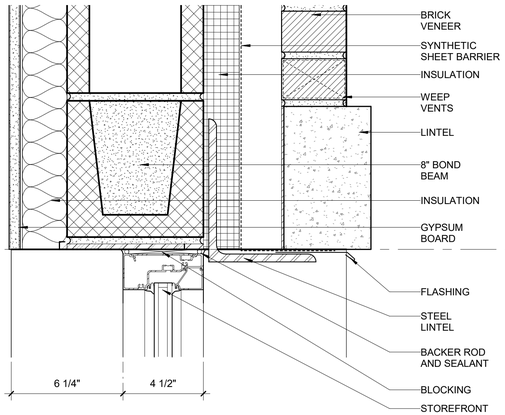
Scale: 1/4" = 1'-0"

GLAZING GENERAL NOTES:

1. ALL GLAZING TO BE TEMPERED, U.N.O.
2. ALL INSULATED UNITS TO HAVE LOW-E COATING, U.N.O.
3. REFER TO DOOR SCHEDULE AND WINDOW TYPES FOR LOCATION OF GLAZING TYPES.
4. DIMENSIONS SHOWN ARE NOMINAL AND MAY NEED ADJUSTMENT BASED ON SYSTEM SHIM AND DEFLECTION REQUIREMENTS. FIELD MEASURE OPENINGS PRIOR TO FABRICATION OF GLAZING TYPES.
5. REFER TO SPECIFICATIONS FOR DETAILED DESCRIPTIONS OF GLAZING TYPES.

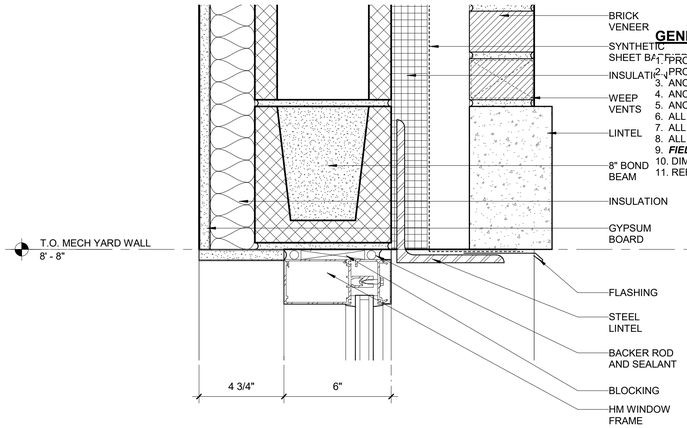
GLAZING SCHEDULE

G1	1/4" CLEAR, SAFETY GLASS
G2	1/4" TINTED, SAFETY GLASS
G3	1" CLEAR, INSULATED UNIT
G4	1" TINTED, INSULATED UNIT
G5	I" SPANDREL, INSULATED UNIT
G6	1/4" CLEAR, LAMINATED GLASS
G7	1/4" TINTED, LAMINATED GLASS
G8	I" CLEAR, INSULATED LAMINATED UNIT
G9	I" TINTED, INSULATED LAMINATED UNIT
G10	1" SPANDREL, INSULATED LAMINATED UNIT
G11	<OTHER>
SG-1	1/2" LAMINATED POLYCARBONATE
SG-2	15/16" LAMINATED GLASS-CLAD POLYCARBONATE
SG-3	1 3/8" LAMINATED GLASS-CLAD POLYCARBONATE
SG-4	1 1/4" MULTI-PLY POLYCARBONATE
SG-5	1 1/4" INSULATED, GLASS-CLAD POLYCARBONATE
SG-6	<OTHER>



B1 STOREFRONT HEAD DETAIL

Scale: 3" = 1'-0"

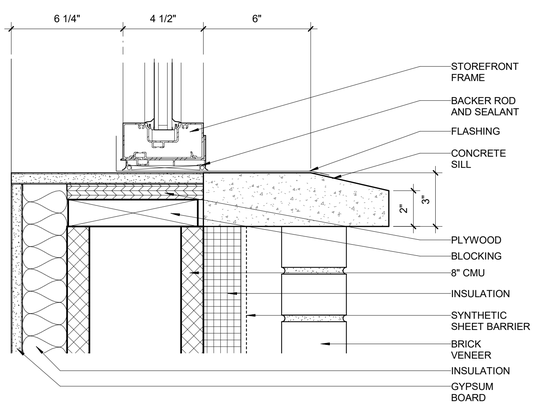


B2 WINDOW HEAD DETAIL

Scale: 3" = 1'-0"

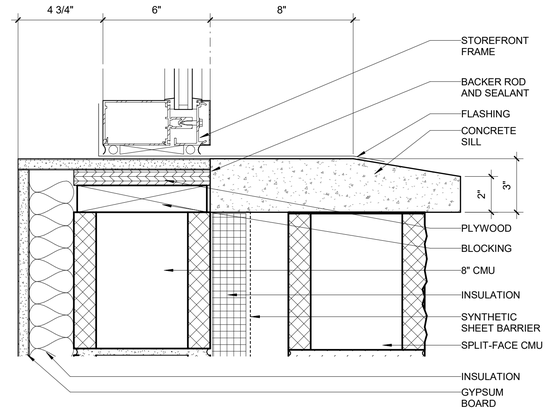
GENERAL NOTES - DOORS AND WINDOWS

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3. ANCHORS AT MASONRY SHALL BE 12 GA. GALVANIZED STEEL PERFORATED, T-SHAPED, ADJUSTABLE, 10" LONG, AT 16" O.C.
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9. ***FIELD MEASURE ALL OPENINGS PRIOR TO FABRICATION OF GLAZING TYPES.***
10. DIMENSIONS SHOWN ON DOOR AND WINDOW ELEVATIONS ARE NOMINAL AND MAY NEED ADJUSTMENT BASED ON SYSTEM SHIM AND DEFLECTION REQUIREMENTS.
11. REFER TO DOOR AND WINDOW ELEVATIONS FOR LOCATION OF GLAZING TYPES.



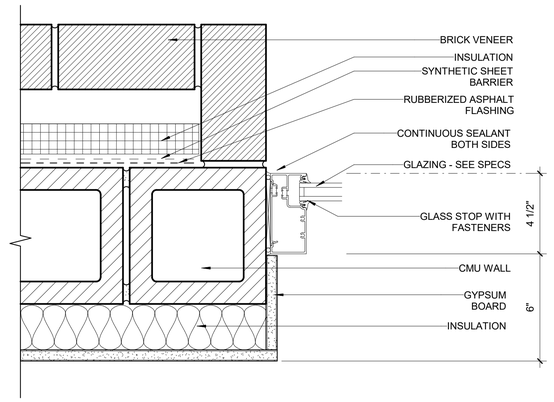
A1 STOREFRONT SILL DETAIL

Scale: 3" = 1'-0"



A2 WINDOW SILL DETAIL

Scale: 3" = 1'-0"



A4 WINDOW JAMB DETAIL

Scale: 3" = 1'-0"

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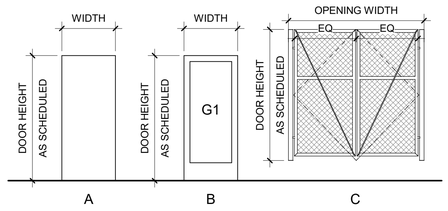
WINDOW SCHEDULE AND DETAILS

PROJECT NO. 50150343

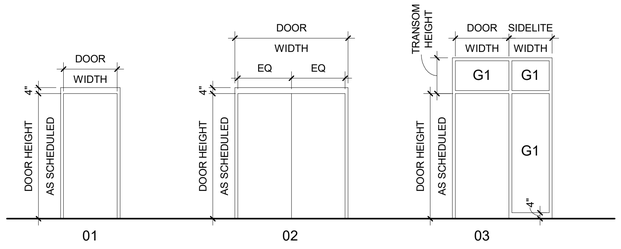
A-601

SHEET NO.

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E1 DOOR PANEL TYPES
Scale: 1/4" = 1'-0"

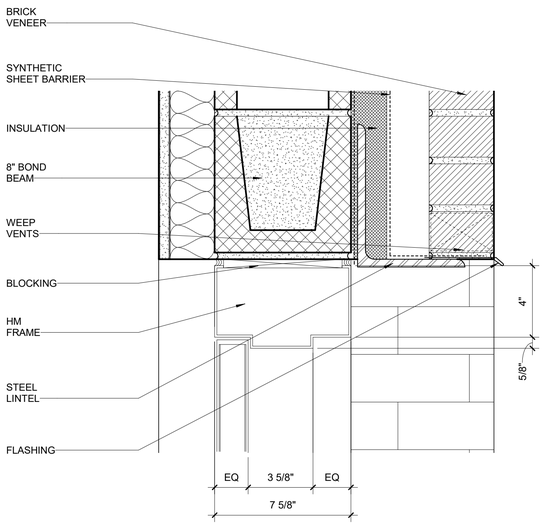


E2 DOOR FRAME TYPES
Scale: 1/4" = 1'-0"

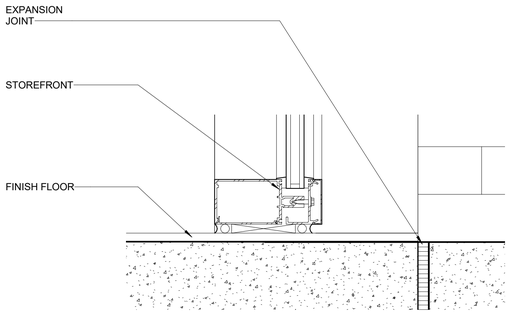
DOOR NUMBER	DOOR						FRAME				DETAILS				
	SIZE														
	LEAF QTY	WIDTH	HEIGHT	THICKNESS	TYPE	MATERIAL	TYPE	MATERIAL	SIDELIGHT WIDTH	TRANSOM HEIGHT	HEAD	JAMB	SILL	FIRE LABEL	HARDWARE
100A	1	3' - 0"	7' - 0"	1 3/4"	FG / HG	AL		AL	2' - 1"	1' - 8"					
100B	1	3' - 0"	7' - 0"	1 3/4"	FG / HG	AL		AL	2' - 1"	1' - 8"					
101	1	3' - 0"	7' - 0"	1 3/4"	A	HCW	01	HM							
102	1	3' - 0"	7' - 0"	1 3/4"	A	HCW	01	HM							
103	1	3' - 0"	7' - 0"	1 3/4"	A	HCW	01	HM							
104	1	2' - 6"	7' - 0"	1 3/4"	A	HCW	01	HM							
105A	1	3' - 0"	7' - 0"	1 3/4"	A	HCW	01	HM							
105B	1	3' - 8"	7' - 0"	1 3/4"	A	HM	01	HM							
107	1	3' - 0"	7' - 0"	1 3/4"	A	HCW	01	HM							
110A	2	3' - 0"	7' - 0"	1 3/4"	A	HCW	02	HM							
110B	1	3' - 0"	7' - 0"	1 3/4"	FG / HG	AL		AL	2' - 1"	1' - 8"					
111A	2	3' - 0"	7' - 0"	1 3/4"	A	HCW	02	HM							
111B	2	3' - 0"	7' - 0"	1 3/4"	A	HCW	02	HM							
113	1	3' - 0"	7' - 0"	1 3/4"	A	HCW	01	HM							
118	1	2' - 6"	7' - 0"	1 3/4"	A	HCW	01	HM							
120A	1	3' - 0"	7' - 2"	1 3/4"	FG / HG	AL		AL							
120B	1	3' - 0"	7' - 2"	1 3/4"	FG / HG	AL		AL							
122	1	2' - 6"	7' - 0"	1 3/4"	A	HCW	01	HM							
123	1	3' - 0"	7' - 0"	1 3/4"	A	HCW	01	HM							
130	2	3' - 6"	7' - 4"	1 3/4"	C	CL	-	AL							

GENERAL NOTES - DOORS AND WINDOWS

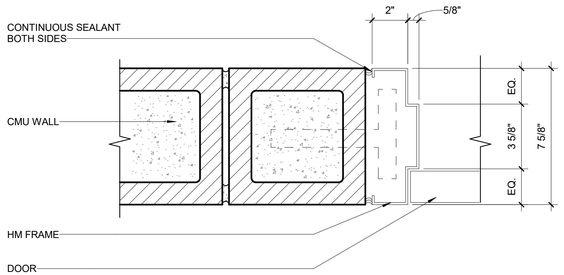
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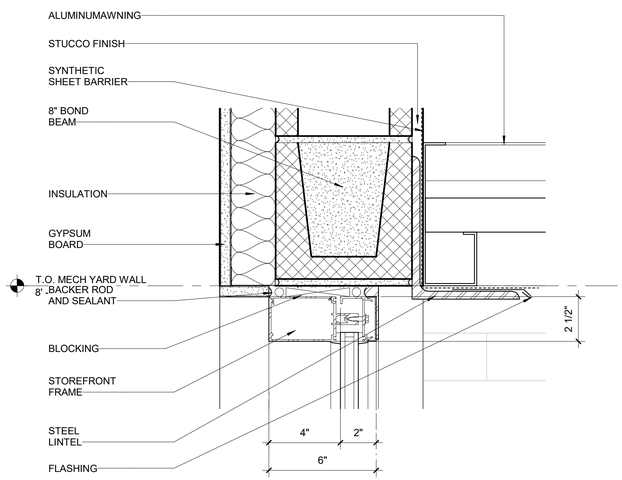
B1 DOOR HEAD DETAIL TYP.
Scale: 3" = 1'-0"



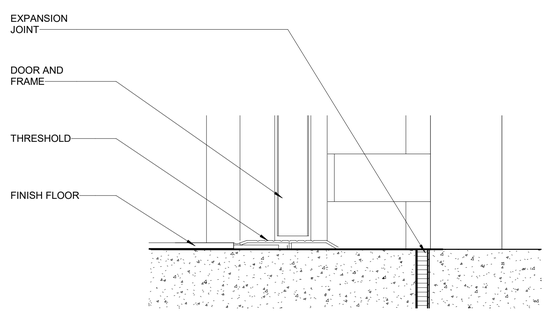
B2 THRESHOLD 1 DETAIL
Scale: 3" = 1'-0"



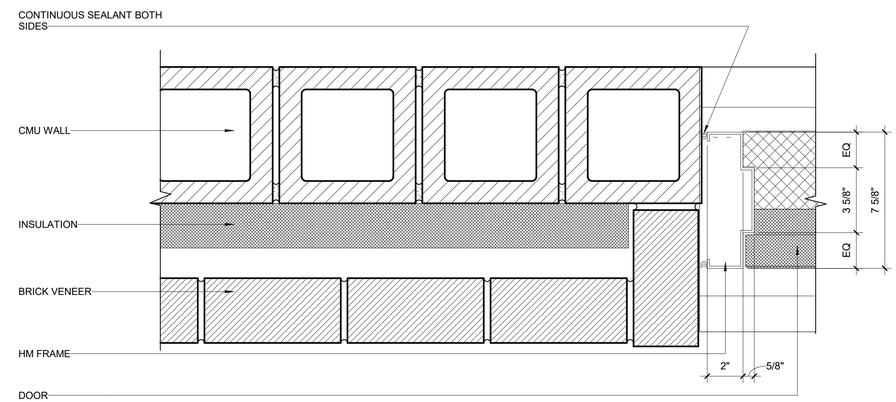
B4 INTERIOR DOOR JAMB
Scale: 3" = 1'-0"



A1 DOOR HEAD DETAIL @ ENTRY
Scale: 3" = 1'-0"



A2 THRESHOLD 3 DETAIL
Scale: 3" = 1'-0"



A4 EXTERIOR DOOR JAMB
Scale: 3" = 1'-0"

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TITLE

DOOR SCHEDULE AND DETAILS

PROJECT NO. 50150343

A-602

SHEET NO.

2/6/2024 12:39:45 PM

PLUMBING SYMBOL LEGEND

SYMBOL	DESCRIPTION
	NEW PIPING
	EXISTING PIPING
	DEMOLISHED PIPING
CW	COLD WATER PIPING
HW	110° HOT WATER PIPING
HWR	HOT WATER RETURN PIPING
SAN U/G	SANITARY DRAINAGE PIPING (UNDERGROUND)
SAN	SANITARY DRAINAGE PIPING (ABOVE SLAB)
STO	STORM OVERFLOW (SECONDARY)
ST	STORM (PRIMARY)
ST U/G	STORM PIPING (UNDERGROUND)
V	VENT PIPING
CD	CONDENSATE PIPING
OR	CLEANOUTS
	PIPE END CAP
	PIPE TURNING DOWN
	PIPE TURNING UP
	PIPE TURNING DOWN (TEE)
	PIPING TEE
	ROLL DOWN
	P-TRAP
	FLOW ARROW
HB-1 OR WHY-1	HOSE BIBB / WALL HYDRANT
	PRESSURE GAUGE
	CIRCULATING PUMP
	BALL VALVE
	CALIBRATING BALANCING VALVE
	BUTTERFLY VALVE
	UNION
	STRAINER
	CONTROL VALVE
	PSI REG.
	PSI REG.
	CHECK VALVE
	FLOW SWITCH
	FLEX CONNECTION
	THREE-WAY CONTROL VALVE
	THERMOMETER
	RELIEF VALVE
	VALVE ON RISER
	TEST PLUG
	FLOW SWITCH
	PRESSURE SWITCH
	GLOBE VALVE
	AUTOMATIC AIR VENT

SYMBOL	DESCRIPTION
A / 1	PLUMBING RISER DESIGNATION: A = RISER IDENTIFYING SYSTEM TYPE 1 = RISER IDENTIFYING SYSTEM NUMBER
A / B SIM	SECTION SYMBOL: A = IDENTIFYING LETTER B = SHEET WHERE SECTION IS SHOWN SIM = SIMILAR (ONLY NOTED IF IT APPLIES)
A	TITLE SYMBOL ON SHEET WHERE SHOWN A = IDENTIFYING NUMBER/LETTER
1	REVISION CLOUD AND REVISION NUMBER
1	SHEET NOTE CALLOUT
	GATE VALVE
	BALL VALVE
	CIRCUIT SETTER VALVE
	CHECK VALVE
	THERMOSTATIC MIXING VALVE
	PRESSURE REGULATING VALVE
	BUTTERFLY VALVE
PDI-"A"	WATER HAMMER ARRESTER & SIZE

WATER HAMMER ARRESTOR

SYMBOL	PIPE SIZE	PDI STANDARD	FIXTURE UNIT CAP.
	1/2"	A	1 TO 11
	3/4"	B	12 TO 32
	1"	C	33 TO 60
	1-1/4"	D	61 TO 113

NOTE: SOME SYMBOLS SHOWN ON THIS LEGEND MAY NOT PERTAIN TO THIS PROJECT

PLUMBING ABBREVIATIONS

ABBR.	DESCRIPTION
ABV	AUTOMATIC BALANCING VALVE
ADA	AMERICANS WITH DISABILITIES ACT
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
AP	ACCESS PANEL
AS	ABOVE SLAB
ASTM	AMERICAN STANDARDS TESTING MATERIALS
AWWA	AMERICAN WATER WORKS ASSOCIATION
BFP	BACKFLOW PREVENTER
BS	BELOW SLAB
BF	BELOW FLOOR
BG	BELOW GRADE
BV	BALL VALVE (SHUTOFF)
CA	COMPRESSED AIR
CD	CONDENSATE
CO	CLEANOUT
CONN	CONNECTION
CONT	CONTINUOUS
CP	CIRCULATING PUMP
CW	COLD WATER
DF	DRINKING FOUNTAIN
DFU	DRAINAGE FIXTURE UNITS
DIA	DIAMETER
DN	DOWN
DWG	DRAWING
DW	DOMESTIC WATER
ECO	EXTERIOR CLEANOUT
ELEV	ELEVATION
EQUIP	EQUIPMENT
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
EXIST	EXISTING
°F	DEGREES FAHRENHEIT
FCO	FLOOR CLEANOUT
FD	FLOOR DRAIN
FIN	FINISH
FL	FLOOR
FPS	FEET PER SECOND
FT	FEET
FU	FIXTURE UNITS
G	NATURAL GAS
GAL	GALLON(S)
GPM	GALLONS PER MINUTE
GR	GREASE WASTE
HB	HOSE BIBB
HP	HORSEPOWER
HR	HOUR
HW	HOT WATER
HWR	HOT WATER RETURN
HZ	HERTZ
IE	INVERT ELEVATION
ID	INTERNAL DIAMETER
IN	INCHES
IPS	INTERNATIONAL PIPE STANDARD
IRR	IRRIGATION WATER
KW	KILOWATT

ABBR.	DESCRIPTION
LAV	LAVATORY
LF	LINEAR FEET
MAX	MAXIMUM
MIN	MINIMUM
MNTG	MOUNTING
MS	MOP SINK
NA	NOT APPLICABLE
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NSF	NATIONAL SANITATION FOUNDATION
NTS	NOT TO SCALE
OD	OUTSIDE DIAMETER
ORWL	OVERFLOW RAIN WATER LEADER
PDI	PLUMBING DRAINAGE INSTITUTE
PH	PHASE
PPP	PRECISION PLUMBING PRODUCTS
PSI	POUNDS PER SQUARE INCH
RD	ROOF DRAIN
RPM	REVOLUTIONS PER MINUTE
RWL	RAIN WATER LEADER
S	SANITARY
SAN	SANITARY
SH	SHOWER
SK	SINK
SL	SODA LINE
SPEC	SPECIFICATION
SQ	SQUARE
SS	STAINLESS STEEL
STD	STANDARD
ST	STORM
TDH	TOTAL DYNAMIC HEAD
TEMP	TEMPERATURE
TET	THERMAL EXPANSION TANK
TMV	THERMOSTATIC MIXING VALVE
TP	TRAP PRIMER
TYP	TYPICAL
UL	UNDERWRITER'S LABORATORY
U/G	UNDERGROUND
UNO	UNLESS NOTED OTHERWISE
UR	URINAL
V	VENT
VTR	VENT THROUGH ROOF
VIV	VALVE IN VERTICAL
VLV	VALVE
VOL	VOLUME
W	WATTS
W/	WITH
WC	WATER CLOSET
WCO	WALL CLEANOUT
WHA	WATER HAMMER ARRESTOR
WHY	WALL HYDRANT
WFU	WATER SUPPLY FIXTURE UNITS

SHEET LIST

SHEET NUMBER	SHEET NAME
P-001	PLUMBING NOTES, LEGENDS, & SYMBOLS
PS101	GRAVITY PIPING PLANS
PP101	PRESSURE PIPING PLAN
P-501	PLUMBING DETAILS
P-502	PLUMBING DETAILS
P-601	PLUMBING ISOMETRICS
P-801	PLUMBING SCHEDULES

PLUMBING GENERAL NOTES

1. DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT OF SYSTEMS. PROVIDE COMPONENTS INDICATED IN DETAILS AND/OR RISER DIAGRAMS WHETHER OR NOT INDICATED ON PLANS AND VICE VERSA. WHERE A DISCREPANCY OR CONFLICT IS FOUND BETWEEN ONE DRAWING AND ANOTHER, OR BETWEEN A DRAWING AND APPLICABLE SPECIFICATIONS, NOTIFY THE ARCHITECT/ENGINEER IMMEDIATELY IN WRITTEN FORM. IN GENERAL, THE MOST STRINGENT REQUIREMENT SHALL GOVERN UNLESS THE DISCREPANCY CONFLICTS WITH APPLICABLE CODES OR OWNER'S DESIGN STANDARDS, WHEREIN THE CODE OR OWNER'S DESIGN STANDARDS SHALL GOVERN.
2. LOCATE VALVES IN ACCESSIBLE AREAS WHERE NECESSARY. (12"X12" MIN.)
3. COORDINATE ACTUAL LOCATIONS OF MECHANICAL FLOOR DRAINS WITH FINAL EQUIPMENT LOCATIONS ON SHOP DRAWINGS.
4. VENT PIPING SHOWN IS ONLY FOR DIAGRAMMATIC PURPOSES. COORDINATE VTRS WITH HVAC AIR INTAKES.
5. PROVIDE BACKWATER VALVES FOR CONDENSATE PIPING CONNECTIONS TO STORM SEWER.
6. ROUTE WATER HEATER T&P VALVE PIPING TO BUILDING EXTERIOR WHERE POSSIBLE. ALTERNATE DISCHARGE LOCATIONS WILL BE MOP SINKS OR ADJACENT FLOOR DRAINS ONLY.
7. PROVIDE PIPE MARKER FOR ALL PIPING ABOVE THE CEILING SPACES IN ACCORDANCE WITH DIVISION 22 SPECIFICATION SECTION. "IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT".
8. LABEL VALVES ABOVE CEILINGS AND IN CONCEALED SPACES AT CEILING TILE WITH METAL CEILING TACKS INDICATING VALVE # AND TYPE OF WATER. (i.e.; BLUE= COLD WATER, LETTERING CW VLV1-001).
9. PROVIDE AND INSTALL WATER WATER HAMMER ARRESTORS IN ACCORDANCE WITH PDI-WH201 IN ALL HW AND CW SUPPLY PIPING WITH QUICK CLOSING VALVES AS REQUIRED. AIR CHAMBERS ARE NOT ACCEPTABLE SUBSTITUTIONS.
10. PROVIDE THERMAL INSULATION FOR HOT WATER AND HOT WATER RETURN PIPING IN ACCORDANCE WITH THE ENERGY EFFICIENCY CODE FOR BUILDING CONSTRUCTION AND PER SPECIFICATIONS.
11. PROVIDE CLEANOUTS AT THE BASE OF EACH SANITARY STACK. SIZE CLEANOUTS TO MATCH THE PIPING SERVED. SPACE FLOOR CLEANOUTS AT 100'-0" MAX. ALSO PROVIDE CLEANOUTS IN HORIZONTAL CHANGE OF DIRECTION > 45°.
12. THE MANUFACTURERS OF EQUIPMENT SHOWN ARE THE BASIS OF DESIGN AND ARE THE OWNER'S PREFERRED MANUFACTURER OF CHOICE. SEE SPECIFICATION FOR OTHER ACCEPTABLE MANUFACTURERS.
13. FIRE CAULK AND SLEEVE PENETRATIONS THROUGH FIRE RATED ASSEMBLIES. REFER TO LIFE SAFETY PLANS FOR RATED ASSEMBLY LOCATIONS. REFER TO ARCHITECTURAL SHEETS FOR DETAILS AND UL ASSEMBLY NUMBERS.
14. REFER TO ARCHITECTURAL SHEETS FOR FIXTURE MOUNTING.
15. COORDINATE UNDERGROUND PIPING INVERT ELEVATIONS WITH STRUCTURAL FOOTING ELEVATIONS AND CIVIL INVERT CONNECTIONS PRIOR TO ANY UNDERGROUND PIPING INSTALLATIONS. IF FOOTINGS ARE IN CONFLICT AND WHERE A PIPING ROLL DOWN IS NOT POSSIBLE, COORDINATE WITH GENERAL CONTRACTOR FOR DROPS IN FOOTING AS REQUIRED.
16. COORDINATE CEILING PIPING AND ELEVATIONS IN SHOP DRAWINGS WITH ALL OTHER TRADES (I.E. HVAC, FIRE PROTECTION, ELECTRICAL, TELECOMM, STRUCTURAL, ETC.) PRIOR TO ANY INSTALLATION TO ENSURE PROPER CLEARANCES AND PENETRATIONS.
17. SLOPE SANITARY PIPING 2-1/2" OR LESS AT 1/4" PER FOOT. SLOPE SANITARY PIPING 3" AND LARGER AT 1/8" PER FOOT.
18. VALVES AND FITTINGS SHALL BE THE SAME SIZE AS THE PIPING WHERE THEY ARE LOCATED UNLESS NOTED OTHERWISE.
19. PROVIDE ALL NECESSARY SUPPORTING DEVICES FOR FIXTURES PER MANUFACTURER INSTALLATION INSTRUCTIONS.
20. PROVIDE ALL FLOOR DRAINS, FLOOR SINKS AND HUB DRAINS WITH DEEP SEAL P-TRAPS. ALL DRAINS NOT RECEIVING CONTINUOUS DISCHARGE SHALL BE PROVIDED WITH TRAP PRIMER CONNECTIONS TO ENSURE TRAP SEAL PROTECTION.
21. ROUGH-IN WASTE AND WATER SUPPLIES FOR FIXTURES AND PERFORM FINAL CONNECTIONS PER MANUFACTURER RECOMMENDATIONS.
22. THE CONTRACTOR SHALL BASE THEIR PROPOSAL UPON THE EQUIPMENT AS SCHEDULE OR SPECIFIED, USING THE MANUFACTURERS AND MODEL NUMBERS AS CALLED FOR IN THE SPECIFICATIONS AND SCHEDULED ON THE DRAWINGS. IF MORE THAN ONE MANUFACTURE OF EQUIPMENT IS SPECIFIED, ANY ONE OF THE MANUFACTURERS OF EQUIPMENT MAY BE USED IN THIS CONTRACTOR'S PROPOSAL. IF THE CONTRACTOR WISHES TO USE EQUIPMENT NOT SPECIFIED, THEY MUST SUBMIT SEPARATELY ON LETTERHEAD STATIONARY OF THE BIDDER AT THE TIME OF BIDDING THE EQUIPMENT THEY WOULD SUBSTITUTE AND THE COST TO BE ADDED OR TO BE DEDUCTED FROM THEIR PROPOSAL.
23. COMPLY WITH THE AMERICANS WITH DISABILITIES ACT (ADA) ACCESSIBILITY GUIDELINES FOR BUILDINGS AND FACILITIES.
24. ALL AUTOMATIC CONTROL, PROTECTIVE OR SIGNAL DEVICES REQUIRED FOR THE OPERATION SPECIFIED, SHALL BE PROVIDED WITH ANY CONTROL WIRING AND INSTALLED PER MANUFACTURERS REQUIREMENTS.
25. PROVIDE AN AIR GAP, WHEN REQUIRED BY CODE, SERVING INDIVIDUAL FIXTURES, DEVICES, APPLIANCES AND APPARATUS.
26. SHOP DRAWING SUBMITTALS SHALL BE FULLY COORDINATED PRIOR TO SUBMITTAL.
27. ALL PIPING SHALL BE INSTALLED AS HIGH AS POSSIBLE TO MAINTAIN CEILING HEIGHTS AS SHOWN ON ARCHITECTURAL DRAWINGS.

APPLICABLE CODES

1. FEMA P-361 GUIDANCE FOR COMMUNITY AND RESIDENTIAL SAFE ROOMS 2015 EDITION
2. ICC 500 ICC/NSSA STANDARD FOR THE DESIGN AND CONSTRUCTION OF STORM SHELTERS 2020 EDITION
3. FLORIDA BUILDING CODE: CONFORM IN STRICT COMPLIANCE TO THE FLORIDA BUILDING CODE (FBC) AND THE AMENDMENTS WHICH ARE ENFORCED BY THE LOCAL AUTHORITY HAVING JURISDICTION.
   A. FLORIDA BUILDING CODE - PLUMBING (FPC) 2023 EDITION
   B. FLORIDA BUILDING CODE - ENERGY CONSERVATION (FECC) 2023 EDITION
4. OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA)
5. AMERICANS WITH DISABILITIES ACT (ADA)
6. AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)
7. APPLICABLE REGULATORY REQUIREMENTS AND ADVISORY PRACTICES OF APPROPRIATE AUTHORITIES HAVING JURISDICTION (AHJs)
8. APPLICABLE STANDARDS, REGULATIONS, AND PRACTICES OF THE OWNER

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2/26/24

NICHOLAS O. KUGLER, P.E.
FL License #78501

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CHECKED BY NOK
DATE 2.6.24

TITLE

PLUMBING NOTES, LEGENDS, & SYMBOLS

PROJECT NO. 0122062

P-001

SHEET NO.

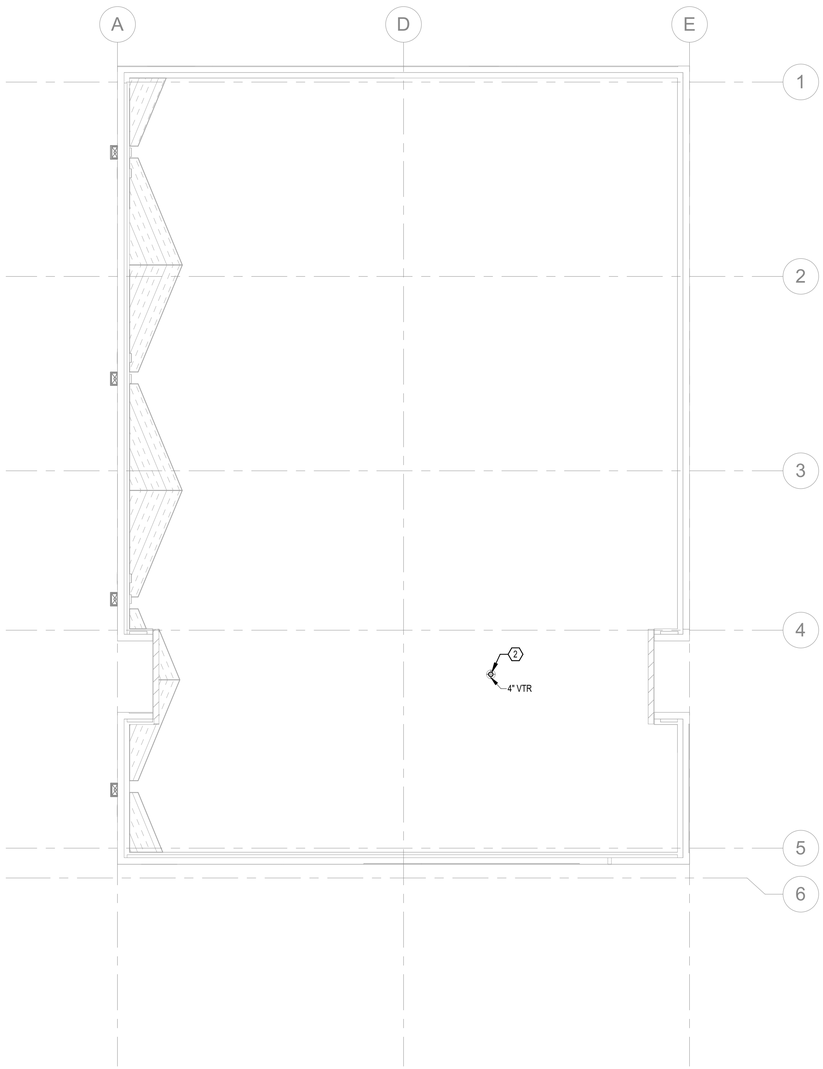
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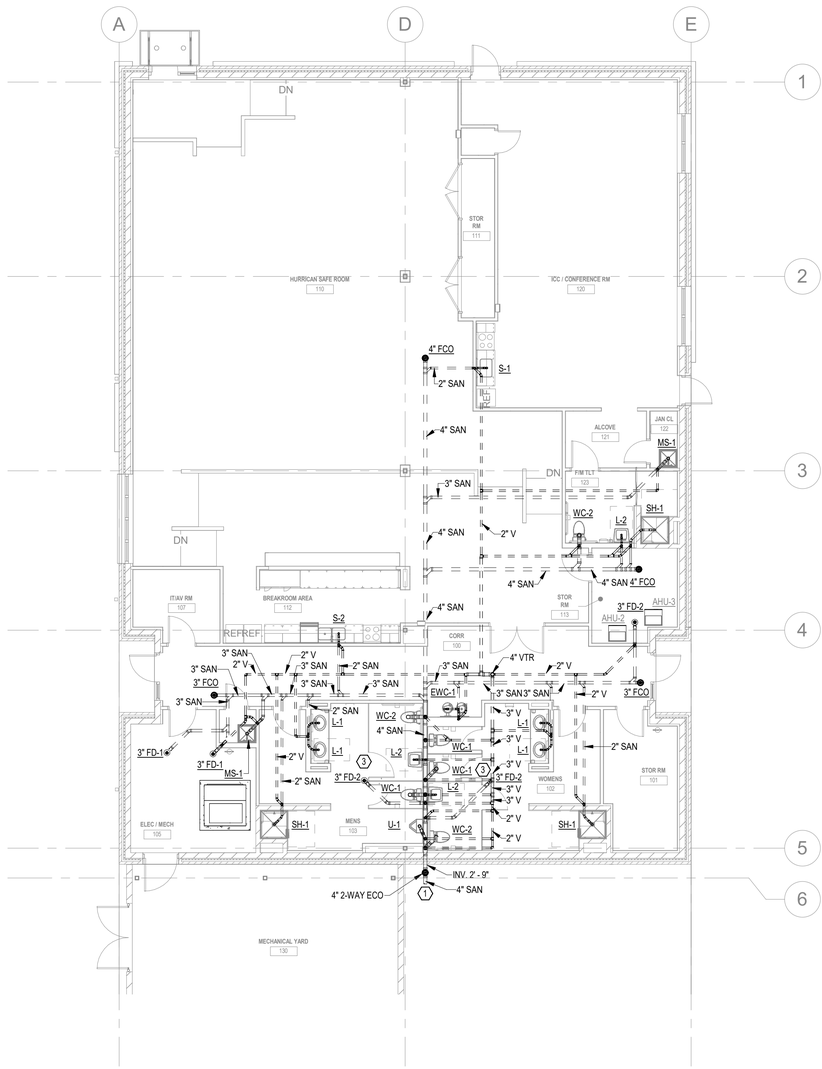
1. SLOPE ALL VENT PIPING BACK TO SANITARY MAIN.
2. REFER TO PLUMBING FIXTURE SCHEDULE FOR BRANCH PIPE SIZES.

CODED NOTES:

1. 4" SANITARY PIPNG TO SEWER MAIN. REFER TO CIVIL DRAWINGS FOR CONTINUATION. OFFSET PIPING AS REQUIRED AFTER CLEANOUT AS NECESSARY TO MATCH CIVIL INVERT.
2. PROVIDE HURRICANE RESISTANT ROOF VENT PENETRATION MEETING FEMA P-361 MISSILE IMPACT RATING. BASIS OF DESIGN: ROOF PENETRATION HOUSINGS - CVTR 2004.
3. COORDINATE EXACT FLOOR DRAIN LOCATION WITH ARCHITECTURAL PLANS.



2 PROPOSED GRAVITY PIPING ROOF PLAN
1/8" = 1'-0"



1 PROPOSED GRAVITY PIPING PLAN
1/8" = 1'-0"

N
0 4' 8' 16' 24'
1/8" = 1'-0"

2/27/2024 2:36:27 PM

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1/8" = 1'-0"

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TITLE

GRAVITY PIPING PLANS

PROJECT NO. 0122062

PS101

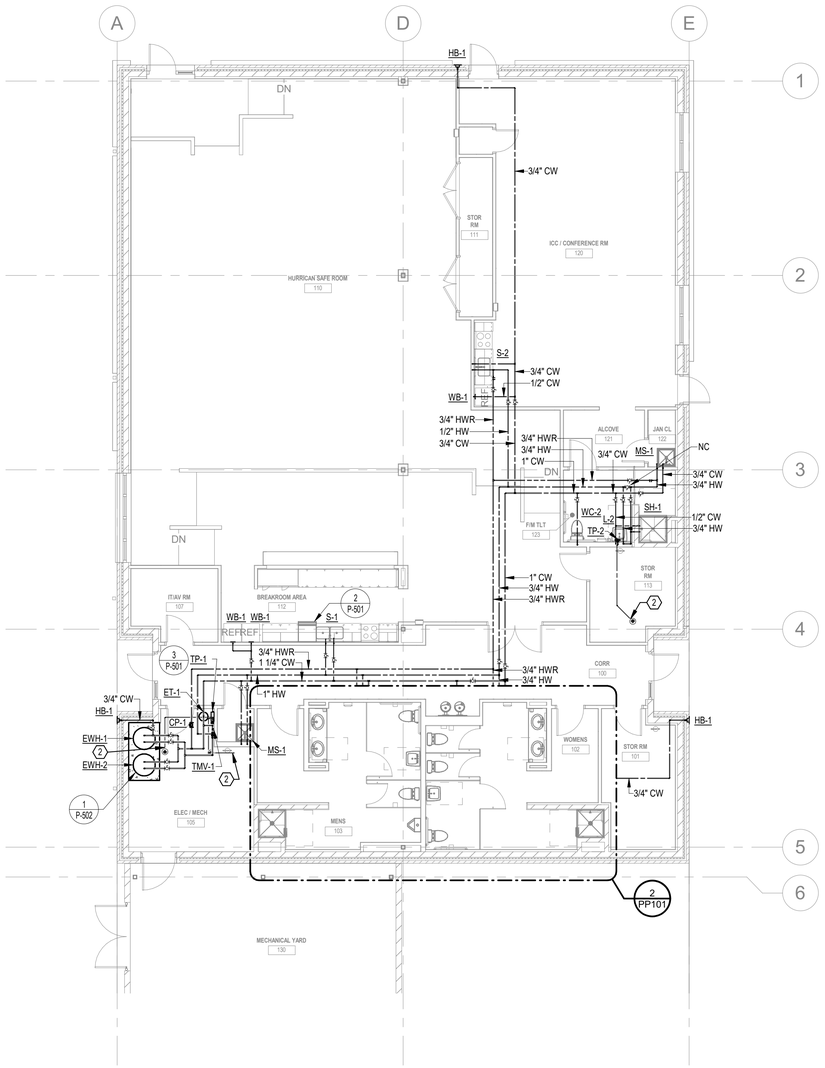
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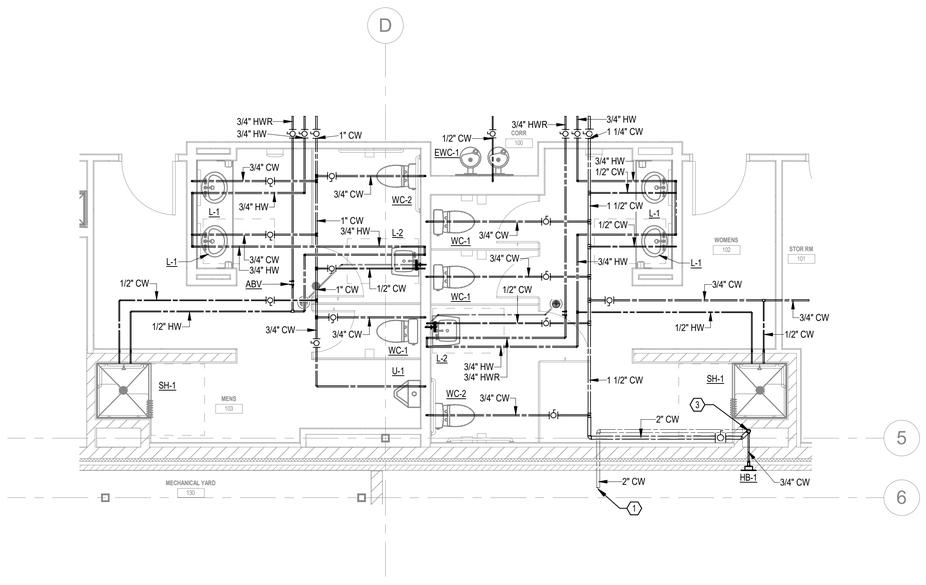
1. REFER TO PLUMBING FIXTURE SCHEDULE FOR ROUGH-IN PIPE SIZES.

CODED NOTES:

1. REFER TO CIVIL UTILITY PLAN C4 FOR CONTINUATION OF DOMESTIC WATER UTILITY SOURCE. REFER TO DETAILS ON CIVIL DETAIL PLAN CD4 FOR DETAILS ON WATER SERVICE ENTRY.
2. ROUTE 1/2" CW PIPING FROM TRAP PRIMER (TP-1) TO FLOOR DRAIN.
3. ROUTE 2" CW SERVICE LINE UNDERGROUND TO CHASE AND RISE UP ABOVE CEILING.



1 PROPOSED PRESSURE PIPING PLAN
1/8" = 1'-0"



2 ENLARGED PRESSURE PIPING PLAN - RESTROOMS
1/4" = 1'-0"

N

0 4' 8' 16' 24'
1/8" = 1'-0"

0 2' 4' 8' 12'
1/4" = 1'-0"

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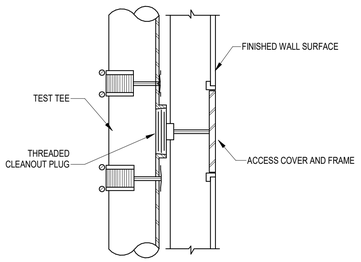
PRESSURE PIPING PLAN

PROJECT NO. 0122062

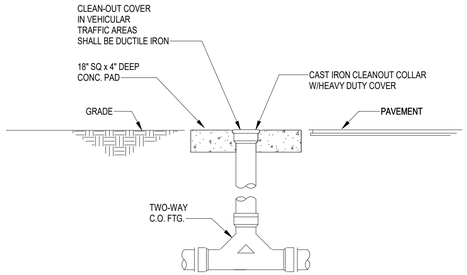
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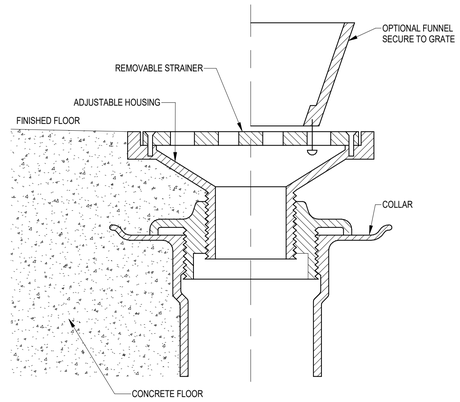
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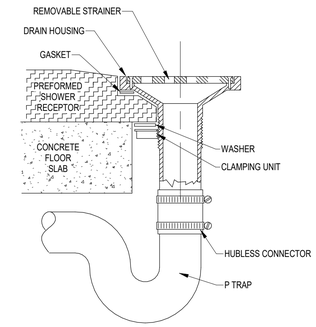
10 WALL CLEANOUT
N.T.S.



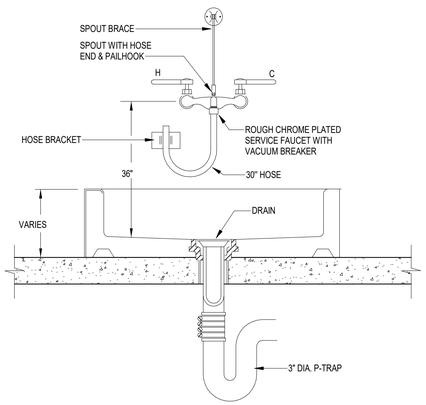
7 EXTERIOR CLEAN OUT DETAIL
N.T.S.



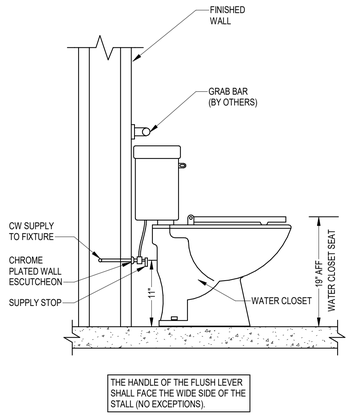
4 FLOOR DRAIN DETAIL
N.T.S.



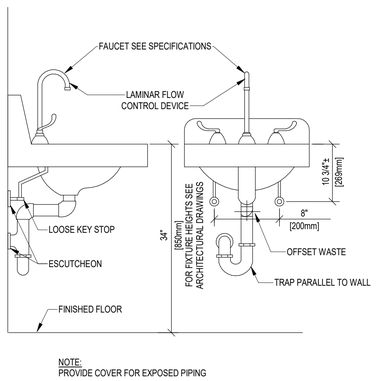
1 SHOWER DRAIN DETAIL
N.T.S.



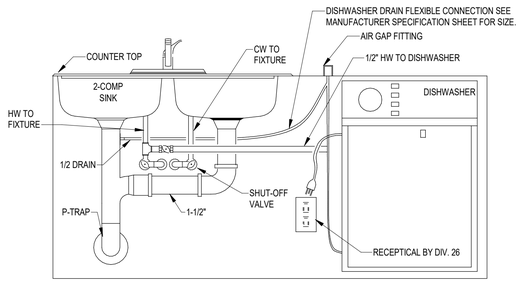
12 MOP SINK DETAIL
N.T.S.



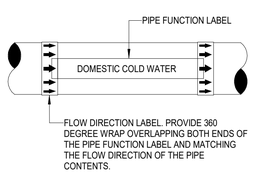
6 WATER CLOSET. TANK DETAIL
N.T.S.



5 TYPICAL WHEELCHAIR LAVATORY DETAIL
N.T.S.



2 DISHWASHER DETAIL
N.T.S.



DETAIL NOTES:

A. PROVIDE A PIPE LABEL FOR EACH PIPE FUNCTION.

B. PROVIDE AT LEAST ONE LABEL ON EACH PIPE FOR EVERY ROOM THE PIPE PASSES THROUGH.

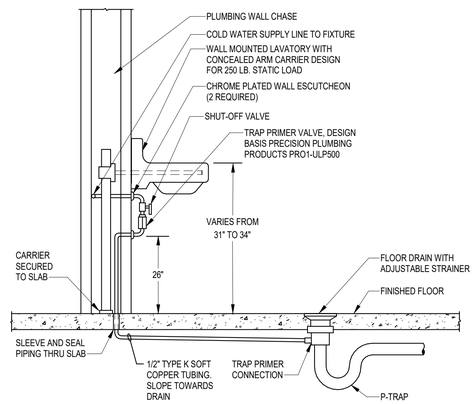
C. PROVIDE LABELS IN LARGE SPACES ON MAXIMUM 20' CENTERS FOR EVERY PIPE UNLESS OTHERWISE NOTED IN THE SPECIFICATIONS.

D. LABELS TO BE LOCATED IN AN EASILY VISIBLE LOCATION AS THEY WOULD NORMALLY BE SEEN. IE. ON THE BOTTOM HALF OF PIPES IN THE AIR AND ON THE TOP HALF OR SIDES OF PIPES MOUNTED LOW.

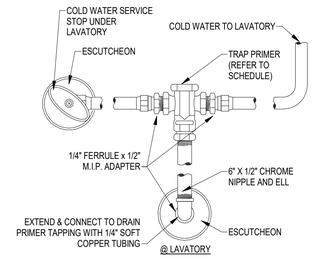
E. LABELS SHALL BE, COLOR CODED, PRE-PRINTED, SELF ADHESIVE VINYL.

F. SEE SPECIFICATION FOR OTHER REQUIREMENTS AND LIST OF PIPE FUNCTIONS.

9 PIPING IDENTIFICATION LABEL DETAIL
N.T.S.

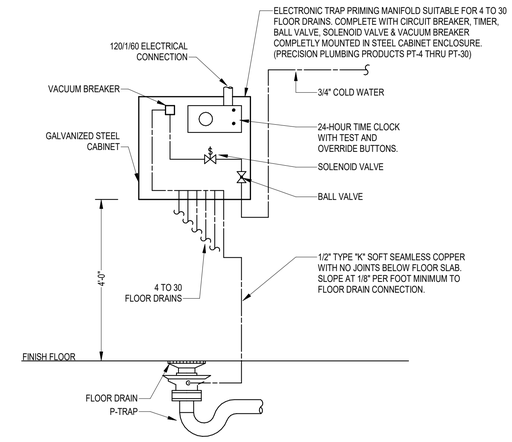


11 LAVATORY TRAP PRIMER DETAIL
N.T.S.



NOTE: ALL DRAINS OTHER THAN PARKING DRAINS IN THE BUILDING SHALL HAVE PRIMERS. DRAINS REMOTE FROM PLUMBING FIXTURES SHALL HAVE PRECISION PLUMBING MODEL P-1 OR P-2 PRIMER.

8 UNDER LAV TRAP PRIMER PIPING DETAIL
N.T.S.



3 ELECTRONIC TRAP PRIMER DETAIL
N.T.S.

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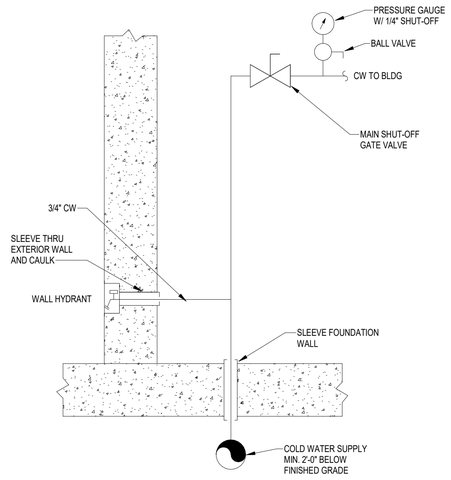
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PLUMBING DETAILS

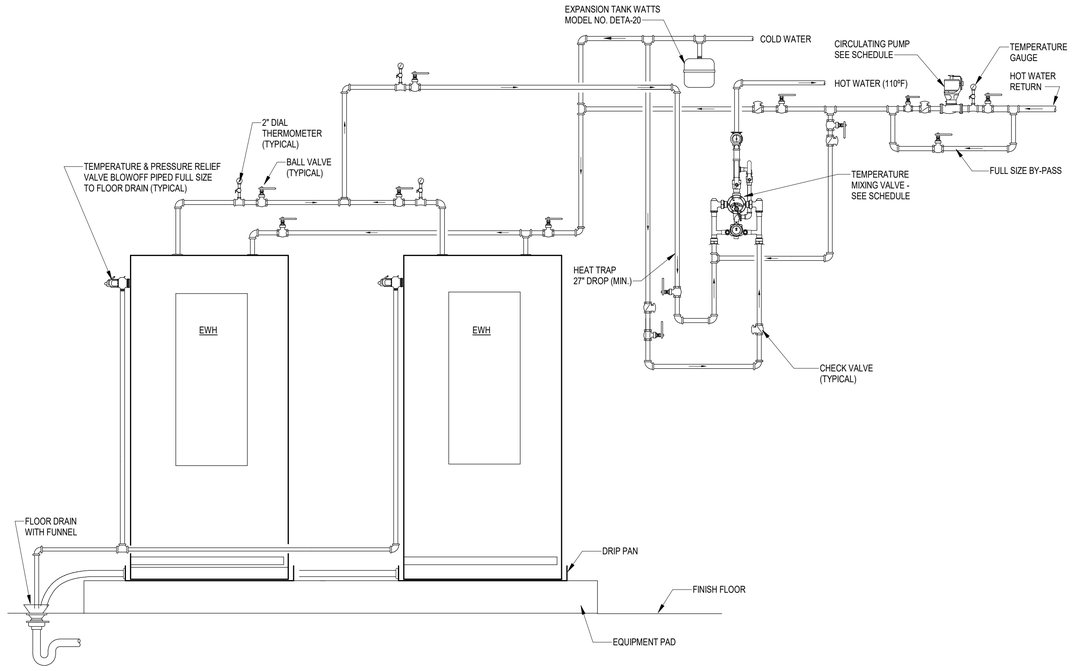
PROJECT NO. 0122062

P-501

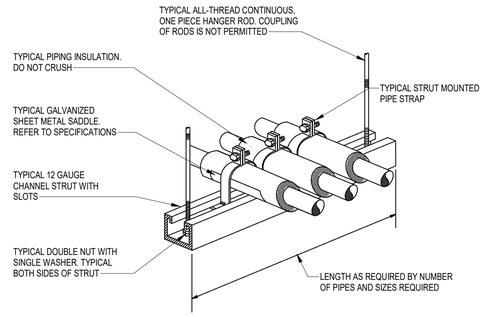
SHEET NO.



4 DOMESTIC WATER ENTRY DETAIL
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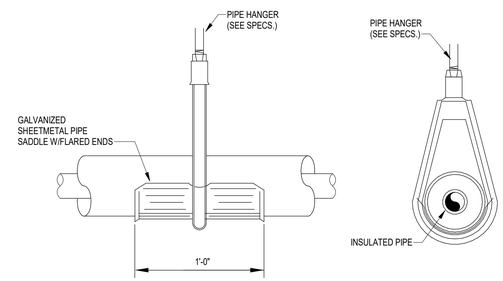


1 ELECTRIC WATER HEATER DETAIL
N.T.S.



NOTE:
1. REFER TO SPECIFICATIONS AND FLOOR PLANS FOR SPECIFIED HANGER ROD, STRUT, NUTS, WASHER, AND PIPE STRAPS SHALL BE OF GALVANIZED PLATED MATERIAL

3 TRAPEZE HANGER DETAIL
N.T.S.



2 INSULATED PIPE HANGER
N.T.S.

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PLUMBING DETAILS

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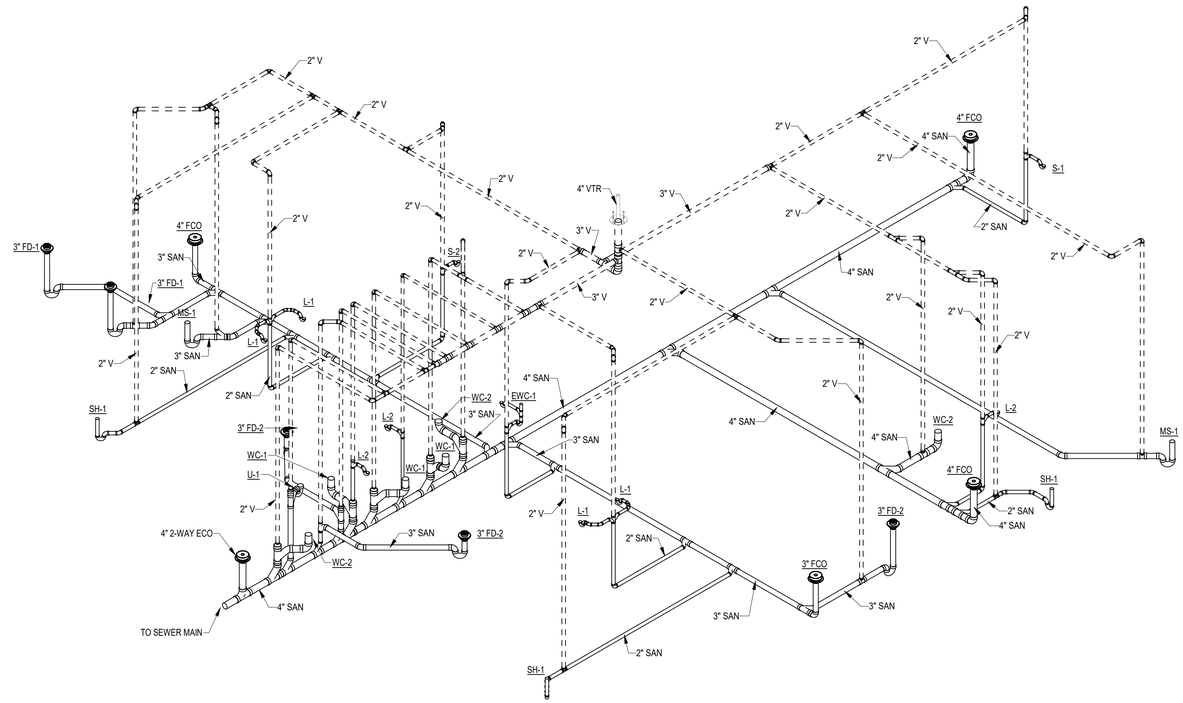
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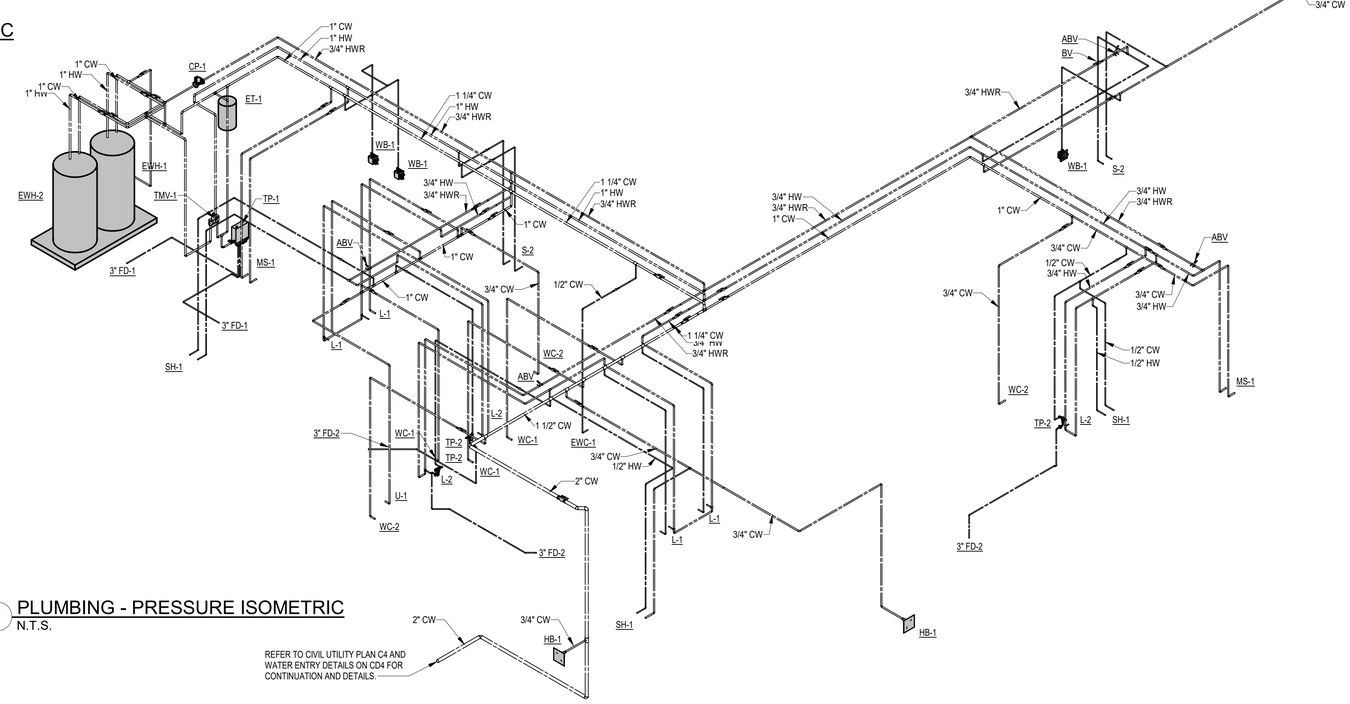
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DRAWING NOTES:

1. ISOMETRICS PROVIDED FOR REFERENCE ONLY. REFER TO FLOOR PLANS FOR MORE INFORMATION.
2. REFER TO PLUMBING FIXTURE SCHEDULE FOR ROUGH-IN PIPING SIZES.



2 PLUMBING - GRAVITY ISOMETRIC
N.T.S.



1 PLUMBING - PRESSURE ISOMETRIC
N.T.S.

REFER TO CIVIL UTILITY PLAN C4 AND WATER ENTRY DETAILS ON CD4 FOR CONTINUATION AND DETAILS.

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GULF COAST ELECTRICAL CO-OP

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REVISIONS

NO.	DESCRIPTION	DATE

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TITLE

PLUMBING ISOMETRICS

PROJECT NO. 0122062

P-601

SHEET NO.

2/27/2024 2:36:15 PM

PLUMBING FIXTURE SCHEDULE

MARK	FIXTURE	TYPE	MATERIAL	WASTE	VENT	CW	HW	BASIS OF DESIGN	REMARKS
WC-1	WATER CLOSET (ADA ACCESSIBLE)	FLUSH TANK FLOOR MOUNT	VITREOUS CHINA	4"	2"	3/4"	-	ZURN :Z5555-K	FLOOR MOUNTED AT ADA HEIGHT,VITREOUS CHINA, HIGH EFFICIENCY, 1.28 GPF LOW CONSUMPTION, HIGH PERFORMANCE SIPHON-JET WITH 3" FLUSH VALVE, ADA/COMFORT HEIGHT, ELONGATED FRONT RIM AND 12"STANDARD ROUGH-IN. SEAT: ZURN: Z5958SS-EL. SUPPLIES: MCGUIRE:2167CC.
WC-2	WATER CLOSET	FLUSH TANK FLOOR MOUNT	VITREOUS CHINA	4"	2"	3/4"	-	ZURN : Z5535-K	VITREOUS CHINA, HIGH EFFICIENCY, 1.28 GPF LOW CONSUMPTION, HIGH PERFORMANCE SIPHON-JET WITH 3" FLUSH VALVE, ELONGATED, AND 12" STANDARD ROUGH-IN. SEAT: ZURN: Z5958SS-EL. SUPPLIES: MCGUIRE: 2167CC.
L-1	LAVATORY - WALL HUNG (ADA ACCESSIBLE)	WALL MOUNT	VITREOUS CHINA	1-1/2"	1-1/2"	1/2"	1/2"	ZURN : Z5314	ADA ACCESSIBLE WALL HUNG 20"X18", VITREOUS CHINA, 4" CENTER FAUCETHOLES WITH OVERFLOW, DRILLED FOR CONCEALED CARRIER. FAUCET: WATTS - P1070A5. DRAIN: Z8746-PC - OFFSET WHEELCHAIR GRID DRAIN. PTRAP: Z8700-8B-PC. TRAP WRAP: Z8946-1-NT. SUPPLY: MCGUIRE 2165CC.
L-2	LAVATORY	DROP-IN	VITREOUS CHINA	1-1/2"	1-1/2"	1/2"	1/2"	ZURN : Z5114	20" X 17" VITREOUS CHINA, SELF-RIMMING, COUNTERTOP LAVATORY WITH 4" CENTER FAUCET HOLES. FRONT OVERFLOW DESIGN. WASTE: 1-1/4" O.D. FAUCET: WATTS - P1070A5. GRID DRAIN: Z8743-PC. SUPPLY: MCGUIRE 2165CC.
U-1	URINAL (ADA ACCESSIBLE)	WALL MOUNT	VITREOUS CHINA	3"	2"	1"	-	ZURN : Z5755	WALL MOUNTED VITREOUS CHINA, HIGH EFFICIENCY URINAL WITH ZURN Z6003PL-ULF FLUSH VALVE, .125GPF. 3/4" TOP SPUD, WITH VACUUM BREAKER AND CONTROL STOP. INSTALL FIXTURE PER ADA MOUNTING HEIGHT.
SH-1	SHOWER	STANDARD	-	2"	2"	3/4"	3/4"	REFER TO ARCHITECTURAL	PROVIDE SYMMONS ORIGINS SHOWER UNIT MODEL #: 9603-PLR-1.5. DRAIN: ZURN MODEL ZS415-BZ1. SET HW LIMIT STOP TO 110°F. PROVIDE SHOWER HEAD WITH 1.5 GPM MAX FLOW. COORDINATE DRAIN LOCATION AND ORIENTATION OF VALVE WITH SHOWER UNIT WITH ARCHITECTURAL.
EWC-1	ELECTRICAL WATER COOLER (ADA ACCESSIBLE)	WALL MOUNT	-	1-1/2"	2"	1/2"	-	ELKAY : LZSTL8WSSP	UNIT SHALL PROVIDE 8.0 GPH OF 50 DEGREE F. WATER AT 90 DEGREE F. AMBIENT AND 80 DEGREE F. INLET WATER. SINGLE LEVEL BARRIER-FREE STAINLESS STEEL WATER COOLER. SURFACE MOUNTED ON WALL REFRIGERATION SYSTEM AND STAINLESS STEEL GRILL. ADA ACCESSIBLE STAINLESS STEEL TUBULAR SUPPORT ARMS. ALL STAINLESS STEEL POLISHED TO LUSTROUS SATIN FINISH WITH HIGH SHINED OUTER EDGE. FLEX-GUARD SAFETY BUBBLERS, AND VANDAL-RESISTANT FRONT PUSH BUTTONS. EQUIPPED WITH ELKAY BOTTLE FILLING STATION AND FLOW REGULATOR. PROVIDE MCGUIRE P-TRAP AND SUPPLIES 8902 AND 158LK.
MS-1	MOP SINK	FLOOR MOUNT	TERRAZZO	3"	2"	3/4"	3/4"	FIAT PRODUCTS : TSB100	24"x24"x12" TERRAZZO PRECAST MOP SINK, STAINLESS-STEEL DRAIN ASSEMBLY WITH POLISHED STAINLESS-STEEL STRAINER, AND 3" IPS CONNECTION DRAIN. PROVIDE SATINLESS-STEEL CAPS ON ALL CURBS AND STAINLESS-STEEL WALL GUARDS. FAUCET: ZURN - Z843M1 W/ 3/4" HOSE THREAD OUTLET & 2-1/2" LEVER HANDLES. TERRAZZO BASIN MUST BE INSTALLED ON A 1/2" LAYER OF MORTAR ACCORDING TO MANUFACTURER'S INSTALLATION INSTRUCTIONS.
S-1	SINK (DOUBLE COMPARTMENT)	UNDERMOUNT	STAINLESS STEEL	2"	2"	1/2"	1/2"	ELKAY : ELUHAD361655	35-3/4" X 18-1/2" X 5-3/8" DOUBLE COMPARTMENT UNDERMOUNT, ADA, 18 GUAGE TYPE 304 STAINLESS STEEL W/ LUSTROUS SATIN FINSH, REAR CENTER DRAIN PLACEMENT. FAUCET: DELTA: 19881Z-DST. DRAIN: ELKAY - LKAD35. PTRAP: MCGUIRE: C8912CECO. SUPPLY: MCGUIRE 2165CC.
S-2	SINK (SINGLE COMPARTMENT)	UNDERMOUNT	STAINLESS STEEL	2"	2"	1/2"	1/2"	ELKAY : ELUHAD211555	23-1/2" X 18-1/4" X 5-3/8" STAINLESS STEEL, SINGLE COMPARTMENT UNDERMOUNT ADA SINK WITH REAR CENTERED PERFECT DRAIN, 18 GAUGE 304 STAINLESS STEEL WITH A LUSTROUS SATIN FINISH, REAR CENTER DRAIN PLACEMENT. FAUCET: DELTA: 19881Z-DST. DRAIN: ELKAY : LKAD35. MCGUIRE: C8912CECO. SUPPLY: MCGUIRE 2165CC.
HB-1	HOSE BIBB	WALL MOUNT	CAST IRON	-	-	3/4"	-	ZURN : Z1320	ENCASED ECOLOTROL "ANTI-SIPHON" AUTOMATIC DRAINING WALL HYDRANT FOR FLUSH INSTALLATION. COMPLETE WITH INTEGRAL BACKFLOW PREVENTER, COPPER CASING, ALL BRONZE INTERIOR PARTS AND COMBINATION 3/4" FEMALE OR 3/4" MALE THREAD INLET. STAINLESS STEEL BOXED AND HINGED COVER WITH OPERATING KEY LOCK AND "WATER" STAMPED ON COVER.
WB-1	ICE MAKER BOX W/SHUT-OFF VALVE	WALL MOUNT	-	-	-	1/2"	-	OATEY : PART NO. 37679	RECESSED PVC ICE MAKER BOX ASSEMBLY WITH TWO-PIECE 1/4" OD COMPRESSION VALVE PRE-INSTALLED.

DRAINAGE SPECIALTIES AND CONNECTIONS SCHEDULE

MARK	SPECIALTY	TYPE	MATERIAL	STYLE	SIZE	DOMESTIC CW	BASIS OF DESIGN	REMARKS
FD-1	FLOOR DRAIN (MECHANICAL ROOM)	NO HUB OR NEO-LOCK	CAST IRON/NICKEL BRONZE TOP	POLISHED ROUND TOP	PER DWGS.	1/2" TRAP PRIMER	ZURN : ZN415-BZ1-P	COATED CAST IRON BODY WITH BOTTOM OUTLET, COMBINATION INVERTIBLE MEMBRANE CLAMP AND ADJUSTABLE TYPE "B" NICKEL BRONZE STRAINER, 5 7/16" ROUND TOP, TAPPED FOR TRAP PRIMER CONNECTION.
FD-2	FLOOR DRAIN (FINISHED AREA)	NO HUB OR NEO-LOCK	CAST IRON/NICKEL BRONZE TOP	POLISHED ROUND TOP	PER DWGS.	1/2" TRAP PRIMER	ZURN : ZN415-BZ1-P-VP	COATED CAST IRON BODY WITH BOTTOM OUTLET, COMBINATION INVERTIBLE MEMBRANE CLAMP AND ADJUSTABLE TYPE "B" NICKEL BRONZE STRAINER, 5 7/16" ROUND TOP, TAPPED FOR TRAP PRIMER CONNECTION, VANDAL PROOF.
BWV	BACK WATER VALVE	NO HUB	CAST IRON	FLAPPER STYLE	PER DWGS.	-	ZURN : Z1090	COATED CAST IRON BODY, HUB INLET AND OFFSET SPIGOT OUTLET, BRONZE THREADED COVER, AUTOMATIC PVC FLAPPER TYPE BACKWATER VALVE WITH O-RING.

ELECTRIC WATER HEATER SCHEDULE

MARK	KW	NO. OF ELEMENTS	KW PER ELEMENT	RECOVERY (GPH) @ 70°	STORAGE (GAL.)	SIZE (D"xH")	VOLTS/PHASE/HERTZ	OPERATING WEIGHT (LBS)	BASIS OF DESIGN
EWH-1	8.0	2	4.0	45	120	29.5X62.5	208/3/60	1330	AO SMITH : DEN-120
EWH-2	8.0	2	4.0	45	120	29.5X62.5	208/3/60	1330	AO SMITH : DEN-120

NOTES:

1. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
2. PROVIDE SINGLE POINT ELECTRICAL CONNECTION.
3. DISCONNECT PROVIDED BY ELECTRICAL. REFER TO ELECTRICAL DRAWINGS.
4. ROUTE T&P VALVE AND INDIRECT DISCHARGE TO FLOOR DRAIN.
5. OUTLET TEMPERATURE SHALL BE SET TO 140°F ON WATER HEATER.
6. WATER HEATER SHALL BE PLACED ON A 4" RAISED CONCRETE PAD.

HOT WATER RECIRC. PUMP SCHEDULE

MARK	TYPE	CAPACITY (GPM)	HEAD (FEET)	MOTOR (HP)	MOTOR (VOLTS/PHASE/HERTZ)	BASIS OF DESIGN
CP-1	INLINE	2.07	7.9	1/35	115/1/60	TACO : 005-SF2

NOTES:

1. PROVIDE SINGLE POINT ELECTRICAL CONNECTION.
2. RECIRC PUMP SHALL BE PIPED PER MANUFACTURER'S RECOMMENDATIONS.
3. BALANCING VALVES SHALL BE PROVIDED FOR ALL CIRCULATING SYSTEMS. VALVES SHALL BE SET TO FLOW RATES SHOWN UNLESS NOTED OTHERWISE.
4. PROVIDE AQUASTAT AQS-3/4 FOR EACH PUMP LOCATION.
5. ELECTRICAL CONTRACTOR TO PROVIDE DISCONNECT.

EXPANSION TANK SCHEDULE

MARK	TANK VOLUME (GAL)	ACCEPTANCE VOLUME (GAL)	SIZE (D" x H")	CONNECTION SIZE	WEIGHT (LBS)	BASIS OF DESIGN
ET-1	8	5.3	12" x 20"	3/4"	100	WATTS : DETA-20

NOTES:

1. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.

TRAP PRIMER SCHEDULE

MARK	CW INLET SIZE	CW OUTLET SIZE	MAX NUMBER OF DRAINS SERVED	DIMENSIONS (L" x W" x H")	ELECTRICAL (V/P/HZ)	BASIS OF DESIGN
TP-1	3/4"	1/2"	4	16" x 14" x 3-3/8"	120/1/60	PRECISION PLUMBING PRODUCTS : PTS-4
TP-2	1/2"	1/2"	1	7" x 8-1/4" x 1"	-	PRECISION PLUMBING PRODUCTS : PRO1-ULP500

NOTES:

1. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
2. PROVIDE SINGLE POINT ELECTRICAL CONNECTION.
3. PROVIDE WITH INTEGRAL DISCONNECT.

THERMOSTATIC MIXING VALVE SCHEDULE

MARK	OUTLET TEMPERATURE	INLET/OUTLET SIZE	MIN. FLOW RATE	LOCATION	BASIS OF DESIGN
TMV-1	110°F	3/4" / 1"	1.5	ELEC/MECH 105	BRADLEY : S59-3045

NOTES:

1. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
2. PROVIDE SHUTOFF VALVES ON THE INLET AND OUTLET OF THE MIXING VALVE.

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PLUMBING SCHEDULES

PROJECT NO. 0122062

P-801

SHEET NO.

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HVAC SYMBOL LEGEND

SYMBOL	DESCRIPTION
SD	-SMOKE DAMPER (WITH ACCESS PANEL)
FD	-FIRE DAMPER (WITH ACCESS PANEL)
MOD	-MOTOR OPERATED CONTROL DAMPER (MOD)
VD	-MANUAL BALANCING DAMPER
	-DOOR GRILLE
UC	-UNDERCUT DOOR
	-ACCESS DOORS, VERTICAL OR HORIZONTAL
	-FLEXIBLE CONNECTION
24x12	-NEW DUCTWORK, FIRST DIMENSION IS SIDE SHOWN
UP DN	-CHANGE OF ELEVATION
	-DUCT ELBOW, SUPPLY OR OUTSIDE AIR
DOWN UP	-DUCT ELBOW, EXHAUST AIR
	-DUCT ELBOW, RETURN AIR
	-FLEXIBLE DUCT
	-CEILING DIFFUSER, ROUND NECK (CEILING DIFFUSERS ARE 4-WAY THROW UNO)
	-CEILING RETURN
	-CEILING EXHAUST
	-CEILING DIFFUSER, RECTANGULAR OR SQUARE NECK (CEILING DIFFUSERS ARE 4-WAY THROW UNO)
	-SUPPLY DIFFUSER OR GRILLE (VERTICAL MOUNT, SIDEWALL)
	-RETURN/EXHAUST REGISTER OR GRILLE (VERTICAL MOUNT, SIDEWALL)
CO2	-CARBON DIOXIDE SENSOR
T	-THERMOSTAT / TEMPERATURE SENSOR
H	-HUMIDISTAT / HUMIDITY SENSOR
	-DUCT SMOKE DETECTOR
H	-HUMIDITY SENSOR (DUCT MOUNTED)
CO2	-CARBON DIOXIDE SENSOR (DUCT MOUNTED)
M	-MOTORIZED CONTROL DAMPER
F	-AIRFLOW SENSOR/STATION
T	-TEMPERATURE SENSOR
SP	-STATIC PRESSURE SENSOR
BD	-BACKDRAFT DAMPER
	-CEILING MOUNTED ACCESS DOOR
EQUIPMENT / CLEARANCE	-EQUIPMENT WITH MANUFACTURER'S CLEARANCE

HVAC SYMBOL LEGEND CONT.

SYMBOL	DESCRIPTION
	-TRANSITION, CONCENTRIC
	-TRANSITION, ECCENTRIC
	-TRANSITION, SQUARE TO ROUND
	-SQUARE THROAT ELBOW W/ TURNING VANES
	-RADIUS ELBOW
	-RECTANGULAR/ROUND BRANCH TAKE-OFF OR ROUND/ROUND BRANCH TAKE-OFF
	-SQUARE THROAT TEE W/ TURNING VANES
	-RADIUS TEE
	-RECTANGLE-TO-ROUND TAKE-OFF
	-STANDARD BRANCH TAKE-OFF
	-SPIN-IN TAKE-OFF

HVAC ABBREVIATIONS

SYMBOL	DESCRIPTION
ABV	-AUTOMATIC BALANCING VALVE
ADA	-AMERICANS WITH DISABILITIES ACT
AFF	-ABOVE FINISHED FLOOR
AFR	-ABOVE FINISHED ROOF
AHU	-AIR HANDLING UNIT
AP	-ACCESS PANEL
APPROX	-APPROXIMATE
ASTM	-AMERICAN STANDARDS TESTING MATERIALS
BAS	-BUILDING AUTOMATION SYSTEM
BOP	-BOTTOM OF PIPE
BHP	-BRAKE HORSEPOWER
BFV	-BUTTERFLY VALVE
BTU	-BRITISH THERMAL UNIT
CL	-CENTER LINE
CFM	-CUBIC FEET PER MINUTE
CD	-CONDENSATE
CO	-CLEAN OUT
CT	-COOLING TOWER
CAV	-CONSTANT AIR VOLUME
CU	-CONDENSING UNIT
DB	-DRY BULB
DDC	-DIRECT DIGITAL CONTROLS
DN	-DOWN
EA	-EXHAUST AIR
EAT	-ENTERING AIR TEMPERATURE
ECC	-ENGINEERING CONTROL CENTER
EER	-ENERGY EFFICIENCY RATING
EQUIP	-EQUIPMENT
ESP	-EXTERNAL STATIC PRESSURE
ETR	-EXISTING TO REMAIN
EWT	-ENTERING WATER TEMPERATURE
EX	-EXISTING
°F	-DEGREES FAHRENHEIT
FAS	-FIRE ALARM SYSTEM
FD	-FLOOR DAMPER
FE	-FLUE EXHAUST
FLA	-FULL LOAD AMPS
FPM	-FEET PER MINUTE
FT	-FEET
GPM	-GALLONS PER MINUTE
HP	-HORSEPOWER
HR	-HOUR
HZ	-HERTZ
IPLV	-INTEGRATED PART-LOAD VALUE
IN	-INCHES
KW	-KILOWATT
LAT	-LEAVING AIR TEMPERATURE
LD	-LINEAR DIFFUSER
LWT	-LEAVING WATER TEMPERATURE
MAX	-MAXIMUM
MBH	-THOUSAND BTUs PER HOUR
MCA	-MINIMUM CIRCUIT AMPS
MIN	-MINIMUM
MOCP	-MAXIMUM OVER CURRENT PROTECTION
MOD	-MOTORIZED CONTROL DAMPER
NA	-NOT APPLICABLE
NC	-NORMALLY CLOSED
NIC	-NOT IN CONTRACT
NO	-NORMALLY OPEN
NTS	-NOT TO SCALE
OA	-OUTSIDE AIR
OAT	-OUTSIDE AIR TEMPERATURE
PH	-PHASE
PRV	-PRESSURE REDUCING VALVE
PRS	-PRESSURE REDUCING STATION
PSI	-POUNDS PER SQUARE INCH
PSIG	-PSI GAUGE
PTAC	-PACKAGED TERMINAL AIR CONDITIONER
PVC	-POLYVINYL CHLORIDE PIPE
RA	-RETURN AIR
RH	-RELATIVE HUMIDITY
RHC	-REHEAT COIL
RHP	-ROOFTOP HEAT PUMP
RPM	-REVOLUTIONS PER MINUTE
RS/L	-REFRIGERANT SUCTION & LIQUID LINES
RTU	-ROOFTOP AIR CONDITIONING UNIT
SA	-SUPPLY AIR
SF	-SQUARE FEET
SP	-STATIC PRESSURE
SPEC	-SPECIFICATION
SS	-STAINLESS STEEL
STD	-STANDARD
TA	-TRANSFER AIR
TDH	-TOTAL DYNAMIC HEAD
TEMP	-TEMPERATURE
TSP	-TOTAL STATIC PRESSURE
TYP	-TYPICAL
UL	-UNDERWRITER'S LABORATORY
U/G	-UNDERGROUND
UNO	-UNLESS NOTED OTHERWISE
V/PH	-VOTS/PHASE
VAV	-VARIABLE AIR VOLUME
VFD	-VARIABLE FREQUENCY DRIVE
VRF	-VARIABLE REFRIGERANT FLOW
W	-WATTS
W/	-WITH
WB	-WET BULB

GENERAL NOTES

1. DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT OF SYSTEMS. PROVIDE COMPONENTS INDICATED IN DETAILS, RISER DIAGRAMS, CONTROL DIAGRAMS, AND/OR FLOW DIAGRAMS WHETHER OR NOT INDICATED ON PLANS AND VICE VERSA. WHERE A DISCREPANCY OR CONFLICT IS FOUND BETWEEN ONE DRAWING AND ANOTHER, OR BETWEEN A DRAWING AND APPLICABLE SPECIFICATIONS, NOTIFY THE ARCHITECT/ENGINEER IMMEDIATELY IN WRITTEN FORM. IN GENERAL, THE MOST STRINGENT REQUIREMENT SHALL GOVERN UNLESS THE DISCREPANCY CONFLICTS WITH APPLICABLE CODES OR OWNER'S DESIGN STANDARDS, WHEREIN THE CODE OR OWNER'S DESIGN STANDARDS SHALL GOVERN.
2. CONNECTION TO EQUIPMENT SHALL BE VERIFIED WITH MANUFACTURER'S CERTIFIED DRAWINGS. TRANSITIONS TO ALL EQUIPMENT SHALL BE VERIFIED AND PROVIDED FOR EQUIPMENT FURNISHED.
3. DIMENSIONS SHALL BE FIELD-VERIFIED AND COORDINATED PRIOR TO PROCUREMENT OR FABRICATION. COORDINATE THE WORK WITH OTHER TRADES INVOLVED. FIELD MODIFICATIONS SUCH AS OFFSETS IN PIPING OR DUCTWORK (INCLUDING DIVIDED DUCTWORK) NEEDED DUE TO OBSTRUCTIONS OR INTERFERENCES SHALL BE PROVIDED AT NO ADDITIONAL COST.
4. DUCT CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE SMACNA HVAC DUCT CONSTRUCTION STANDARD.
5. INSTALL ALL FIRE DAMPERS, SMOKE DAMPERS AND COMBINATION FIRE/SMOKE DAMPERS IN ACCORDANCE WITH MANUFACTURE'S INSTALLATION DIRECTIONS. PROVIDE ACCESS DOORS TO ALLOW COMPLETE INSPECTION AND MAINTENANCE OF ALL DEVICES.
6. PROVIDE 1.5R ELBOWS IN DUCTWORK AS INDICATED. IF 1.5R ELBOWS DO NOT FIT, PROVIDE 1.0R ELBOWS. IF 1.0R ELBOWS DO NOT FIT, PROVIDE 90 DEGREE RECTANGULAR DUCT ELBOWS WITH TURNING VANES.
7. DUCT SIZES AND ALL OPENINGS THROUGH BUILDING CONSTRUCTION SHALL SUIT EQUIPMENT FURNISHED.
8. COORDINATE DIFFUSER, GRILLE AND REGISTER LOCATIONS WITH ARCHITECTURAL REFLECTED CEILING PLANS AND EQUIPMENT OF ALL TRADES.
9. LOCATE THERMOSTATS, TEMPERATURE SENSORS, HUMIDISTATS, AND HUMIDITY SENSORS AT 48" ABOVE FINISHED FLOOR UNLESS NOTED OTHERWISE. COORDINATE LOCATIONS WITH OTHER EQUIPMENT, FURNITURE, AND DOOR SWINGS.
10. ALL EQUIPMENT, DUCTWORK, ETC., SHALL BE SUPPORTED AS DETAILED AND/OR SPECIFIED. PROVIDE ADDITIONAL SUPPORTS AS REQUIRED TO PROVIDE A VIBRATION-FREE, RIGID INSTALLATION.
11. ALL DUCT SIZES SHOWN ARE INSIDE CLEAR DIMENSIONS.
12. DAMPERS AND INSIDES OF DUCTS VISIBLE THROUGH GRILLES, REGISTERS AND DIFFUSERS SHALL BE PAINTED FLAT BLACK.
13. REFER TO TYPICAL DETAILS FOR PIPING AND INSTALLATION OF EQUIPMENT.
14. TRAPPED CONDENSATE DRAINS FROM ALL MECHANICAL EQUIPMENT SHALL BE PROVIDED FOR PROPER DRAINAGE TO SUIT EQUIPMENT FURNISHED.
15. ACCESS PANELS IN DUCTWORK AND CEILINGS SHALL BE PROVIDED WHERE REQUIRED FOR OPERATION, BALANCING OR MAINTENANCE OF ALL MECHANICAL EQUIPMENT.
16. ALL DUCTWORK AND PIPING IS SHOWN SCHEMATICALLY. PROVIDE ALL TRANSITIONS, TURNING VANES, ELBOWS, FITTINGS, ETC., TO ALLOW SMOOTH FLOWS. ALL SPLIT DUCT FITTINGS SHALL TRANSITION TO FULL SIZE OF THE SUM OF BOTH BRANCHES, UPSTREAM OF SPLIT.
17. COORDINATE SIZE REQUIREMENTS OF ALL CONCRETE HOUSEKEEPING PADS UNDER ALL FLOOR-MOUNTED EQUIPMENT. SEE STRUCTURAL DRAWINGS FOR PAD DETAILS AND SPECIFICATIONS.
18. VERIFY FINISH WITH ARCHITECT PRIOR TO PURCHASING GRILLES, REGISTERS, DIFFUSERS, LOUVERS AND OTHER AIR DISTRIBUTION DEVICES.
19. PROVIDE FLEXIBLE DUCT CONNECTIONS ON ALL DUCTWORK CONNECTING TO FANS, AIR HANDLING UNITS, AND FAN COIL UNITS.
20. PROVIDE TRANSITIONS AT DIFFUSER NECKS AS REQUIRED TO MATCH SIZES OF FLEX DUCTS TO BE CONNECTED.
21. SLEEVE AND SEAL ALL PIPING PENETRATIONS THROUGH BUILDING PARTITIONS.
22. MAINTAIN CLEARANCE OF A MINIMUM OF 6" BETWEEN DUCTWORK, PIPING, EQUIPMENT, ETC., AND ALL FIRE RATED AND FIRE/SMOKE RATED PARTITIONS, TO ALLOW FOR INSPECTIONS OF RATED WALLS.
23. LOCATE ALL OUTSIDE AIR INTAKES A MINIMUM OF 10'-0" CLEAR FROM ALL PLUMBING VENTS AND EXHAUST AIR DISCHARGE LOCATIONS.
24. DUCT RUNOUTS TO DIFFUSERS SHALL MATCH THE SIZE OF THE DIFFUSER NECK.
25. UNLESS OTHERWISE NOTED, ALL EQUIPMENT AND VALVE DRAINS SHALL BE INDEPENDENTLY PIPED FULL SIZE TO THE NEAREST PLUMBING DRAIN.

PIPING LEGEND

SYMBOL	DESCRIPTION
CD	-CONDENSATE
R	-REFRIGERANT LIQUID AND SUCTION LINES
	-BALL VALVE
	-GATE VALVE
	-CHECK VALVE
	-FLOW DIRECTION
	-FLANGES
	-UNION
	-CAP
	-QUICK-COUPLE HOSE CONNECTION
	-BOTTOM CONNECTION, 45° OR 90°
	-TOP CONNECTION, 45° OR 90°
	-SIDE CONNECTION
	-ELBOW, 90°
	-ELBOW, 45°
	-ELBOW, TURNED DOWN
	-ELBOW, TURNED UP
	-TEE, OUTLET DOWN
	-TEE, OUTLET UP
R R	-45° PIPE RISE (R)/DROP (D)

CONTROLS LEGEND

SYMBOL	DESCRIPTION
	-TEMPERATURE SENSOR
	-RELATIVE HUMIDITY SENSOR
	-PUSH-BUTTON OVER-RIDE SWITCH
	-PRESSURE SENSOR
I	-HARD-WIRED INTERLOCK
	-DRY CONTACT
	-STARTER
S	-DUCT SMOKE DETECTOR
	-IMMERSION TEMPERATURE TRANSMITTER W/ THERMOWELL
	-EMERGENCY PUSHBUTTON
CO2	-SPACE CARBON DIOXIDE SENSOR
R	-REFRIGERANT SENSOR
H	-SPACE HUMIDISTAT / HUMIDITY SENSOR
T	-SPACE THERMOSTAT SENSOR
P	-SPACE PRESSURE SENSOR
	-DUCT MOUNTED TEMPERATURE SENSOR
	-INDICATES AVERAGING ELEMENT SENSOR
	-INDICATES PROBE SENSOR
24VAC	-ACTUATOR W / 24VAC OR 120VAC AS INDICATED
24VAC	-TWO POSITION VALVE W / 24VAC OR 120VAC AS INDICATED

SYMBOL	DESCRIPTION
CS	-CURRENT SENSING STATUS
A	-ALARM
DPS	-DIFF. PRESSURE SWITCH DIGITAL
DPIT	-DIFF. PRESSURE INDICATING TRANSMITTER
VFD	-VARIABLE FREQUENCY DRIVE
SPS	-STATIC PRESSURE SWITCH DIGITAL
	-OPPOSED BLADE DAMPER
	-PARALLEL BLADE DAMPER
AFS-X	-AIRFLOW SENSOR
CO2-X	-CARBON DIOXIDE SENSOR
D-X	-DAMPER
DPS-X	-DIFFERENTIAL PRESSURE SENSOR
H-X	-HUMIDITY TRANSMITTER
HOA	-HAND SWITCH (HAND-OFF-AUTO SWITCH)
IT-X	-CURRENT TRANSMITTER
LC-X	-LEVEL CONTROLLER
LT-X	-LEVEL TRANSMITTER
PT-X	-PRESSURE TRANSMITTER
PDT-X	-PRESSURE DIFFERENTIAL TRANSMITTER
SPS-X	-STATIC PRESSURE SWITCH
TT-X	-TEMPERATURE TRANSMITTER
TS-X	-TEMPERATURE SWITCH (FREEZESTAT)

APPLICABLE CODES

1. FEMA P-361 GUIDANCE FOR COMMUNITY AND RESIDENTIAL SAFE ROOMS 2015 EDITION
2. ICC 500 ICC/NSSA STANDARD FOR THE DESIGN AND CONSTRUCTION OF STORM SHELTERS 2020 EDITION
3. FLORIDA BUILDING CODE: CONFORM IN STRICT COMPLIANCE TO THE FLORIDA BUILDING CODE (FBC) AND THE AMENDMENTS WHICH ARE ENFORCED BY THE LOCAL AUTHORITY HAVING JURISDICTION.
   A. FLORIDA BUILDING CODE - MECHANICAL (FMC) 2023 EDITION
   B. FLORIDA BUILDING CODE - PLUMBING (FPC) 2023 EDITION
   C. FLORIDA BUILDING CODE - ENERGY CONSERVATION (FECC) 2023 EDITION
4. FLORIDA FIRE MARSHALL'S RULE CHAPTER 69A-3.012
5. FLORIDA ADMINISTRATIVE CODE RULE CHAPTER 69A-60
6. AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR-CONDITIONING ENGINEERS (ASHRAE):
   A. VENTILATION FOR ACCEPTABLE INDOOR AIR QUALITY (ASHRAE 62.1) 2019 EDITION
7. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA), INCLUDING (BUT NOT LIMITED TO):
   A. NATIONAL ELECTRICAL CODE (NFPA 70 - NEC) 2020 EDITION
   B. NATIONAL FIRE ALARM CODE (NFPA 72) 2019 EDITION
   C. STANDARD FOR THE INSTALLATION OF AIR-CONDITIONING AND VENTILATING SYSTEMS (NFPA 90A) 2021 EDITION
   D. STANDARD FOR THE INSTALLATION OF WARM AIR HEATING AND AIR-CONDITIONING SYSTEMS (NFPA 90B) 2021 EDITION
   E. STANDARD FOR SMOKE CONTROL SYSTEMS (NFPA 92) 2018 EDITION
   F. LIFE SAFETY CODE (NFPA 101) 2021 EDITION
   G. FLORIDA NOTIFICATION: COMPLY WITH ALL OF THE REQUIREMENTS OF THE FEDERAL "RIGHT-TO-KNOW" REGULATIONS AND THE FLORIDA "RIGHT-TO-KNOW" LAW AND PROVIDE NOTIFICATION TO ALL PARTIES CONCERNED AS TO THE USE OF TOXIC SUBSTANCES.
8. SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)
9. OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA)
10. AMERICANS WITH DISABILITIES ACT (ADA)
11. AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)
12. AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)
13. APPLICABLE REGULATORY REQUIREMENTS AND ADVISORY PRACTICES OF APPROPRIATE AUTHORITIES HAVING JURISDICTION (AHJs)

SHEET LIST

SHEET NUMBER	SHEET NAME
M-001	MECHANICAL NOTES, LEGENDS, & SYMBOLS
M-101	MECHANICAL PLANS
M-401	MECHANICAL ENLARGED PLANS
M-501	MECHANICAL DETAILS
M-502	MECHANICAL DETAILS
M-601	MECHANICAL AIRFLOW DIAGRAMS
M-701	MECHANICAL CONTROLS
M-801	MECHANICAL SCHEDULES

DRAWING SYMBOLS

-NEW (HEAVY, SOLID LINE)
-REVISION REFERENCE
-SHEET NOTE CALLOUT
-VIEW NUMBER
-SHEET NUMBER
-SECTION LETTER
-DRAWING NUMBER WHERE SHOWN
-EQUIPMENT ABBREVIATION.
-AHU NUMBER
-TYPICAL UNIT NUMBER; AHU NO. 1
-DEVICE MARK
-DEVICE FLOW RATE (CFM)
-TYPICAL AIR DISTRIBUTION DEVICE TAG
-DUCT DIMENSION (INCHES)
-SYSTEM TYPE (SA = SUPPLY AIR , RA = RETURN AIR, OA = OUTSIDE AIR, EA = EXHAUST AIR)
-TYPICAL DUCTWORK TAG

NOTE: SOME SYMBOLS SHOWN MAY NOT PERTAIN TO THIS PROJECT

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FL License #78501

SCALE

NOT TO SCALE

REVISIONS

NO.	DESCRIPTION	DATE

DRAWN BY	AJZ
APPROVED BY	NOK
CHECKED BY	NOK
DATE	2.6.24

TITLE

MECHANICAL NOTES, LEGENDS, & SYMBOLS

PROJECT NO. 0122062

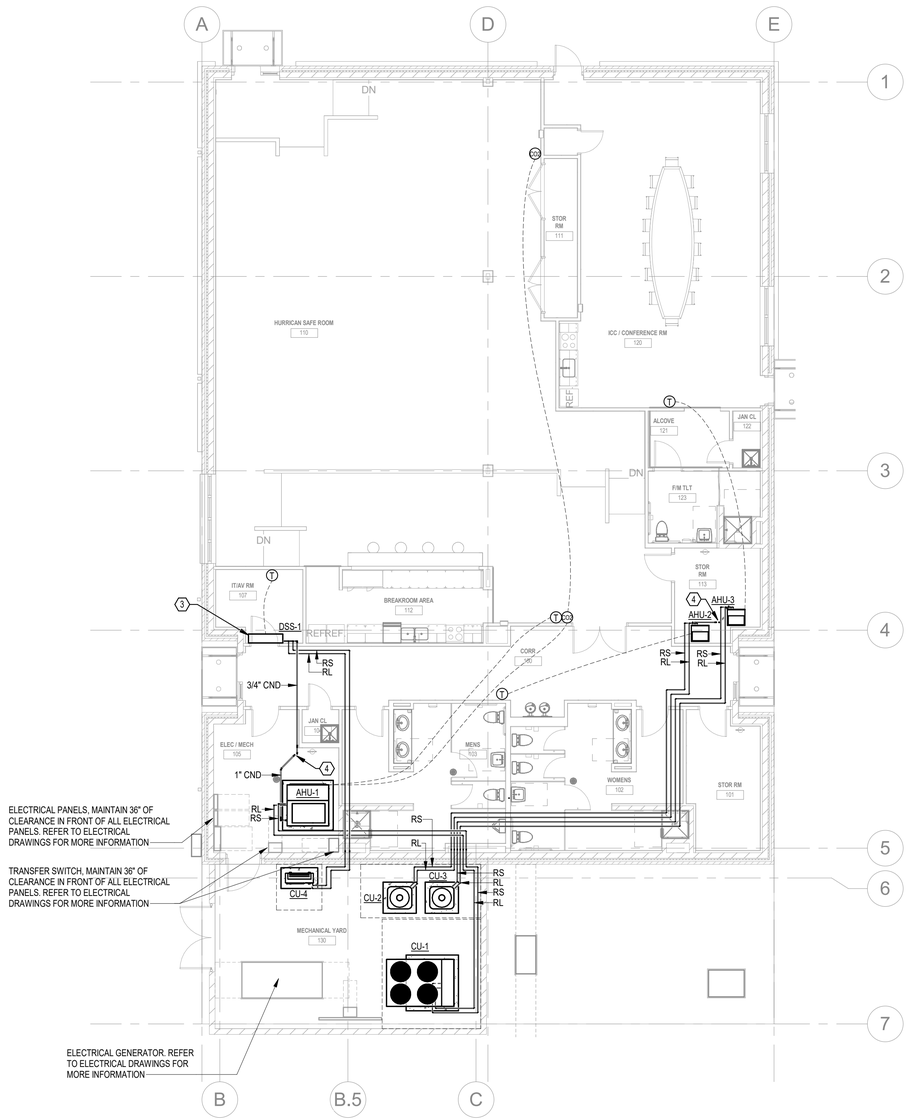
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SHEET NO.

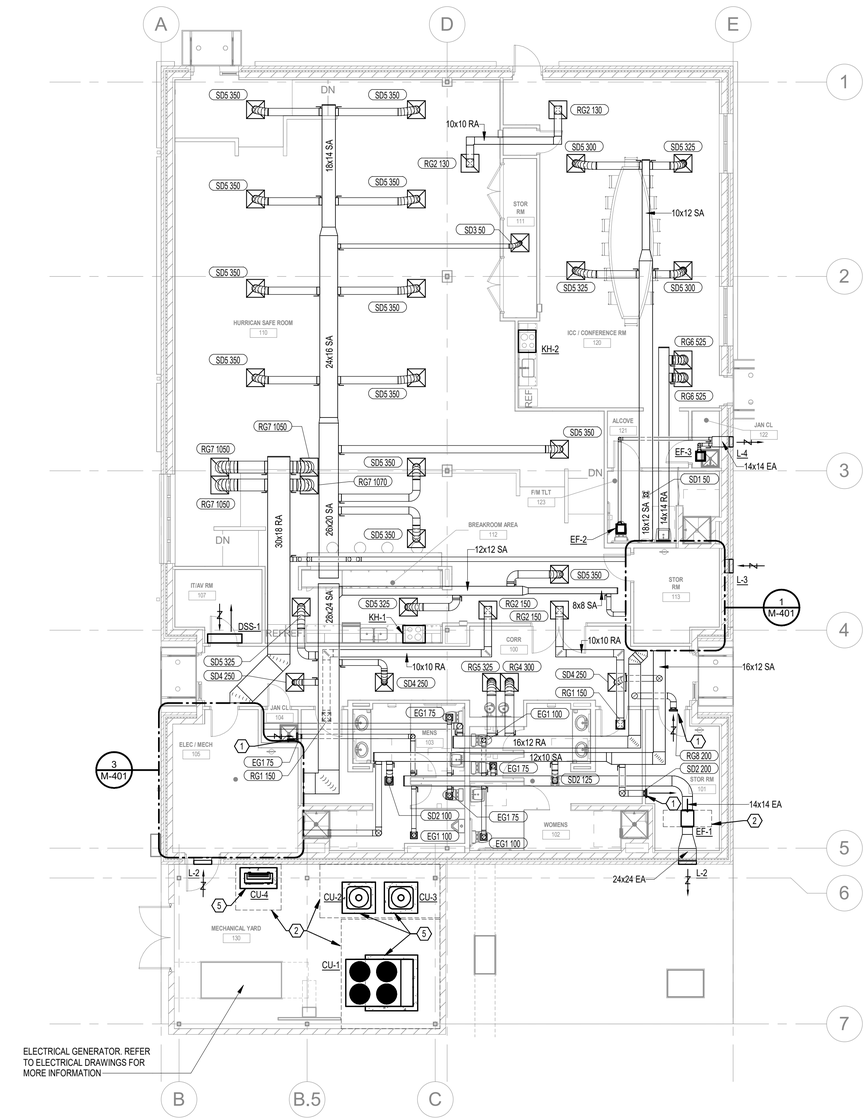
2/27/2024 2:34:23 PM

DRAWING NOTES:
1. EQUIPMENT SHALL NOT BE MOUNTED TO THE ROOF.

CODED NOTES:
1 INSTALL BOTTOM OF REGISTER/GRILLE A MINIMUM OF 9' - 6" AFF.
2 MANUFACTURERS RECOMENDED CLEARANCE.
3 INSTALL BOTTOM OF SPLIT SYSTEM A MINIMUM OF 9' - 0" AFF. PROVIDE A 24V CONDENSATE PUMP WIRED TO UNIT. ROUTE CONDENSATE TO DISPOSAL POINT IN ELEC/MECH 103. COORDINATE FINAL DRAIN LOCATION WITH PLUMBING CONTRACTOR.
4 (2) CONDENSATE PIPES DN TO FLOOR DRAIN. COORDINATE FINAL DRAIN LOCATION WITH PLUMBING CONTRACTOR.
5 MECHANICAL EQUIPMENT MOUNTED ON A 4" THICK CONCRETE PAD. CONCRETE PAD TO EXTEND 6" BEYOND THE PERIMETER OF MECHANICAL EQUIPMENT.



2 PROPOSED MECHANICAL PIPING PLAN
1/8" = 1'-0"



1 PROPOSED MECHANICAL DUCTWORK PLAN
1/8" = 1'-0"

N
0 4' 8' 16' 24'
1/8" = 1'-0"

2/27/2024 2:34:28 PM

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FL License #78501

SCALE

1/8" = 1'-0"

REVISIONS

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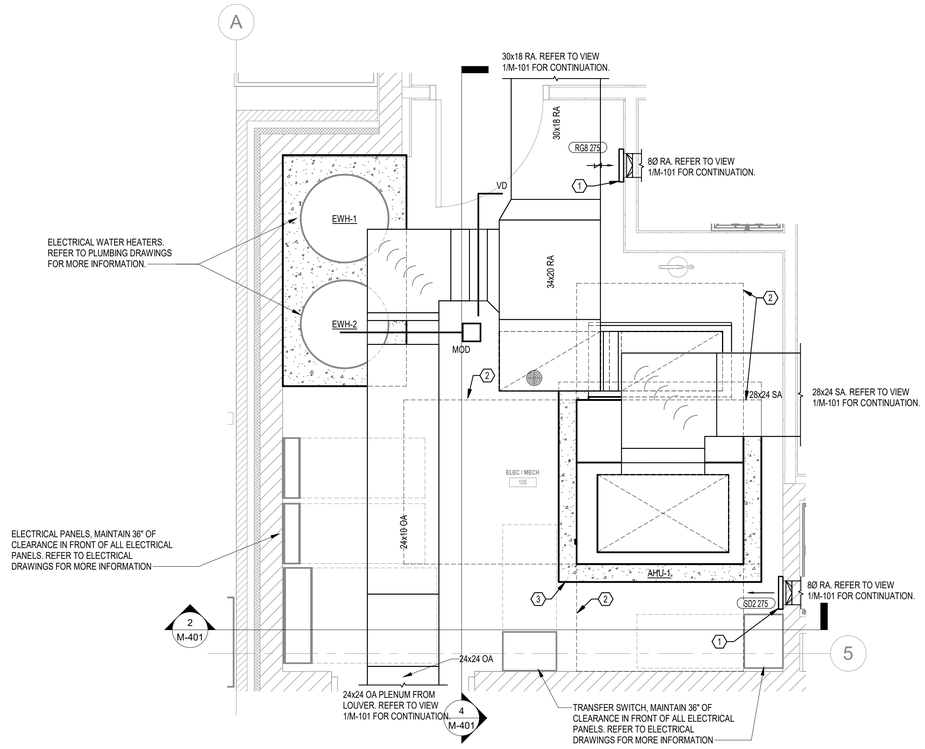
DRAWN BY	AJZ
APPROVED BY	NOK
CHECKED BY	NOK
DATE	2.6.24

TITLE
MECHANICAL PLANS

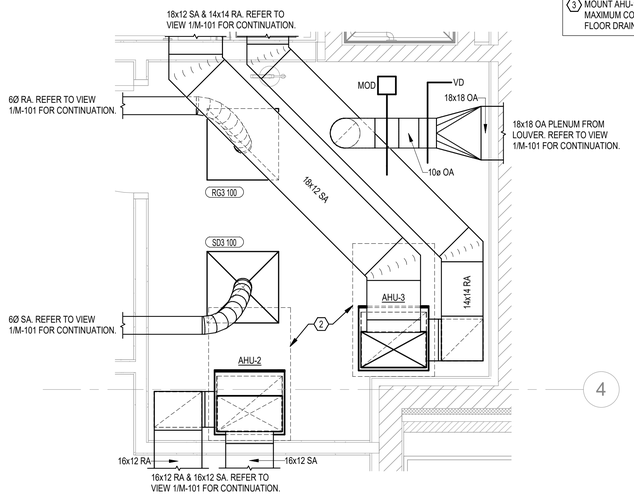
PROJECT NO. 0122062

M-101

SHEET NO.



3 ENLARGED ELEC/MECH 105 DUCTWORK PLAN
1/2" = 1'-0"



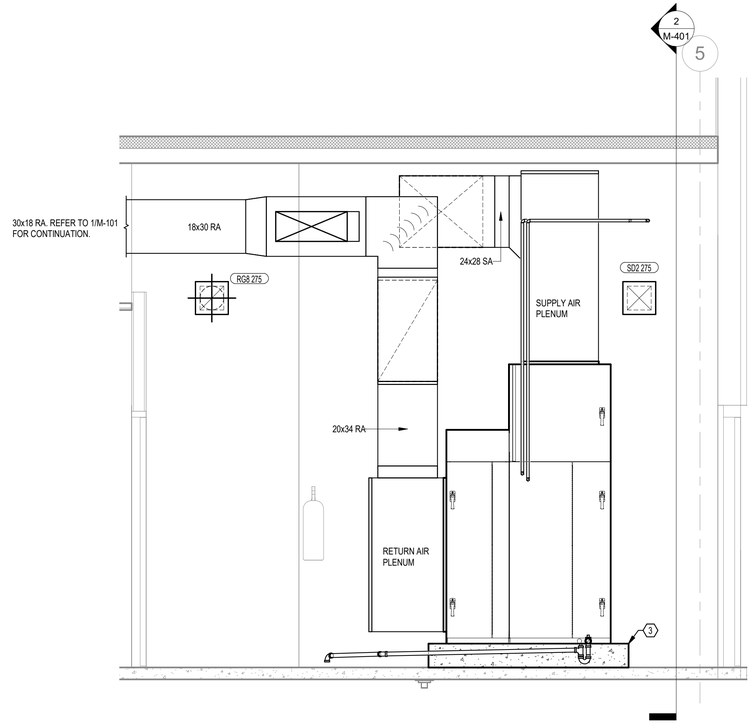
1 ENLARGED STOR RM 113 DUCTWORK PLAN
1/2" = 1'-0"

DRAWING NOTES:

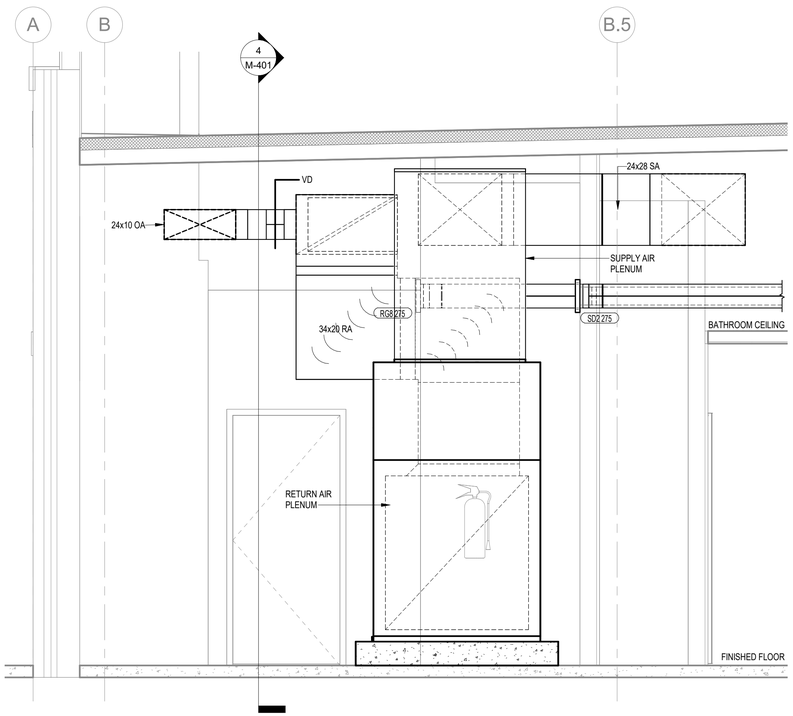
1. EQUIPMENT SHALL NOT BE MOUNTED TO THE ROOF.

CODED NOTES:

1. INSTALL BOTTOM OF GRILLE A MINIMUM OF 9' - 6" AFF.
2. MANUFACTURERS RECOMENDED CLEARANCE.
3. MOUNT AHU-1 TO SUPPORT STAND OR CONCRETE PAD. COORDINATE MINIMUM STAND HEIGHT OR MAXIMUM CONCRETE PAD HEIGHT WITH CONDENSATE DRAIN HEIGHT. CONDENSATE DRAIN TO SLOPE TO FLOOR DRAIN AT 1/4" PER 1'. REFER TO DETAILS.



4 ELEC/MECH 105 - NORTH & SOUTH - MECHANICAL SECTION
1/2" = 1'-0"



2 ELEC/MECH 105 - WEST & EAST - MECHANICAL SECTION
1/2" = 1'-0"

N

0 1' 2' 4' 6'
1/2" = 1'-0"

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SCALE

1/2" = 1'-0"

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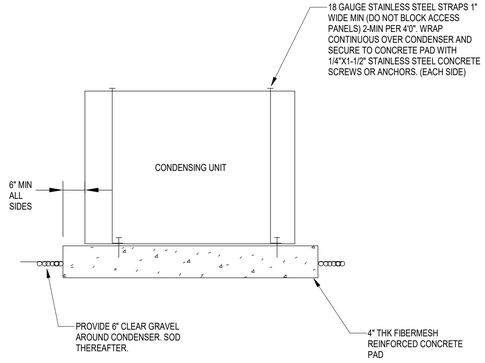
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MECHANICAL ENLARGED PLANS

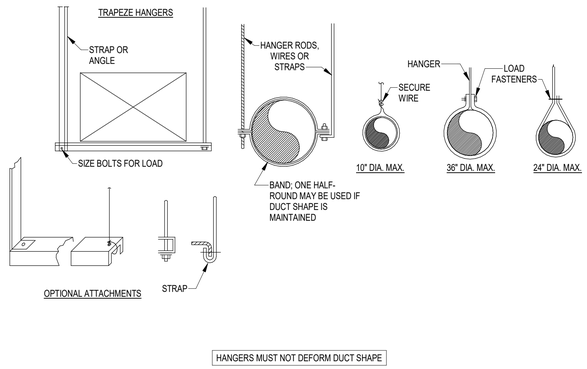
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M-401

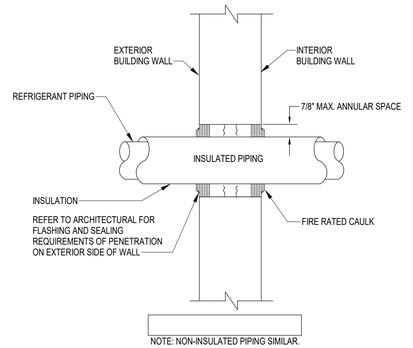
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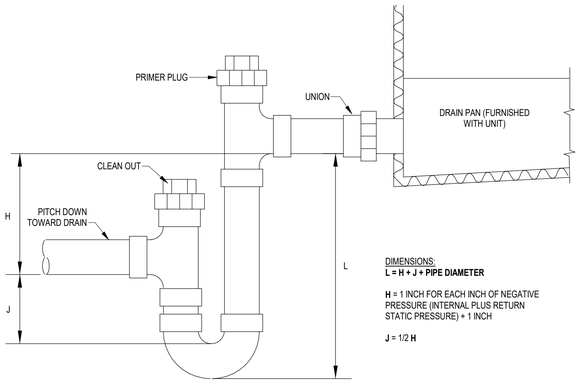
7 CU MOUNTED ON GRADE
N.T.S.



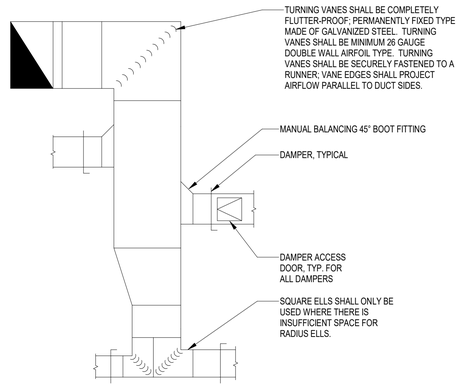
4 DUCT SUPPORTS - RECT. & ROUND DETAIL
N.T.S.



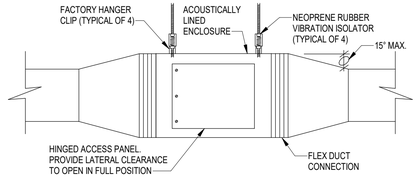
1 PIPING PENETRATION DETAIL
N.T.S.



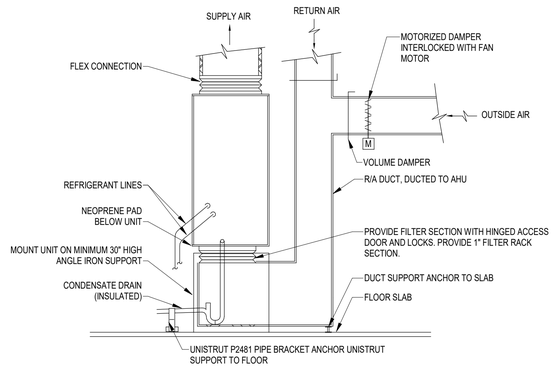
8 CONDENSATE DRAIN TRAP DETAIL
N.T.S.



5 LOW PRESSURE DUCTWORK DETAIL
N.T.S.

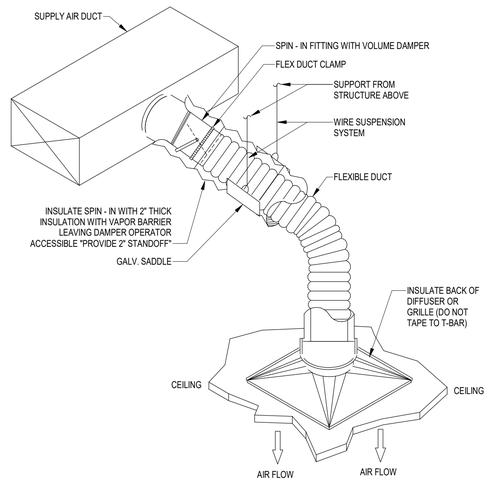


2 INLINE CENTRIFUGAL EXHAUST FAN DETAIL
N.T.S.

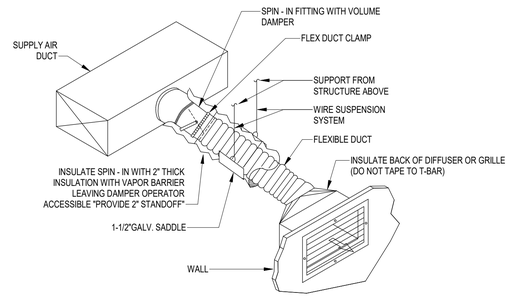


NOTE: AN OVERFLOW DEVICE SHALL BE PROVIDED FOR CONDENSATE CONTROL IN ACCORDANCE TO FBC - MECHANICAL (2023) 307.2.3.

9 AHU INSTALLATION FOR VERTICAL DRAW THRU UNITS
N.T.S.



6 DUCT/DIFFUSER CEILING MOUNTED DETAIL
N.T.S.



3 DUCT/DIFFUSER SIDEWALL DETAIL
N.T.S.

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2/26/24

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FL License #78501

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REVISIONS

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DATE	2.6.24

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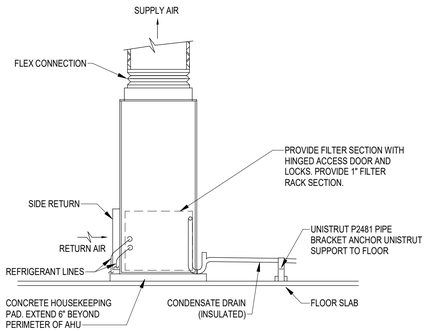
MECHANICAL DETAILS

PROJECT NO. 0122062

M-501

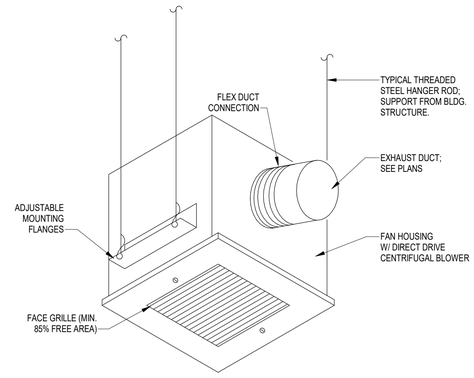
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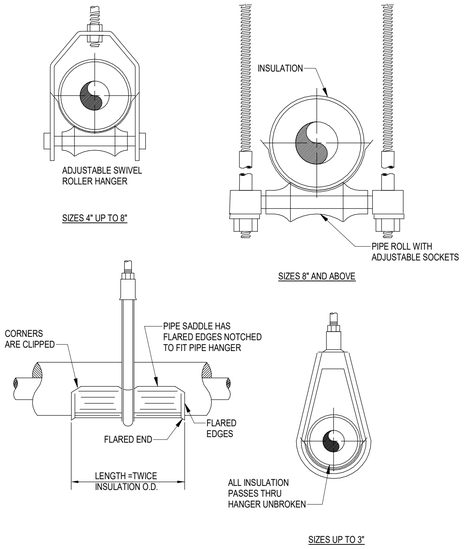


NOTE: AN OVERFLOW DEVICE SHALL BE PROVIDED FOR CONDENSATE CONTROL IN ACCORDANCE TO FBC - MECHANICAL (2023) 307.2.3.

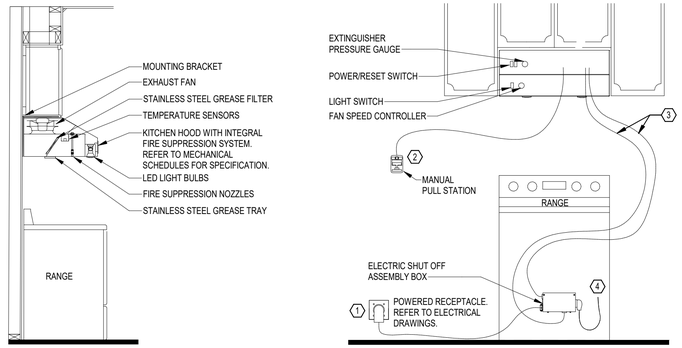
6 AHU MOUNTED ON CONCRETE PAD DETAIL
N.T.S.



3 CABINET EXHAUST FAN MOUNTING
N.T.S.



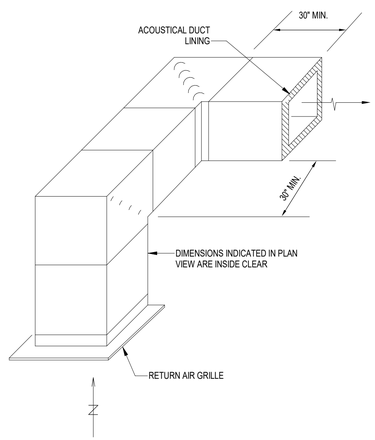
1 INSULATED PIPE HANGER DETAIL
N.T.S.



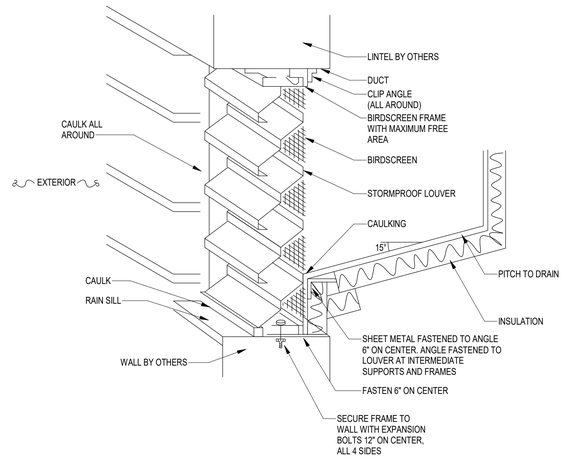
NOTES:

1. CONNECT ELECTRIC SHUT OFF ASSEMBLY BOX POWER CORD TO RECEPTACLE. REFER TO ELECTRICAL DRAWINGS.
2. CONNECT CABLE TO MANUAL PULL STATION VIA QUICK CONNECTOR IN STATION J-BOX.
3. CONNECT DISCONNECT TWO DISCONNECT CABLES FROM HOOD TO ELECTRIC SHUT OFF ASSEMBLY BOX.
4. CONNECT RANGE POWER CORD INTO RECEPTACLE ON ELECTRIC SHUT OFF ASSEMBLY BOX.

4 RANGE HOOD DETAIL
N.T.S.



5 DUCT TRANSFER DETAIL
NTS



NOTE: SUPPORT PLENUM FROM FLOOR OR STRUCTURE ABOVE WITH GALVANIZED STEEL ANGLES AND CHANNELS

2 WALL LOUVER/PLENUM DETAIL
N.T.S.

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CHECKED BY	NOK
DATE	2.6.24

TITLE

MECHANICAL DETAILS

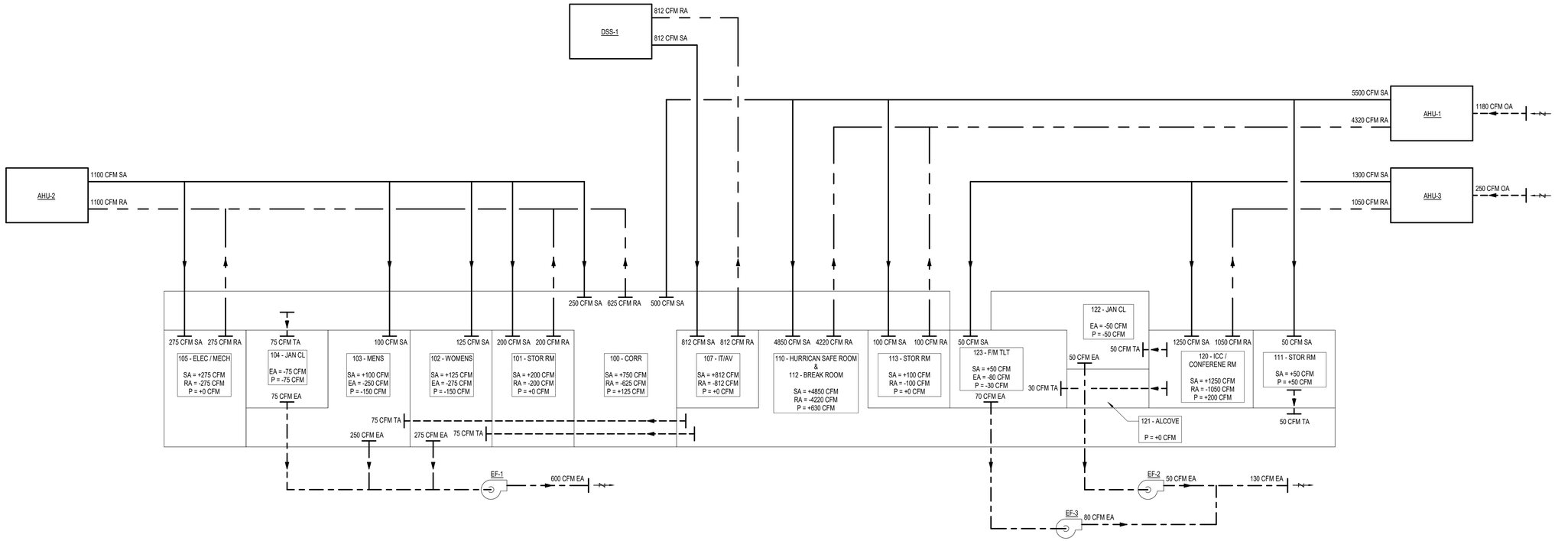
PROJECT NO. 0122062

M-502

SHEET NO.

2/27/2024 2:34:33 PM

KEY	AIR FLOW
———	SA (SUPPLY AIR)
— — —	RA (RETURN AIR)
— - — - —	EA (EXHAUST AIR)
- - - - - -	TA (TRANSFER AIR)



1 AIRFLOW SCHEMATIC
N.T.S.

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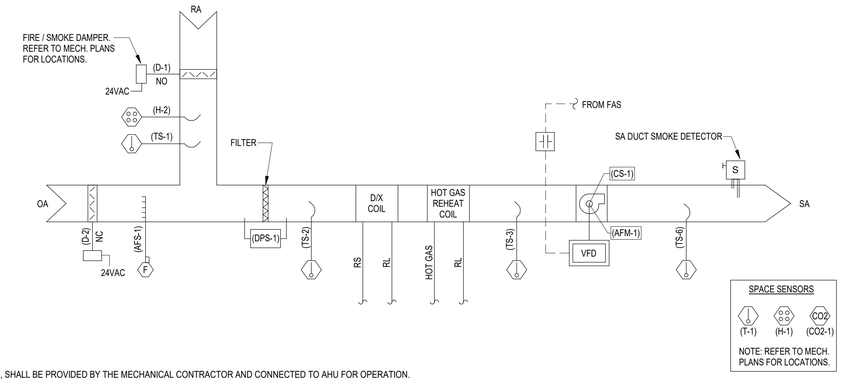
MECHANICAL AIRFLOW DIAGRAMS

PROJECT NO. 0122062

M-601

SHEET NO.

2/27/2024 2:34:33 PM



NOTES:
1. DAMPERS, D-1 & D-2, SHALL BE PROVIDED BY THE MECHANICAL CONTRACTOR AND CONNECTED TO AHU FOR OPERATION.
2. AIRFLOW MONITOR, AFM-1, SHALL BE AN AVERAGING FLOW SENSOR AND SHALL BE PROVIDED BY THE MECHANICAL CONTRACTOR AND CONNECTED TO AHU FOR OPERATION.
3. AIRFLOW MONITOR, AFM-2, SHALL BE PIEZOMETER RINGS AND SHALL BE INSTALLED BY AHU MANUFACTURER.

SEQUENCE OF OPERATION

GENERAL:
1. THE SINGLE-ZONE VARIABLE AIR VOLUME AIR HANDLING UNIT UNIT SHALL BE AVAILABLE FOR OPERATION AT ALL TIMES, BUT IN GENERAL, THE UNIT SHALL RUN 24/7 TO MAINTAIN TEMPERATURE, HUMIDITY, AND VENTILATION CONDITIONS IN THE SPACE. UNIT SHALL BE NORMALLY STARTED AND STOPPED AT THE UNIT THERMOSTAT AND BUILDING OCCUPANCY SENSORS.
2. ALL CONTROLS SHALL BE AUTOMATIC AND ALL SETPOINTS SHALL BE ADJUSTABLE.

SYSTEM START / STOP:
1. THE AHU SHALL START WHEN THE SCHEDULE AND THE OCCUPANCY SENSOR INDICATE THE SPACE IS OCCUPIED. THE UNIT WILL SEND A SIGNAL TO THE ASSOCIATED EXHAUST FANS TO START. AFTER A 2 MINUTE (ADJUSTABLE) TIME DELAY, THE AHU SUPPLY FAN SHALL START AND ALL SAFETIES AND INTERLOCKS SHALL OPERATE THROUGH THE STARTER AND BYPASS CONTACTOR.
2. WHEN INDEXED TO STOP BY A SIGNAL FROM THE UNIT CONTROLLER AND THE OCCUPANCY SENSOR INDICATE THE SPACE IS OCCUPIED, THE AHU SUPPLY FAN SHALL DE-ENERGIZE, OA DAMPER SHALL COMPLETELY CLOSE, AND RA DAMPER SHALL FULLY OPEN.

AIR FLOW CONTROL:
1. THE UNIT CONTROLLER SHALL MODULATE THE VFD FREQUENCY TO MEET SPACE TEMPERATURE SETPOINT OF 74°F (ADJUSTABLE) THROUGH THE USE OF THE RA DUCT MOUNTED TEMPERATURE SENSOR. THERMOSTATS SHALL BE LOCATED IN THE HURRICANE SAFE ROOM.

SUPPLY AIR TEMPERATURE CONTROL:
1. WHEN THE SUPPLY FAN IS ENERGIZED, THE DIRECT EXPANSION (DX) VALVE SHALL MODULATE AND THE COMPRESSORS SHALL STAGE/MODULATE TO MAINTAIN THE LEAVING AIR TEMPERATURE SETPOINT OF 55°F (ADJUSTABLE).
2. IF THE VFD IS AT MINIMUM SPEED AND THE SPACE TEMPERATURE DROPS BELOW HEATING SPACE SETPOINT OF 70°F (AS SENSED BY THE RETURN DUCT TEMPERATURE SENSOR) FOR MORE THAN 5 MINUTES (ADJUSTABLE), THE UNIT SHALL BE PUT IN HEAT PUMP MODE AND D/X COIL SHALL BE MODULATED TO MAINTAIN THE HEATING SPACE TEMPERATURE SETPOINT. ONCE THE SPACE TEMPERATURE HAS RISEN ABOVE THE HEATING SETPOINT, OF 70°F (ADJUSTABLE), THE HEAT PUMP COIL SHALL DE-ENERGIZE AND THE SYSTEM ALLOWED TO DRIFT THROUGH A DEADBAND TO THE SPACE COOLING TEMPERATURE SETPOINT OF 74°F (ADJUSTABLE). AFTER THAT, THE SYSTEM SHALL RETURN TO NORMAL COOLING OPERATION.
3. THE DISCHARGE AIR TEMPERATURE SETPOINT SHALL BE DYNAMICALLY RESET BASED ON THE DEVIATION OF ACTUAL SPACE TEMPERATURE FROM THE ACTIVE SPACE TEMPERATURE SETPOINT.
4. IF THE DISCHARGE AIR TEMPERATURE SENSOR FAILS, THE DX COOLING SHALL CONTROL TO MAINTAIN THE ACTIVE SPACE TEMPERATURE SETPOINT AND AN ALARM SHALL ANNUNCIATE AT THE UNIT CONTROLLER. IF THE DISCHARGE AIR TEMPERATURE SENSOR AND THE SPACE TEMPERATURE SENSOR FAIL, THE DX COOLING SHALL BE DISABLED AND AN ALARM SHALL ANNUNCIATE AT THE UNIT CONTROLLER.

OUTSIDE/RETURN AIR DAMPER CONTROL:
1. THE RETURN AIR DAMPER SHALL BE OPENED 100% AND THE OUTSIDE AIR DAMPER SHALL MODULATE TO MAINTAIN THE OUTSIDE AIR VOLUME SETPOINT AS SCHEDULED. AIRFLOW SHALL BE MONITORED BY AFM-1.
2. WHEN THE OUTSIDE AIR DAMPER IS OPEN 100% AND THE OUTSIDE AIR VOLUME IS BELOW SETPOINT, THE RA DAMPER SHALL MODULATE TO MAINTAIN THE OUTSIDE AIR VOLUME SETPOINT.

OUTSIDE AIR DEMAND CONTROL VENTILATION:
1. SYSTEM SHALL UTILIZE A LOCAL CO2 SENSOR AND SHALL MONITOR AND COMPARE THE MEASURED SPACE CO2 TO THE SPACE CO2 CONCENTRATION SETPOINT (ADJUSTABLE). THE UNIT SHALL AGGREGATE EACH SPACE CO2 SENSOR IN THE ZONE AND CONTROL BASED ON THE HIGHEST CO2 MEASUREMENT.
2. IF CARBON DIOXIDE DIFFERENTIAL RISES TO 700 PPM, THE AIR HANDLING UNIT OUTSIDE AIR DAMPER SHALL MODULATE OPEN TOWARDS MAXIMUM SETTING OR UNTIL OUTSIDE AIR DAMPER REACHES FULL OPEN POSITION. ONCE THE MEASURED CO2 CONCENTRATION FALLS BELOW A DIFFERENTIAL OF 700 PPM, THE OUTSIDE AIR DAMPER SHALL MODULATE TOWARD MINIMUM OUTDOOR AIR POSITION SETPOINT.

DISCHARGE AIR TEMPERATURE RESET CONTROL:
1. THE SPACE TEMPERATURE, OCCUPIED HEATING SETPOINT, OCCUPIED COOLING SETPOINT, AND THE HEAT/COOL MODE SHALL BE COMMUNICATED TO THE UNIT CONTROLLER. THE DISCHARGE AIR TEMPERATURE SHALL BE RESET BASED UPON THE DEVIATION OF SPACE TEMPERATURE FROM THE APPROPRIATE MODE SETPOINT DERIVED BY THE CONTROLLER. ALSO, THE UNIT CONTROLLER SHALL OVERRIDE THIS RESET FUNCTION WHENEVER OUTDOOR DEW POINT IS HIGHER THAN 60°F (ADJUSTABLE) OR INDOOR HUMIDITY (MEASURED AT THE SOURCE OF CONTROL) IS HIGHER THAN 60% RH (ADJUSTABLE). IF THE DISCHARGE AIR TEMPERATURE DROPS BELOW THE MINIMUM LIMIT, A LOW TEMPERATURE ALARM SHALL BE SENT TO THE UNIT CONTROLLER, AND THE UNIT SHALL SHUT DOWN. IF THE DISCHARGE AIR TEMPERATURE RISES ABOVE THE MAXIMUM LIMIT, A HIGH TEMPERATURE ALARM SHALL ANNUNCIATE.

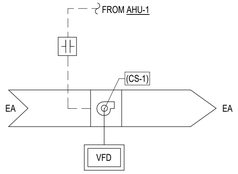
MIXED AIR LOW LIMIT:
1. THE INITIAL DAMPER OPENING RATE SHALL BE LIMITED TO 2% PER MINUTE (ADJUSTABLE) UNTIL THE DAMPER HAS REACHED ITS MINIMUM VENTILATION POSITION. THE OUTSIDE AIR DAMPER SHALL MODULATE TO APOSITION LESS THAN THE MINIMUM DAMPER POSITION IF THE MIXED AIR TEMPERATURE DROPS BELOW 50°F (ADJUSTABLE). IF THE MIXED AIR TEMPERATURE SENSOR FAILS AN ALARM SHALL BE SENT TO THE UNIT CONTROLLER AND THE OUTSIDE AIR DAMPER SHALL RETURN TO THE MINIMUM POSITION.

HUMIDITY CONTROL:
1. WHENEVER RETURN AIR RELATIVE HUMIDITY IS AT OR ABOVE 55% (ADJUSTABLE), AS SENSED BY THE DUCT MOUNTED RA HUMIDITY SENSOR, THE DX COOLING COIL SHALL CONTROL TO MAINTAIN SPACE HUMIDITY OF 50%.
2. IF THE VFD IS AT MINIMUM SPEED AND THE SPACE TEMPERATURE DROPS BELOW SETPOINT OF 74°F (ADJUSTABLE), THE HOT GAS REHEAT COIL SHALL MODULATE TO PREVENT OVERCOOLING OF THE SPACE AND MAINTAIN SPACE TEMPERATURE SETPOINT.
3. WHEN SPACE RELATIVE HUMIDITY HAS DROPPED BACK TO 50% RH (ADJUSTABLE) FOR MORE THAN 20 MINUTES (ADJUSTABLE), THE SUPPLY AIR DISCHARGE TEMPERATURE SHALL INCREASE TO SCHEDULED OPERATION SETPOINT.
4. IF THE SPACE RELATIVE HUMIDITY SENSOR FAILS THE DEHUMIDIFICATION SEQUENCE SHALL BE TERMINATED AND AN ALARM SHALL BE SENT TO THE UNIT CONTROLLER.

FILTER STATUS:
1. A DIFFERENTIAL PRESSURE SWITCH SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FILTER WHEN THE FAN IS RUNNING. IF THE SWITCH CLOSES DURING NORMAL OPERATION, A DIRTY FILTER ALARM SHALL ANNUNCIATE AT THE UNIT CONTROLLER.

UN-OCCUPIED MODE:
1. THE UNIT SUPPLY FAN SHALL DE-ENERGIZE, THE OA DAMPER SHALL CLOSE, AND THE RA DAMPER SHALL OPEN.
2. IF SPACE TEMPERATURE DROPS BELOW UN-OCCUPIED WINTER SPACE TEMPERATURE SET-POINT 60°F (ADJUSTABLE) AS MEASURED BY THE SPACE TEMPERATURE SENSOR, THE SUPPLY FAN SHALL START, THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED AND THE HEAT PUMP SHALL BE ENABLED. WHEN THE SPACE TEMPERATURE RISES ABOVE THE UN-OCCUPIED HEATING SETPOINT OF 60°F (ADJUSTABLE) PLUS THE UN-OCCUPIED DIFFERENTIAL OF 4°F (ADJUSTABLE), THE SUPPLY FAN SHALL STOP AND THE HEAT PUMP SHALL BE DISABLED
3. IF SPACE TEMPERATURE RISES ABOVE THE SUMMER UN-OCCUPIED TEMPERATURE SET-POINT 80°F (ADJUSTABLE), THE SUPPLY FAN SHALL START, THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED AND THE DX COOLING SHALL BE ENABLED. WHEN THE SPACE TEMPERATURE FALLS BELOW THE UNOCCUPIED COOLING SETPOINT OF 80°F (ADJUSTABLE) MINUS THE UNOCCUPIED DIFFERENTIAL OF 4°F (ADJUSTABLE), THE SUPPLY FAN SHALL STOP, THE DX COOLING SHALL BE DISABLED, ANDTHE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED.

GRAPHICAL USER INTERFACE:
1. PROVIDE A GRAPHICAL DISPLAY OF THE SYSTEM AT THE UNIT CONTROLLER. THE DISPLAY SHALL SHOW ALL POINTS WITH THEIR MEASURED VALUES OR STATES, WHICH SHALL BE UPDATED CONTINUOUSLY AND SHOWN AS CURRENT VALUE.



SEQUENCE OF OPERATION

GENERAL:
1. THE EXHAUST FAN SERVES AS GENERAL EXHAUST AND IS COMPRISED WITH AN EXHAUST AIRFLOW PATH, A FACTORY PROVIDED GRAVITY BACKDRAFT DAMPER, AND AN ELLECTRONICALLY COMMUNICATED MOTOR (ECM).
2. OCCUPIED: FAN SHALL MAINTAIN CONSTANT SCHEDULED AIRFLOW AIR ALL TIMES.
3. UNOCCUPIED: FAN SHALL BE DE-ENERGIZED.

STARTUP/SHUTDOWN:
1. FAN SHALL BE INTERLOCKED WITH THE ASSOCIATED AIR HANDLER. FAN SHALL BE INTERLOCKED WITH THE ASSOCIATED AIR HANDLER. UPON SHUTDOWN OF ASSOCIATED AIR HANDLER, EXHAUST FAN SHALL DE-ENERGIZE. EXHAUST FAN SHALL ENERGIZE UPON START-UP OF ASSOCIATED AIR HANDLER. ALARM SHALL BE SENT TO ASSOCIATED AIR HANDLER CONTROLLER UPON FAILURE OF FAN.

INPUT/OUTPUT SUMMARY

SYSTEM		ANALOG								DIGITAL								SYSTEM FEATURES											
		INPUT							OUTPUT	INPUT					OUTPUT			ALARMS					PROGRAMS						
EXHAUST FAN	COMMUNICATION/ DATA INTERFACE	DIFF. PRESSURE	STATIC PRESSURE	FREQUENCY	FLOW RATE	SPEED	REAL TIME EFFICIENCY	SETPOINT ADJUSTMENT	DAMPER ACTUATOR	DIFF. PRESSURE SWITCH	STATUS	SPEED SWITCH	CURRENT RELAY	FLOW SWITCH	ON-OFF	DAMPER ACTUATOR	SPEED SIGNAL	PROOF	COMMUNICATION FAILURE	DIRTY FILTER	HIGH-LOW VALUE	HIGH/LOW PRESSURE	TIME SCHEDULE / TREND	RESET	RUN TIME	GRAPHIC	REMARKS
FAN													●		●												CS-1

2 EF-1 CONTROL DIAGRAM
N.T.S.

INPUT/OUTPUT SUMMARY

SYSTEM		ANALOG									DIGITAL									SYSTEM FEATURES												
		INPUT								OUTPUT	INPUT					OUTPUT				ALARMS					PROGRAMS							
SINGLE-ZONE VARIABLE AIR VOLUME AIR HANDLING UNIT	COMMUNICATION/ DATA INTERFACE	TEMPERATURE	HUMIDITY	DIFF. PRESSURE	STATIC PRESSURE	FREQUENCY	FLOW RATE	SPEED	REAL TIME EFFICIENCY	SETPOINT ADJUSTMENT	VALVE ACTUATOR	DAMPER ACTUATOR	DIFF. PRESSURE SWITCH	STATUS	SPEED SWITCH	CURRENT RELAY	FLOW SWITCH	ON-OFF	DAMPER ACTUATOR	VALVE ACTUATOR	SPEED SIGNAL	ELEC. HEAT STAGES	PROOF	COMMUNICATION FAILURE	DIRTY FILTER	HIGH-LOW VALUE	HIGH/LOW PRESSURE	CO2 LEVEL	TIME SCHEDULE / TREND	OPT. START / STOP	RESET	RUN TIME	SET BACK - SET UP	MORNING WARM-UP	GRAPHIC	REMARKS
SYSTEM																		●																●	CS-1
FAN VFD	●					●				●				●							●		●	●						●	●			●	SUPPLY FAN VFD
SUPPLY FAN															●																			●	CS-1
RETURN AIR		●	●									●																						●	H-1, TS-1
SUPPLY AIR		●																																●	TS-3, TS-4
OUTSIDE AIR							●					●																						●	D-1, AFM-1
MIXED AIR		●																							●									●	TS-2
COILS														●				●																●	COMPRESSOR, D/X VALVE, HGR, HEAT PUMP
FILTERS													●											●										●	DPS-1
SPACE		●	●																						●			●						●	T-1, H-1, CO2-1
DUCT SMOKE DETECTOR												●												●										●	INTERLOCK W/ FIRE ALARM SYSTEM

1 AHU-1 CONTROL DIAGRAM
N.T.S.

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100% DESIGN

SEAL

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2/26/24

NICHOLAS O. KUGLER, P.E.
FL License #78501

SCALE

NOT TO SCALE

REVISIONS

NO.	DESCRIPTION	DATE

DRAWN BY	AJZ
APPROVED BY	NOK
CHECKED BY	NOK
DATE	2.6.24

TITLE

MECHANICAL CONTROLS

PROJECT NO. 0122062

M-701

SHEET NO.

2/27/2024 2:34:35 PM

AIR HANDLING UNIT SCHEDULE

UNIT NO.	AREA SERVED	LOCATION	AIRFLOW		SUPPLY FAN					COOLING COIL						HEAT PUMP				ELECTRICAL DATA							UNIT WEIGHT	BASIS OF DESIGN
			OA CFM	SA CFM	FAN QTY.	FAN BHP	FAN HP	FAN MAX RPM	MAX. ESP	TOTAL CAP. (MBH)	SENS. CAP. (MBH)	EAT DB (°F)	EAT WB (°F)	LAT DB (°F)	LAT WB (°F)	REFR. TYPE	TOTAL CAP. (MBH)	EAT DB (°F)	LAT DB (°F)	MAX APD (In. H2O)	FLA	MCA	MOCP	V	PH	HZ		
AHU-1	110 HURRICANE SAFE ROOM	105 MECH/ELEC	1180	5500	2	2.19	-	1882	1.80	305.3	217.7	80.0	67.0	55.9	54.2	R-410A	176	40	80	0.40	14.0	16	20	208	3	60	850	AAON : V3-ERB-8
AHU-2	100 CORR / 102 WOMENS / 103 MENS	113 STOR RM	0	1100	1	-	.5	-	0.77	36.4	26.0	77.1	66.0	54.3	55.2	R-410A	32	40	80	-	3.9	4	15	208	1	60	170	LENNOX : CBA25UHV-036
AHU-3	120 CONFERENCE	113 STOR RM	250	1300	1	-	1.0	-	0.79	41.8	29.6	78.1	66.9	56.1	56.1	R-410A	35	40	80	-	6.9	6	15	208	1	60	170	LENNOX : CBA25UHV-042

AHU-1 NOTES:

1. PROVIDE SINGLE POINT ELECTRICAL CONNECTION.
2. DISCONNECT PROVIDED BY ELECTRICAL. REFER TO ELECTRICAL DRAWINGS.
3. PROVIDE FACTORY MOUNTED DISCONNECT.
4. PROVIDE 4" THROWAWAY PLEATED FILTERS, MIN. MERV 8.
5. PROVIDE FLOOR MOUNTED SUPPORT STAND WITH VIBRATION ISOLATION.
6. PROVIDE REFRIGERANT LINES SIZE AS RECOMMENDED BY MANUFACTURER. FOR LONGER RUNS COORDINATE WITH MANUFACTURER PRIOR TO PURCHASE OR ANY WORK.
7. PROVIDE 3" AUXILLARY DRAIN PAN WITH AUTOMATIC SHUT OFF FLOAT SWITCH OR SENSOR SWITCH IN UNIT'S DRAIN PAN SECONDARY CONNECTION.
8. PROVIDE FULLY MODULATING HOT GAS REHEAT COIL AND HOT GAS REHEAT COIL AND VALVES FOR DEHUMIDIFICATION OPERATION.
9. PROVIDE UNIT WITH FACTORY DDC CONTROLLER. DDC CONTROLLER SHALL HAVE LCD DISPLAY WITH GRAPHICAL USER INTERFACE.
10. PROVIDE FACTORY TOUCHSCREEN PROGRAMMABLE CONTROLLER.
11. PROVIDE 6 ROW DX COOLING COIL FOR HIGH CAPACITY DEHUMIDIFICATION.
12. PROVIDE CLOGGED FILTER STATUS.
13. COORDINATE FINAL ELECTRICAL REQUIREMENTS FOR FINAL SELECTION OG AHU-1/CU-1 WITH ELECTRICAL PRIOR TO BID.

AHU-2,3 NOTES:

1. PROVIDE SINGLE POINT ELECTRICAL CONNECTION.
2. DISCONNECT PROVIDED BY ELECTRICAL. REFER TO ELECTRICAL DRAWINGS.
3. PROVIDE FACTORY MOUNTER DISCONNECT/BREAKER.
4. PROVIDE ECM MULTI SPEED SUPPLY FAN
5. PROVIDE 4-INCH THROWAWAY MERV 8 MIN. PLEATED AIR FILTER AND VIBRATION ISOLATION. PROVIDE FILTER RACK BETWEEN THE UNIT RETURN AIR INTAKE AND RETURN AIR DUCT TO ACCOMMODATE FILTER.
6. PROVIDE 7-DAY PROGRAMMABLE THERMOSTAT. UNITS SHALL BE THERMOSTATICALLY CONTROLLED TO CYCLE WITH LOADS. NO ADDITIONAL CONTROLS ARE REQUIRED.
7. PROVIDE REFRIGERANT LINES SIZE AS RECOMMENDED BY MANUFACTURER. FOR LONGER RUNS COORDINATE WITH MANUFACTURER PRIOR TO PURCHASE OR ANY WORK.
8. MECHANICAL CONTRACTOR TO PROVIDE AND INSTALL 3" AUXILIARY DRAIN PAN WITH AUTOMATIC SHUT OFF FLOAT SWITCH OR SENSOR SWITCH IN UNIT'S DRAIN PAN SECONDARY CONNECTION.
9. PROVIDE MOTORIZED OUTSIDE AIR DAMPER INTERLOCKED WITH SUPPLY AIR FAN FOR AHU-3. PROVIDE MOTORIZED RETURN AIR DAMPER. RA DAMPER SHALL BE TWO POSITION TYPE. POSITION ONE: RA DAMPER BALANCED WITH OA DAMPER 100% OPEN. POSITION TWO: RA DAMPER 100% OPEN WITH OUTSIDE AIR DAMPER CLOSED.

AIR-COOLED CONDENSING UNIT SCHEDULE

UNIT NO.	LOCATION	ASSOCIATED AHU	NOMINAL COOLING CAPACITY (TONS)	NOMINAL HEATING CAPACITY (TONS)	FAN QTY	FAN FLA (EA)	COMPRESSOR QTY	COMPRESSOR RLA (EA)	COMPRESSOR MIN. EER	REFRIGERANT TYPE	REFRIGERANT GAS SIZE	REFRIGERANT LIQUID SIZE	ELECTRICAL DATA MCA	MOP	V	PH	HZ	UNIT WEIGHT	BASIS OF DESIGN
CU-1	130 MECHANICAL YARD	AHU-1	22.67	15.0	4	3.4	2	48.1	10.2	R-410A	NOTE 1	NOTE 1	122	150	208	3	60	1518	AAON : CFA-025-C
CU-2	130 MECHANICAL YARD	AHU-2	3	-	1	-	-	-	-	R-410A	NOTE 1	NOTE 1	18	30	208	1	60	220	LENNOX : ML17XP1-036-230
CU-3	130 MECHANICAL YARD	AHU-3	3.5	-	1	-	-	-	-	R-410A	NOTE 1	NOTE 1	26	40	208	1	60	250	LENNOX : ML17XP1-042-230

NOTES:

1. SIZE REFRIGERANT LINES PER MANUFACTURER RECOMMENDATIONS. PROVIDE OVERSIZE LINES AND/OR REFRIGERATION LINE EXTENSION KIT BASEDON MANUFACTURERS RECOMMENDATIONS FOR EXTENDED REFRIGERATION LINE RUNS.
2. AMBIENT DESIGN TEMPERATURE IS 95° F.
3. DISCONNECT PROVIDED BY ELECTRICAL. REFER TO ELECTRICAL DRAWINGS.
4. PROVIDE SINGLE POINT ELECTRICAL CONNECTION.
5. PROVIDE 5 YEAR COMPRESSOR WARRANTY.
6. PROVIDE PROTECTIVE COATING ON CASING, BASE, FRAME AND CONDENSER COIL OF OUTSIDE CONDENSING UNIT. ACCEPTABLE PROVIDERS ARE GOLDFIN, BLYGOLD, LUVATA, AND BRONZ-GLOW. COIL COATING SHALL BE APPLIED AFTER CONSTRUCTION OF THE COIL (COATED FIN STOCK IS NOT ACCEPTABLE). COATING SHALL BE DOCUMENTED TO ENDURE A MINIMUM OF 4,000 HOURS OF SALT SPRAY (ASTM B117). COATING SHALL BE APPLIED BY THE FACTORY TRAINED AND CERTIFIED APPLICATOR.
7. PROVIDE CONDENSER COIL GUARDS.
8. PROVIDE CU-1 WITH HEAT PUMP OPERATION CAPABILITY.
9. PROVIDE CU-1 WITH VARIABLE SPEED COMPRESSORS FOR FULL PART LOAD CAPACITY CONTROL.

AIR DEVICE SCHEDULE

MARK	MIN CFM	MAX CFM	FACE SIZE	NECK SIZE	MAX. NC	TYPE	BASIS OF DESIGN
SUPPLY AIR							
SD1	0	75	8x8	6x6	30	GRILLE	TITUS 300RL
SD2	76	250	10x10	8x8	30	GRILLE	TITUS 300RL
SD3	50	150	24x24	6ø	30	LOUVERED	TITUS TDC
SD4	151	275	24x24	8ø	30	LOUVERED	TITUS TDC
SD5	276	425	24x24	10ø	30	LOUVERED	TITUS TDC
RETURN AIR							
RG1	100	210	12x12	10x10	30	PERFORATED	TITUS PAR
RG2	100	210	24x24	10x10	30	PERFORATED	TITUS PAR
RG3	50	100	24x24	6ø	30	PERFORATED	TITUS PAR
RG4	210	320	24x24	10ø	30	PERFORATED	TITUS PAR
RG5	320	400	24x24	12ø	30	PERFORATED	TITUS PAR
RG6	400	600	24x24	14ø	30	PERFORATED	TITUS PAR
RG7	600	1100	24x24	16ø	30	PERFORATED	TITUS PAR
RG8	0	250	10x10	8x8	30	GRILLE	TITUS 350FL
EXHAUST AIR							
EG1	0	125	12x12	6x6	35	EGGCRATE	TITUS 50F

NOTES:

1. AIR DISTRIBUTION DEVICES LOCATED IN SMALL ROOMS WHERE FULL 24"x24" GRID ARE NOT AVAILABLE SHALL BE PROVIDED WITH SURFACE MOUNTING BORDERS IN LIEU OF LAY-IN. SECURE EACH DEVICE TO CEILING GRID WITH FIELD-FABRICATED SUPPORTS.
2. ALL GRILLES SHALL BE SUPPLIED WITH A SQUARE TO ROUND DUCT ADAPTOR.

FAN SCHEDULE

FAN NO.	AREA SERVED	LOCATION	FAN TYPE	FAN CHARACTERISTICS CFM	ESP (in H2O)	FAN RPM	HP / W	DRIVE	ELECTRICAL DATA V	PH	HZ	EMERGENCY POWER	BASIS OF DESIGN	COMMENTS
EF-1	RESTROOMS & JAN CL	STORAGE RM 101	INLINE	600	0.25	980	1/4 HP	DIRECT	115	1	60	YES	GREENHECK : SQ-100-VG	1, 2, 3
EF-2	F/M 123	F/M 123	CEILING CABINET	80	0.25	-	5.8 W	DIRECT	120	1	60	YES	BROAN : XB80	1, 2, 4
EF-3	JAN CL 122	JAN CL 122	CEILING CABINET	50	0.25	-	5.1 W	DIRECT	120	1	60	NO	BROAN : XB50	1, 2, 4

NOTES:

1. PROVIDE SINGLE POINT ELECTRICAL CONNECTION AND FACTORY DISCONNECT SWITCH.
2. PROVIDE BACKDRAFT DAMPER.
3. FAN SHALL BE INTERLOCKED WITH AHU-1 OPERATION & CORRESPONDING OUTSIDE AIR DAMPER.
4. FAN SHALL BE INTERLOCKED WITH LIGHTING CONTROL TO BE "ON" WHEN SPACE IS OCCUPIED. PROVIDE FACTORY TIME DELAY SWITCH TO ALLOW FAN TO REMAIN "ON" WHEN SPACE IS UN-OCCUPIED FOR 10-MINUTES (ADJUSTABLE).

LOUVER SCHEDULE

MARK	SIZE (W"xH")	AIRFLOW (CFM)	PRESSURE DROP (IN-WG)	FREE AREA (SF)	SERVICE	LOCATION	BASIS OF DESIGN MFR: MODEL
L-1	30x30	1180	0.1	2.9	OUTSIDE AIR	ELEC / MECH 105	GREENHECK: EVH-501D
L-2	24x24	600	0.1	1.7	EXHAUST AIR	WOMENS 102	GREENHECK: EVH-501D
L-3	18x18	250	0.1	0.8	OUTSIDE AIR	STOR RM 113	GREENHECK: EVH-501D
L-4	14x14	125	0.1	0.4	EXHAUST AIR	F/M 123	GREENHECK: EVH-501D

NOTES:

1. PROVIDE ALL LOUVERS WITH DAMPER. REFER TO DAMPER SCHEDULE.
2. ALL LOUVERS TO BE AMCA 540 AND AMCA 550 LISTED.

RANGE HOOD SCHEDULE

UNIT NO.	TOTAL EXHAUST CFM	SONES	WEIGHT (LBS.)	ELECTRICAL V	PH	HZ	LIGHT WATTS	BASIS OF DESIGN
KH-1	250	8.9	90	120	1	60	60	GREENHECK : GRRS-W
KH-2	250	8.9	90	120	1	60	60	GREENHECK : GRRS-W

NOTES:

1. PROVIDE STAINLESS STEEL GREASE FILTER AND TRAY
2. COORDINATE 30" OR 36" HOOD WIDTH WITH ARCHITECTURAL PLANS
3. PROVIDE INTEGRAL UL300A WET CHEMICAL FIRE SUPPRESSION SYSTEM
4. PROVIDE INTEGRAL VARIABLE SPEED FAN WITH ELECTRONICALLY COMMUTATED (ECM) MOTOR
5. PROVIDE HOOD WITH LED LIGHTS.
6. HOOD CONTROLLER SHALL AUTOMATICALLY SHUT OFF POWER TO APPLIANCE AND RELEASE WET CHEMICAL FIRE SUPPRESSANT UPON ACTIVATION OF TEMPERATURE HIGH LIMIT. HOOD CONTROLLER SHALL ALSO OFFER MANUAL ACTIVATION VIA PULL STATION
7. PROVIDE TROUBLE AND FIRE ALARM CONTACTS FOR INTERFACE WITH BUILDING FIRE ALARM SYSTEM.
8. PROVIDE MANUAL PULL STATION
9. PROVIDE ELECTRIC SHUTOFF MODULE.
10. PROVIDE FRONT RECIRCULATION VENTILATION.

DUCTLESS SPLIT SYSTEM - OUTDOOR UNIT SCHEDULE

UNIT NO.	NOM. TONS	AMBIENT TEMP. (°F)	SEER2	ELECTRICAL DATA V	PH	HZ	MCA	MOP	UNIT SIZE LENGTH	WIDTH	HEIGHT	WEIGHT (LBS.)	BASIS OF DESIGN
CU-4	3.0	95	20.1	208	1	60	25	40	37-1/2"	13"	54-3/8"	218	LG : ARUN038GSS4

NOTES:

1. PROVIDE SINGLE POINT ELECTRICAL CONNECTION.
2. DISCONNECT PROVIDED BY ELECTRICAL. REFER TO ELECTRICAL DRAWINGS.
3. SIZE REFRIGERANT LINES PER MANUFACTURERS RECOMMENDATIONS.
4. AMBIENT DESIGN TEMPERATURE IS 95° F.
5. PROVIDE 5 YEAR COMPRESSOR WARRANTY.
6. PROVIDE ANTI-RECYCLE COMPRESSOR TIMER.
7. PROVIDE CONDENSER COIL GUARDS.
8. PROVIDE PROTECTIVE COATING ON CASING, BASE, FRAME AND CONDENSER COIL OF OUTSIDE CONDENSING UNIT. ACCEPTABLE PROVIDERS ARE GOLDFIN, BLYGOLD, LUVATA, AND BRONZ-GLOW. COIL COATING SHALL BE APPLIED AFTER CONSTRUCTION OF THE COIL (COATED FIN STOCK IS NOT ACCEPTABLE). COATING SHALL BE DOCUMENTED TO ENDURE A MINIMUM OF 4,000 HOURS OF SALT SPRAY (ASTM B117). COATING SHALL BE APPLIED BY THE FACTORY TRAINED AND CERTIFIED APPLICATOR.

DUCTLESS SPLIT SYSTEM - INDOOR UNIT SCHEDULE

UNIT NO.	ASSOCIATED OUTDOOR UNIT	CFM (MAX.)	TOTAL COOLING CAP. (MBH)	SENSIBLE COOLING CAP.	TOTAL HEATING CAP. (MBH)	ELECTRICAL DATA V	PH	HZ	MCA	MOP	BASIS OF DESIGN
DSS-1	CU-4	812	30,000	24,000	32,000	208	1	60	1.02	15	LG : ARNU303SVA4

NOTES:

1. INDOOR UNIT POWER SUPPLIED FROM OUTDOOR UNIT.
2. HIGH SIDEWALL INDOOR UNIT. INSTALL REFRIGERANT LINES THROUGH REAR OF UNIT CONCEALED WITHIN WALL. NO EXPOSED PIPING SHALL BE ALLOWED.
3. PROVIDE HARD WIRED 7-DAY PROGRAMMABLE THERMOSTAT. UNIT(S) SHALL BE THERMOSTATICALLY CONTROLLED TO CYCLE WITH LOADS. NO ADDITIONAL CONTROLS ARE REQUIRED.
4. PROVIDE AND INSTALL INTEGRAL/ACCESSORY CONDENSATE PUMP WITHIN INDOOR UNIT AND WIRE TO UNIT TERMINAL BLOCK PER MANUFACTURER'S INSTRUCTIONS.
5. PROVIDE REFRIGERANT LINES SIZED AS RECOMMENDED BY MANUFACTURER. FOR LONGER RUNS, COORDINATE WITH MANUFACTURER PRIOR TO PURCHASE OR ANY WORK.

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GULF COAST ELECTRICAL CO-OP

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SEAL

NICHOLAS OSKAR KUGLER LICENSE No. 78501 STATE OF FLORIDA PROFESSIONAL ENGINEER 2/26/24

NICHOLAS O. KUGLER, P.E.
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SCALE

NOT TO SCALE

REVISIONS

NO.	DESCRIPTION	DATE

DRAWN BY AJZ
APPROVED BY NOK
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TITLE

MECHANICAL SCHEDULES

PROJECT NO. 0122062

M-801

SHEET NO.

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ELECTRICAL SYMBOLS - POWER/LIGHTING PLANS

SYMBOL	DESCRIPTION
	EXISTING TO BE REMOVED (HEAVY, DASHED LINE)
	EXISTING TO REMAIN (LIGHT, SOLID LINE)
	NEW (HEAVY, SOLID LINE)
ABCD-##	BRANCH CIRCUIT HOMERUN. "ABCD" INDICATES PANEL NAME, "##" INDICATE POLE POSITIONS IN PANEL. ONE SEPARATE GREEN GROUNDING CONDUCTOR SHALL BE PROVIDED FOR EACH HOMERUN
UP	CONDUIT TURNING UP
DN	CONDUIT TURNING DOWN
	CONDUIT STUBBED OUT OR UP
	CONDUIT CONTINUED
	SWITCHBOARD/ SWITCHGEAR/ DISTRIBUTION PANEL, UNDER 250 VOLTS
	BRANCH CIRCUIT PANELBOARD, UNDER 250 VOLTS, SURFACE MOUNTED
	BRANCH CIRCUIT PANELBOARD, UNDER 250 VOLTS, FLUSH MOUNTED
	MOTOR CONNECTION
	GROUND BUS BAR, COPPER
	DISCONNECT SWITCH, FUSED
	DISCONNECT SWITCH, UNFUSED
	STARTER, COMBINATION WITH DISCONNECT SWITCH
	STARTER OR MOTOR CONTROLLER
VFD	VARIABLE FREQUENCY DRIVE
	JUNCTION BOX
	WALL MOUNTED JUNCTION BOX
	RECEPTACLE, DUPLEX SUBSCRIPTS (TYPICAL FOR ALL RECEPTACLES): G = GFCI TYPE T = TAMPER RESISTANT CH = MOUNTED AT COUNTER HEIGHT WITH BOTTOM OF DEVICE AT 6" ABOVE COUNTER OR 2" ABOVE BACKSPLASH OR AS NOTED ON PLANS USB = DUPLEX RECEPTACLE WITH (1) USB TYPE 'A' AND (1) USB TYPE 'C' WP = DEVICE PROVIDED WITH WEATHERPROOF IN-USE METAL COVER
	RECEPTACLE, DOUBLE DUPLEX (QUADRAPLEX)
	RECEPTACLE, SINGLE
	RECEPTACLE, SPECIAL PURPOSE, SEE CODED NOTES ON FLOOR PLANS FOR NEMA CONFIGURATION AND WIRING REQUIREMENTS
	FLOOR BOX WITH DUPLEX RECEPTACLE WITH APPROPRIATE FLANGE
	FLOOR BOX, TWO DUPLEX RECEPTACLES (QUAD) WITH APPROPRIATE FLANGE
	MULTI-SERVICE FLOOR BOX WITH DUPLEX RECEPTACLE, VOICE/DATA/AV DEVICES (REFER TO TECHNOLOGY DRAWINGS OR OWNER'S VENDOR DRAWINGS FOR LOW VOLTAGE REQUIREMENTS)
	MULTI-SERVICE FLOOR BOX WITH TWO DUPLEX RECEPTACLES (QUAD) , VOICE/DATA/AV DEVICES (REFER TO TECHNOLOGY DRAWINGS OR OWNER'S VENDOR DRAWINGS FOR LOW VOLTAGE REQUIREMENTS)

SYMBOL	DESCRIPTION
$\$_{\#}$	SWITCH (# SUBSCRIPT AS INDICATED BELOW) - SEE PLANS AND SPECIFICATIONS FOR DETAILS BLANK = SINGLE POLE D = DIMMER LV= LOW VOLTAGE - SEE BELOW FOR DETAILS M = MANUAL MOTOR STARTING WP= WEATHER PROOF OS= DUAL TECHNOLOGY OCCUPANCY SENSOR
S LV2Dab	LOW VOLTAGE SWITCH - SEE PLANS, SPECIFICATIONS AND WIRING DIAGRAMS FOR DETAILS SUBSCRIPT(S) INDICATE FIXTURES CONTROLLED 'D' INDICATES 0-10V DIMMING '2' INDICATES NUMBER OF LOW VOLTAGE ZONES 'LV' INDICATES LOW VOLTAGE SWITCH
LPP a	LIGHTING POWER PACK RELAY SUBSCRIPT INDICATES CONTROLLING SWITCH AND FIXTURES CONTROLLED (TYPICAL)
LPD	LIGHTING POWER PACK RELAY WITH 0-10V DIMMING
LPE	EMERGENCY LIGHTING POWER PACK RELAY - UL924 COMPLIANT
LPDE	EMERGENCY LIGHTING POWER PACK RELAY - UL924 COMPLIANT AND 0-10V DIMMING
OS	CEILING MOUNTED DUAL TECHNOLOGY OCCUPANCY SENSOR
A	FIXTURE TYPE
	LED FIXTURE, RECESSED, PENDANT OR SURFACE CEILING
2 a	LOWER CASE LETTER INDICATES CONTROLLING SWITCH CIRCUIT NUMBER
	LED, RECESSED, PENDANT OR SURFACE CEILING LIGHTING FIXTURE
	SHADING INDICATES FIXTURE CONNECTED TO EMERGENCY CIRCUIT; "E" AFTER FIXTURE TYPE TAG INDICATES INTEGRAL BATTERY PACK UNLESS OTHERWISE NOTED ON LIGHT FIXTURE SCHEDULE (TYPICAL FOR ALL LIGHT FIXTURE SYMBOLS)
	LIGHTING, EXTERIOR BUILDING
	EXIT LIGHT, LED, CEILING OR PENDANT MOUNTED; DIRECTIONAL ARROWS AS INDICATED; SHADED QUADRANT INDICATES FACE(S) OF LUMINAIRE

LIGHTNING PROTECTION SYSTEM

SYMBOL	DESCRIPTION
	AIR TERMINAL; PROVIDE PARAPET TYPE BASE WHERE MOUNTED ON PARAPET; PROVIDE FLAT BASE FOR MECHANICAL EQUIPMENT OR ROOF PERIMETER WITH NO PARAPET; PROVIDE BLUNT TIP WHERE MOUNTED ON INTERIOR OF ROOF, UNLESS OTHERWISE NOTED ON LIGHTNING PROTECTION PLANS
	GROUND TERMINAL
DN	DOWN CONDUCTOR
DN	THRU-ROOF CONDUCTOR

ELECTRICAL ONE-LINE

SYMBOL	DESCRIPTION
	TRANSFORMER, ONE-LINE
M	METER, ONE-LINE
## / ABC	PANELBOARD MAIN CIRCUIT BREAKER TYPE, ONE-LINE ### - INDICATES BREAKER RATING ABC - INDICATES PANEL DESIGNATION
## / ABC	PANELBOARD MAIN LUG TYPE, ONE-LINE ### - INDICATES BUS RATING ABC - INDICATES PANEL DESIGNATION
###A	ENCLOSED CIRCUIT BREAKER ### - INDICATES BREAKER RATING
G	GENERATOR, ONE-LINE
	TRANSFER SWITCH, ONE-LINE
	EARTH GROUND
SPD	SURGE PROTECTIVE DEVICE

ELECTRICAL ABBREVIATIONS

ABBR.	DESCRIPTION
1PH	SINGLE-PHASE
3PH	THREE-PHASE
4W	FOUR-WIRE
A/E	ARCHITECT/ENGINEER
AF	AMPERE FRAME OR AMP FUSE
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHJ	AUTHORITY HAVING JURISDICTION
AIC	AMPERE INTERRUPTING CAPACITY
ALT	ALTERNATE
AMP	AMPERE
ASC	AMPS SHORT CIRCUIT
AT	AMPERE TRIP
ATS	AUTOMATIC TRANSFER SWITCH
AUTO	AUTOMATIC
AV	AUDIO VISUAL
AWG	AMERICAN WIRE GAUGE
BLDG	BUILDING
C	CONDUIT
CAT	CATALOG
CATV	COMMUNITY ANTENNA TELEVISION
CCTV	CLOSED CIRCUIT TELEVISION
cd	CANDELA
CD	CONSTRUCTION DOCUMENTS
CKT	CIRCUIT
CLG	CEILING
COAX	COAX CABLE
COMM	COMMUNICATION
CONC	CONCRETE
CONT	CONTINUE
COORD	COORDINATE
CRI	COLOR RENDERING INDEX
CT	CURRENT TRANSFORMER
CU	COPPER
DB	DECIBEL OR DIRECT BURIAL
DC	DIRECT CURRENT
DEG C	DEGREES CELSIUS
DEG F	DEGREES FAHRENHEIT
DEMO	DEMOLITION
DISC	DISCONNECT
DN	DOWN
DPDT	DOUBLE POLE, DOUBLE THROW
DPST	DOUBLE POLE, SINGLE THROW
DS	DISCONNECT SWITCH
DWG	DRAWING
ELEC	ELECTRIC OR ELECTRICAL
ELEV	ELEVATOR
EMT	ELECTRICAL METALLIC TUBING
ENCL	ENCLOSURE
EPO	EMERGENCY POWER OFF
ESMT	EASEMENT
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
ETR	EXISTING TO REMAIN
FA	FIRE ALARM
FAAP	FIRE ALARM ANNUNCIATOR PANEL
FACP	FIRE ALARM CONTROL PANEL
FC	FOOTCANDLE
FLA	FULL LOAD AMPS
FP	FIRE PROTECTION
FT	FEET OR FOOT
GND	GROUND
G or GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GTB	GROUND TERMINAL BOX
HD	HEAT DETECTOR
HOA	HAND-OFF-AUTOMATIC
HP	HORSEPOWER
HZ	HERTZ
IESNA	ILLUMINATION ENGINEERING SOCIETY OF NORTH AMERICA
IMC	INTERMEDIATE METAL CONDUIT
IR	INFRARED
IWH	INSTANTANEOUS WATER HEATER
J-BOX	JUNCTION BOX
KCMIL	ONE-THOUSAND CIRCULAR MILS
kV	KILOVOLT
kVA	KILOVOLT AMPERE
kVAH	KILOVOLT AMPERE PER HOUR
kVAR	KILOVOLT AMPERE REACTIVE
kW	KILOWATT
kWH	KILOWATT HOUR

ABBR.	DESCRIPTION
LED	LIGHT EMITTING DIODE
LF	LINEAR FEET (FOOT)
LM	LUMEN
LP	LIGHT POLE
LRA	LOCKED ROTOR AMPS
LTG	LIGHTING
LV	LOW VOLTAGE
MAX	MAXIMUM
MC	METAL-CLAD
MCA	MINIMUM CIRCUIT AMPS
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MDP	MAIN DISTRIBUTION PANEL
MECH	MECHANICAL
MH	MANHOLE
MIN	MINIMUM
MOCP	MAXIMUM OVERCURRENT PROTECTION
MLO	MAIN LUGS ONLY
MTD	MOUNTED
MTG	MOUNTING
MTS	MANUAL TRANSFER SWITCH
MV	MEDIUM VOLTAGE
MVA	MEGAVOLT-AMPERE
MW	MEGAWATT MICROWAVE
NA	NOT APPLICABLE
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NEUT OR N	NEUTRAL
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NIC	NOT IN CONTRACT
NL	NIGHT LIGHT
NO	NORMALLY OPEN
NS	NO SCALE
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OL	OVERLOAD
P	POLE
PA	PUBLIC ADDRESS
PCB	POLYCHLORINATED BIPHENYL
PH	PHASE
PNL	PANEL
POD	POWER OPERATED DAMPER
PVC	POLYVINYL CHLORIDE (PLASTIC)
PWR	POWER
RCP	REFLECTED CEILING PLAN
RGS	RIGID GALVANIZED STEEL
RM	ROOM
RMS	ROOT MEAN SQUARE
REQD	REQUIRED
SCC	SHORT CIRCUIT CAPACITY
SD	SMOKE DETECTOR
SF	SQUARE FOOT (FEET)
SI	INTERNATIONAL SYSTEM OF UNITS
SPEC	SPECIFICATION
SPST	SINGLE POLE, SINGLE THROW
SW	SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
TEL	TELEPHONE
TP	TWISTED PAIR
TPS	TWISTED PAIR SHIELDED
TTB	TELEPHONE TERMINAL BOARD
TV	TELEVISION
TYP	TYPICAL
UGND	UNDERGROUND
UL	UNDERWRITERS LABORATORY
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLT
VA	VOLT AMPERE
VAR	VOLT AMPERE REACTIVE
VFD	VARIABLE FREQUENCY DRIVE
VOLT	VOLTAGE
W	WATT
WH	WATER HEATER
WP	WEATHERPROOF
XFER	TRANSFER
XFMR	TRANSFORMER

SHEET LIST

SHEET NUMBER	SHEET NAME
E-001	ELECTRICAL LEGENDS & SYMBOLS
E-002	ELECTRICAL GENERAL NOTES
ES100	ELECTRICAL SITE PLAN
EL101	FIRST FLOOR PLAN - LIGHTING - NEW WORK
EP101	FIRST FLOOR AND ROOF PLAN - ELECTRICAL EQUIP. - NEW WORK
E-501	ELECTRICAL DETAILS
E-502	ELECTRICAL DETAILS
E-601	ELECTRICAL DIAGRAMS
E-801	ELECTRICAL SCHEDULES

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TITLE

ELECTRICAL LEGENDS & SYMBOLS

PROJECT NO. 0122062

E-001

SHEET NO.

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ELECTRICAL GENERAL NOTES

1. THE DRAWINGS AND APPLICABLE SPECIFICATIONS SHALL BE CONSIDERED SUPPLEMENTARY, ONE TO THE OTHER AND ARE CONSIDERED THE "CONTRACT DOCUMENTS". ALL WORKMANSHIP, METHODS AND/OR MATERIALS DESCRIBED OR IMPLIED BY ONE AND NOT DESCRIBED OR IMPLIED BY THE OTHER SHALL BE PROVIDED, FURNISHED OR PERFORMED AS IF IT HAD APPEARED IN BOTH SECTIONS. THE TERM "CONTRACT DOCUMENTS" DESCRIBED HEREIN IS NOT LIMITED SOLELY TO THE ELECTRICAL PORTION OF THE DRAWINGS AND SPECIFICATIONS, BUT ENCOMPASSES THE DRAWINGS AND SPECIFICATIONS OF ALL DIVISIONS AS A WHOLE.
2. PROVIDE AN OPERATING AND MAINTENANCE MANUAL TO OWNER PRIOR TO THE FINAL ACCEPTANCE. THE MANUAL SHALL INCLUDE, AS A MINIMUM, (1) SUBMITTAL DATA STATING EQUIPMENT RATING AND SELECTED OPTIONS FOR EACH PIECE OF EQUIPMENT REQUIRING MAINTENANCE. ALSO PROVIDE TWO OPERATIONS AND MAINTENANCE MANUALS FOR EACH PIECE OF EQUIPMENT REQUIRING MAINTENANCE. REQUIRED ROUTINE MAINTENANCE ACTIONS AND METHOD OF OPERATION FOR EQUIPMENT SHALL BE CLEARLY IDENTIFIED, AND THE NAME, PHONE NUMBER AND ADDRESS OF AT LEAST ONE QUALIFIED SERVICE AGENCY.
3. INCLUDE ALL COSTS FOR EXCAVATION, SAW CUTTING, DIRECTIONAL BORING, CORE DRILLING, BACKFILLING, SURFACE RESTORATION, REPAIR OF FINISHES, ETC. THAT IS REQUIRED IN ORDER TO MEET THE PROJECT REQUIREMENTS.
4. INCLUDE IN BID ALL COSTS ASSOCIATED WITH TEMPORARY ELECTRICAL SERVICE AS REQUIRED FOR USE BY ALL TRADES DURING CONSTRUCTION. REMOVE TEMPORARY POWER AT THE COMPLETION OF THE PROJECT. OBTAIN AND PAY FOR ALL REQUIRED PERMITS FOR TEMPORARY POWER. ENGINEER OF RECORD SHALL BE PROVIDED WITH ADDITIONAL COMPENSATION FROM THE CONTRACTOR WHERE SIGNED & SEALED DRAWINGS ARE REQUESTED BY THE CONTRACTOR TO THE ENGINEER OF RECORD IF REQUIRED BY THE AHJ FOR THE TEMPORARY POWER.
5. PROVIDE A COMPLETE UL LISTED LIGHTNING PROTECTION SYSTEM WITH A MASTER LABEL FOR THE ENTIRE FACILITY PER THE REQUIREMENTS OF NFPA 780, AND THE DIVISION 26 SPECIFICATIONS, UNLESS NOTED OTHERWISE. LIGHTNING PROTECTION SYSTEM SHALL INCLUDE BURIED COUNTERPOISE, UNLESS NOTED OTHERWISE.
6. LOCATE, IDENTIFY, PROTECT AND DOCUMENT ALL UTILITY LINES LOCATED WITHIN THE PROJECT BOUNDARY. FOR LOCATING SITE UTILITIES, CONTACT SUNSHINE STATE ONE CALL OF FLORIDA, INC. AT LEAST 48 HOURS IN ADVANCE PRIOR TO DIGGING, AT 1-800-432-4770.
7. INCLUDE IN BID THE TRANSPORT AND DISPOSAL OR RECYCLING OF ALL WASTE MATERIALS GENERATED BY THIS PROJECT IN ACCORDANCE WITH ALL LOCAL, STATE AND FEDERAL RULES, REGULATIONS AND GUIDELINES APPLICABLE. COMPLY FULLY WITH FLORIDA STATUTES REGARDING MERCURY-CONTAINING DEVICES, AND WITH ALL DEP AND EPA APPLICABLE GUIDELINES AT THE TIME OF DISPOSAL. PROVIDE OWNER WITH WRITTEN CERTIFICATION OF ACCEPTED DISPOSAL.
8. ALL POWER CIRCUITS HAVE BEEN DESIGNED IN COMPLIANCE WITH SECTION C405.7.3 OF THE ENERGY CONSERVATION CODE, FLORIDA BUILDING CODE REQUIRING 2% OR LESS VOLTAGE DROP FOR FEEDERS, AND 3% OR LESS VOLTAGE DROP FOR BRANCH CIRCUITS. ELECTRICAL SYSTEM HAS BEEN DESIGNED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NFPA 70).
9. ALL BRANCH CIRCUITS SHALL BE FURNISHED WITH A DEDICATED NEUTRAL. SHARED NEUTRALS ARE NOT ALLOWED UNLESS SPECIFICALLY NOTED ON THE DRAWINGS.
10. VERIFY AND COORDINATE LOCATIONS OF ANY MISCELLANEOUS EQUIPMENT REQUIRING ELECTRICAL CONNECTIONS (I.E., COPIERS, FAX MACHINES, PRINTERS, KITCHEN APPLIANCES, PROJECTION SCREENS, ETC.) WITH APPROVED SHOP DRAWINGS, OWNER-PROVIDED CUT SHEETS, MANUFACTURER'S INSTRUCTIONS, AND EQUIPMENT NAMEPLATE INFORMATION, PRIOR TO ROUGH IN, AND PROVIDE ALL NECESSARY ELECTRICAL REQUIRED.
11. VERIFY AND COORDINATE LOCATIONS AND EXACT ELECTRICAL REQUIREMENTS FOR ALL MECHANICAL AND PLUMBING EQUIPMENT PRIOR TO SUBMITTAL OF SHOP DRAWINGS OF ELECTRICAL EQUIPMENT. PROVIDE ALL NECESSARY RACEWAYS, CONDUCTORS, BOXES, EQUIPMENT, ACCESSORIES, ASSOCIATED DISCONNECT SWITCHES, CIRCUIT BREAKERS, CONTROL TRANSFORMERS, ETC. REQUIRED FOR A COMPLETE AND OPERATIONAL SYSTEM. COORDINATE WITH APPROPRIATE TRADE'S APPROVED SHOP DRAWINGS, MANUFACTURER'S INSTRUCTIONS, AND EQUIPMENT NAMEPLATE INFORMATION, PRIOR TO ROUGH IN, AND PROVIDE ALL NECESSARY ELECTRICAL REQUIRED, UNLESS OTHERWISE NOTED.
12. THIS PROJECT REQUIRES COORDINATION DRAWINGS BY THE CONTRACTOR. PARTICIPATE IN THE COORDINATION DRAWING PREPARATION PROCESS AND PROVIDE ALL NECESSARY INFORMATION REQUIRED TO COORDINATE ALL TRADE INFORMATION.
13. ALL WORK ON THE ELECTRICAL SYSTEM REQUIRED BY THE CONTRACT DOCUMENTS SHALL BE COORDINATED WITH THE WORK OF ALL OTHER DIVISIONS/TRADES PRIOR TO COMMENCEMENT OF WORK. AVOID INTERFERENCES WITH THE PROGRESS OF OTHER DIVISIONS/TRADES.
14. LOCATIONS OF VFD'S, DISCONNECTS, MOTOR STARTERS, ETC. FOR HVAC EQUIPMENT ARE DIAGRAMMATIC ON THE PLAN DRAWINGS. EXACT LOCATIONS ARE TO BE COORDINATED WITH CONTRACTOR'S COORDINATION DRAWINGS PRIOR TO ROUGHING IN TO ENSURE PROPER NEC CLEARANCES AND APPROPRIATE MOUNTING SURFACE.
15. DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT OF SYSTEMS. PROVIDE COMPONENTS INDICATED ON RISER DIAGRAMS WHETHER OR NOT INDICATED ON PLANS AND VICE VERSA.
16. ROUTING OF CONDUIT IS DIAGRAMMATIC AND NOT INTENDED TO SHOW REQUIRED OFFSETS AND DETAILS. COORDINATE EXACT ROUTING WITH FIELD CONDITIONS AND OTHER TRADES.
17. COORDINATE RECEPTACLE LOCATIONS WITH TECHNOLOGY DRAWINGS OR OWNER'S VENDOR DRAWINGS SO THAT A 120V 20A 5-20R RECEPTACLE IS LOCATED ADJACENT TO EACH VOICE/DATA OUTLET AND TV OUTLET INDICATED ON PLANS. RECEPTACLE IS TO BE CONNECTED TO NEAREST 120V RECEPTACLE CIRCUIT, UNLESS OTHERWISE NOTED ON PLANS.
18. REFER TO ARCHITECTURAL, MECHANICAL, PLUMBING, CIVIL, LANDSCAPE, INTERIOR DESIGN, TECHNOLOGY, AND STRUCTURAL DRAWINGS FOR RELATED INFORMATION AND ADDITIONAL INSTALLATION REQUIREMENTS TO BE PERFORMED AS PART OF THE WORK. REFER TO ARCHITECTURAL ELEVATIONS FOR EXACT MOUNTING HEIGHT AND LOCATIONS.
19. WHERE A DISCREPANCY OR CONFLICT IS FOUND BETWEEN ONE DRAWING AND ANOTHER, OR BETWEEN A DRAWING AND APPLICABLE SPECIFICATIONS, NOTIFY THE ARCHITECT/ENGINEER IMMEDIATELY IN WRITTEN FORM. IN GENERAL, THE MOST STRINGENT REQUIREMENT SHALL GOVERN UNLESS THE DISCREPANCY CONFLICTS WITH APPLICABLE CODES OR OWNER'S DESIGN STANDARDS, WHEREIN THE CODE OR OWNER'S DESIGN STANDARDS SHALL GOVERN.
20. CAREFULLY EXAMINE THOSE PORTIONS OF THE SITE AFFECTED BY THIS WORK PRIOR TO SUBMITTAL BID PRICE, SO AS TO BECOME FAMILIAR WITH EXISTING CONDITIONS AND DIFFICULTIES THAT MAY AFFECT EXECUTION OF THE WORK. SUBMISSION OF A BID PRICE SHALL BE CONSTRUED AS EVIDENCE THAT SUCH EXAMINATION HAS BEEN MADE. LATER CLAIMS FOR LABOR, EQUIPMENT AND/OR MATERIALS REQUIRED DUE TO DIFFICULTIES ENCOUNTERED THAT COULD HAVE BEEN REASONABLY OBSERVED WILL NOT BE RECOGNIZED.
21. COORDINATE ALL PROJECT SCHEDULING AND PHASING REQUIREMENTS WITH ARCHITECT/ENGINEER AND OWNER PRIOR TO SUBMITTING BID PRICE. THIS PROJECT MAY REQUIRE PHASING SEQUENCES AND POTENTIAL PREMIUM TIME WORK AND ALL COSTS FOR SUCH SHALL BE INCLUDED IN THE BID PRICE. PROVIDE ADEQUATE WORK FORCE AND EQUIPMENT, AND INCLUDE PREMIUM TIME AS MAY BE REQUIRED IN ORDER TO ADHERE TO THE PROJECT SCHEDULE. ADDITIONALLY, ENSURE THAT LONG LEAD ITEMS DO NOT IMPACT THE PROJECT'S SCHEDULE OR PHASING.
22. COORDINATE EXACT REQUIREMENTS WITH THE LOCAL UTILITY COMPANIES AND PROVIDERS (ELECTRIC, TELEPHONE, CABLE TV, ETC.) AND INCLUDE ALL COSTS FOR PROVIDING TEMPORARY AND PERMANENT SERVICES REQUIRED FOR THIS PROJECT IN THE BID PRICE. BID PRICE SHALL INCLUDE, BUT NOT BE LIMITED TO, EXCAVATION, RACEWAYS, BACKFILL, EQUIPMENT, EQUIPMENT PADS, BACKBOARDS, METERS, GROUNDING, UTILITY ENGINEERING AND IMPACT FEES.
23. CONDUCT WORK OPERATIONS AND DEBRIS REMOVAL IN A MANNER THAT ENSURES MINIMUM INTERFERENCE WITH NORMAL BUSINESS OPERATIONS, TRAFFIC, PARKING, ETC. ONGOING IN ADJACENT OCCUPIED SPACES OR FACILITIES. PROVIDE ALL THAT IS REQUIRED TO EFFECTIVELY PROTECT SURROUNDING OCCUPANTS, EQUIPMENT, FINISHES, FURNITURE, ETC. FROM DAMAGE OR EXCESSIVE NOISE THROUGHOUT THE DURATION OF THIS PROJECT. CONTRACTOR IS RESPONSIBLE FOR ANY LOSSES OR DAMAGE. ANY DAMAGE RESULTING FROM THE FAILURE TO ADHERE TO THIS REQUIREMENT. RESTORE DAMAGED ELEMENTS TO ORIGINAL CONDITION BY THE CONTRACTOR TO THE SATISFACTION OF THE ARCHITECT/ENGINEER AND OWNER, AT NO ADDITIONAL COSTS. REPORT OF ANY SUCH OCCURRENCE TO THE ARCHITECT/ENGINEER AND OWNER IMMEDIATELY AND AWAIT WRITTEN DIRECTION PRIOR TO PROCEEDING WITH REPAIRS.
24. COORDINATE THE LOCATION OF ALL LIGHT FIXTURES, DEVICES AND BOXES WITH WINDOWS, MIRRORS, MILLWORK, CABINETS, GLASS CURTAIN WALLS, AND GLASS WALLS PRIOR TO INSTALLATION OF CONDUITS OR BOXES. REVIEW ALL CONTRACT DRAWINGS TO ASCERTAIN ANY CONFLICTS PRIOR TO BIDDING. OBTAIN CLARIFICATION FROM A/E PRIOR TO BID. CONTRACTOR SHALL NOT BE ENTITLED TO ADDITIONAL COMPENSATION FOR WORK REQUIRED TO RELOCATE OUTLET BOXES OR RACEWAYS FOR COORDINATION WITH OTHER TRADE'S WORK.
25. THE EXCLUSIVELY DEDICATED SPACE EXTENDING FROM FLOOR TO 6' ABOVE EQUIPMENT OR STRUCTURAL CEILING, WHICHEVER DISTANCE IS LOWER, WITH A WIDTH AND DEPTH OF THE PANELBOARD OR SWITCHBOARD MUST BE CLEAR OF ALL PIPING, DUCTS, EQUIPMENT FOREIGN TO THE ELECTRICAL EQUIPMENT OR ARCHITECTURAL APPURTENANCES IN ACCORDANCE WITH NEC.
26. PROVIDE ALL TEMPORARY NORMAL LIGHTING, EMERGENCY LIGHTING AND EXIT SIGNAGE REQUIRED DURING THE PROJECT CONSTRUCTION PHASE.
27. THE INFRASTRUCTURE FOR THE ACCESS CONTROL/ CCTV OR SECURITY ELECTRONICS SYSTEM (CONDUITS, ELECTRICAL BOXES) SHALL BE INSTALLED BY DIVISION 26. THE ACCESS CONTROL/ CCTV OR SECURITY ELECTRONICS SYSTEM CONTRACTOR SHALL PROVIDE AND INSTALL THE WIRE AND CABLE FOR THE SYSTEM AND ALL REQUIRED EQUIPMENT. INSTALLATION OF THE CONDUITS AND ELECTRICAL BOXES SHALL BE UNDER THE DIRECT SUPERVISION OF THE ACCESS CONTROL/ CCTV SYSTEM CONTRACTOR. COORDINATE EXACT LOCATIONS OF DEVICES, RACEWAY LOCATIONS, SIZES AND QUANTITY, CONDUIT STUB-UPS PRIOR TO ROUGH IN.
28. THE INFRASTRUCTURE FOR THE VOICE/DATA TELECOMMUNICATIONS SYSTEM (CONDUITS, ELECTRICAL BOXES) SHALL BE INSTALLED BY DIVISION 26. THE TELECOMMUNICATIONS CONTRACTOR SHALL PROVIDE AND INSTALL THE WIRE AND CABLE FOR THE SYSTEM AND ALL REQUIRED EQUIPMENT AND COMPONENTS. INSTALLATION OF THE CONDUITS AND ELECTRICAL BOXES SHALL BE UNDER THE DIRECT SUPERVISION OF THE TELECOMMUNICATIONS CONTRACTOR. COORDINATE EXACT LOCATIONS OF DEVICES, RACEWAY LOCATIONS, SIZES AND QUANTITY, CONDUIT STUB-UPS PRIOR TO ROUGH IN.
29. PROVIDE 120V 20A 5-20R RECEPTACLE AT ALL FAN COIL UNITS FOR CONDENSATE PUMP POWER AND HOT WATER RECIRCULATING PUMPS, WHETHER SHOWN ON PLANS OR NOT. RECEPTACLE IS TO BE CONNECTED TO NEAREST 120V RECEPTACLE CIRCUIT.
30. PROVIDE 120V CONNECTION TO ALL MOTORIZED DAMPERS INDICATED ON MECHANICAL PLANS, WHETHER SHOWN ON DIVISION 26 DRAWINGS OR NOT. MOTORIZED DAMPERS WITHIN THE SAME AREA CAN BE CIRCUITED TO THE SAME CIRCUIT (I.E., DEDICATED CIRCUIT IS NOT REQUIRED).
31. UNLESS NOTED AS EXISTING, ALL ELECTRICAL INDICATED ON THE CONTRACT DOCUMENTS SHALL BE NEW, SHALL BE U.L. LISTED, AND SHALL BEAR A U.L. LABEL. WHERE NO U.L. LABEL OR LISTING IS AVAILABLE, THE MATERIAL SHALL BE LISTED WITH AN APPROVED, NATIONALLY RECOGNIZED ELECTRICAL TESTING AGENCY.
32. PROVIDE EXPERIENCED, QUALIFIED AND RESPONSIBLE SUPERVISION FOR ALL WORK REQUIRED BY THE CONTRACT DOCUMENTS. ALL ELECTRICAL EQUIPMENT SHALL BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER, TO THE SATISFACTION OF THE ARCHITECT/ENGINEER AND OWNER.
33. THE ELECTRICAL PORTION OF THE CONTRACT DOCUMENTS ARE COORDINATED WITH THE DESIGN BASIS EQUIPMENT SPECIFIED BY DIVISION 26 AND OTHER DIVISIONS. WHERE THE CONTRACTOR ELECTS TO SUBSTITUTE A PRODUCT IN LIEU OF PROVIDING THE DESIGN BASIS, AND SAID SUBSTITUTION IS ACCEPTED BY THE A/E AND OWNER, THE CONTRACTOR SHALL MAKE ALL CORRECTIONS TO THE ELECTRICAL SYSTEM NECESSARY IN ORDER TO ENSURE A COMPLETE AND OPERATIONAL INSTALLATION OF THE EQUIPMENT AT NO ADDITIONAL COSTS. WHERE THE CONTRACTOR'S DESIGN SUBSTITUTION RESULTS IN THE NEED FOR THE ENGINEER TO REVISE THE CONTRACT DOCUMENTS, THE ENGINEER RESERVES THE RIGHT TO REQUEST COMPENSATION FROM THE CONTRACTOR FOR SAID SERVICES.
34. MAINTAIN A CURRENT AND ACCURATE SET OF PROJECT RECORD DOCUMENTS (AS-BUILTS) AT THE SITE THROUGHOUT THE DURATION OF THE PROJECT. RECORD DRAWINGS SHALL BE UPDATED EACH DAY TO REFLECT THE ACTUAL LOCATIONS, SIZES, ROUTING, ETC. OF EACH PORTION OF THE ELECTRICAL SYSTEM AFFECTED BY THIS WORK. A FINAL SET OF RECORD DOCUMENTS SHALL BE ISSUED TO THE A/E FOR REVIEW AND THEN SUBMITTED TO THE OWNER WITHIN 30 DAYS AFTER THE DATE OF FINAL ACCEPTANCE. PROVIDE RECORD DRAWINGS OF THE ACTUAL INSTALLATION INCLUDING SINGLE LINE DIAGRAM, POWER RISER DIAGRAM OF THE BUILDING ELECTRICAL DISTRIBUTION SYSTEM, SITE PLANS AND ALL ELECTRICAL FLOOR PLANS, DETAILS, PANEL SCHEDULES, ETC.
35. OWNER FURNISHED EQUIPMENT: VERIFY AND COORDINATE ELECTRICAL ROUGH IN REQUIREMENTS FOR OWNER FURNISHED EQUIPMENT PRIOR TO ROUGH IN.
36. WHERE SUBMITTED EQUIPMENT REQUIRES REVISION TO OVERCURRENT PROTECTION, CONDUIT OR WIRING, MAKE CHANGES IN ACCORDANCE WITH APPLICABLE CODES.

APPLICABLE CODES

1. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA), INCLUDING (BUT NOT LIMITED TO):
   a. NATIONAL ELECTRICAL CODE (NEC), NFPA 70 - 2023
   c. LIFE SAFETY CODE, NFPA 101 – 2024
   d. EMERGENCY AND STANDBY POWER SYSTEMS, NFPA 110 – 2022
   e. STANDARD FOR THE INSTALLATION OF LIGHTNING PROTECTION SYSTEMS, NFPA 780
2. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI), INCLUDING (BUT NOT LIMITED TO):
   a. NATIONAL ELECTRICAL SAFETY CODE, ANSI C2
3. OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA)
4. FEDERAL COMMUNICATION COMMISSION (FCC)
5. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
6. INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)
7. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
8. NATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)
9. AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)
10. ILLUMINATION ENGINEERING SOCIETY (IES)
11. ANTI-FRICTION BEARING MANUFACTURERS ASSOCIATION (AFBMA)
12. BUILDING OFFICIALS AND CODE ADMINISTRATORS INTERNATIONAL, INC. (BOCA)
13. INTERNATIONAL CODE COUNCIL (ICC):
    a. INTERNATIONAL BUILDING CODE (IBC)
14. UNIFORM BUILDING CODE (UBC)
15. INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)
    a. INTERNATIONAL ENERGY CONSERVATION CODE (IECC), ENDORSED BY THE U.S. DEPARTMENT OF ENERGY (DOE)
16. NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION INSTALLATION STANDARDS (NECA)
17. AMERICANS WITH DISABILITIES ACT (ADA)
18. APPLICABLE STATE AND LOCAL CODES, AMENDMENTS, REGULATIONS, AND PRACTICES.
19. APPLICABLE REGULATORY REQUIREMENTS AND ADVISORY PRACTICES OF APPROPRIATE
    a. AUTHORITIES HAVING JURISDICTION (AHJs).
20. APPLICABLE STANDARDS, REGULATIONS, AND PRACTICES OF THE OWNER.
21. CODES APPLICABLE TO FLORIDA ONLY, INCLUDING:
    a. FLORIDA BUILDING CODE
    b. FLORIDA ENERGY CONSERVATION
    c. FLORIDA FIRE PREVENTION CODE

WHERE THERE IS A DISCREPANCY BETWEEN ABOVE GENERAL NOTES AND SPECIFICATIONS, WHERE APPLICABLE, SPECIFICATIONS SHALL BE FOLLOWED

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722 WEST HIGHWAY 22
WEWAHITCHKA, FL 32465
100% DESIGN

SEAL

BRANDON M. SMITH
LICENSED
No. 92822
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

SCALE

12" = 1'-0"

REVISIONS

NO.	DESCRIPTION	DATE

DRAWN BY	WWS
APPROVED BY	BMS
CHECKED BY	BMS
DATE	2.6.24

TITLE

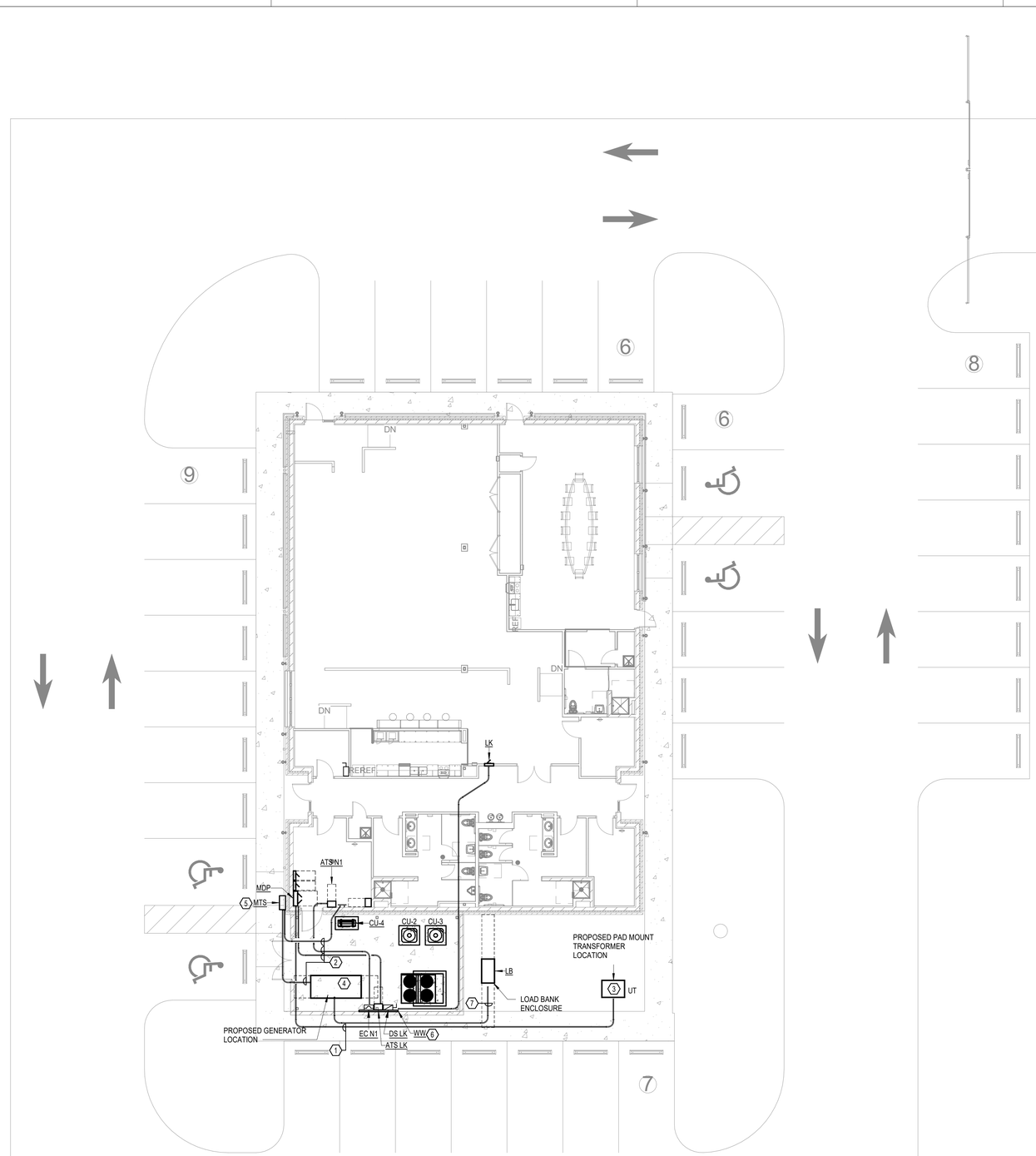
ELECTRICAL GENERAL NOTES

PROJECT NO. 0122062

E-002

SHEET NO.

2/27/2024 1:27:18 PM



1 ELECTRICAL SITE PLAN
3/32" = 1'-0"

DRAWING NOTES:

1. REFER TO ELECTRICAL ONE LINE DIAGRAM SHEET E601 FOR FEEDER SIZE INFORMATION.

CODED NOTES:

1. UNDERGROUND SECONDARY CONDUIT AND CONDUCTORS FROM UTILITY PAD MOUNTED TRANSFORMER TO PANEL 'MDP'. REFER TO ELECTRICAL ONE-LINE DIAGRAM ON SHEET E-601 FOR ADDITIONAL INFORMATION.
2. STAND-BY AND EMERGENCY UNDERGROUND CONDUITS AND CONDUCTORS FROM GENERATOR TO MTS, ATS-LK, ATS-LS AND ATS-N. REFER TO SHEETS EP101 AND E-601 FOR ADDITIONAL INFORMATION.
3. PAD MOUNT UTILITY TRANSFORMER. PROVIDE CONCRETE PAD IN ACCORDANCE WITH UTILITY REQUIREMENTS. REFER TO SHEET E-601 FOR ADDITIONAL INFORMATION.
4. DIESEL GENERATOR IN HURRICANE RATED ENCLOSURE. PROVIDE CONCRETE PAD IN ACCORDANCE WITH MANUFACTURER RECOMMENDED INSTALLATION INSTRUCTIONS. REFER TO SHEET E-601 FOR ADDITIONAL INFORMATION.
5. PROVIDE GENERATOR DOCKING STATION SIMILAR TO TRYSTAR. REFER TO TRANSFER SWITCH SCHEDULE SHEET E601 FOR MORE INFORMATION.
6. PROVIDE WIREWAY, ATS AND DISCONNECT SWITCH MOUNTED ON A STAINLESS STEEL UNISTRUT RACK.
7. CONDUITS AND CONDUCTORS FROM LOAD BANK TO GENERATOR. REFER TO SHEETS EP101 AND E-601 FOR ADDITIONAL INFORMATION.

N
0 8' 16' 24' 32'
3/32" = 1'-0"

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SEAL



SCALE

3/32" = 1'-0"

REVISIONS

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DRAWN BY	WWS
APPROVED BY	BMS
CHECKED BY	BMS
DATE	2.6.24

TITLE
ELECTRICAL SITE PLAN

PROJECT NO. 0122062

ES100

SHEET NO.

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LIGHTING FIXTURE SCHEDULE

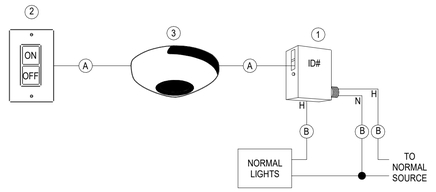
TYPE	DESCRIPTION	MANUFACTURER	MODEL	VOLTAGE	VA	LAMP TYPE	FIXTURE LUMENS	FIXTURE COLOR TEMP (K)	DRIVER/BALLAST	COMMENTS
A	2'x2', LED, RECESSED DIRECT/INDIRECT DROP BASKET FIXTURE - ACT	LITHONIA	2BLT-33L-ADP-120V-EZ1-LP835	120 V	27 VA	LED	3300	3500K	0-10V DIMMING	
B	2'x2', LED, RECESSED DIRECT/INDIRECT DROP BASKET FIXTURE - HARD CEILING	LITHONIA	2BLT-33L-ADP-120V-EZ1-LP835	120 V	27 VA	LED	3300	3500K	0-10V DIMMING	PROVIDE DRYWALL GRID ADAPTER FOR RECESSED MOUNTING IN GYP CEILING
C	4" RECESSED, LED DOWNLIGHT, UL WET LOCATION LISTED	LITHONIA	LDN4-35/10-LO4-120V	120 V	11 VA	LED	1000	3500K	0-10V DIMMING	
C1	4" RECESSED, EXTERIOR LED DOWNLIGHT, UL WET LOCATION LISTED	DALS	RGR4-CC-XX	120 V	14 VA	LED	1000	3500K	0-10V DIMMING	ARCHITECT TO CHOOSE TRIM COLOR.
CE	4" RECESSED, LED DOWNLIGHT, UL WET LOCATION LISTED WITH INTEGRAL EMERGENCY BATTERY PACK.	LITHONIA	LDN4-35/10-LO4-120V-EZ10-ELSD	120 V	11 VA	LED	1000	3500K	0-10V DIMMING	
D	WALL MOUNTED LINEAR VANITY LIGHT	MARK ARCHITECTURAL LIGHTING	SL4L-LOP-3'-80CRI-3500K-400LMF	120 V	30 VA	LED	1200	3500K	0-10V DIMMING	
F	SURFACE MOUNTED LINEAR LED FIXTURE	LITHONIA	CSS-L48-4000LM-MVOLT-40K-80CRI	120 V	35 VA	LED	4000	4000K	0-10V DIMMING	
F1	SURFACE MOUNTED LINEAR LED FIXTURE	LITHONIA	CSS-L24-2000LM-MVOLT-40K-80CRI	120 V	15 VA	LED	2150	4000K	0-10V DIMMING	
G	LED SURFACE MOUNT EXTERIOR UP & DOWN SCONCE	LITHONIA	OLLWDU LED-P1-4000K-MVOLT	120 V	15 VA	LED	947	4000K	0-10V DIMMING	
H	LED EXTERIOR ABOVE DOOR EGRESS FIXTURE	LITHONIA	WEDGE2-P1-40K-80CRI-VF-MVOLT	120 V	18 VA	LED	1200	4000K		
P16	16' CONFERENCE TABLE, PENDANT MOUNTED, DIRECT/INDIRECT LIGHT FIXTURE.	ACUITY	PLLR1OID-LLP-16FT-MSL8-80CRI-35K-700LMF-11000L MF-SCT-MIN1-SBL-MVOLT-WHSG-ZT-SCEP-36A-WHT CY-WCRDMCS	120 V	121 VA	LED	4000	4000K	0-10V DIMMING	PROVIDE MOUNTING HARDWARE TO SUSPEND FIXTURE FROM CEILING. BOTTOM OF FIXTURE @ 8' AFF
S	4' LED, BACK OF HOUSE, STRIP FIXTURE.	LITHONIA	CSS-L48-4000LM-MVOLT-40K-80CRI	120 V	121 VA	LED	4000	4000K	0-10V DIMMING	MOUNT FIXTURE AT 10' AFF.
X	RECESSED EDGE LIT LED EXIT SIGN, CEILING MOUNTED, RED LETTERS, CLEAR BACKGROUND AND SINGLE OR DOUBLE FACE. AC ONLY	LITHONIA	EDGR	120 V	10 VA	LED	NA	NA	NA	REFER TO PLANS FOR NUMBER OF FACES

NOTES: (APPLICABLE TO LUMINAIRE SCHEDULE ONLY)
1. CATALOG NUMBERS FOR LUMINAIRES INDICATE THE TYPE AND QUALITY OF THE LUMINAIRE TO BE PROVIDED BY THE CONTRACTOR AND ARE GENERAL IN NATURE. THE CATALOG NUMBERS ARE NOT INTENDED TO INDICATE AN ACTUAL ORDER MODEL NUMBER. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE LUMINAIRES WITH THE TYPE OF DRIVER, LENS OR DIFFUSER, AND CONSTRUCTION FEATURES AS INDICATED IN THE SPECIFICATIONS.
2. COORDINATE CONTROL COMPATIBILITY BETWEEN DRIVER TYPES FOR ALL DIMMED LUMINAIRES WITH MANUFACTURER AND MODEL OF DIMMING CONTROL DEVICES.
3. PROVIDE EXIT SIGNS WITH SINGLE FACE OR DOUBLE FACE AND WITH OR WITHOUT CHEVRONS AS INDICATED ON THE DRAWINGS. PROVIDE RED OR GREEN LETTERING AS REQUIRED BY AHJ.
4. ALL MOUNTING HEIGHTS SHALL BE AS INDICATED ON THE DRAWINGS OR AS DIRECTED BY ARCHITECT OR ENGINEER. MOUNTING HEIGHTS OF WALL MOUNTED LUMINAIRES SHALL BE MEASURED FROM THE FINISHED FLOOR TO THE CENTERLINE OF THE LUMINAIRE. MOUNTING HEIGHTS OF CEILING SUSPENDED LUMINAIRES SHALL BE MEASURED FROM THE FINISHED FLOOR TO THE BOTTOM OF THE LUMINAIRE.

		LINE VOLTAGE CONTROL DEVICE											LOW VOLTAGE CONTROL DEVICE										SWITCHING/DIMMING				MISCELLANEOUS								NOTES
	TYPICAL SPACE TYPE	TOGGLE SWITCH(ES)	CEILING/WALL MOUNTED OCCUPANCY SENSOR(S)	WALL BOX OCCUPANCY SENSOR(S) WITH SINGLE OUTPUT RELAY	WALL BOX OCCUPANCY SENSOR(S) WITH DIMMING	LUMINAIRE WITH BUILT-IN OCCUPANCY SENSOR	.	DIGITAL SWITCH(ES)	CEILING/WALL MOUNTED OCCUPANCY SENSOR(S)	INDOOR PHOTOSENSOR(S)	OUTDOOR PHOTOCELL(S)	ASTRONOMICAL TIMECLOCK	FRESCA	SWITCHING	STEP-DIMMING	FULL RANGE DIMMING	CENTRALIZED CIRCADIAN RHYTHM CCT CONTROL	VACANCY SENSOR TIMEOUT/DELAY (IN MINUTES)	LIGHTS MANUAL ON	LIGHTS AUTOMATIC ON TO 100% LIGHT LEVEL UPON OCCUPANCY	LIGHTS AUTOMATIC ON TO 50% LIGHT LEVEL UPON OCCUPANCY, 100% MANUAL ON	TIMECLOCK SCHEDULED "ON" TIME WITH PHOTOCELL OVERRIDE	TIMECLOCK SCHEDULED "OFF" TIME WITH PHOTOCELL OVERRIDE	OCC. SENSOR OVERRIDE TIMECLOCK DURING "OFF" HOURS	DAY LIGHTING/DIM LIGHTS TO MAINTAIN MINIMUM 50FC AT 30" AFF	
1	OPEN OFFICE	-	-	-	-	-	-	X	X	-	-	-	-	-	X	-	20	-	X	-	-	-	-	-	-	-
2	CONFERENCE ROOM	-	-	-	-	-	-	X	X	-	-	-	-	-	X	-	20	-	X	-	-	-	-	-	-	-
3	TOILET ROOM	-	-	X	-	-	-	-	-	-	-	-	X	-	-	-	20	-	X	-	-	-	-	-	-	-
4	ELEC/MECH ROOM	X	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
5	IT/AV ROOM	-	-	X	-	-	-	-	-	-	-	-	X	-	-	-	20	X	-	-	-	-	-	-	-	-
6	STORAGE ROOM	-	-	X	-	-	-	-	-	-	-	-	X	-	-	-	5	X	-	-	-	-	-	-	-	-
7	BREAKROOM	-	-	-	-	-	-	X	X	-	-	-	-	-	X	-	20	-	X	-	-	-	-	-	-	-
8	JANITOR CLOSET	-	-	X	-	-	-	-	-	-	-	-	X	-	-	-	5	X	-	-	-	-	-	-	-	-
9	EXTERIOR SCONCE LIGHTS	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
10	EXTERIOR WALL PACKS	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-	-	-	-	-	-	X	X	-	-	-
10	POLE MOUNTED LIGHTS	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-	20	-	-	-	-	X	X	-	-	-

NOTES: (APPLICABLE TO LIGHTING CONTROL MATRIX ONLY)
1. PHOTOCELL ON/OFF, TIMECLOCK OFF 1HR AFTER CLOSE OF BUISNESS, TIMECLOCK ON 1HR BEFORE BUISNESS OPENING, PER 2018 IECC C405.2.6.1

2 LIGHTING CONTROL MATRIX
N.T.S

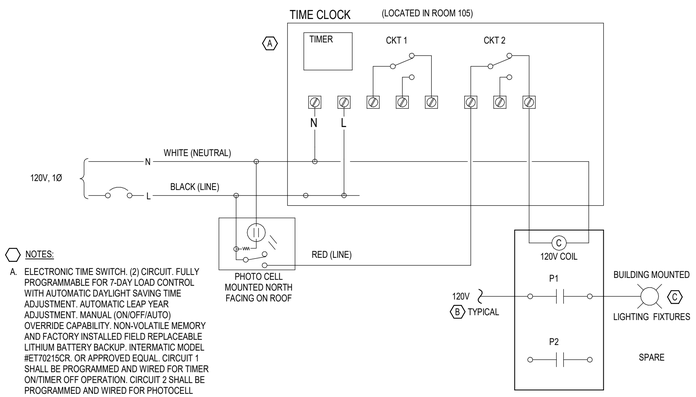


WIRE LEGEND	
A	CAT 6 (LOW VOLTAGE)
B	CLASS 1 (LINE VOLTAGE)

EQUIPMENT LEGEND	
1	RELAY POWER PACK
2	LOW VOLTAGE WALL SWITCH
3	CEILING OCCUPANCY/VACANCY SENSOR

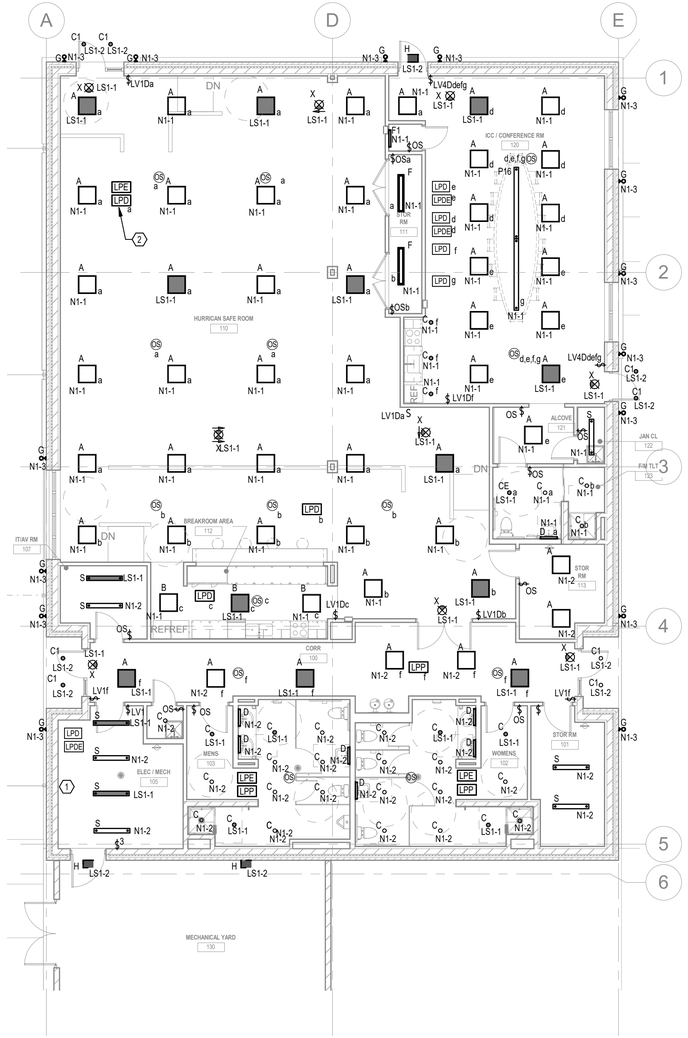
LIGHTING CONTROL NOTES:
1. REFER TO FLOOR PLANS FOR QUANTITIES OF CONTROL DEVICES SUCH AS OCCUPANCY SENSORS, AND CONTROL SWITCHES.
2. PROVIDE ALL PROGRAMMING AS REQUIRED.

4 LOW VOLTAGE LIGHTING CONTROL DIAGRAM
N.T.S



NOTES:
A. ELECTRONIC TIME SWITCH. (2) CIRCUIT. FULLY PROGRAMMABLE FOR 7-DAY LOAD CONTROL WITH AUTOMATIC DAYLIGHT SAVING TIME ADJUSTMENT. AUTOMATIC LEAP YEAR ADJUSTMENT. MANUAL (ON/OFF/AUTO) OVERRIDE CAPABILITY. NON-VOLATILE MEMORY AND FACTORY INSTALLED FIELD REPLACEABLE LITHIUM BATTERY BACKUP. INTERMATIC MODEL #ET70215CR. OR APPROVED EQUAL. CIRCUIT 1 SHALL BE PROGRAMMED AND WIRED FOR TIMER ON/TIMER OFF OPERATION. CIRCUIT 2 SHALL BE PROGRAMMED AND WIRED FOR PHOTOCELL ON/OFF OPERATION.
B. REFER TO SHEETS ES100 AND EL101 FOR CIRCUIT INFORMATION.
C. PROVIDE UNSWITCHED CONDUCTOR FOR ALL EMERGENCY BALLASTS, TYPICAL.

3 TIME CLOCK WIRING DIAGRAM "TC"
N.T.S.



1 FIRST FLOOR PLAN - LIGHTING - NEW WORK
1/8" = 1'-0"

N
0 4' 8' 16' 24'
1/8" = 1'-0"

DRAWING NOTES:
1. LIFE SAFETY LIGHTING SHALL BE PROVIDED FROM BUILDING GENERATOR. PROVIDE UNSWITCHED HOT FROM BUILDING EMERGENCY DISTRIBUTION TO ALL EXIT SIGNS AND EMERGENCY LIGHTS INDICATED ON PLANS.

CODED NOTES:
1. REFER TO SHEET EP101 FOR LIGHTING CONTROL TIMECLOCK "TC" LOCATION. SEE TIME CLOCK WIRING DIAGRAM ON THIS SHEET FOR ADDITIONAL INFORMATION.
2. ENSURE LIGHTING POWER PACKS ARE INSTALLED IN ACCESSIBLE CEILING SPACE. THIS NOTE TYPICAL OF LP, LPD, LPE, LPDE.

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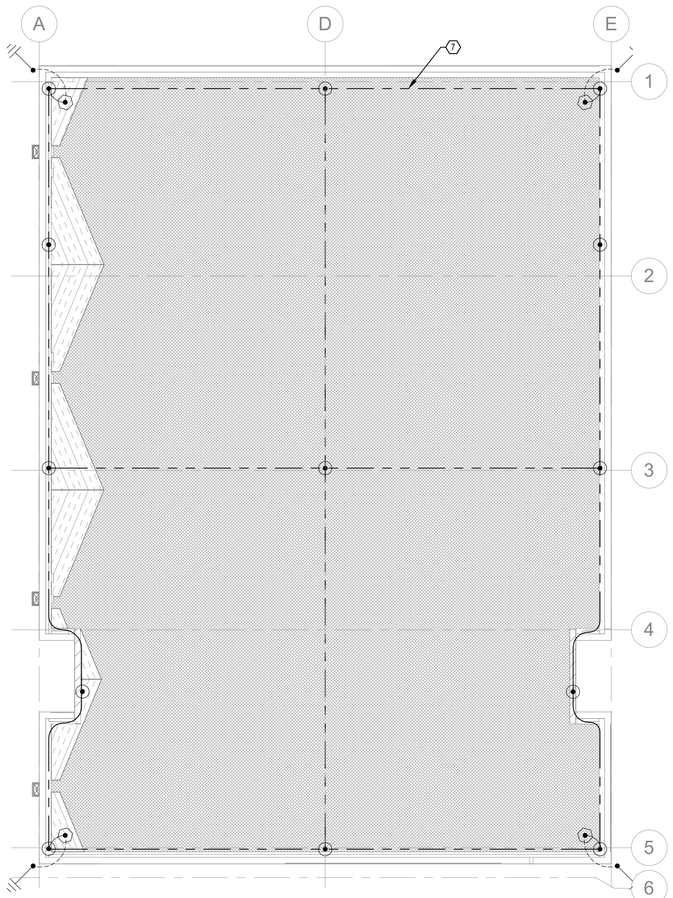
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FIRST FLOOR PLAN - LIGHTING - NEW WORK

PROJECT NO. 0122062

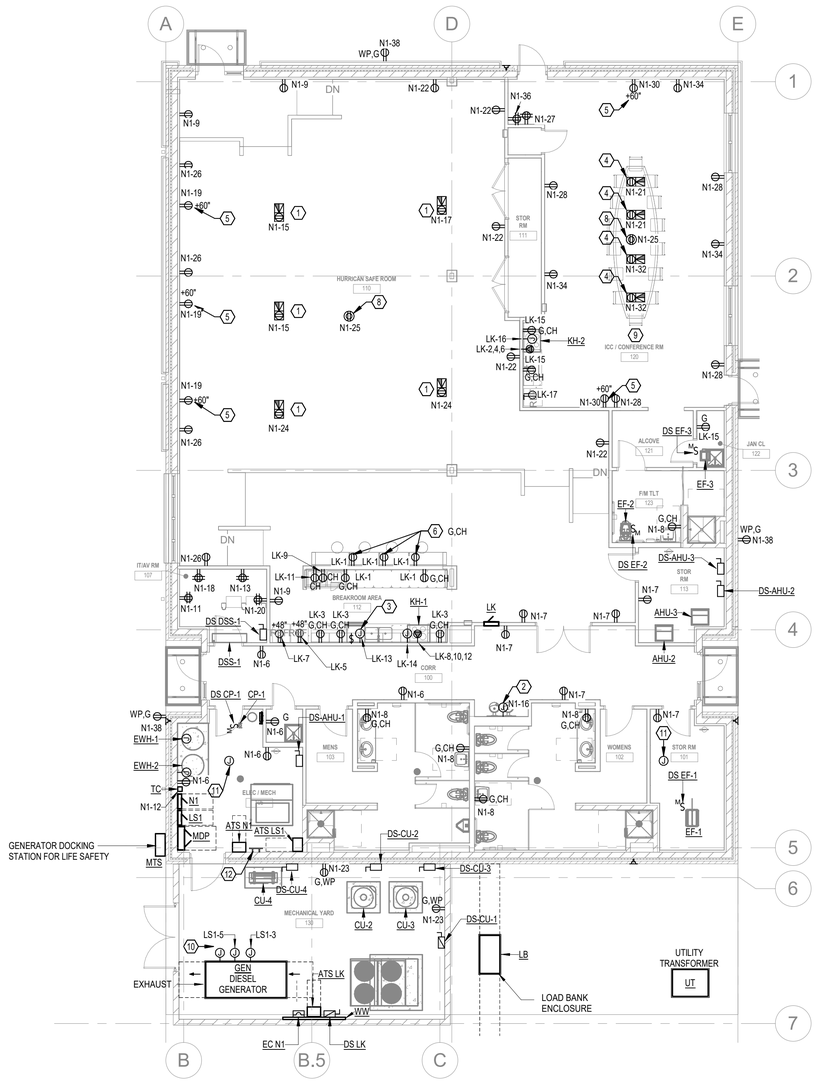
EL101

SHEET NO.

2/27/2024 1:27:24 PM



2 ROOF PLAN - ELECTRICAL EQUIPMENT - NEW WORK
1/8" = 1'-0"



1 FIRST FLOOR PLAN - ELECTRICAL EQUIPMENT - NEW WORK
1/8" = 1'-0"

N
0 4' 8' 16' 24'
1/8" = 1'-0"

DRAWING NOTES:

1. REFER TO DISCONNECT AND EQUIPMENT SCHEDULE SHEET E601 FOR CONNECTION INFORMATION.

CODED NOTES:

1. PROVIDE RECESSED 2-GANG RECTANGULAR RAISED FLOOR BOX (HUBBELL #AFB2G50). 5" DEEP MINIMUM, UL514A SCRUBSHIELD COMPLIANT BLACK POWDER COATED COVER (HUBBELL #2GAFBCVRBK), DUPLEX PLATE (HUBBELL #FBMPDUP), TELEDATA KEYSTONE JACK PLATE (HUBBELL #FBMP6KS) AND ALL PARTS AND ACCESSORIES REQUIRED FOR A COMPLETE SYSTEM. EQUALS BY FSR OR WIREMOLD. PROVIDE (1) 1" CONDUIT WITH PULLWIRE TO ACCESSIBLE CEILING SPACE FOR DATA/AV CABLING. REFER TO TELECOM DRAWINGS FOR FURTHER DETAILS. COORDINATE EXACT FLOOR BOX ROUGH IN LOCATION WITH FURNITURE SUPPLIER.
2. PROVIDE 120V POWER FOR WATER FOUNTAIN. WIRE TO 20/1 GFCI BRANCH CIRCUIT BREAKER INDICATED. COORDINATE WITH PLUMBING CONTRACTOR FOR MOUNTING LOCATION.
3. DISHWASHER LOCATION. PROVIDE LOCAL DISCONNECTING MEANS FOR DISHWASHER PER NEC 422.31.
4. PROVIDE RECESSED 2-GANG RECTANGULAR FLOOR BOX (HUBBELL #CFB2G30). UL514A SCRUBSHIELD COMPLIANT BLACK POWDER COATED COVER (HUBBELL #2GAFBCVRBK), DUPLEX PLATE (HUBBELL #FBMPDUP), TELEDATA KEYSTONE JACK PLATE (HUBBELL #FBMP6KS) AND ALL PARTS AND ACCESSORIES REQUIRED FOR A COMPLETE SYSTEM. EQUALS BY FSR OR WIREMOLD. PROVIDE (1) 1" CONDUIT WITH PULLWIRE TO ACCESSIBLE CEILING SPACE FOR DATA/AV CABLING. REFER TO TELECOM DRAWINGS FOR FURTHER DETAILS. COORDINATE EXACT FLOOR BOX ROUGH IN LOCATION WITH FURNITURE SUPPLIER.
5. TV LOCATION. PROVIDE LEGRAND #TV3WTVSSW OR EQUAL 3-GANG RECESSED TV BACKBOX. PROVIDE DUPLEX RECEPTACLE IN BOX. REFER TO TELECOM DRAWINGS FOR TELE/AV REQUIREMENTS. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT WITH ARCHITECTURAL DRAWINGS PRIOR TO CONSTRUCTION.
6. PROVIDE 20A DUPLEX OUTLET WITH TYPE A AND TYPE C USB OUTLETS. BASIS OF DESIGN IS LEVITON GUAC2. OUTLETS MOUNTED IN WALL ABOVE COUNTER. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT WITH ARCHITECTURAL PLANS AND MILL WORK PRIOR TO CONSTRUCTION.
7. PROVIDE COMPLETE A UL MASTER LABELED LIGHTNING PROTECTION SYSTEM INCLUDING PLANS AND INSTALLATION DETAILS FOR REVIEW BY ENGINEER OF RECORD. LIGHTNING PROTECTION DEVICES AND LOCATIONS INDICATED HERE ARE DIAGRAMMATIC FOR COST ESTIMATING ONLY.
8. CEILING MOUNTED PROJECTOR RECEPTACLE. COORDINATE EXACT LOCATION WITH ARCHITECTURAL PLANS. COORDINATE LOCATION OF CEILING MOUNTED PROJECTOR POWER AND DATA OUTLETS.
9. DATA, COMM, A/V WORK IN ROOM 120 IS LIMITED TO BOX AND CONDUIT WITH PULLSTRING ONLY. CONTRACTOR TO PROVIDE PATHWAY BACK TO IT CABINET LOCATED IN ROOM 120. CABLES PROVIDED, INSTALLED AND TERMINATED BY OTHERS.
10. PROVIDE GENERATOR AUX CIRCUITS AS REQUIRED BY GENERATOR MANUFACTURER(BATTERY CHARGER, BLOCK HEATER, ETC). PROVIDE ADDITIONAL CONNECTIONS FROM ATS TO GENERATOR CONTROL PANEL. REFER TO DETAIL 1/E-502.
11. PROVIDE POWER FOR MOTORIZED DAMPERS. VERIFY EXACT LOCATION WITH MECHANICAL PRIOR TO INSTALLATION.
12. REFER TO TELECOMMUNICATION DRAWINGS FOR GROUND BAR DETAILS

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GULF COAST ELECTRICAL CO-OP

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722 WEST HIGHWAY 22
WEWAHITCHKA, FL 32465
100% DESIGN

SEAL



SCALE
1/8" = 1'-0"

REVISIONS

NO.	DESCRIPTION	DATE

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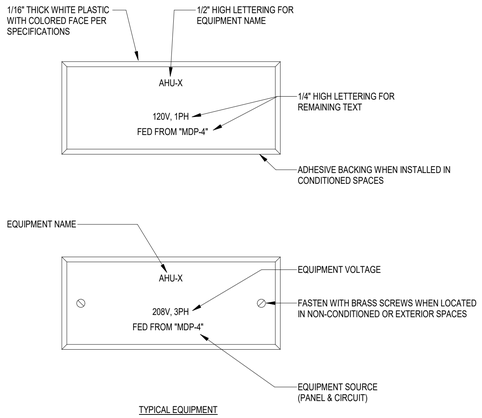
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FIRST FLOOR AND ROOF PLAN - ELECTRICAL EQUIP. - NEW WORK

PROJECT NO. 0122062

EP101

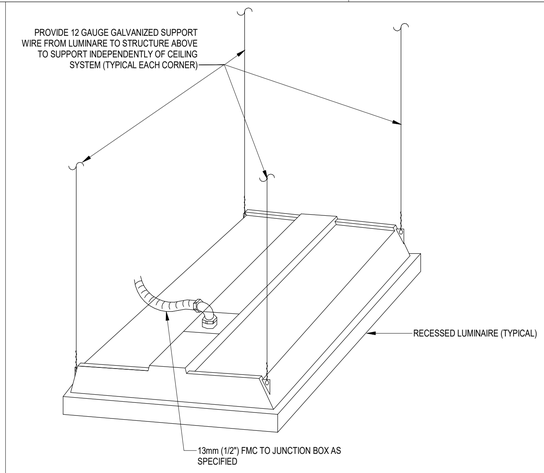
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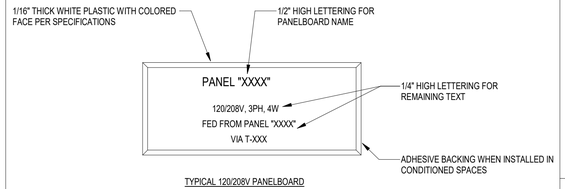


TYPICAL EQUIPMENT

8 EQUIPMENT NAMEPLATE
N.T.S.



6 LUMINAIRE SUPPORT DETAIL
N.T.S.



TYPICAL 120/208V PANELBOARD

4 PANELBOARD NAMEPLATE
N.T.S.

CONDUCTORS:

1. ALL WIRE SHALL BE SIZED AS SHOWN ON THE DRAWINGS IF NO SIZE IS SHOWN, THEN WIRE SHALL BE #12 AWG, EXCEPT AS MODIFIED FOR VOLTAGE DROP BY THE TABLE BELOW. REFER TO BRANCH CIRCUIT VOLTAGE DROP TABLES BELOW. BRANCH CIRCUIT WIRING SHALL BE SIZED TO LIMIT THE VOLTAGE DROP TO 3% OF NOMINAL VOLTAGE OR LESS.

120V (BASED ON 1500W LOAD) MIN. CONDUCTOR SIZE

CIRCUIT LENGTH	INCREASE FOR VOLTAGE DROP
0 FT - 70 FT	#12 AWG
71 FT - 115 FT	#10 AWG
116 FT - 180 FT	#8 AWG

181 FEET AND LONGER: SUBMIT WIRE SIZE TO ENGINEER OF RECORD FOR WRITTEN APPROVAL.

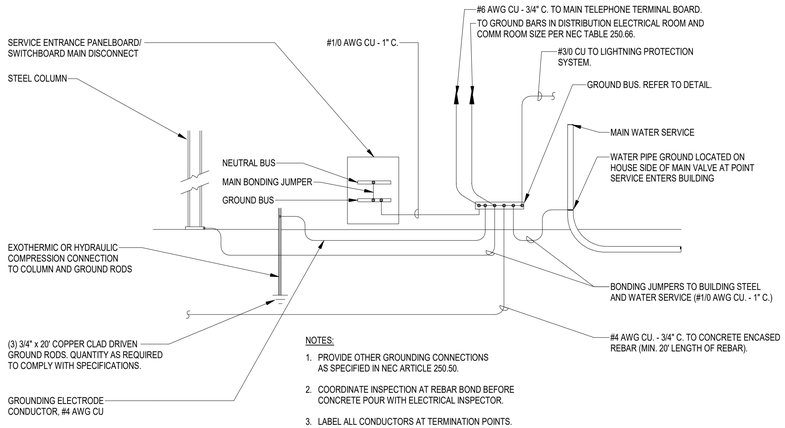
1 CONDUCTORS DETAIL
N.T.S.

IDENTIFICATION OF GROUNDED CONDUCTORS SHALL BE PERFORMED BASED ON NEC ARTICLE 200.

VOLTAGE 208Y/120V	
PHASE A	BLACK
PHASE B	RED
PHASE C	BLUE
NEUTRAL	WHITE
GROUND	GREEN

VOLTAGE 480Y/277V	
PHASE A	BROWN
PHASE B	ORANGE
PHASE C	YELLOW
NEUTRAL	GREY
GROUND	GREEN

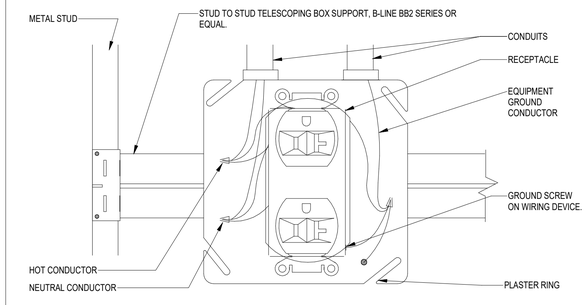
2 WIRE COLOR TABLE
N.T.S.



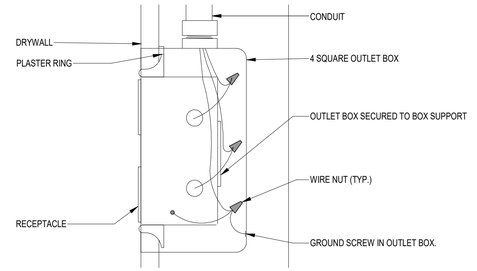
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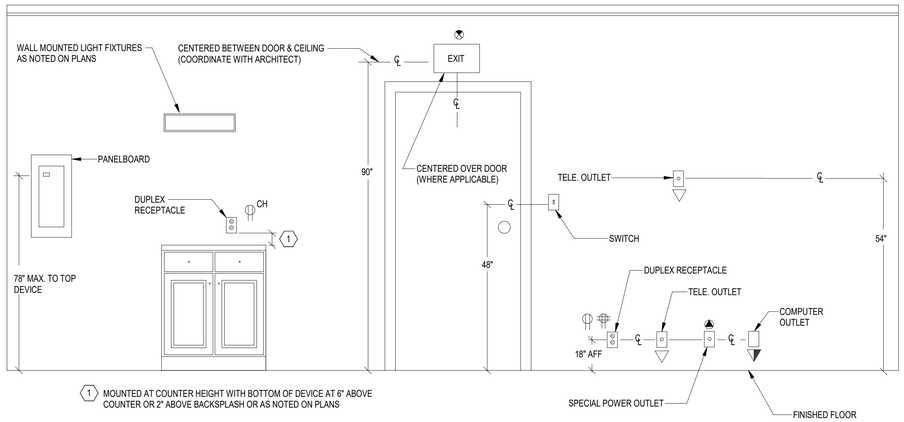
1. PROVIDE OTHER GROUNDING CONNECTIONS AS SPECIFIED IN NEC ARTICLE 250.50.
2. COORDINATE INSPECTION AT REBAR BOND BEFORE CONCRETE POUR WITH ELECTRICAL INSPECTOR.
3. LABEL ALL CONDUCTORS AT TERMINATION POINTS.
4. LABEL PER NEC 70 - 700 OR 70 - 702.8.
5. MAIN BONDING JUMPER SHALL BE LOCATED IN SERVICE ENTRANCE PANEL/SWITCHBOARD FOR SEPARATELY DERIVED POWER SOURCE.

9 SYSTEM GROUNDING DETAIL
N.T.S.

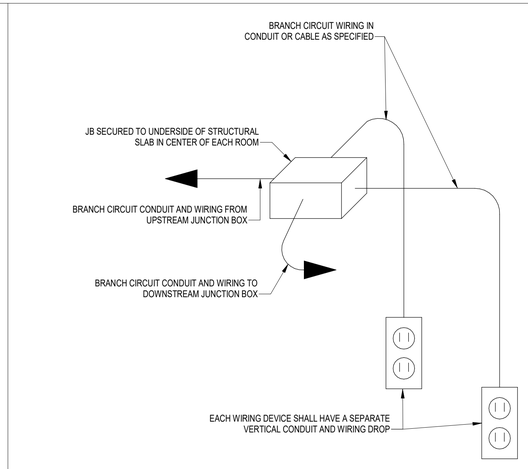


5 TYPICAL RECEPTACLE MOUNTING DETAIL
N.T.S.





7 TYPICAL MOUNTING HEIGHTS
N.T.S.



NOTE: CIRCUIT CONTINUITY TO BE MAINTAINED THROUGH CEILING MOUNTED JUNCTION BOX

3 TYPICAL WIRING DEVICE INSTALLATION DETAIL
N.T.S.

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100% DESIGN

SEAL

BRANDON M. SUBLETT
LICENSED
No. 92822
STATE OF FLORIDA
PROFESSIONAL ENGINEER

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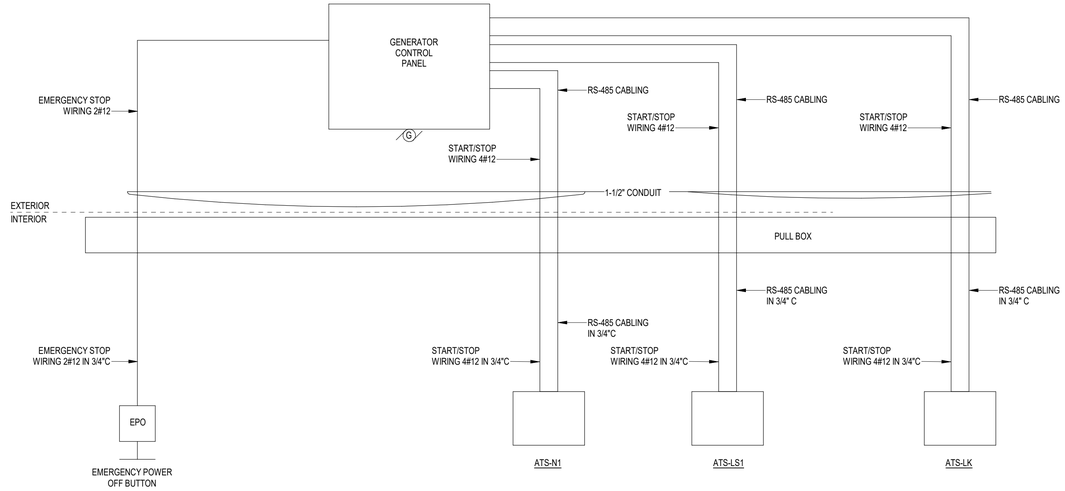
ELECTRICAL DETAILS

PROJECT NO. 0122062

E-501

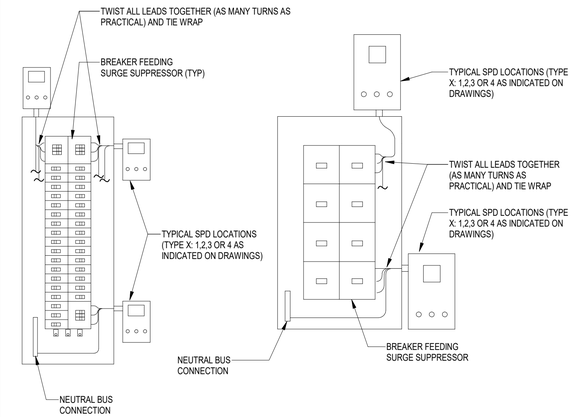
SHEET NO.

2/27/2024 1:27:18 PM



NOTE: THIS DIAGRAM IS INTENDED TO SHOW GENERAL DESIGN INTENT. PROVIDE WIRING AS REQUIRED BASED UPON MANUFACTURER RECOMMENDATIONS AND TO FULFILL ALL PROJECT REQUIREMENTS.

1 GENERATOR CONTROL DIAGRAM
N.T.S.



NOTE: MOUNT SPD DEVICE IN A LOCATION TO MAINTAIN ALL LEADS AS SHORT AS POSSIBLE. (18" MAX.)

2 TYPICAL SPD MOUNTING DETAIL
N.T.S.

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PROFESSIONAL ENGINEER

BRA

Brandon Smith

, P.E.

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ELECTRICAL DETAILS

PROJECT NO. 0122062

E-502

SHEET NO.

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DISCONNECT SCHEDULE

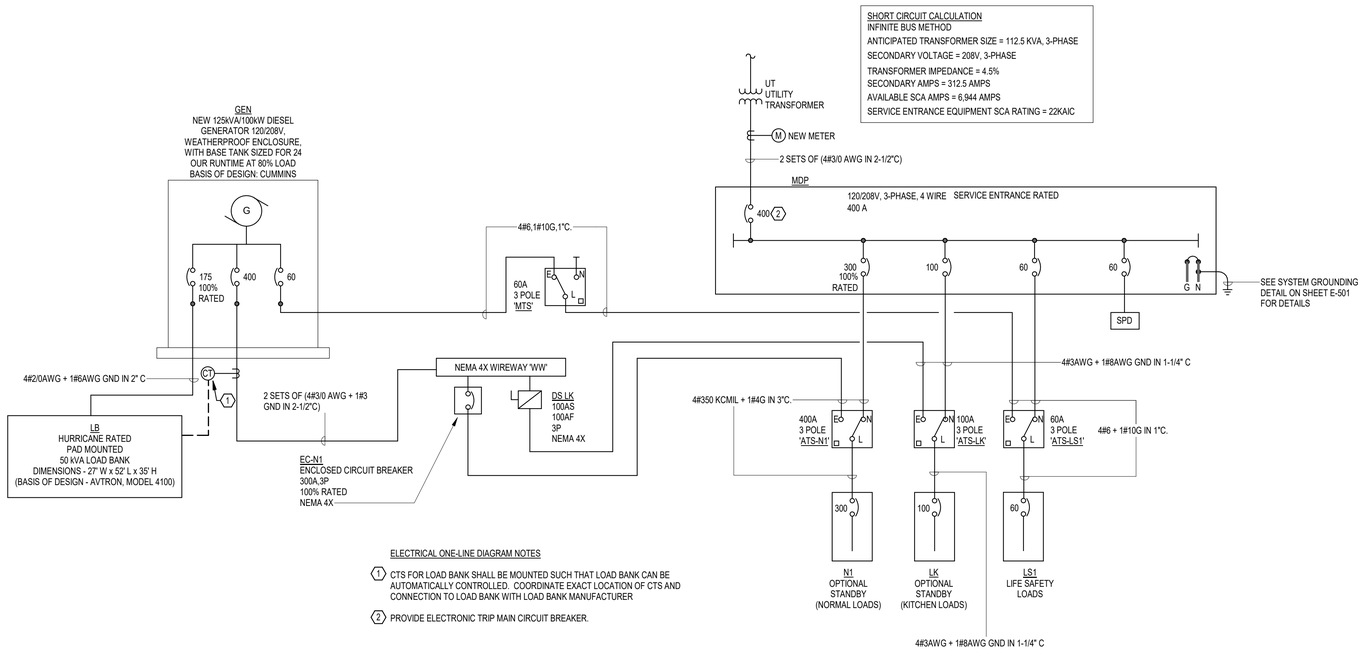
DISC NAME	TYPE OF EQUIPMENT	VOLTAGE RATING	ENCLOSURE RATING	DISC. AMP/POLE	FUSE/BREAKER SIZE	STARTER SIZE	DISCONNECT NOTES
DS CP-1	MOTOR RATED TOGGLE SWITCH	120V/1PH	NEMA 1	20A/1P	N/A	N/A	
DS DSS-1	NON FUSED DISCONNECT SWITCH	208V/1PH	NEMA 1	30A/2P	N/A	N/A	
DS EF-1	MOTOR RATED TOGGLE SWITCH	120V/1PH	NEMA 1	20A/1P	N/A	INTERLOCK WITH AIR HANDLING UNIT AHU-2	
DS EF-2	MOTOR RATED TOGGLE SWITCH	120V/1PH	NEMA 1	20A/1P	N/A	INTERLOCK WITH AIR HANDLING UNIT AHU-3	
DS EF-3	MOTOR RATED TOGGLE SWITCH	120V/1PH	NEMA 1	20A/1P	N/A	INTERLOCK WITH AIR HANDLING UNIT AHU-3	
DS-AHU-1	NON FUSED DISCONNECT SWITCH	208V/3PH	NEMA 1	30A/3P	N/A	N/A	
DS-AHU-2	NON FUSED DISCONNECT SWITCH	208V/1PH	NEMA 1	30A/2P	N/A	N/A	
DS-AHU-3	NON FUSED DISCONNECT SWITCH	208V/1PH	NEMA 1	30A/2P	N/A	N/A	
DS-CU-1	FUSED DISCONNECT SWITCH	208V/3PH	NEMA 4X	200A/3P	150A	N/A	
DS-CU-2	NON FUSED DISCONNECT SWITCH	208V/1PH	NEMA 4X	30A/2P	N/A	N/A	
DS-CU-3	NON FUSED DISCONNECT SWITCH	208V/1PH	NEMA 4X	60A/2P	N/A	N/A	
DS-CU-4	NON FUSED DISCONNECT SWITCH	208V/1PH	NEMA 4X	60A/2P	N/A	N/A	

EQUIPMENT SCHEDULE

EQUIPMENT NAME	IDENTIFICATION	HP	FLA	MCA	VOLT / PH / LOAD (VA)	MOCP	CB AMPS	PANEL	CKT #	FEEDER SIZE	CONDUIT	MOTOR STARTING	DISC MEANS	COMMENTS
AHU-1	AIR HANDLING UNIT			16A	208 V/3-5760 VA	20A	20A	N1	49,51,53	3#12 AWG, #12 AWG GND	3/4"	BY MECH	DS-AHU-1	
AHU-2	AIR HANDLING UNIT			4A	208 V/1-832 VA	15A	15A	N1	45,47	2#12 AWG, #12 AWG GND	3/4"	BY MECH	DS-AHU-2	
AHU-3	AIR HANDLING UNIT			6A	208 V/1-1248 VA	15A	15A	N1	33,35	2#12 AWG, #12 AWG GND	3/4"	BY MECH	DS-AHU-3	
CP-1	CIRCULATION PUMP	1/35			120 V/1-100 VA	15A	15A	N1	10	2#12 AWG, #12 AWG GND	3/4"	BY PLUMB	DS CP-1	
CU-1	CONDENSING UNIT			122A	208 V/3-35136 VA	150	150	N1	Feed Through Lugs	3#1/0 AWG, #6 AWG GND	1-1/2"	BY MECH	DS-CU-1	
CU-2	CONDENSING UNIT			18A	208 V/1-3000 VA	30A	30A	N1	29,31	2#10 AWG, #10 AWG GND	3/4"	BY MECH	DS-CU-2	
CU-3	CONDENSING UNIT			26A	208 V/1-4326 VA	40A	40A	N1	41,43	2#8 AWG, #10 AWG GND	3/4"	BY MECH	DS-CU-3	
CU-4	CONDENSING UNIT			25A	208 V/1-212 VA	40A	40A	N1	37,39	2#8 AWG, #10 AWG GND	3/4"	BY MECH	DS-CU-4	
DSS-1	INDOOR UNIT			1.02A	208 V/1-200 VA	15A	15A	N1	52,54	2#12 AWG, #12 AWG GND	3/4"	BY MECH	DS DSS-1	
EF-1	EXHAUST FAN	1/4			120 V/1-400 VA	15A	15A	N1	56	2#12 AWG, #12 AWG GND	3/4"	BY MECH	DS EF-1	
EF-2	EXHAUST FAN		1A		120 V/1-400 VA	15A	15A	N1	55	2#12 AWG, #12 AWG GND	3/4"	BY MECH	DS EF-2	
EF-3	EXHAUST FAN		1A		120 V/1-400 VA	15A	15A	N1	57	2#12 AWG, #12 AWG GND	3/4"	BY MECH	DS EF-3	
EWH-1	ELECTRICAL WATER HEATER		22A		208 V/3-8000 VA	30A	30A	N1	46,48,50	3#10 AWG, #10 AWG GND	3/4"	BY MECH	DS EF-9	
EWH-2	ELECTRICAL WATER HEATER		22A		208 V/3-8000 VA	30A	30A	N1	40,42,44	3#10 AWG, #10 AWG GND	3/4"	BY MECH	DS EF-8	

TRANSFER SWITCH SCHEDULE

NAME	MOUNTING	VOLTAGE/POLE	SHORT CIRCUIT RATING	DIMENSIONS	NEMA RATING	TYPE	BASIS OF DESIGN
ATS N1	WALL	208V/3P	22KAIC	18" W x 48" H x 13" D	NEMA 1	AUTOMATIC TRANSFER SWITCH, OPEN TRANSITION	ASCO
ATS LK	WALL	208V/3P	10KAIC	18" W x 48" H x 13" D	NEMA 4X	AUTOMATIC TRANSFER SWITCH, OPEN TRANSITION	ASCO
MTS	WALL	208V/3P	10KAIC	30" W x 48" H x 16" D	NEMA 4X	DOCKING STATION, KIRK KEY INTERLOCK, CAMLOCKS	TRYSTAR
ATS LS1	WALL	208V/3P	10KAIC	18" W x 48" H x 13" D	NEMA 1	AUTOMATIC TRANSFER SWITCH, OPEN TRANSITION	ASCO



ELECTRICAL ONE-LINE DIAGRAM NOTES

1. CTS FOR LOAD BANK SHALL BE MOUNTED SUCH THAT LOAD BANK CAN BE AUTOMATICALLY CONTROLLED. COORDINATE EXACT LOCATION OF CTS AND CONNECTION TO LOAD BANK WITH LOAD BANK MANUFACTURER
2. PROVIDE ELECTRONIC TRIP MAIN CIRCUIT BREAKER.

1 ELECTRICAL ONE-LINE DIAGRAM
N.T.S

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ELECTRICAL DIAGRAMS

PROJECT NO. 0122062

E-601

SHEET NO.

2/27/2024 1:27:18 PM

BRANCH PANEL: LK

LOCATION: BREAKROOM 112 | **VOLTS:** 120/208 Wye | **A.I.C. RATING:** 10000
SUPPLY FROM: MDP | **PHASES:** 3 | **MAINS TYPE:** MCB
MOUNTING: Flush | **WIRES:** 4 | **MAINS RATING:** 100 A
ENCLOSURE: Type 1 | **SERVICE ENTRANCE:** No

GENERAL NOTES:
1.) THIS PANEL SERVES OPTIONAL STANDBY, KITCHEN LOADS

CKT	CIRCUIT DESCRIPTION	NOTES	TRIP	POLES	A	B	C	POLES	TRIP	NOTES	CIRCUIT DESCRIPTION	CKT
1	RECP: 112, 110	1	20 A	1	900 VA 4667...							2
3	RECP: 112	1	20 A	1		540 VA 4667...		3	50 A	1	ELECTRIC RANGE	4
5	REFRIG RECP: 112	1	20 A	1			800 VA 4667...					6
7	REFRIG RECP: 112	1	20 A	1	800 VA 4667...							8
9	MICROWAVE RECP: 112	1	20 A	1		1200... 4667...		3	50 A	1	ELECTRIC RANGE	10
11	MICROWAVE RECP: 112	1	20 A	1			1200... 4667...					12
13	DISHWASHER: 112	1	20 A	1	500 VA 500 VA			1	20 A		HOOD RM 112	14
15	RECP: 123, 122, 120	1	20 A	1		580 VA 500 VA		1	20 A		HOOD RM 120	16
17	REFRIG CONFERENCE RM 120	1	20 A	1			800 VA 0 VA	1	20 A		Spare	18
19	Spare		20 A	1	0 VA 0 VA			1	20 A		Spare	20
21	Spare		20 A	1		0 VA 0 VA		1	20 A		Spare	22
23	Spare		20 A	1			0 VA 0 VA	1	20 A		Spare	24
25	Spare		20 A	1	0 VA 0 VA							26
27	Spare		20 A	1		0 VA 0 VA		3	30 A		SPD	28
29	Spare		20 A	1			0 VA 0 VA					30
			TOTAL...		12033 VA	12153 VA	12133 VA					
			TOTAL...		100 A	101 A	101 A					

LEGEND:

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
KITCHEN EQUIPMENT	32980 VA	65.00%	21437 VA		
Motor	1000 VA	112.50%	1125 VA	**TOTAL CONNECTED LOAD:**	36320 VA
Other	500 VA	100.00%	500 VA	**TOTAL EST. DEMAND:**	24902 VA
Receptacle	1840 VA	100.00%	1840 VA	**TOTAL CONNECTED...**	101 A
				TOTAL EST. DEMAND...	69 A

BRANCH CIRCUIT NOTES:
PROVIDE GFCI CIRCUIT BREAKER

Switchboard: MDP

Location: ELEC / MECH 105 | **Volts:** 120/208 Wye | **A.I.C. Rating:** 22000
Supply From: UT | **Phases:** 3 | **Mains Type:** MCB
Mounting: Surface | **Wires:** 4 | **Mains Rating:** 400 A
Enclosure: NEMA 1 | **MCB Rating:** 400 A
Neutral Rating: 100.00%

GENERAL NOTES:
1. SERVICE RATED
2. ENCLOSURE DIMENSIONS 32" W x 73" H x 9.5" D, (BASIS OF DESIGN, SQUARE D, I-LINE)

CKT	Circuit Description	# of Poles	Trip Rating	Load	BRANCH CIRCUIT/FEEDER NOTES
1	PANEL LS1	3	60 A	2.0 kVA	
2	PANEL N1	3	300 A	84.9 kVA	
3	PANEL LK	3	100 A	36.3 kVA	
4	SPACE	1	--	--	
5	SPACE	1	--	--	
6	SPD	3	60 A	0.0 kVA	
				123238 VA	
				342 A	

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	3212 VA	100.00%	3212 VA		
Lighting	3643 VA	100.00%	3643 VA	**Total Conn. Load:**	123238 VA
Motor	10140 VA	114.20%	11580 VA	**Total Est. Demand:**	119769 VA
Other	23851 VA	100.00%	23851 VA	**Total Conn. Current:**	342 A
Receptacle	14300 VA	84.97%	12150 VA	**Total Est. Demand...**	332 A
KITCHEN EQUIPMENT	32980 VA	65.00%	21437 VA		
Largest Motor	35136 VA	125.00%	43920 VA		

BRANCH CIRCUIT/FEEDER NOTES:

BRANCH PANEL: N1

LOCATION: ELEC/MECH 105 | **VOLTS:** 120/208 Wye | **A.I.C. RATING:** 22000
SUPPLY FROM: MDP | **PHASES:** 3 | **MAINS TYPE:** MCB
MOUNTING: Surface | **WIRES:** 4 | **MAINS RATING:** 300 A
ENCLOSURE: Type 1 | **SERVICE ENTRANCE:** NO

GENERAL NOTES:
1.) 100% RATED MAIN CIRCUIT BREAKER 2.) THIS PANEL SERVES OPTIONAL STANDBY, NORMAL LOADS 3.) PROVIDE SUBFEED LUG FOR CONDENSING UNIT CU-1

CKT	CIRCUIT DESCRIPTION	NOTES	TRIP	POLES	A	B	C	POLES	TRIP	NOTES	CIRCUIT DESCRIPTION	CKT
1	LTG: 110,111,112,120,121		20 A	1	1499... 1106...			1	20 A		LTG: 100,113,107,105,,102,121	2
3	LTG: EXT SCONCE		20 A	1		261 VA --		1	--		HOLD FOR SITE LIGHTING	4
5							900 VA	1	20 A		RECP: 105,100	6
7	RECP: 100, 113, 121, 110		20 A	1	1100... 940 VA			1	20 A		RECP: 103, 102	8
9	RECP: 112, 110		20 A	1		560 VA 100 VA		1	15 A		RECIRC PUMP	10
11	QUAD RECP: 107		20 A	1			360 VA 100 VA	1	20 A		TIMECLOCK	12
13	QUAD RECP: 107		20 A	1	360 VA 0 VA			1	20 A		Spare	14
15	FLR RECP: 110		20 A	1		360 VA 500 VA		1	20 A	1	EWC: 100	16
17	FLR RECP: 110		20 A	1			180 VA 360 VA	1	20 A		QUAD RECP: 107	18
19	TV RECP: 110		20 A	1	600 VA 360 VA			1	20 A		QUAD RECP: 107	20
21	FLR RECP: 120		20 A	1		360 VA 900 VA		1	20 A		RECP: 110	22
23	RECP: EXT 130		20 A	1			380 VA 360 VA	1	20 A		FLR RECP: 110	24
25	CEILING PROJ RECP: 110,120		20 A	1	360 VA 740 VA			1	20 A		TV RECP: 110	26
27	QUAD RECP: 120		20 A	1		360 VA 720 VA		1	20 A		RECP: 120	28
29	CU-2		30 A	2			1500... 400 VA	1	20 A		TV RECP: 120	30
31					1500... 360 VA			1	20 A		FLR RECP: 120	32
33	AHU-3		15 A	2		624 VA 540 VA		1	20 A		RECP: 120	34
35							624 VA 360 VA	1	20 A		QUAD RECP: 120	36
37	CU-4		40 A	2	106 VA 540 VA			1	20 A		EXTERIOR REC	38
39						106 VA 2667...						40
41	CU-3		40 A	2			2163... 2667...	3	30 A		EWH-2	42
43					2163... 2667...							44
45	AHU-2		15 A	2		416 VA 2667...						46
47							416 VA 2667...	3	30 A		EWH-1	48
49					1920... 2667...							50
51	AHU-1		20 A	3		1920... 100 VA		2	15 A		DSS-1	52
53							1920... 100 VA					54
55	EF-2		15 A	1	400 VA 400 VA			1	15 A		EF-1	56
57	EF-3		15 A	1		400 VA 0 VA		1	20 A		Spare	58
59	MOTORIZED DAMPER		20 A	1			1000... 0 VA	1	20 A		Spare	60
61	Spare		20 A	1	0 VA 0 VA			1	20 A		Spare	62
63	Spare		20 A	1		0 VA 0 VA		1	20 A		Spare	64
65	Spare		20 A	1			0 VA 0 VA	1	20 A		Spare	66
67	Spare		20 A	1	0 VA 0 VA							68
69	Spare		20 A	1		0 VA 0 VA		3	30 A		SPD	70
71	Spare		20 A	1			0 VA 0 VA					72
			TOTAL...		31480 VA	25272 VA	28168 VA					
			TOTAL...		266 A	211 A	238 A					

LEGEND:

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
HVAC	3212 VA	100.00%	3212 VA		
Lighting	2638 VA	100.00%	2638 VA	**TOTAL CONNECTED LOAD:**	84920 VA
Motor	9140 VA	115.75%	10580 VA	**TOTAL EST. DEMAND:**	93914 VA
Other	22351 VA	100.00%	22351 VA	**TOTAL CONNECTED...**	236 A
Receptacle	12460 VA	90.13%	11230 VA	**TOTAL EST. DEMAND...**	261 A
Largest Motor	35136 VA	125.00%	43920 VA		

BRANCH CIRCUIT NOTES:
1. PROVIDE GFCI TYPE BREAKER.

BRANCH PANEL: LS1

LOCATION: ELEC/MECH 105 | **VOLTS:** 120/208 Wye | **A.I.C. RATING:** 10000
SUPPLY FROM: MDP | **PHASES:** 3 | **MAINS TYPE:** MCB
MOUNTING: Surface | **WIRES:** 4 | **MAINS RATING:** 60 A
ENCLOSURE: Type 1 | **SERVICE ENTRANCE:** NO

GENERAL NOTES:
1.) THIS PANEL SERVES LIFE SAFETY LOADS

CKT	CIRCUIT DESCRIPTION	NOTES	TRIP	POLES	A	B	C	POLES	TRIP	NOTES	CIRCUIT DESCRIPTION	CKT
1	EM LTG: INTERIOR		20 A	1	840 VA 166 VA			1	20 A		EM LTG: EXT WALL MNT	2
3	GEN BATTERY CHARGER		20 A	1		500 VA 0 VA		1	20 A		SPARE	4
5	GEN BLOCK HEATER		20 A	1			500 VA 0 VA	1	20 A		SPARE	6
7	SPARE		20 A	1	0 VA 0 VA			1	20 A		SPARE	8
9	SPARE		20 A	1		0 VA --		1	--		SPACE	10
11	SPARE		20 A	1			0 VA --	1	--		SPACE	12
13	SPARE		20 A	1	0 VA 0 VA			1	20 A		SPARE	14
15	SPACE		--	1		-- --		1	--		SPACE	16
17	SPACE		--	1			-- --	1	--		SPACE	18
19	SPACE		--	1	-- --			1	--		SPACE	20
21	SPACE		--	1		-- --		1	--		SPACE	22
23	SPACE		--	1			-- --	1	--		SPACE	24
25	SPACE		--	1	-- 0 VA							26
27	SPACE		--	1		-- 0 VA		3	30 A		SPD	28
29	SPACE		--	1			-- 0 VA					30
			TOTAL...		1005 VA	500 VA	500 VA					
			TOTAL...		8 A	4 A	4 A					

LEGEND:

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
Lighting	1005 VA	100.00%	1005 VA		
Other	1000 VA	100.00%	1000 VA	**TOTAL CONNECTED LOAD:**	2002 VA
				TOTAL EST. DEMAND:	2002 VA
				TOTAL CONNECTED...	6 A
				TOTAL EST. DEMAND...	6 A

BRANCH CIRCUIT NOTES:
1. PROVIDE GFCI TYPE BREAKER.

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100% DESIGN

SEAL

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SCALE

REVISIONS

NO.	DESCRIPTION	DATE

DRAWN BY WWS
APPROVED BY BMS
CHECKED BY BMS
DATE 2.6.24

TITLE
ELECTRICAL SCHEDULES

PROJECT NO. 0122062

E-801

SHEET NO.

2/27/2024 1:27:19 PM

SHEET LIST

SHEET NUMBER	SHEET NAME
T-001	TELECOMM LEGEND, ABBREVIATIONS AND GENERAL NOTES
T-100	TELECOMM SITE PLAN
T-101	FIRST FLOOR PLAN - TELECOMM - NEW WORK
T-501	TELECOMM DETAILS

COMMUNICATION SYMBOLS

SYMBOL	DESCRIPTION
V CH	WORK AREA TCO, COMBINATION TELEPHONE/DATA COMMUNICATION OUTLET - 4 DATA PORT FACE PLATE WITH 4 DATA PORTS - (1) CAT6A CABLE PER PORT. 1-1/2" CONDUIT TO ABOVE ACCESSIBLE CEILING. CH = COUNTER HEIGHT
V	FLOOR RECEPTACLE, COMBINATION TELEPHONE/DATA COMMUNICATION OUTLET - 4 DATA PORTS - (1) CAT6A CABLE PER PORT. 1-1/2" CONDUIT BELOW SLAB TO NEAREST WALL AND TO ABOVE ACCESSIBLE CEILING.
V	CEILING MOUNTED DATA OUTLET - (1) DATA PORT AND CAT6A CABLE
V	AUDIO/VIDEO CONNECTION - REFER TO DRAWING NOTES FOR CONNECTION REQRUIEMENTS. 1-1/2" CONDUIT TO ABOVE ACCESSIBLE CEILING.
TTB	TELEPHONE BACKBOARD (WALL MOUNTED)
	4-POST NETWORK EQUIPMENT RACK.
	VERTICAL CABLE MANAGEMENT.
	TELECOMM GROUND BUS BAR, COPPER

DEVICE MOUNTING LOCATION AND HEIGHT NOTES:

1. FOR WHEELCHAIR PATIENT USE MOUNT TELEPHONE OUTLET 36" AFF TO BOTTOM OF OUTLET BOX.
2. DESK PHONES - MOUNT OUTLET 1'-6" AFF.
3. PAY PHONES - MOUNT OUTLET 4'-0" AFF
4. HEIGHT OF TELECART OUTLETS SHALL BE AS INDICATED ON BEDWALLS OR PBPU DETAILS.

GENERAL NOTES

1. PRODUCTS SHALL BE OF MATERIALS THAT ARE SUITABLE FOR THE ENVIRONMENT IN WHICH THEY ARE TO BE INSTALLED.
2. WORKING CLEARANCES AROUND ELECTRICAL EQUIPMENT SHALL BE MAINTAINED IN COMPLIANCE WITH THE NATIONAL ELECTRICAL CODE ARTICLE 110, COORDINATE EQUIPMENT INSTALLATION TO MAINTAIN REQUIRED CLEARANCES.
3. IF AN OUTLET BOX IS REQUIRED TO BE LOCATED IN AN ASSEMBLY OR PARTITION RATED AS "FIRE/SMOKE" OR "SMOKE" OR IDENTIFIED AS EITHER "FIRE/SMOKE" OR "SMOKE", THEN ALL OF THE FOLLOWING CONDITIONS SHALL BE MET:
   A. THE OUTLET BOX SHALL BE METALLIC.
   B. THE OUTLET BOX OPENINGS SHALL OCCUR ONLY ON ONE SIDE OF THE FRAMING SPACE.
   C. THE OUTLET BOX OPENINGS SHALL NOT EXCEED 16 SQUARE INCHES.
   D. ALL CLEARANCES BETWEEN THE OUTLET BOX AND THE WALL BOARD MATERIAL SHALL BE COMPLETELY SEALED WITH APPROVED MATERIALS IN ACCORDANCE WITH THE APPLICABLE CODES AND STANDARDS FOR THE PROJECT.
   E. PROVIDE A SUPPLEMENTAL BARRIER AROUND OUTLETS LARGER THAN 16 INCHES SO THAT THE ORIGINAL RATING OF THE PENETRATION IS MAINTAINED.
   F. THE TOTAL AGGREGATE SURFACE AREA OF THE OUTLET BOX SHALL NOT EXCEED 100 SQUARE INCHES PER 100 SQUARE FEET.
   G. THE OUTLET BOX SHALL BE SEPARATED FROM OPENINGS ON THE OPPOSITE SIDE OF THE RATED PARTITION BY A MINIMUM HORIZONTAL DISTANCE OF 24 INCHES.
   H. THE OUTLET BOX SHALL BE SECURELY FASTENED TO A PARTITION FRAMING MEMBER BY MEANS OF AN APPROVED ATTACHMENT METHOD.
   I. OPENINGS CUT INTO THE WALL BOARD MATERIAL SHALL NOT EXCEED 1/8 INCH BETWEEN THE EDGES OF THE OUTLET BOX AND THE EDGES OF THE OPENING.
4. LOCATIONS OF EQUIPMENT SHOWN ON THE DRAWINGS ARE APPROXIMATE. COORDINATE EXACT EQUIPMENT LOCATION AND CONNECTION REQUIREMENTS WITH THE APPROPRIATE TRADE PRIOR TO INSTALLATION.
5. FOR EXACT LOCATION OF CEILING MOUNTED EQUIPMENT REFER TO THE ARCHITECTURAL REFLECTED CEILING PLAN. LOCATIONS OF EQUIPMENT NOT INCLUDED ON THE REFLECTED CEILING PLAN SHALL BE COORDINATED WITH THOSE ITEMS SHOWN. COORDINATION OF CEILING MOUNTED EQUIPMENT SHALL BE PRIOR TO ANY ROUGH-IN. NOTIFY ARCHITECT OF ANY DISCREPANCY.
6. PROVIDE FINAL CONNECTIONS TO OWNER PROVIDED EQUIPMENT WHERE INDICATED ON THE PLAN DRAWINGS.
7. PRIOR TO ROUGH-IN AND INSTALLATION OF ANY FLOOR MOUNTED DEVICE, VERIFY LOCATION WITH THE ARCHITECT.
8. VERIFY AND COORDINATE THE LOCATION OF REQUIRED DIVISION 27 OUTLETS WITH OTHER TRADE DRAWINGS AND OWNER PROVIDED EQUIPMENT.
9. ALL RACEWAY SYSTEMS SHOWN TO SUPPORT THE INSTALLATION OF THE DIVISION 27 EQUIPMENT SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR. PROVIDE COORDINATION FOR THE INSTALLATION OF THIS RACEWAY SYSTEM WITH THE ELECTRICAL CONTRACTOR.
10. EACH VOICE/DATA OUTLET LOCATION SHOWN, SHALL HAVE A DOUBLE GANG OUTLET BOX WITH A SINGLE GANG PLASTER RING AND (1) 1-1/2" CONDUIT STUBBED UP TO AN ACCESSIBLE LOCATION ABOVE THE FINISHED CEILING OR TO AN ACCESSIBLE CABLE TRAY WHERE PROVIDED. WORK BY ELECTRICAL CONTRACTOR PER SPECS.
11. ALL BONDING AND GROUNDING ELEMENTS UTILIZED FOR STRUCTURED CABLING SYSTEM SHALL BE IN COMPLIANCE WITH SPECIFICATION SECTION 262000.
12. PROVIDE ALL SLEEVES AS REQUIRED FOR ALL LOW VOLTAGE CABLE PATHWAYS. RESTORE THE FIRE RATING OF THE SURFACE.
13. CABLE INSTALLED BELOW SLAB SHALL HAVE INDOOR/OUTDOOR RATED JACKET FOR PROTECTION OF STRUCTURED CABLE.
14. TELECOMMUNICATIONS ROOM SHALL BE BONDED AND GROUNDED IN ACCORDANCE WITH TIA-607B.
15. ALL TELECOMMUNICATIONS CONDUITS SHALL BE PROVIDED WITH BUSHINGS AT EACH END FOR PROTECTION OF STRUCTURED CABLE.

PULL SCHEDULE REQUIREMENTS

CONTRACTOR SHALL PROVIDE PULL SCHEDULE WITH TELECOM SHOP DRAWINGS. TELECOM SHOP DRAWINGS WILL NOT BE REVIEWED UNLESS THEY INCLUDE PULL SCHEDULES.

CAT6A COPPER CABLE COLOR CODING

WHITE	- VOICE
BLUE	- DATA
ORANGE	- WIRELESS
VIOLET	- VIDEO SURVEILLANCE
RED	- FIRE ALARM
BLACK	- BAS & DAS

TELECOMMUNICATIONS ABBREVIATIONS

A/C UNIT	AIR CONDITIONING UNIT
A/E	ARCHITECT/ENGINEER
AAP	ALARM ANNUNCIATOR PANEL
AC	ALTERNATING CURRENT OR ARMORED CABLE
ACC	ACCESSIBLE
ADDL	ADDITIONAL
ADJ	ADJACENT, ADJOINING
ADO	AUTOMATIC DOOR OPENER
AFC	ABOVE FINISHED COUNTER
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHJ	AUTHORITY HAVING JURISDICTION
ALT	ALTERNATE
AMB OR A	AMBIENT
ARCH	ARCHITECT
ATS	AUTOMATIC TRANSFER SWITCH
AUTO	AUTOMATIC
AV	AUDIO VISUAL
BAT	BATTERY
BBC	BONDING BACKBONE CONDUCTOR
BC	BARE COPPER
BD	BOARD
BFF	BELOW FINISH FLOOR
BLDG	BUILDING
BPIP	BOILER PLANT INSTRUMENTATION PANEL
BYP	BY PASS
C	CONDUIT
CAB	CABINET
CALC	CALCULATE
CAP	CAPACITY
CAT	CATALOG
CATV	COMMUNITY ANTENNA TELEVISION
CCR	CONTROL CONTACTOR
CCTV	CLOSED CIRCUIT TELEVISION
CD	CONSTRUCTION DOCUMENTS
CF	CONTRACTOR FURNISHED
CF/CI	CONTRACTOR FURNISHED/CONTRACTOR INSTALLED
CF/OI	CONTRACTOR FURNISHED/OWNER INSTALLED
CFE	CONTRACTOR FURNISHED EQUIPMENT
CLG	CEILING
CMU	CONCRETE MASONRY UNIT
COAX	COAX CABLE
COMM	COMMUNICATION
COMPT	COMPARTMENT
CONC	CONCRETE
CONT	CONTINUE
CONTR	CONTRACTOR
COORD	COORDINATE
CTV	CABLE TELEVISION
CU	COPPER
CU FT	CUBIC FEET
CUR	CURRENT
DB	DECIBEL OR DIRECT BURIAL
DC	DIRECT CURRENT
DEG C	DEGREES CELSIUS
DEG F	DEGREES FAHRENHEIT
DEMO	DEMOLITION
DIAG	DIAGRAM
DISTR	DISTRIBUTION
DN	DOWN
DRSW	DOOR SWITCH
DWG	DRAWING
EC	EMPTY CONDUIT
EG	EQUIPMENT GROUND
EL	ELEVATION
ELEC	ELECTRIC OR ELECTRICAL
ELEV	ELEVATOR
EMER	EMERGENCY
EMI	ELECTROMAGNETIC INTERFERENCE
EMT	ELECTRICAL METALLIC TUBING
ENCL	ENCLOSURE
EPO	EMERGENCY POWER OFF
ESMT	EASEMENT
EXIST	EXISTING
FLEX	FLEXIBLE METALLIC CONDUIT
FOUTT	TELEPHONE FLOOR OUTLET
FP	FIRE PROTECTION
FT	FEET OR FOOT
G OR GND	GROUND OR GENERATOR
GEN	GENERATOR
GTB	GROUND TERMINAL BOX
HT	HEIGHT
HZ	HERTZ
IMC	INTERMEDIATE METAL CONDUIT
IR	INFRARED
J-BOX	JUNCTION BOX
LF	LINEAR FEET (FOOT)
LTNG	LIGHTNING
LV	LOW VOLTAGE
MATV	MASTER ANTENNA TELEVISION SYSTEM
MAX	MAXIMUM
MECH	MECHANICAL
MH	MANHOLE
MIN	MINIMUM
MT	MOUNT
MTD	MOUNTED
MTG	MOUNTING
NA	NOT APPLICABLE
NEC	NATIONAL ELECTRICAL CODE
NEUT OR N	NEUTRAL
NIC	NOT IN CONTRACT
NS	NO SCALE
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
P	POLE
PA	PUBLIC ADDRESS
PB	PANELBOARD, PULL BOX, OR PUSHBUTTON
PBB	PRIMARY BONDING BUSBAR
PBPU	PREFABRICATED BEDSIDE PATIENT UNIT
PED	PEDESTAL
PEND	PENDANT
PF	POWER FACTOR
PH	PHASE
PNL	PANEL
PVC	POLYVINYL CHLORIDE (PLASTIC)
PWR	POWER
RCP	REFLECTED CEILING PLAN
REC	RECESSED
RECPT	RECEPTACLE
RGS	RIGID GALVANIZED STEEL
RM	ROOM
REQD	REQUIRED
SF	SQUARE FOOT (FEET)
SHT	SHEET
SI	INTERNATIONAL SYSTEM OF UNITS
SPEC	SPECIFICATION
SURF	SURFACE
SW	SWITCH
TBC	TELECOMMUNICATIONS BONDING BUSBAR
TEL	TELEPHONE
TP	TWISTED PAIR
TPS	TWISTED PAIR SHIELDED
TR	TELECOMMUNICATIONS ROOM
TTB	TELEPHONE TERMINAL BOARD
TV	TELEVISION
TYP	TYPICAL
MSB	MAIN SWITCH BOARD
UFD	UNDERFLOOR DUCT
UGND	UNDERGROUND
UL	UNDERWRITERS LABORATORY
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
UTIL	UTILITY
V	VOLT
WP	WEATHERPROOF

COORDINATION NOTES:

STRUCTURED CABLING SYSTEM (SCS):
THE SCS CONTRACTOR (SCSC) SHALL PROVIDE ALL BACKBONE AND HORIZONTAL CABLING, COMPONENTS AND TERMINATIONS AS REQUIRED FOR A COMPLETE AND OPERATIONAL CABLING SYSTEM PER INDUSTRY BEST PRACTICES AS PRESCRIBED BY BICSI AND NEC.

THE SCSC SHALL BE RESPONSIBLE FOR COORDINATION WITH THE ELECTRICAL CONTRACTOR (EC) FOR SPECIFIC LOCATIONS OF ALL TELECOMMUNICATIONS SYSTEM DEVICES, INCLUDING ANCILLARY SYSTEM COMPONENTS AND ASSOCIATED CONDUITS PROVIDED BY THE EC.

THE ELECTRICAL CONTRACTOR (EC) SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL ROUGH-IN COMPONENTS ASSOCIATED WITH THE TELECOMMUNICATIONS SYSTEM COMPONENTS AS NOTED ON THE DRAWINGS AND SPECIFICATIONS, INCLUDING BUT NOT LIMITED TO, CONDUIT AND BACK-BOXES. THE EC SHALL COORDINATE ALL REQUIREMENTS WITH THE SCS CONTRACTOR.

TELECOM ROOM (TR) EQUIPMENT RACKS:
THE SCS CONTRACTOR (SCS) SHALL FURNISH AND INSTALL ALL EQUIPMENT RACKS. THE SCS CONTRACTOR SHALL FURNISH AND INSTALL ALL CABLING PATCH PANELS (COPPER AND FIBER) WITH RACK, AND SHALL BE RESPONSIBLE FOR ALL CABLE TERMINATIONS AT THE PATCH PANELS.

THE VA SHALL BE RESPONSIBLE FOR FURNISHING AND INSTALLING ALL ACTIVE EQUIPMENT, CONTROLLERS, SWITCHES, ETC. THAT RESIDE WITHIN THESE RACKS.

ACCESS CONTROL:
THE SCS CONTRACTOR (SCS) SHALL BE RESPONSIBLE FOR INSTALLING ALL CABLING AND DEVICES TO SUPPORT THE VA PROVIDED SECURITY HEAD END EQUIPMENT. VA SHALL INSTALL, CONNECT AND CONFIGURE FINAL SECURITY HEAD END EQUIPMENT.

THE ELECTRICAL CONTRACTOR (EC) SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL ROUGH-IN COMPONENTS ASSOCIATED WITH THE SECURITY SYSTEM AS NOTED ON THE DRAWINGS AND SPECIFICATIONS, INCLUDING BUT NOT LIMITED TO, CONDUIT AND BACK-BOXES. THE EC SHALL COORDINATE WITH THE SCS CONTRACTORS.

GROUNDING AND BONDING:
THE EC SHALL BE RESPONSIBLE FOR INSTALLING THE GROUNDING BUSBAR(S) AS ILLUSTRATED ON THE DRAWINGS AND SPECIFICATIONS, AND CONNECTING IT TO THE BUILDING MAIN ELECTRICAL SERVICE GROUND. THE EC SHALL BE RESPONSIBLE FOR GROUNDING ALL BACKBONE CONDUIT AND CABLE TRAY.

THE SCSC SHALL BE RESPONSIBLE FOR GROUNDING ALL RACKS, CABINETS, ENCLOSURES, PROTECTOR BLOCKS AND CABLE LADDER-RACK INSIDE TELECOMMUNICATIONS ROOMS.

FIRESTOPPING:
THE EC SHALL BE RESPONSIBLE FOR FIRE-STOPPING SLEEVE ASSEMBLIES TO OBTAIN A UL RATING.

THE SCSC SHALL BE RESPONSIBLE FOR FIRE-STOPPING INSIDE THE SLEEVES AFTER CABLE INSTALLATION IS COMPLETE.

CASEWORK / MILLWORK:
THE SCSC SHALL BE RESPONSIBLE FOR INSTALLING TELECOMMUNICATIONS OUTLETS IN CASEWORK, AS REQUIRED. CABLES SHALL BE CONCEALED IN CASEWORK.

THE EC SHALL BE RESPONSIBLE FOR INSTALLING ASSOCIATED CONDUIT AND BACK-BOXES AND SHALL STUB CONDUIT TO THE ABOVE ACCESSIBLE CEILING SPACE.

CONDUIT:
THE EC SHALL BE RESPONSIBLE TO PROVIDE AND INSTALL ALL BACKBONE AND HORIZONTAL CABLING PATHWAYS. THIS SHALL INCLUDE ALL INTERIOR CONDUITS, PATHWAY COMPONENTS SUCH AS JUNCTION BOXES, PULL BOXES, WALL/CEILING PENETRATIONS AND CONDUIT SLEEVES, WHETHER SHOWN ON THE DRAWINGS OR AS REQUIRED TO PENETRATE FULL-HEIGHT PARTITIONS AS SHOWN ON THE DRAWINGS. THE EC SHALL PROVIDE AND INSTALL ALL BUSHINGS ON TELECOMMUNICATIONS CONDUITS PRIOR TO INSTALLATION OF CABLING.

THE SCSC SHALL BE RESPONSIBLE FOR ALL WIRE RACEWAYS, CABLE RUNWAY (LADDER RACK) AND OTHER REQUIREMENTS FOR ROUTING AND SECURING CABLE INSIDE THE MAIN TELECOMMUNICATIONS ROOM (MTR) AND ALL TR'S.

TELECOMMUNICATIONS COMMUNICATIONS OUTLETS (C.O.'S) AND DEVICES:
THE EC SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL CONDUIT AND BACK-BOXES ASSOCIATED WITH THE TELECOMMUNICATIONS C.O.'S AND DEVICES.

THE SCSC SHALL BE RESPONSIBLE FOR INSTALLATION OF ALL STRUCTURED CABLING, JACKS, FACEPLATES AND JUMPER/PATCH CORDS.

BACKBOARDS:
THE EC SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL BACKBOARDS AS ILLUSTRATED ON THE DRAWINGS AND AS REQUIRED FOR A COMPLETE SYSTEM AS ILLUSTRATED IN THE SPECIFICATIONS. THE EC SHALL BE RESPONSIBLE FOR ROUGH-IN OF ALL CONDUIT AND BACK-BOXES. POWER CONDUITS SHALL BE CONCEALED BEHIND ALL BACKBOARDS. BACKBONE CONDUIT SHALL BE EXPOSED AS ILLUSTRATED ON THE DRAWINGS (TR WALL ELEVATIONS).

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FL License #92822

SCALE

NOT TO SCALE

REVISIONS

NO.	DESCRIPTION	DATE

DRAWN BY	CVM
APPROVED BY	BMS
CHECKED BY	BMS
DATE	2.6.24

TITLE

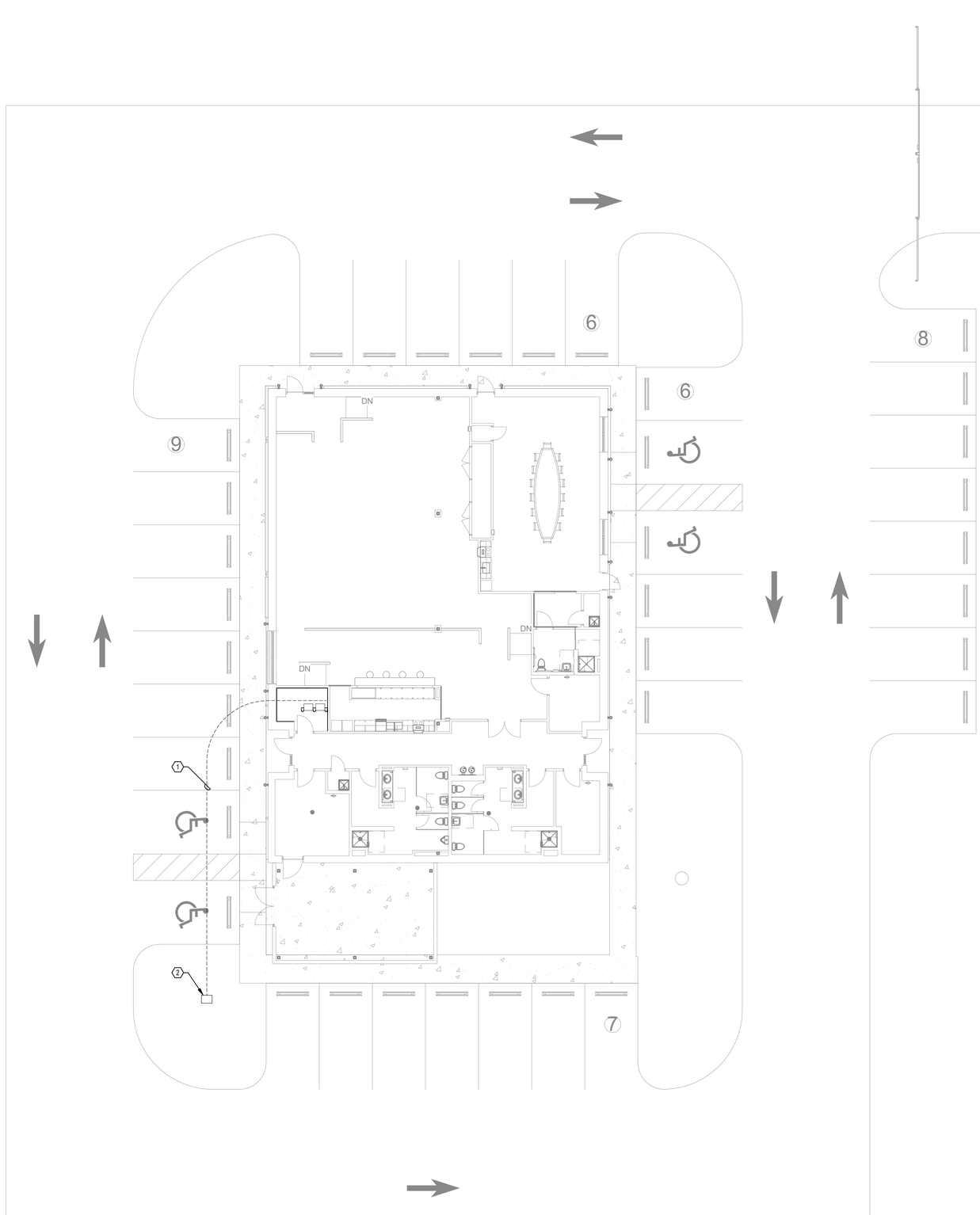
TELECOMM LEGEND, ABBREVIATIONS AND GENERAL NOTES

PROJECT NO. 0122062

T-001

SHEET NO.

2/27/2024 4:08:44 PM



1 TELECOM SITE PLAN
3/32" = 1'-0"

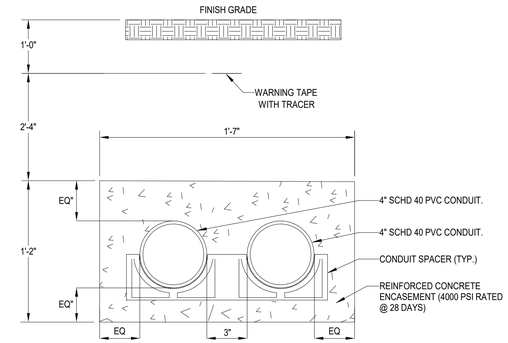
DRAWING NOTES:

1. CONDUIT ROUTING ON THIS PLAN IS DIAGRAMMATIC. EXACT CONDUIT ROUTING TO BE DETERMINED IN FIELD; COORDINATE WITH EXISTING FIELD CONDITIONS, AND ALL OTHER DISCIPLINES PRIOR TO CONSTRUCTION. PROVIDE PULL BOXES AS REQUIRED TO MAINTAIN CABLE PULL TENSION LIMITATIONS.

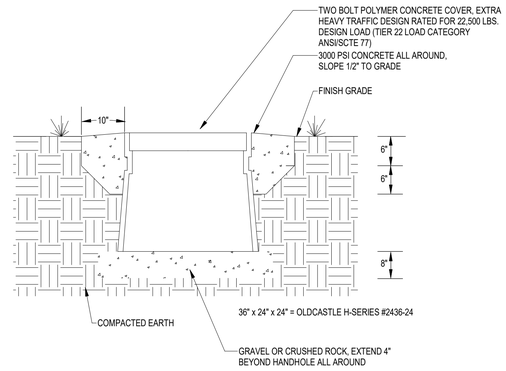
CODED NOTES:

(1) (2) 4" CONCRETE ENCASED CONDUITS FROM UTILITY CONNECTION POINT. COORDINATE EXACT LOCATION OF UTILITY CONNECTION WITH UTILITY COMPANY PRIOR TO CONSTRUCTION. TERMINATE CONDUITS AT 4" AFF. REFER TO SHEET T-101 FOR ADDITIONAL INFORMATION.

(2) COMMUNICATIONS HANDHOLE. EXACT LOCATION TO BE COORDINATE IN FIELD PRIOR TO CONSTRUCTION. REFER TO HAND HOLE DETAIL ON THIS SHEET FOR ADDITIONAL INFORMATION.



2 CONCRETE ENCASED DUCT BANK DETAIL
N.T.S.



COMMUNICATION HANDHOLE NOTES:

1. HANDHOLE SHALL BE OLDCASTLE H SERIES. SIZE AS NOTED ON SITE PLAN. COVER AND BODY SHALL BOTH BE HEAVY TRAFFIC RATED, 22,500 POUND DESIGN LOAD, ANSI/SCTE 77 TIER 22 LOAD CATEGORY, COVER AND LOGO SHALL BE "TELECOM" OR "COMMUNICATIONS". INSTALL IN ACCORDANCE WITH THE MANUFACTURER'S PRINTED INSTRUCTIONS AND THE REQUIREMENTS OF THIS PROJECT.
2. TERMINATE CONDUITS ENTERING MANHOLE WITH END BELL (CARLON E997), CONSTRUCT CONDUIT RISE TO ENTER BOX FROM SIDE WITH 22-1/2" SWEEP ELBOWS. SEE "TYPICAL HANDHOLE CONDUIT ENTRY DETAIL". DO NOT ENTER HANDHOLE FROM BOTTOM.

3 HAND HOLE DETAIL
N.T.S.

N
0 8' 16' 24' 32'
3/32" = 1'-0"

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100% DESIGN

SEAL

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FL License #92822

SCALE
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REVISIONS

NO.	DESCRIPTION	DATE

DRAWN BY	CVM
APPROVED BY	BMS
CHECKED BY	BMS
DATE	2.6.24

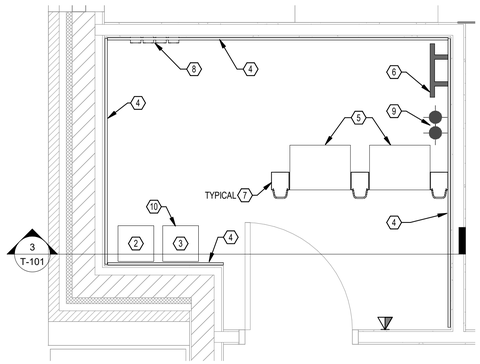
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TELECOMM SITE PLAN

PROJECT NO. 0122062

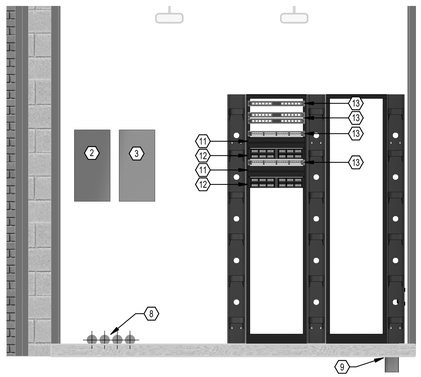
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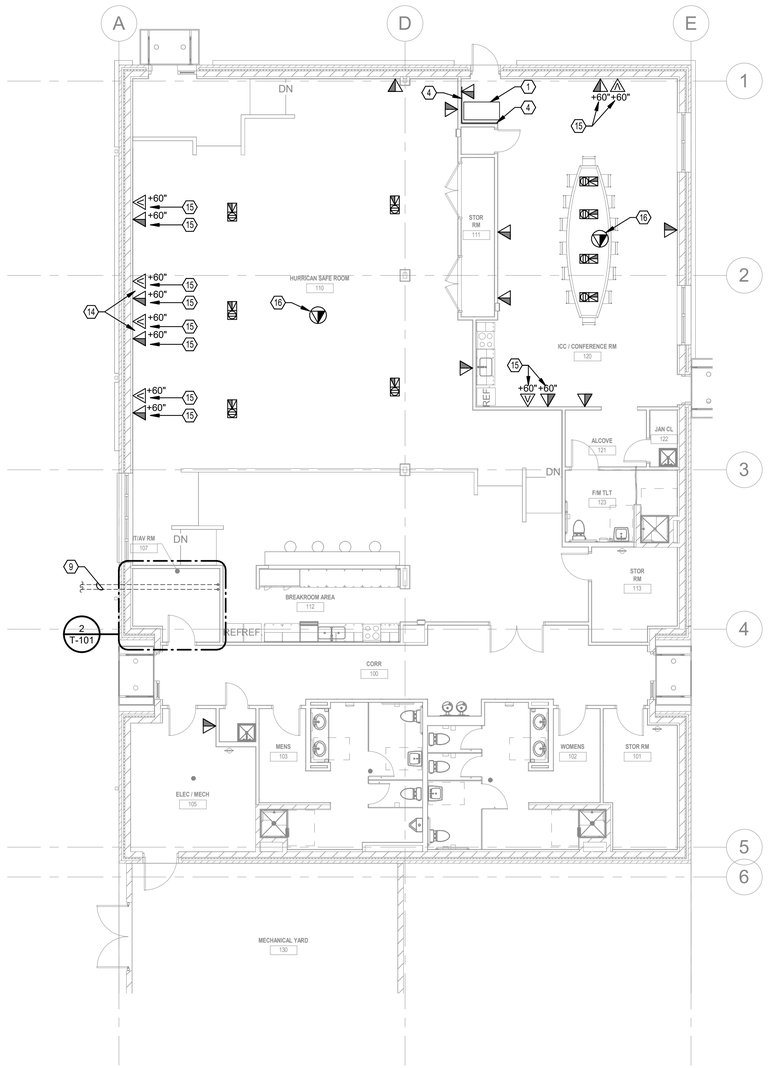
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2 ENLARGED IT/AV RM 107
1/2" = 1'-0"



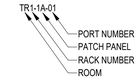
3 IT/AV RM 107 ELEVATION
1/2" = 1'-0"



1 FIRST FLOOR PLAN - SYSTEMS - NEW WORK
1/8" = 1'-0"

DRAWING NOTES:

1. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT OF ALL DATA OUTLETS WITH ARCHICTURAL PLANS, MILL WORK, AND ELECTRICAL PLANS PRIOR TO CONSTRUCTION.
2. ACTIVE EQUIPMENT (SWITCHES, FIBER TRAY, UPS, PDU, ETC.) PROVIDED BY OWNER. PASSIVE EQUIPMENT (PATCH PANELS, HORIZONTAL CABLE MANAGEMENT, CABLE TRAY, CONDUITS) PROVIDED AND INSTALLED BY DIV 26/27 CONTRACTOR.
3. LABELING STANDARDS SHALL BE FOLLOWED FOR TR NUMBER, RACK NUMBER, PATCH PANEL (A-Z), AND PORT NUMBER. EXAMPLE: TR1-1A-01.
4. 8P8C CONNECTIONS IN WALL PLATES SHALL BE COLOR CODED BASED ON TYPE. REFER TO SHEET T-000 FOR CABLE COLOR CHART.
5. LABEL ALL CABLES AND PORTS ON BOTH ENDS WITH COMPUTER GENERATED, SELF-LAMINATING, ADHESIVE, WRAPAROUND LABELS WITH THE ROOM NUMBER (TR1, TR2...), RACK NUMBER, PATCH PANEL IDENTIFIER AND TERMINATION POINT.



6. CONTRACTOR SHALL PROVIDE CABLE PULL SCHEDULE FOR EACH SWITCH IN ALL RACKS AS PART OF SHOP DRAWING SUBMITTAL.
7. PROVIDE SERVICE LOOP, (1) FULL LOOP IN CABLE TRAY AROUND PERIMETER OF DATA ROOM, FOR ALL STRUCTURED CABLING PRIOR TO TERMINATION ON PATCH PANEL.

CODED NOTES:

1. WALL MOUNTED NETWORK CABINET BY OTHERS.
2. CELLULAR REPEATER EQUIPMENT PROVIDED AND INSTALLED BY CELLULAR SERVICE PROVIDER. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT WITH EQUIPMENT AND CELLULAR PROVIDER REQUIREMENTS PRIOR TO CONSTRUCTION.
3. CATV PROVIDER HEAD END AND DISTRIBUTION EQUIPMENT BY CATV PROVIDER. COORDINATE EXACT TERMINATION LOCATION WITH CATV PROVIDER PRIOR TO CONSTRUCTION.
4. PROVIDE TIA APPROVED, FIRE RATED, AC GRADE PLYWOOD BACKBOARD 4'x8'x1/2", OR APPROVED FIRE PLYWOOD. PAINT ON ALL SIDES AND WITHIN CUTOUT AREAS WITH AT LEAST (2) COATS OF FIRE RETARDANT, LIGHT COLORED PAINT. LOCATE BACKBOARD 12" AFF, INSTALL SO 'A' SIDE OF PLYWOOD IS EXPOSED.
5. PROVIDE 45RU 2-POST EQUIPMENT RACK. BASIS OF DESIGN IS CHATSWORTH STANDARD RACK 6"D.
6. GROUND BUSBAR. ALL VERTICAL/HORIZONTAL RACKS AND CABLE TRAY SHALL BE BONDED TO BUSBAR. REFER TO GROUND BUS BAR DETAIL ON SHEET T-501 FOR MORE INFORMATION.
7. 6" VERTICAL WIRE MANAGERS. (TYPICAL)
8. (4) 3" SLEEVES THROUGH WALL WITH BUSHINGS ON BOTH SIDES.
9. (2) 4" CONDUITS FROM SITE. PROVIDE BUSHINGS ON EACH END OF CONDUIT AND FABRIC INNERDUCT WITH PULL STRING. BASIS OF DESIGN IS MAXCELL 3-CELL, 2" INNERDUCT. TERMINATE CONDUITS AT 4" AFF. REFER TO SHEET T-100 FOR ADDITIONAL INFORMATION.
10. TERMINATE CATV OUTLET COAXIAL SERIES-6 CABLE AT THIS LOCATION FOR CONNECTION TO CATV PROVIDER DISTRIBUTION EQUIPMENT. COORDINATE EXACT TERMINATION POINT WITH CATV PROVIDER PRIOR TO CONSTRUCTION.
11. 2U HORIZONTAL CABLE MANAGEMENT.
12. 2U, (48) PORT, ANGLED PATCH PANEL.
13. ACTIVE EQUIPMENT BY OWNER.
14. PROVIDE DATA OUTLETS AND TV CONNECTION BOX STACKED VERTICALLY (2) HIGH IN THIS LOCATION FOR A TOTAL OF (4) SCREENS. COORDINATE EXACT LOCATION AND MOUNTING HEIGHTS WITH SCREENS PRIOR TO CONSTRUCTION.
15. TV DATA AND VIDEO CONNECTION. REFER TO SHEET EP101 FOR ADDITIONAL INFORMATION AND COORDINATION REQUIREMENTS.
16. DATA OUTLET FOR CEILING MOUNTED PROJECTOR. REFER TO SHEER EP101 FOR COORDINATION INFORMATION.

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APPROVED BY	BMS
CHECKED BY	BMS
DATE	2.6.24

TITLE

FIRST FLOOR PLAN - TELECOMM - NEW WORK

PROJECT NO. 0122062

T-101

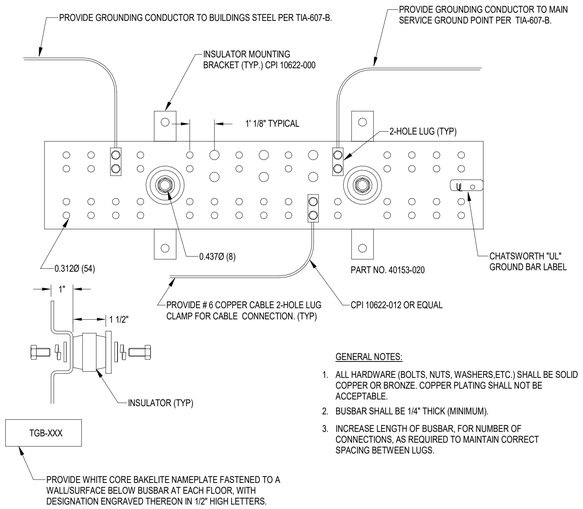
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1/2" = 1'-0"

N

0 4' 8' 16' 24'
1/8" = 1'-0"

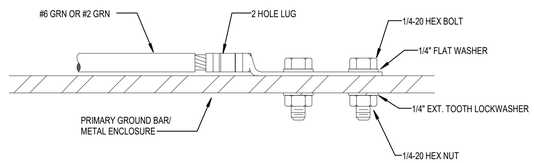
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GENERAL NOTES:

1. ALL HARDWARE (BOLTS, NUTS, WASHERS,ETC.) SHALL BE SOLID COPPER OR BRONZE. COPPER PLATING SHALL NOT BE ACCEPTABLE.
2. BUSBAR SHALL BE 1/4" THICK (MINIMUM).
3. INCREASE LENGTH OF BUSBAR, FOR NUMBER OF CONNECTIONS, AS REQUIRED TO MAINTAIN CORRECT SPACING BETWEEN LUGS.

4 GROUND BUS BAR (TYP FOR ALL TR'S)
N.T.S.



#6 OR #2 GRN TO GROUND BAR OF FLAT SURFACE.
#6 IS USED PRIMARILY AS CABINET TO BUS LINK.

INSTALLATION NOTES:

A. SELECT BOLT LENGTH TO PROVIDE A MINIMUM OF TWO EXPOSED THREADS.
B. BURNISH MOUNTING SURFACE TO REMOVE PAINT IN THE AREA OF LUG CONTACT.
C. APPLY ANTI-OXIDANT COMPOUND TO MATING SURFACE OF LUG AND WIPE CLEAN EXCESS COMPOUND.
D. USE SOLID COPPER WIRE AND MECHANICAL 2-HOLE LUG FOR ALL EXTERIOR GROUNDING.

5 GROUND BAR 2-HOLE LUG TERMINATION
N.T.S.

GENERAL NOTES:

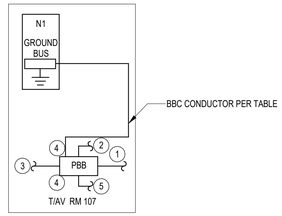
1. BONDING CONDUCTOR SHALL BE NO SMALLER THAN #2 CU.
2. ALL WORK SHALL COMPLY WITH NEC ARTICLE 250, UL 467, ANSI/TIA TIA-607-C, NECA/BICSI 607-2011.
3. PREPARE BUSBAR SURFACE AS DESCRIBED BELOW:
   a. USE AN ABRASIVE PAD, REMOVE ANY DIRT, GREASE, OIL OR OXIDATION THAT IS PRESENT AT THE SURFACE.
   b. APPLY THIN COAT OF AN ANTIOXIDANT TO THE CONNECTION POINT ON THE BUSBAR.
   c. USE STAINLESS STEEL OR SILICON BRONZE HARDWARE, TIGHTEN AND TORQUE TO THE REQUIREMENTS OF THE HARDWARE MATERIAL, SIZE AND GRADE.
4. CONDUCTORS SHALL BE COPPER.
5. LUGS SHALL BE 2-HOLE TYPE WITH INSPECTION WINDOW, LONG BARREL, IRREVERSIBLE (COMPRESSION OR EXOTHERMIC WELDING) AND MECHANICAL.
6. REFER TO ELECTRICAL DRAWINGS FOR ADDITIONAL GROUNDING INFORMATION.

PBB: PRIMARY BONDING BUSBAR
SBB: SECONDARY BONDING BUSBAR
MSB: MAIN SWITCH BOARD
BBC: BACKBONE BONDING CONDUCTOR

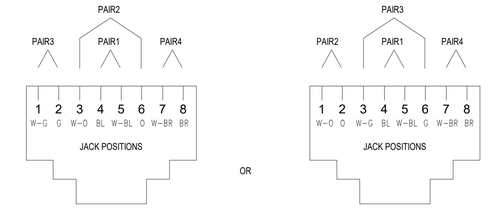
(X) NOTES:

1. #3/0 TO PRIMARY PROTECTOR.
2. #3/0 TO ELECTRICAL PANEL.
3. #3/0 TO EQUIPMENT RACKS/CABLE TRAY.
4. TWO-HOLE LUG, IRREVERSIBLE.
5. #6 SCIF PERIMETER BONDING CONDUCTOR.

BBC CONDUCTOR TABLE	
BBC LENGTH (FT)	BBC SIZE (AWG)
<13	6
14-20	4
21-26	3
27-33	2
34-41	1
42-52	1/0
53-66	2/0
67-84	3/0
85-105	4/0
106-125	250 KCMIL
126-150	300 KCMIL
151-175	350 KCMIL
176-250	500 KCMIL
251-300	600 KCMIL
>301	750 KCMIL

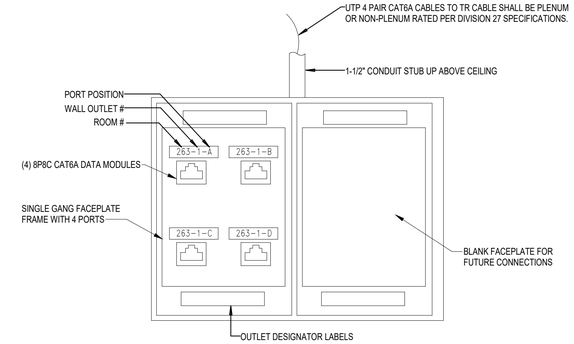


6 TELECOM GROUNDING RISER DIAGRAM
N.T.S.



VERIFY FACILITY STANDARD WITH IT REPRESENTATIVE PRIOR TO CONSTRUCTION.

1 MODULAR JACK WIRING DETAIL
N.T.S.

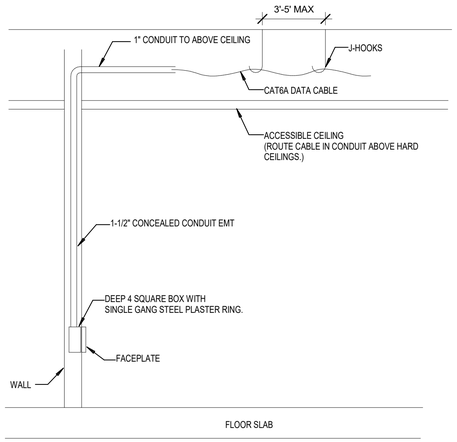


TCO PLAN SYMBOL

NOTES:

1. LABELING STANDARDS SHALL BE FOLLOWED FOR ROOM NUMBER OUTLET IS LOCATED IN, OUTLET POSITION IN ROOM (STARTING ON WALL TO LEFT OF ENTRY DOOR), AND PORT POSITION IN OUTLET - 101-1-A.
2. 8P8C CONNECTIONS IN WALL PLATES SHALL BE COLOR CODED TO MATCH CABLE COLORS INDICATED ON SHEET T-001.
3. WALL BOX SHALL BE DOUBLE-GANG TELECOMMUNICATIONS-RATED WORK BOX WITH RIGID CONDUIT EXTENDING TO THE HORIZONTAL PATHWAY.

2 WALL MOUNTED OUTLET - (TCO) VOICE/DATA
N.T.S.



3 TYPICAL FLUSH OUTLET MOUNTING
N.T.S.

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SCALE
NOT TO SCALE

REVISIONS

NO.	DESCRIPTION	DATE

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APPROVED BY	BMS
CHECKED BY	BMS
DATE	2.6.24

TITLE
TELECOMM DETAILS

PROJECT NO. 0122062

T-501

SHEET NO.

2/27/2024 4:08:59 PM

Appendix B
Davis Bacon Wage Decision

"General Decision Number: FL20220102 02/25/2022

Superseded General Decision Number: FL20210102

State: Florida

Construction Type: Heavy

Counties: Franklin, Gulf, Liberty and Walton Counties in Florida.

HEAVY CONSTRUCTION PROJECTS (Including Sewer and Water Lines)

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $15.00 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2022.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $11.25 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at https://www.dol.gov/agencies/whd/government-contracts.

Modification Number	Publication Date
0	01/07/2022

PAIN0164-005 06/01/2021

	Rates	Fringes
PAINTER: Brush and Spray	$ 20.21	12.38

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* SUFL2009-141 06/24/2009

	Rates	Fringes
LABORER: Common or General	$ 8.46 **	0.00
LABORER: Pipelayer	$ 12.63 **	1.49
OPERATOR: Backhoe/Excavator	$ 10.50 **	1.33
OPERATOR: Bulldozer	$ 13.30 **	1.92
OPERATOR: Loader	$ 11.00 **	0.00
TRUCK DRIVER, Includes 4 Axle, Distributor, Dump, Lowboy and Tandem Trucks	$ 9.89 **	0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

==========

** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($15.00) or 13658 ($11.25). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

==========

END OF GENERAL DECISIO"

"General Decision Number: FL20260005 01/02/2026

Superseded General Decision Number: FL20250005

State: Florida

Construction Type: Building

Counties: Bay and Gulf Counties in Florida.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Modification Number	Publication Date
0	01/02/2026

ELEV0124-002 01/01/2025

	Rates	Fringes
ELEVATOR MECHANIC	$ 52.29	38.435+a+b

FOOTNOTE:
a.Employer contributions 8% of regular hourly rate to vacation pay credit for employee who has worked in business more than 5 years; Employer contributions 6% of regular hourly rate to vacation pay credit for employee who has worked in business less than 5 years.

b.Paid Holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Veterans Day; Thanksgiving Day; The Friday after Thanksgiving Day; and Christmas Day.

ENGI0487-021 07/01/2016

	Rates	Fringes
OPERATOR: Crane		
All Cranes 160 Ton Capacity and Over	$ 33.05	9.20
All Cranes Over 15 Ton Capacity	$ 32.05	9.20
OPERATOR: Forklift	$ 23.25	9.20
OPERATOR: Mechanic	$ 32.05	9.20
OPERATOR: Oiler	$ 23.50	9.20

IRON0402-001 10/01/2024

	Rates	Fringes
IRONWORKER, ORNAMENTAL	$ 28.90	15.66

PLUM0234-012 09/01/2025

	Rates	Fringes
PIPEFITTER (Includes HVAC Unit Installation)	$ 37.50	17.59

SUFL2014-043 08/16/2016

	Rates	Fringes

CARPENTER.....$ 16.00 0.00

CEMENT MASON/CONCRETE FINISHER...$ 14.61 0.00

ELECTRICIAN.....$ 17.39 2.57

INSULATOR: Mechanical (Duct,
Pipe and Mechanical System
Insulation).....$ 20.78 10.89

IRONWORKER, REINFORCING.....$ 22.81 11.58

IRONWORKER, STRUCTURAL.....$ 23.79 8.74

LABORER: Common or General.....$ 11.05 0.00

LABORER: Mason Tender -
Cement/Concrete.....$ 11.69 0.00

LABORER: Pipelayer.....$ 13.56 1.34

OPERATOR:
Backhoe/Excavator/Trackhoe.....$ 22.07 8.80

OPERATOR: Bulldozer.....$ 15.40 1.90

OPERATOR: Grader/Blade.....$ 18.97 0.00

OPERATOR: Loader.....$ 14.83 1.84

OPERATOR: Roller.....$ 14.43 4.78

PAINTER: Brush, Roller and
Spray.....$ 14.54 2.01

PLUMBER.....$ 19.40 0.36

ROOFER.....$ 16.99 0.00

SHEET METAL WORKER, Includes
HVAC Duct Installation.....$ 20.05 0.00

TILE SETTER.....$ 18.01 0.00

TRUCK DRIVER: Dump Truck.....$ 13.22 2.12

TRUCK DRIVER: Lowboy Truck.....$ 14.24 0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is

like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Note: Executive Order 13658 generally applies to contracts subject to the Davis-Bacon Act that were awarded on or between January 1, 2015 and January 29, 2022, and that have not been renewed or extended on or after January 30, 2022. Executive Order 13658 does not apply to contracts subject only to the Davis-Bacon Related Acts regardless of when they were awarded. If a contract is subject to Executive Order 13658, the contractor must pay all covered workers at least $13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025. The applicable Executive Order minimum wage rate will be adjusted annually.   Additional information on contractor requirements and worker protections under Executive Order 13658 is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for

those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests

for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
"

Appendix C
Drug Free Workplace Programs

STATEMENT UNDER SECTION 287.087 FLORIDA STATUTES
ON PREFERENCE TO BUSINESSES WITH DRUG-FREE WORKPLACE PROGRAMS

IDENTICAL TIE BIDS: Preference shall be given to businesses with drug-free workplace programs. Whenever two or more bids which are equal with respect to price, quality and service are received by the State or by any political subdivision for the procurement of commodities or contractual services, a bid received by the State or by any political subdivision for the procurement of commodities or contractual services, a bid received from a business that certifies that it has implemented a drug-free workplace program shall be given preference in the award process. Established procedures for processing tie bids will be followed if none of the tied vendors have a drug-free workplace program. In order to have a drug-free workplace program, a business shall:

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition.
2. Inform employees about the dangers of drug abuse in the workplace, the business' policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations.
3. Give each employee engaged in providing the commodities or contractual services that are under bid a copy of the statement specified in subsection (1).
4. In the statement specified in subsection (1), notify the employees that, as a condition of working on the commodities or contractual services that are under bid, the employee will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendere to, any violation of Chapter 893 or of any controlled substance law of the United States or any state, for a violation occurring in the workplace not later than five (5) days after such conviction.
5. Impose a sanction on, or require the satisfactory participation in a drug abuse assistance or rehabilitation program is such is available in the employee's community, by an employee who is so convicted.
6. Make a good faith effort to continue to maintain a drug-free workplace through implementation of this section.

As the person authorized to sign this statement, I certify that this firm complies fully with the above requirements.

_____

Bidder's Signature

Appendix D
Public Entity Crimes

SWORN STATEMENT UNDER FLORIDA STATUTE SECTION 287.133 (3) (A) ON PUBLIC ENTITY CRIMES

THIS FORM MUST BE SIGNED IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICER AUTHORIZED TO ADMINISTER OATHS.

1. This sworn statement is submitted with Bid, Proposal or Contract for _____.

2. This sworn statement is submitted by (entity), _____, whose business address is, _____, and (if applicable) Federal Employer Identification Number (FEIN) is _____ (if the entity has no FEIN, include the Social Security Number of the individual signing this sworn statement).

3. My name is _____ and my relationship to the entity named above is _____ (title).

4. I understand that a "public entity crime" as defined in paragraph 287.133(1) (g) Florida Statute, means a violation of any state or federal law by a person with respect to and directly related to the transaction of business with any public entity or with an agency or political subdivision of any other state or with the United States including, but not limited to , any bid or contract for goods or services to be provided to any public entity or any agency or public subdivision of any other state or of the United States and involved antitrust, fraud, theft, bribery, collusion, racketeering, conspiracy or material misrepresentation.

5. I understand that "convicted" or "convicted" as defined in paragraph 287.133 (1) (b), Florida Statutes, means a finding of guilt or a conviction of a public entity crime with or without an adjudication of guilt, in any federal or state trial court of records relating to charges brought by indictment or information after July 1, 1989, as a result of a jury verdict, non-jury trial, or entry of a plea of guilty or nolo contendere.

6. I understand that an "affiliate" as defined in Paragraph 287.133(1) (a), Florida Statutes, means:

A predecessor or successor of a person convicted of a public entity crime; or an entity under the control of any natural person who is active in the management of the entity and who has been convicted of a public entity crime. The term "affiliate" includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in the management of an affiliate. The ownership by one of shares constituting a controlling income among persons when not for fair interest in another person, or a pooling of equipment or income among persons when not for fair market value under a length agreement, shall be a prima facie case that one person controls another person. A person who knowingly convicted of a public entity crime, in Florida during the preceding 36 months shall be considered an affiliate.

7. I understand that a "person" as defined in paragraph 287.133 (1) (e), Florida Statutes, means any natural person or entity organized under the laws of the state or of the United States with the legal power to enter into a binding contract provision of goods or services let by a public entity, or which otherwise transacts or applies to transact business with a public entity. The term "person" includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in management of an entity.

8. Based on information and belief, the statement which I have marked below is true in relation to the entity submitting this sworn statement. (Please indicate which statement applies)

☐ Neither the entity submitting this sworn statement, nor any officers, directors, executive, partners, shareholders, employees, member, or agents who are active in management of the entity, nor affiliate of the entity have been charged with and convicted of a public entity crime subsequent to July 1, 1989.

☐ The entity submitting this sworn statement, or one or more of the officers, directors, executives, partners, shareholders, employees, members, or agents who are active in management of the entity, or an affiliate of the

entity has been charged with and convicted of a public entity crime subsequent to July 1, 1989. (Please attach a copy of the final order)

- ☐ The person or affiliate was placed on the convicted vendor list. There has been a subsequent proceeding before a hearing officer of the State of Florida, Division of Administrative Hearings. The final order entered by the hearing officer determined that it was in public interest to remove the person or affiliate from the convicted vendor list. (Please attach a copy of the final order)
- ☐ The person or affiliate has not been placed on the convicted vendor list. (Please describe any action taken by, or pending with, the department of General Services)

I understand that the submission of this form to the contracting officer for the Public Entity identified in paragraph 4 above is for that Public Entity only, and that this form is valid through December 31 of the calendar year in which it is filed. I also understand that I am required to inform the Public Entity prior to entering a contract in excess of the threshold amount provided in Section 287.017, Florida Statutes, for category two of any change in the information contained in this form.

_____ _____

Signature Date

STATE OF FLORIDA

COUNTY OF: _____

PERSONALLY APPEARED BEFORE ME, the undersigned authority, who, after first being sworn by me, affixed his/her signature at the space provided above on this day of _____, 20__, and is personally known to me, or has provided _____ as identification.

_____

Notary Public

My Commission expires: _____

Appendix E
Conflict of Interest Disclosure Form

CONFLICT OF INTEREST DISCLOSURE FORM

Please mark which of the following applies to you/your company:

_____ I hereby attest that no Gulf Coast Electric Cooperative employee(s), elected officials(s), of if any of its agencies is also an owner, corporate officer, agency, employee, etc., of their corporation/ partnership/individual business.

_____ The following person(s) name(s) and position(s) with your business.

NAME(S) POSITION(S)

_____

_____

_____

_____

_____
(Signature)

Title / Date: _____

Business Name: _____

Appendix F
Certification Regarding Lobbying

44 C.F.R. APPENDIX A, PART 18
CERTIFICATION REGARDING LOBBYING

Certification for Contracts, Grants, Loans, and Cooperative Agreements (To be submitted with each bid).

The undersigned certifies, to the best of his or her knowledge, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31, U.S.C. § 1352 (as amended by the Lobbying Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

The Contractor_____ certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. § 3801 et seq., apply to this certification and disclosure, if any.

_____
Signature of Contractor's Authorized Official

_____
Name and Title of Contractor's Authorized Official

_____
Date

Appendix G
Contractor E-Verify Affidavit

CONTRACTOR E-VERIFY AFFIDAVIT

I hereby certify that _____ [insert contractor company name] does not employ, contract with, or subcontract with an unauthorized alien, and is otherwise in full compliance with, section 448.095, Florida Statutes.

All employees hired on or after January 1, 2021, have had and shall have their work authorization status verified through the E-Verify system.

A true and correct copy of _____ [insert contractor company name] proof of registration in the E-Verify system is attached to this Affidavit.

Contractor acknowledges that section 448.095, Florida Statutes, requires that if Contractor enters into a contract with a subcontractor, the subcontractor must provide the contractor with an affidavit stating that the subcontractor does not employ, contract with, or subcontract with an unauthorized alien. The Contractor shall maintain a copy of such affidavit for the duration of the contract.

Signature: _____

Print Name: _____

Date: _____

Appendix H
Anti-Collusion Statement

ANTI-COLLUSION STATEMENT

I hereby attest that I am the person responsible within my company for the final decision as to the price(s) and amount of this bid or, if not, that I have written authorization, enclosed herewith, from that person to make the statements set out below on his or her behalf and on behalf of my company.

I further attest that:

1. The price(s) and amount of this bid have been arrived at independently, without consultation, communication, or agreement for the purpose or with the effect of restricting competition with any other company or person who is a bidder or potential prime bidder.
2. Neither the price(s) nor the amount of this bid have been disclosed to any other company or person who is a bidder or potential prime bidder on this project and will not be so disclosed prior to bid opening.
3. Neither the prices nor the amount of the bid of any other company or person who is a bidder or potential prime bidder on this project have been disclosed to me or my company.
4. No attempt has been made to solicit, cause, or induce any company or person who is a bidder or potential prime bidder to refrain from bidding on this project, or to submit a bid higher than the bid of this company, or any intentionally high or noncompetitive bid or other form of complementary bid.
5. No agreement has been promised or solicited for any other company or person who is a bidder or potential prime bidder on this project to submit an intentionally high, noncompetitive, or other form of complementary bid on this project.
6. The bid of my company is made in good faith and not pursuant to any consultation, communication, agreement or discussion with, or inducement or solicitation by or from any company or person to submit any intentionally high, noncompetitive or other form of complementary bid.
7. My company has not offered or entered into a subcontract or agreement regarding the purchase or sale of materials or services from any company or person, or offered, promised or paid cash or anything of value to any company or person, whether in connection with this or any other project, in consideration for an agreement or promise by any company or person to refrain from bidding or to submit any intentionally high, noncompetitive or other form of complementary bid or agreeing or promising to do so on this project.
8. My company has not accepted or been promised any subcontract or agreement regarding the sale of materials or services to any company or person and has not been promised or paid cash or anything of value by any company or person, whether in connection with this or any other project, in consideration for my company's submitting any intentionally high, noncompetitive or other form of complementary bid, or agreeing or promising to do so, on this project.
9. I have made a diligent inquiry of all members, officers, employees, and agents of my company with responsibilities relating to the preparation, approval or submission of my company's bid on this project and have been advised by each of them that he or she has not participated in any communication, consultation, discussion, agreement, collusion, or other conduct inconsistent with any of the statements and representations made in this affidavit.
10. I understand and my company understands that any misstatement in this affidavit is and shall be treated as a fraudulent concealment from the Florida Department of Transportation, of the true facts relating to submission of bids for this contract.

ANTI-COLLUSION STATEMENT - SIGNATURE

I DECLARE UNDER PENALTY OF PERJURY IN THE SECOND DEGREE, AND ANY OTHER APPLICABLE STATE OR FEDERAL LAWS, THAT THE STATEMENTS MADE ON THIS DOCUMENT ARE TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

_____	_____
Signature	Company Name
_____	_____
Title	Address
_____	_____
Date	Phone Number

Appendix I
Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion

DEBARMENT

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion

Contractor Covered Transactions

(1) The prospective contractor, _____, of the Sub-Recipient certifies, by submission of this document, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

(2) Where the Sub-Recipient's subcontractor is unable to certify to the above statement, the prospective subcontractor shall attach an explanation to this form.

Contractor Name:

_____

By:

_____

Signature

_____

Name and Title

_____

Street Address

_____

City, State, Zip

_____

Date

REQUIRED DOCUMENTATION WITH ALL BIDS:

A screenshot or a printout of the bidder's current registration with sam.gov, showing the bidder is both currently an active registrant and that they are in good standing (not suspended/debarred), is required to be submitted with all bids.

APPENDIX J

FEDERAL REQUIREMENTS

The CDBG-DR funds available to the Cooperative through this agreement constitute a subaward of the Grantee's federal award under the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, 2 CFR part 200. This appendix includes terms and conditions of the grantee's federal award that are imposed on the Cooperative and that the Cooperative agrees to carry out its obligations in compliance with all of the obligations described in this Contract. With this appendix, the Cooperative notifies the Contractor of these flow-down provisions.

Contractor agrees to, and, by signing this Contract, certifies that, it will comply with all applicable provisions of the Housing and Community Development Act of 1974, as amended, and the regulations at 24 CFR part 570, as modified by the Federal Register notices that govern the use of CDBG-DR funds available under this agreement. These Federal Register notices include, but are not limited to, Federal Register Guidance Vol 83, No. 28/Friday, February 9, 2018/Notices and Vol. 83, No. 157 /Tuesday, August 14, 2018/Notices. Contractor shall also comply with all other applicable federal, state, and local laws, regulations and policies as now in effect and as may be amended from time to time that govern the use of the CDBG-DR funds in complying with its obligations under this agreement, regardless of whether CDBG-DR funds are made available to Cooperative on an advance or reimbursement basis.

Contractor further agrees to comply with all other applicable federal, state, and local laws, regulations and policies governing the funds provided under this Agreement, including, but not limited to the following:

1. State of Florida requirements are stated throughout this Contract and Appendices thereto.

2. Drug-Free Workplace
    a. Contractors must comply with drug-free workplace requirements in Subpart B of part 2429, which adopts the government-wide implementation (2 CFR part 182) of sections 5152-5158 of the Drug-Free Workplace Act of 1988 (Pub. L. 100-690, Title V, Subtitle D; 41 U.S.C. 701-707).

3. Procurement and Contractor Oversight
    a. Cooperative shall comply with the procurement standards in 2 CFR §200.318-327 when procuring property and services under this Contractor. Cooperative shall impose the obligations under this agreement on Contractor, specifically or by reference, so that such obligations will be binding upon Contractor.
    b. Cooperative and Contractor must comply with CDBG regulations regarding debarred or suspended entities, specifically including, 24 CFR 570.609 and 24 CFR 570.489, as applicable. CDBG funds may not be provided to excluded or disqualified persons.
    c. Cooperative shall maintain oversight of all activities under this Contract and shall ensure that for any procured contract or agreement, Contractor performs according to the terms and conditions of the procured contracts or agreements, and the terms and conditions of this agreement.
    d. To check for debarred or suspended entities, please visit: https://sam.gov/

4. Property Standards
    a. Real property acquired by Cooperative under this funding shall be subject to 24 CFR 570.489G) and 24 CFR 5 70.200G). Cooperative must also comply with the Property Standards at 2 CFR 200.310, 2 CFR 200.312, 2 CFR 200.314-316. Cooperative must also comply with 2 CFR 200.313 Equipment, except that when the equipment is sold, the proceeds shall be program income and equipment not needed by Cooperative for activities under this agreement shall be transferred to the Grantee for its CDBG-DR program or shall be retained after compensating the Grantee.
    b. Cooperative shall also comply with the Property Standards in 2 CFR 200.310-316, except to the extent they are inconsistent with 24 CFR 570.200G) and 24 CFR 570.489G), in which case Subrecipient shall comply with 24 CFR 570.200G) and 24 CFR 570.489G), except to the extent that proceeds from the sale of equipment are program income and subject to the program income requirements under this agreement, pursuant to 24 CFR 570.489(e)(1)(ii).

5. Federal Funding Accountability and Transparency Act (FFATA)
    a. Cooperative must comply with the requirements of 2 CFR part 25 Universal Identifier and System for Award Management (SAM). Cooperative and Contractor must have an active registration in SAM, in accordance with 2 CFR part 25, appendix A, and must have a Unique Entity Identifier (UEI) number. Cooperative must also comply with provisions of the Federal Funding Accountability and Transparency Act, which includes requirements on executive compensation, 2 CFR part 170 Reporting Subaward and Executive Compensation Information.

6. Relocation and Real Property Acquisition
    a. Cooperative must comply with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (URA), 42 USC 4601- 4655, 49 CFR part 24, 24 CFR part 42, and 24 CFR 570.606. In addition to other URA requirements, these regulations (49 CFR § 24.403(d)) implement Section 414 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 USC § 5181, which provides that "Notwithstanding any other provision of law, no person otherwise eligible for any kind of replacement housing payment under the URA shall be denied such eligibility as a result of his being unable, because of a major disaster as determined by the President, to meet the occupancy requirements set by such Act."

7. Nondiscrimination
    a. 24 CFR part 6
        i. Cooperative will comply with 24 CFR part 6, which implements the provisions of section 109 of Title I of the Housing and Community Development Act of 1974 (Title I) (42 U.S.C. 5309). Section 109 provides that no person in the United States

shall, on the ground of race, color, national origin, religion or sex, be excluded from participation in, be denied the benefits of or be subjected to discrimination under any program or activity funded in whole or in part with federal financial assistance. Cooperative will adhere to the prohibitions against discrimination on the basis of age under the Age Discrimination Act of 1975 (42 U.S.C. 6101-6107) (Age Discrimination Act) and the prohibitions against discrimination on the basis of disability under section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 794) (Section 504). Section 109 of the HCDA makes these requirements applicable to programs or activities funded in whole or in part with CDBG-DR funds. Thus, Cooperative shall comply with regulations of 24 CFR part 8, which implement Section 504 for HUD programs, and the regulations of 24 CFR part 146, which implement the Age Discrimination Act for HUD programs.

b. Architectural Barriers Act and the Americans with Disabilities Act
    i. Cooperative shall ensure that its activities are consistent with requirements of Architectural Barriers Act and the Americans with Disabilities Act. The Architectural Barriers Act of 1968 (42 U.S.C. 4151-4157) requires certain federal and federally funded buildings and other facilities to be designed, constructed or altered in accordance with standards that ensure accessibility to, and use by, physically handicapped people. A building or facility designed, constructed or altered with funds allocated or reallocated under this part after December 11, 1995 and meets the definition of "residential structure" as defined in 24 CFR 40.2 or the definition of "building" as defined in 41 CFR 101-19.602(a) is subject to the requirements of the Architectural Barriers Act of 1968 (42 U.S.C. 4151-4157) and shall comply with the Uniform Federal Accessibility Standards (appendix A to 24 CFR part 40 for residential structures, and appendix A to 41 CFR part 101-19, subpart 101-19.6, for general type buildings). The Americans with Disabilities Act (42 U.S.C. 12131; 47 U.S.C. 155, 201, 218 and 225) (ADA) provides comprehensive civil rights to individuals with disabilities in the areas of employment, public accommodations, state and local government services and telecommunications. It further provides that discrimination includes a failure to design and construct facilities for first occupancy no later than January 26, 1993, that are readily accessible to and usable by individuals with disabilities. Further, the ADA requires the removal of architectural barriers and communication barriers that are structural in nature in existing facilities, where such removal is readily achievable-that is, easily accomplishable and able to be carried out without much difficulty or expense.

c. State and Local Nondiscrimination Provisions
    i. Cooperative must comply with the Florida Small and Minority Business Assistance Act (§288.703-288.706, F.S.); Title VI of the Civil Rights Act of 1964 (24 CFR part 1).
        1. General Compliance:

Cooperative shall comply with the requirements of Title VI of the Civil Rights Act of 1964 (P.L. 88-352), as amended. No person in the United States shall, on the ground of race, color or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity funded by this agreement. The specific nondiscrimination provisions at 24 CFR 1.4 apply to the use of these funds. Subrecipient shall not intimidate, threaten, coerce or discriminate against any person for the purpose of interfering with any right or privilege secured by title VI of the Civil Rights Act of 1964 or 24 CFR part 1, or because an individual has made a complaint, testified, assisted or participated in any manner in an investigation, proceeding or hearing under 24 CFR part 1. The identity of complainants shall be kept confidential except to the extent necessary to carry out the purposes of 2 CFR part 1, including the conduct of any investigation, hearing or judicial proceeding arising thereunder.

2. Assurances and Real Property Covenants:

Cooperative assures that the program or activities described in this Contract will be conducted and the housing, accommodations, facilities, services, financial aid or other benefits to be provided will be operated and administered in compliance with all requirements imposed by or pursuant to this part. If the federal financial assistance under this agreement is to provide or is in the form of personal property or real property or interest therein or structures thereon, Cooperative's assurance herein shall obligate Cooperative or, in the case of a subsequent transfer, the transferee, for the period during which the property is used for a purpose for which the federal financial assistance is extended or for another purpose involving the provision of similar services or benefits, or for as long as the recipient retains ownership or possession of the property, whichever is longer. In all other cases, the assurance shall obligate Cooperative for the period during which federal financial assistance is extended pursuant to the contract or application. This assurance gives the Grantee and the United States a right to seek judicial enforcement of the assurance and the requirements on real property.

In the case of real property, structures or improvements thereon, or interests therein, acquired with federal financial assistance under this Contract or acquired with CDBG-DR funds and provided to Cooperative under this Contract, the instrument affecting any disposition by Cooperative of such real property, structures or improvements thereon, or interests therein, shall contain a covenant running with the land assuring nondiscrimination for the period during which the real property is used for a purpose for which the federal financial assistance is extended or for another purpose involving the

provision of similar services or benefits. If Cooperative receives real property interests or funds or for the acquisition of real property interests under this Contract, to the extent that rights to space on, over, or under any such property are included as part of the program receiving such assistance, the nondiscrimination requirements of this part 1 shall extend to any facility located wholly or in part in such space.

8. Affirmative Action
    a. Approved Plan- Cooperative agrees that it shall carry out pursuant to the Grantee's specifications an Affirmative Action Program in compliance with the President's Executive Order 11246 of September 24, 1965, as amended, and implementing regulations at 41 CFR 60. The Grantee shall provide Affirmative Action guidelines to Cooperative to assist in the formulation of such program. Cooperative shall submit a plan for an Affirmative Action Program for approval prior to the release of funds under this agreement.
    b. Women- and Minority-Owned Businesses (W /MBE)- Cooperative shall take the affirmative steps listed in 2 CFR 200.321(b)(1) through (5) to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible when Cooperative procures property or services under this agreement.
    c. Notifications- Cooperative will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or worker's representative of Cooperative's commitments hereunder, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
    d. Equal Employment Opportunity and Affirmative Action (EEO/ AA) Statement- Cooperative shall, in all solicitations or advertisements for employees placed by or on behalf of Cooperative, state that it is an Equal Opportunity or Affirmative Action employer.

9. Labor and Employment
    a. Labor Standards
        i. Cooperative shall comply with the in labor standards in Section 110 of the Housing and Community Development Act of 1974, as amended and ensure that all laborers and mechanics employed by contractors or subcontractors in the performance of construction work financed in whole or in part with assistance received under this agreement shall be paid wages at rates not less than those prevailing on similar construction in the locality as determined by the Secretary of Labor in accordance with the Davis-Bacon Act, as amended (40 U.S.C. 3141, *et seq.)* and 29 CFR part 1, 3, 5, 6 and 7, provided, that this requirement shall apply to the rehabilitation of residential property only if such property contains not less than 8 units.

ii. Cooperative agrees to comply with the Copeland Anti-Kick Back Act (18 U.S.C. 874) and its implementing regulations of the U.S. Department of Labor at 29 CFR part 3 and part 5. Subrecipient shall maintain documentation that demonstrates compliance with applicable hour and wage requirements. Such documentation shall be made available to the Grantee for review upon request.

10. Section 3 of the Housing and Urban Development Act of 1968
    a. Low-Income Person Definition
        i. A low-income person, as this term is defined in Section 3 (b)(2) of the 1937 Act (42 U.S.C. 1437a(b)(2)). Section 3(b)(2) of the 1937 Act defines this term to mean families (including single persons) whose incomes do not exceed 80 per centum of the median income for the area, as determined by the Secretary, with adjustments for smaller and larger families, except that the Secretary may establish income ceilings higher and or lower than 80 per centum of the median for the area on the basis of the Secretary's findings that such variations are necessary because of prevailing levels of construction costs or unusually high or low-income families; or A very low-income person, as this term is defined in Section 3(b)(2) of the 1937 Act (42 U.S.C. 1437 a(b)(2)). Section 3(b)(2) of the 1937 Act (42 U.S.C. 1437a(b)(2)) defines this term to mean families (including single persons) whose incomes do not exceed 50 per centum of the median family income for the area, as determined by the Secretary with adjustments for smaller and larger families, except that the Secretary may establish income ceilings higher or lower than 50 per centum of the median for the area on the basis of the Secretary's findings that such variations are necessary because of unusually high or low family incomes.
    b. Compliance
        i. Cooperative shall comply with the provisions of Section 3 of the Housing Urban Development Act of 1968, as amended, 12 USC 1701u, and implementing its implementing regulations at 24 CFR part 75 (formerly 24 CFR part 135). Compliance with Section 3 shall be achieved, to the greatest extent feasible, consistent with existing federal, state and local laws and regulations. Accordingly, a subrecipient of Section 3-covered assistance is required to develop strategies for meeting both the regulatory requirements at 24 CFR part 7 5 and any other applicable statutes or regulations. Cooperative and any of its contractors and subcontractors shall include the following "Section 3 clause" in every "Section 3-covered contract":
            a. The work to be performed under this contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (Section 3). The purpose of Section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or

HUD-assisted projects covered by Section 3, shall, to the greatest extent feasible, be directed to low and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

b. The parties to this contract agree to comply with HUD's regulations in 24 CFR part 7 5, which implement Section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the part 75 regulations.

c. The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this Section 3 Clause and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.

d. The contractor agrees to include this Section 3 clause in every subcontract subject to compliance with regulations in 24 CFR part 75, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this Section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR part 75 and its related regulations in Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701 u. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR part 75.

e. The contractor will certify that any vacant employment positions, including training positions, that are filled after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR part 7 require employment opportunities to be directed, were

not filled to circumvent the contractor's obligations under 24 CFR part 75.

f. Noncompliance with HUD's regulations in 24 CFR part 75 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

g. With respect to work performed in connection with Section 3 covered Indian housing assistance, section 7(b)of the Indian Self-Determination and Education Assistance Act (25 USC 450e) also applies to the work to be performed under this contract. Section 7 (b) requires that to the greatest extent feasible (i) preference and opportunities for training and employment shall be given to Indians and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprises. Parties to this contract that are subject to the provisions of Section 3 and section 7 (b) agree to comply with Section 3 to the maximum extent feasible, but not in derogation of compliance with section 7(b).

c. Section 3 Benchmarks and Reporting

i. Benchmarks. Contracts over $200,000 trigger Section 3 Benchmark requirements. When triggered, best efforts must be made to extend Section 3 opportunities to verified Section 3 workers and business concerns to meet these *minimum* numeric goals:

1. Twenty-five percent (25%) of the total hours on a Section 3 project must be worked by Section 3 workers; and
2. Five percent (5%) of the total hours on a Section 3 project must be worked by Targeted Section 3 workers.

ii. Reporting. If the subrecipient's reporting indicates that the subrecipient has not met the Section 3 benchmarks described in 24 CFR § 75.23, pursuant to 24 CFR § 75.25(b), the subrecipient must report in a form prescribed by HUD on the qualitative nature of its activities and those its contractors and subcontractors pursued.

iii. Recipient will comply with any Section 3 Project Implementation Plan documents, if any, provided by HUD or DEO which may be amended from time to time for HUD reporting purposes.

11. Conduct

a. Hatch Act

i. Cooperative shall comply with the Hatch Act, 5 USC 1501-1508, and shall ensure that no funds provided, nor personnel employed under this agreement, shall be in any way or to any extent engaged in the conduct of political activities in violation of Chapter 15 of Title V of the U.S.C.

b. Conflict of Interest
    i. In the procurement of supplies, equipment, construction and services pursuant to this agreement, Cooperative shall comply with the conflict of interest provisions in the Grantee's procurement policies and procedures. In all cases not governed by the conflict of interest provisions in the Grantee's procurement policies and procedures, Cooperative shall comply with the conflict of interest provisions in 24 CFR 570.489(h).

c. Lobbying Certification
    i. Cooperative hereby certifies that:
        1. No federal appropriated funds have been paid or will be paid, by or on behalf of it, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any federal grant, the making of any federal loan, the entering into of any cooperative agreement and the extension, continuation, renewal amendment or modification of any federal contract, grant, loan, or cooperative agreement;
        2. If any funds other than federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, it will complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions;
        3. The language of paragraph (i) through (iv) of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants and contracts under grants, loans and cooperative agreements) and that all Subrecipients shall certify and disclose accordingly; and
        4. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is required by Section 1352, Title 31, U.S.C. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

12. Religious Activities
    a. Cooperative agrees that funds provided under this agreement shall not be utilized for inherently religious activities prohibited by 24 CFR 570.200G), such as worship, religious instruction or proselytization.

b. Equal Treatment for Faith-Based Organizations prohibits any state or local government receiving funds under any Department program, or any intermediate organization with the same duties as a governmental entity, from discriminating for or against an organization on the basis of the organization's religious character or affiliation. Prohibits religious organizations from engaging in inherently religious activities, such as worship, religious instruction, or proselytization, as part of the programs or services funded with direct financial assistance. Prohibits an organization that participates in programs funded by direct financial assistance from the Department, in providing services, from discriminating against a program beneficiary or prospective program beneficiary on the basis of religion or religious belief. Any restrictions on the use of grant funds shall apply equally to religious and non-religious organizations.

13. Environmental Conditions
    a. Prohibition on Choice Limiting Activities Prior to Environmental Review
        i. Cooperative must comply with the limitations in 24 CFR 58.22 even though Subrecipient is not delegated the requirement under Section 104(g) of the HCD Act for environmental review, decision-making and action (see 24 CFR part 58) and is not delegated the Grantee's responsibilities for initiating the review process under the provisions of 24 CFR Part 52. 24 CPR 58.22 imposes limitations on activities pending clearance and specifically limits commitments of HUD funds or non-HUD funds by any participant in the development process before completion of the environmental review. A violation of this requirement may result in a prohibition on the use of federal funds for the activity. regarding the status of the review process.
    b. Air and Water
        i. Cooperative shall comply with the following requirements insofar as they apply to the performance of this agreement:
            1. Air quality. (1) The Clean Air Act (42 U.S.C. 7401 et. seq.) as amended; particularly section 176(c) and (d) (42 U.S.C. 7506(c) and (d)); and (2) Determining Conformity of Federal Actions to State or Federal Implementation Plans (Environmental Protection Agency--40 CFR parts 6, 51, and 93); and
            2. Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251, *et seq.,* as amended, including the requirements specified in Section 114 and Section 308 of the Federal Water Pollution Control Act, as amended, and all regulations and guidelines issued thereunder.
            3. The Clean Air and Water Act: If this Contract is in excess of $100,000, Contractor shall comply with all applicable standards, orders or regulations issued under the Clean Air Act, as amended, 42 U.S.C. 7401, Section 508 of the Clean Water Act, as amended, 33 U.S.C. 1368, et seq.,

Executive Order 11738 and Environmental Protection Agency regulations. Contractor shall report any violation of the above to Grantee.

4. Energy Efficiency: Contractor shall comply with mandatory standards and policies relating to energy efficiency which are contained in the State of Florida's energy conservation plan issued in compliance with the Energy Policy and Conservation Act, Pub. L. 94-163.

14. Flood Disaster Protection

a. Cooperative shall comply with the mandatory flood insurance purchase requirements of Section 102 of the Flood Disaster Protection Act of 1973, as amended by the National Flood Insurance Reform Act of 1994, 42 USC 4012a. Additionally, Cooperative shall comply with Section 582 of the National Flood Insurance Reform Act of 1994, as amended, (42 U.S.C. 5154a), which includes a prohibition on the provision of flood disaster assistance, including loan assistance, to a person for repair, replacement or restoration for damage to any personal, residential, or commercial property if that person at any time has received federal flood disaster assistance that was conditioned on the person first having obtained flood insurance under applicable federal law and the person has subsequently failed to obtain and maintain flood insurance as required under applicable federal law on such property. Section 582 also includes a responsibility to notify property owners of their responsibility to notify transferees about mandatory flood purchase requirements. More information about these requirements is available in the Federal Register notices governing the CDBG-DR award and listed at the beginning of this Appendix.

15. Lead-Based Paint

a. Cooperative shall follow the Grantee's procedures with respect to CDBG assistance that fulfill the objectives and requirements of the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. 4821-4846), the Residential Lead-Based Paint Hazard Reduction Act of 1992 (42 U.S.C. 4851-4856), and implementing regulations at part 35, subparts A, B, J, K, and R of this title.

16. Historic Preservation

a. Cooperative shall comply with the Historic Preservation requirements set forth in the National Historic Preservation Act of 1966, as amended, codified in title 54 of the United States Code, and the procedures set forth in 36 CFR part 800 insofar as they apply to the performance of this agreement. In general, this requires concurrence from the State Historic Preservation Officer for all rehabilitation and demolition of historic properties that are fifty years old or older or that are included on a federal, state or local historic property list.

17. Additional Regulations

a. The Temporary Assistance for Needy Families Program ("TANF"), 45 CFR Parts 260-265, the Social Services Block Grant ("SSBG"), 42 U.S.C. 1397d, and other applicable federal regulations and policies promulgated thereunder.
b. Title IX of the Education Amendments of 1972, as amended, 20 U.S.C. 1681, *et seq.,* which prohibits discrimination on the basis of sex in educational programs.
c. Section 654 of the Omnibus Budget Reconciliation Act of 1981, as amended, 42 U.S.C. 9849, which prohibits discrimination on the basis of race, creed, color, national origin, sex, handicap, political affiliation or beliefs.
d. The Pro-Children Act: Contractor agrees to comply with the Pro-Children Act of 1994, 20 U.S.C. 6083. Failure to comply with the provisions of the law may result in the imposition of civil monetary penalty up to $1,000 for each violation and/or the imposition of an administrative compliance order on the responsible entity. This clause is applicable to all approved sub-contracts. In compliance with Public Law (Pub. L.) 103-277, the Contract shall not permit smoking in any portion of any indoor facility used for the provision of federally funded services including health, day care, early childhood development, education or library services on a routine or regular basis, to children up to age 18.
e. Public Announcements and Advertising: When issuing statements, press releases, requests for proposals, bid solicitations and other documents describing projects or programs funded in whole or in part with federal money, Contractor shall clearly state (1) the percentage of the total costs of the program or project which will be financed with federal money, (2) the dollar amount of federal funds for the project or program, and (3) percentage and dollar amount of the total costs of the project or program that will be financed by nongovernmental sources.
f. Purchase of American-Made Equipment and Products: Contractor assures that, to the greatest extent practicable, all equipment and products purchased with funds made available under this Contract will be American-made.
g. The Consolidated Appropriations Act, 2010, Division E, Section 511 (Pub. L. 111-117), which prohibits distribution of federal funds made available under the Act to the Association of Community Organizations for Reform Now (ACORN) or its subsidiaries. The Continuing Appropriations Act, 2011, Sections 101 and 103 (Pub. L. 111-242), provides that appropriations made under Pub. L. 111-117 are available under the conditions provided by Pub. L. 111-117.
h. Contract Work Hours and Safety Standards Act (40 U.S.C. §327-333)- If this Contract involves federal funding in excess of $2,000 for construction contracts or in excess of $2,500 for other contracts that involve the employment of mechanics or laborers, compliance with sections 102 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-333), as supplemented by Department of Labor regulations (29 CFR Part 5) is required. Under section 102 of the Act, each contractor shall be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than 1 ½ times the basic rate of pay for all

hours worked in excess of 40 hours in the work week. Section 107 of the Act is applicable to construction work and provides that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

i. Resource Conservation and Recovery Act (RCRA). Under RCRA (Pub. L. 94-580 codified at 42 U.S.C. 6962), state and local institutions of higher education, hospitals, and non-profit organizations that receive direct federal awards or other federal funds shall give preference in their procurement programs funded with federal funds to the purchase of recycled products pursuant to the EPA guidelines.

j. Immigration Reform and Control Act. Contractor shall comply with the requirements of the Immigration Reform and Control Act of 1986, which requires employment verification and retention of verification forms for any individuals hired who will perform any services under the contract.

18. Non-Compliance - When it is determined that the Cooperative is in non-compliance with federal or state program requirements, the State may impose any of the additional conditions and/or requirements outlined in 2 CFR § 200.207.

19. Equal Employment Opportunity

    a. As a condition for the receipt of CDBG-DR funds, the Cooperative must certify that it and the contractors, subcontractors, subrecipients and consultants that it hires with CDBG-DR funds will abide by the Equal Employment Opportunity (EEO) Laws of the United States. A Subrecipient shall demonstrate its commitment to abide by the laws through the actions listed below. The Cooperative shall do the following:
        i. Have in place an equal employment opportunity resolution or ordinance that protects its applicants and employees and the applicants and employees of its contractors, subcontractors, subrecipients and consultants from discrimination in hiring, promotion, discharge, pay, fringe benefits, job training, classification, referral and other aspects of employment, on the basis of race, color, religion, sex, national origin, disability, age or genetics;
        ii. Designate an employee as the EEO Coordinator who is available during regular business hours to receive EEO calls;
        iii. Publish the EEO Coordinator's contact information quarterly in a newspaper of general circulation in Cooperative's jurisdiction so that people know who to call to ask EEO questions or register a complaint. Alternatively, Cooperative can post the coordinator's contact information throughout the quarter on the home page of its website; and
            1. Establish a system to record the following for each EEO call:
                a. The nature of the call,
                b. The actions taken in response to the call and
                c. The results of the actions taken;

iv. The Cooperative shall maintain a list of certified minority-owned business enterprises (MBE) and women owned business enterprises (WBE) that operate in its region. Cooperative shall use this list to solicit companies to bid on CDBG-DR-funded construction activities and shall provide a copy of the list to the prime contractor(s) to use when it hires subcontractors and consultants. The Florida Department of Management Services maintains a list of certified minority- and women-owned businesses that can be used to develop a local MBE/WBE list at the following website: https: //osd.dms.myflorida.com/directories.

v. Incorporate the Equal Employment Opportunity clause set forth in 41 CFR Part 60-1.4(b) into any contracts or subcontracts that meets the definition of "federally assisted construction contract'' in 41 CFR 60-1.3.

20. Section 504 and the Americans with Disabilities Act (ADA)

a. As a condition for the receipt of CDBG-DR funds, Cooperative must certify that it provides access to all federally funded activities to all individuals, regardless of handicap. Cooperative shall demonstrate its commitment to abide by the laws through the actions listed below. Cooperative shall do the following:

i. Have in place a resolution or ordinance that is designed to eliminate discrimination against any person who:

1. Has a physical or mental impairment which substantially limits one or more major life activities,
2. Has a record of such an impairment, or
3. Is regarded as having such an impairment;

ii. Designate an employee as the Section 504/ ADA Coordinator who is available during regular business hours to receive Section 504/ ADA calls;

iii. Publish the Section 504/ ADA Coordinator's contact information quarterly in a newspaper of general circulation in Cooperative's jurisdiction so that people know who to call to ask Section 504/ ADA questions or register a complaint. Alternatively, Cooperative can post the coordinator's contact information throughout the quarter on the home page of its website; and

1. Establish a system to record the following for each Section 504/ ADA call:
    a. The nature of the call,
    b. The actions taken in response to the call and
    c. The results of the actions taken.

iv. Section 504 prohibitions against discrimination (see 45 CFR part 84) apply to service availability, accessibility, delivery, employment and the administrative activities and responsibilities of organizations receiving Federal financial assistance.

v. A Subrecipient of federal financial assistance may not, on the basis of disability:

1. Deny qualified individuals the opportunity to participate in or benefit from federally funded programs, services, or other benefits,
2. Deny access to programs, services, benefits or opportunities to participate as a result of physical barriers, or
3. Deny employment opportunities, including hiring, promotion, training and fringe benefits, for which they are otherwise entitled or qualified.

b. The ADA regulations (Title II, 28 CFR part 35, and Title III, 28 CFR part 36) prohibit discrimination on the basis of disability in employment, state and local government, public accommodations, commercial facilities, transportation, and telecommunications.

To be protected by the ADA, one must have a disability or have a relationship or association with an individual with a disability.

i. Title II covers all activities of state and local governments regardless of the government entity's size or receipt of federal funding. Title II requires that state and local governments give people with disabilities an equal opportunity to benefit from all of their programs, services and activities (e.g. public education, employment, transportation, recreation, health care, social services, courts, voting and town meetings). State and local governments are required to follow specific architectural standards in the new construction and alteration of their buildings. They also must relocate programs or otherwise provide access in inaccessible older buildings, and communicate effectively with people who have hearing, vision or speech disabilities.

ii. Title III covers businesses and nonprofit service providers that are public accommodations, privately operated entities offering certain types of courses and examinations, privately operated transportation and commercial facilities. Public accommodations are private entities who own, lease, lease to or operate facilities such as restaurants, retail stores, hotels, movie theaters, private schools, convention centers, doctors' offices, homeless shelters, transportation depots, zoos, funeral homes, day care centers and recreation facilities including sports stadiums and fitness clubs. Transportation services provided by private entities are also covered by Title III.

21. Section 3 - Economic Opportunities for Low- and Very Low-Income Persons

a. Cooperative shall encourage its contractors to hire qualified low- and moderate-income residents for any job openings that exist on CDBG-DR-funded projects in the community. Cooperative and its contractors shall keep records to document the number of low- and moderate-income people who are hired to work on CDBG-DR-funded projects. The number of low- and moderate-income residents who are hired to work of the project shall be reported in the comment section of the quarterly report.

b. The following Section 3 clause is required to be included in any contracts and subcontracts funded by this Agreement:

i. Section 3 Clause

1. The work to be performed under this contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. § 1701u (Section 3). The purpose of Section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by Section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are Subrecipients of HUD assistance for housing.
2. The Parties to this contract agree to comply with HUD's regulations in 24 CFR part 75, which implement Section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the part 75 regulations.
3. The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising

the labor organization or workers' representative of the contractor's commitments under this Section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.

4. The contractor agrees to include this Section 3 clause in every subcontract subject to compliance with regulations in 24 CFR part 7 5, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this Section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR part 75.
5. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR part 75.
6. The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR part 75 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR part 75.
7. Noncompliance with HUD's regulations in 24 CFR part 75 may result in sanctions, termination of this contract for default and debarment or suspension from future HUD assisted contracts.
8. With respect to work performed in connection with Section 3 covered Indian housing assistance, Section 7 (b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. § 450e) also applies to the work to be performed under this contract. Section 7 (b) requires that to the greatest extent feasible (i) preference and opportunities for training and employment shall be given to Indians, and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprises. Parties to this contract that are subject to the provisions of Section 3 and Section 7 (b) agree to comply with Section 3 to the maximum extent feasible, but not in derogation of compliance with Section 7(b).

22. Civil Rights Regulations

a. As a condition for the receipt of CDBG-DR funds, each Subrecipient must certify that it will abide by the following federal laws and regulations:
    i. Title VI of the Civil Rights Act of 1964 - Prohibits discrimination by government agencies that receive federal funding;
    ii. Title VII of the Civil Rights Act of 1964 - prohibits employment discrimination on the basis of race, color, religion, sex or national origin;
    iii. Title VIII of the Civil Rights Act of 1968 - as amended (the Fair Housing Act of 1988);
    iv. 24 CFR § 570.487(6) -Affirmatively Furthering Fair Housing;

v. 24 CFR § 570.490(6) - Unit of general local government's record;
vi. 24 CFR § 570.606(6) - Relocation assistance for displaced persons at URA levels;
vii. Age Discrimination Act of 1975;
viii. Executive Order 12892 -Leadership and Coordination of Fair Housing in Federal Programs: Affirmatively Furthering Fair Housing;
ix. Section 109 of the Housing and Community Development Act of 1974 - No person shall be excluded from participation in, denied benefits of or subject to discrimination under any program or activity receiving CDBG-DR funds because of race, color, religion, sex or national origin;
x. Section 504 of the Rehabilitation Act of 1973 1 d 24 CFR part 8, which prohibits discrimination against people with disabilities;
xi. Executive Order: 11063 - Equal Opportunity in Housing
xii. Executive Order 11246 - Equal Employment Opportunity; and
xiii. Section 3 of the Housing and Urban Development Act of 1968, as amended – Employment/Training of Lower Income Residents and Local Business Contracting.

23. No Government Obligation to Third Parties

The Cooperative and contractors acknowledge that, notwithstanding any concurrence by the federal government in or approval of this solicitation or award of the underlying contract, absent the express written consent by the federal government, the federal government is not a party to this contract and shall not be subject to any obligations or liabilities to the owner, contractor, or any other party (whether or not a party to that contract) pertaining to any matter resulting from this underlying contract.

It is further agreed that the clause shall not be modified, except to identify the subcontractor who will be subject to its provisions.

24. Program Fraud and False or Fraudulent Statements and Related Acts (31 U.S.C. 3801 et seq)

Contractor acknowledges that the provisions of the Program Fraud and Civil Remedies Act of 1986, as amended, 31 U.S.C. § 3801 et seq., 'Administrative Remedies for False Claims and Statements,' apply to its actions pertaining to this project. Upon execution of the underlying contract, the contractor certifies or affirms the truthfulness and accuracy of any statement it has made, it makes, it may make, or causes to be made, pertaining to the underlying contract for which this contract work is being performed. IN addition to other penalties that may be applicable, the contractor further acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification, the federal government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act of 1986 on the contractor to the extent the federal government deems appropriate.

25. Access to Records and Reports

The following access to records requirements applies to any contract resulting from this solicitation contract:

A. The contractor agrees to provide the Cooperative, the Florida Division of Emergency Management, the Florida Department of Commerce, the Federal Agency Administrator, the Comptroller General of the United States, and any of their authorized representatives access to any books, documents, papers, and records of the contractor which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts, and transcriptions.
B. The contractor agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts, and transcriptions.
C. The contractor agrees to provide the Administrator or their authorized representatives access to construction or other work sites pertaining to the work being completed under the contract.
D. All project-related records will be retained by the contractor for three years after the termination of the awarded contract.
E. In compliance with the Disaster Recovery Act of 2018, no language in this provision is intended to prohibit audits or internal reviews by the federal funding agency or the Comptroller General of the United States.

26. Department of Homeland Security Seal, Logo, and Flags (as applicable)

The Contractor shall not use the DHS seal(s), logo, crests, or reproductions of flags or likenesses of DHS agency officials without specific DHS or FEMA pre-approval.

27. Compliance with Federal Laws, Regulations, and Executive Orders

The Contractor acknowledges that federal financial assistance shall be used to fund contracts only. The contractor will comply with all applicable federal laws, regulations, Executive Orders, federal policies, procedures, and directives.

28. Prohibition on Contracting for Covered Telecommunications Equipment or Services

(a) *Definitions.* As used in this clause, the terms backhaul; covered foreign country; covered telecommunications equipment or services; interconnection arrangements; roaming; substantial or essential component; and telecommunications equipment or services have the meaning as defined in FEMA Policy 405-143-1, Prohibitions on Expending FEMA Award Funds for Covered Telecommunications Equipment or Services (Interim), as used in this clause—

(b) *Prohibitions.*

(1) Section 889(b) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019, Pub. L. No. 115-232, and 2 C.F.R. § 200.216 prohibit the head of an executive agency on or after Aug.13, 2020, from obligating or expending grant, cooperative agreement, loan, or loan guarantee funds on certain telecommunications products or from certain entities for national security reasons.

(2) Unless an exception in paragraph (c) of this clause applies, the contractor and its subcontractors may not use grant, cooperative agreement, loan, or loan guarantee funds from the Federal Emergency Management Agency to:

(i) Procure or obtain any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology of any system;

(ii) Enter into, extend, or renew a contract to procure or obtain any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology of any system;

(iii) Enter into, extend, or renew contracts with entities that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system; or

(iv) Provide, as part of its performance of this contract, subcontract, or other contractual instrument, any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

(c) *Exceptions.*

(1) This clause does not prohibit contractors from providing—

(i) A service that connects to the facilities of a third-party, such as backhaul, roaming, or interconnection arrangements; or

(ii) Telecommunications equipment that cannot route or redirect user data traffic or permit visibility into any user data or packets that such equipment transmits or otherwise handles.

(2) By necessary implication and regulation, the prohibitions also do not apply to:

(i) Covered telecommunications equipment or services that:

i. Are *not used* as a substantial or essential component of any system; *and*

ii. Are *not used* as critical technology of any system.

(ii) Other telecommunications equipment or services that are not considered covered telecommunications equipment or services.

(d) *Reporting requirement.*

(1) In the event the contractor identifies covered telecommunications equipment or services used as a substantial or essential component of any system, or as critical technology as part of any system, during contract performance, or the contractor is notified of such by a subcontractor at any tier or by any other source, the contractor shall report the information in paragraph (d)(2) of this clause to the recipient or subrecipient, unless elsewhere in this contract are established procedures for reporting the information.

(2) The Contractor shall report the following information pursuant to paragraph (d)(1) of this clause:

(i) Within one business day from the date of such identification or notification: The contract number; the order number(s), if applicable; supplier name; supplier unique entity identifier (if known); supplier Commercial and Government Entity (CAGE) code (if known); brand; model number (original equipment manufacturer number, manufacturer part number, or wholesaler number); item description; and any readily available information about mitigation actions undertaken or recommended.

(ii) Within 10 business days of submitting the information in paragraph (d)(2)(i) of this clause: Any further available information about mitigation actions undertaken or recommended. In addition, the contractor shall describe the efforts it undertook to prevent use or submission of covered

telecommunications equipment or services, and any additional efforts that will be incorporated to prevent future use or submission of covered telecommunications equipment or services.

(e) *Subcontracts.* The Contractor shall insert the substance of this clause, including this paragraph (e), in all subcontracts and other contractual instruments.

29. Domestic Preference for Procurement

As appropriate, and to the extent consistent with law, the contractor should, to the greatest extent practicable, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States. This includes, but is not limited to iron, aluminum, steel, cement, and other manufactured products.

For purposes of this clause:

Produced in the United States means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.

Manufactured products mean items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

30. Copyright and Data Rights

The Contractor grants to the Cooperative, a paid-up, royalty-free, nonexclusive, irrevocable, worldwide license in data first produced in the performance of this contract to reproduce, publish, or otherwise use, including prepare derivative works, distribute copies to the public, and perform publicly and display publicly such data. For data required by the contract but not first produced in the performance of this contract, the Contractor will identify such data and grant to the offeror or acquires on its behalf a license of the same scope as for data first produced in the performance of this contract. Data, as used herein, shall include any work subject to copyright under 17 U.S.C. § 102, for example, any written reports or literary works, software and/or source code, music, choreography, pictures or images, graphics, sculptures, videos, motion pictures or other audiovisual works, sound and/or video recordings, and architectural works. Upon or before the completion of this contract, the Contractor will deliver to the offeror data first produced in the performance of this contract and data required by the contract but not first produced in the performance of this contract in formats acceptable by the offeror.

31. Build America, Buy American Act Compliance (as applicable)

When required by federal program legislation, contractors must comply with the Build America, Buy America Act (BABAA), which was enacted as part of the Infrastructure Investment and Jobs Act §§ 70901-70927, Pub. L. No 117-58 (2021); and Executive Order 14005, Ensuring the Future is Made in All of America by All of America's Workers.

(1) BABAA applies to articles, materials, and supplies that are consumed in, incorporated into, or affixed to an infrastructure project.
(2) Iron and steel manufactured products and construction materials used in the project are produced in the United States.

APPENDIX K

ANSI/AWWA C605

ANSI/AWWA C605-13
(Revision of ANSI/AWWA C605-05)

American Water Works Association
Dedicated to the World's Most Important Resource™

AWWA Standard

Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings

Effective date: Feb. 1, 2014.
First edition approved by AWWA Board of Directors Jan. 30, 1994.
This edition approved June 9, 2013.
Approved by American National Standards Institute April 2, 2013.

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Approved American National Standard ANSI

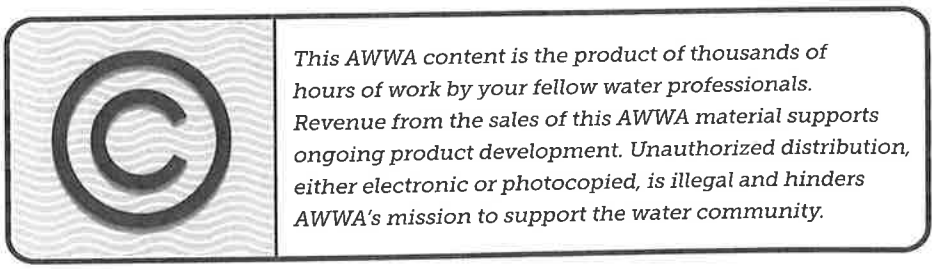
AWWA Standard

This document is an American Water Works Association (AWWA) standard. It is not a specification. AWWA standards describe minimum requirements and do not contain all of the engineering and administrative information normally contained in specifications. The AWWA standards usually contain options that must be evaluated by the user of the standard. Until each optional feature is specified by the user, the product or service is not fully defined. AWWA publication of a standard does not constitute endorsement of any product or product type, nor does AWWA test, certify, or approve any product. The use of AWWA standards is entirely voluntary. This standard does not supersede or take precedence over or displace any applicable law, regulation, or codes of any governmental authority. AWWA standards are intended to represent a consensus of the water supply industry that the product described will provide satisfactory service. When AWWA revises or withdraws this standard, an official notice of action will be placed on the first page of the Official Notice section of *Journal - American Water Works Association.* The action becomes effective on the first day of the month following the month of *Journal - American Water Works Association* publication of the official notice.

American National Standard

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All AWWA standards follow the general format indicated subsequently. Some variations from this format may be found in a particular standard.

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Foreword

This foreword is for information only and is not a part of ANSI/AWWA C605.*

I. Introduction.

I.A. *Background.* ANSI/AWWA C605, Standard for Underground Installation of PVC and PVCO Pressure Pipe and Fittings is offered as a reference to be used when constructing new PVC or PVCO pressurized pipelines or when making repairs or extensions to existing PVC and PVCO pressure pipelines. This standard provides information on pipe handling, trench excavation, pipe installation, appurtenance placement, and preparation of pipelines for use. It is not intended that this AWWA standard be used as a contract document; however, it may be used as a reference in contract documents. This standard represents the consensus of the standards committee on the recommended practice for the proper installation of PVC and PVCO pressure pipe. The standard is not intended to preclude the manufacture, marketing, purchase, or use of any product, process, or procedure.

I.B. *History.* This is the third edition of ANSI/AWWA C605. In 1978, the AWWA Standards Council authorized the AWWA Standards Committee on Thermoplastic Pressure Pipe to prepare a design and installation manual that would be followed by an installation standard for PVC pressure pipe. AWWA Manual M23, *PVC Pipe—Design and Installation*, was published in 1980.

In 1988, the AWWA Standards Committee on Thermoplastic Pressure Pipe was dissolved to allow for the formation of the AWWA Standards Committee on Polyvinyl Chloride (PVC) Pressure Pipe and Fittings. A new subcommittee was convened to resume work on the installation standard in 1989. On completion of the manual, development of this standard began. The first edition was effective July 1, 1995. The second edition of ANSI/AWWA C605 was approved by the AWWA Board of Directors on June 12, 2005. This third edition of ANSI/AWWA C605 was approved on June 9, 2013.

I.C. *Acceptance.* In May 1985, the US Environmental Protection Agency (USEPA) entered into a cooperative agreement with a consortium led by NSF International† (NSF) to develop voluntary third-party consensus standards and a certification program for direct and indirect drinking water additives. Other members of the original consortium included the American Water Works Association Research

* American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
† NSF International, 789 N. Dixboro Road, Ann Arbor, MI 48105.

Foundation (AwwaRF, now Water Research Foundation*) and the Conference of State Health and Environmental Managers (COSHEM). The American Water Works Association (AWWA) and the Association of State Drinking Water Administrators (ASDWA) joined later.

In the United States, authority to regulate products for use in, or in contact with, drinking water rests with individual states.† Local agencies may choose to impose requirements more stringent than those required by the state. To evaluate the health effects of products and drinking water additives from such products, state, provincial, and local agencies may use various references, including

1. An advisory program formerly administered by USEPA, Office of Drinking Water, discontinued on April 7, 1990.
2. Specific policies of the state, provincial, or local agency.
3. Two standards developed under the direction of NSF International, NSF/ANSI 60, Drinking Water Treatment Chemicals—Health Effects, and NSF/ANSI 61, Drinking Water System Components—Health Effects.
4. Other references, including AWWA standards, *Food Chemicals Codex*, *Water Chemicals Codex*,‡ and other standards considered appropriate by the state, provincial, or local agency.

Various certification organizations may be involved in certifying products in accordance with NSF/ANSI 61. Individual states or local agencies have authority to accept or accredit certification organizations within their jurisdiction. Accreditation of certification organizations may vary from jurisdiction to jurisdiction.

Annex A, "Toxicology Review and Evaluation Procedures," to NSF/ANSI 61 does not stipulate a maximum allowable level (MAL) of a contaminant for substances not regulated by a USEPA final maximum contaminant level (MCL). The MALs of an unspecified list of "unregulated contaminants" are based on toxicity testing guidelines (noncarcinogens) and risk characterization methodology (carcinogens). Use of Annex A procedures may not always be identical, depending on the certifier.

ANSI/AWWA C605 does not address additives requirements. Users of this standard should consult the appropriate state, provincial, or local agency having jurisdiction in order to

1. Determine additives requirements, including applicable standards.

---

* Water Research Foundation, 6666 W. Quincy Ave., Denver, CO 80235.

† Persons outside the United States should contact the appropriate authority having jurisdiction.

‡ Both publications available from National Academy of Sciences, 500 Fifth Street, NW, Washington, DC 20001.

2. Determine the status of certifications by parties offering to certify products for contact with, or treatment of, drinking water.

3. Determine current information on product certification.

II. Special Issues. Attention should be called to the need for users of this standard to provide proper design consideration for permeation. The selection of materials is critical for water service and distribution piping in locations where there is likelihood the pipe will be exposed to significant concentrations of pollutants comprising low-molecular-weight petroleum products or organic solvents or their vapors. Research has documented that pipe materials, such as polyethylene, polybutylene, PVC, and asbestos cement, and elastomers, such as used in jointing gaskets and packing glands, are subject to permeation by lower-molecular-weight organic solvents or petroleum products. If a water pipe must pass through such a contaminated area or an area subject to contamination, consult with the manufacturer regarding permeation of pipe walls, jointing materials, etc., before selecting materials for use in that area.

Guidance regarding the permeation resistance of pipe and pipe gasket materials is available in

Ong, S.K., J.A. Gaunt, F. Mao, C.-L. Cheng, L. Esteve-Agelet, and C.R. Hurburgh. 2007. *Impact of Hydrocarbons on PE/PVC Pipes and Pipe Gaskets.* Report No. 91204. Denver, CO: AWWA Research Foundation.

Holsen, T. M., J.K. Park, D. Jenkins, and R.E. Selleck. 1991. Contamination of Potable Water by Permeation of Plastic Pipe. *Journal AWWA*, 83(8): 53–56.

Glaza, E.C., and J.K. Park. 1992. Permeation of Organic Contaminants Through Gasketed Pipe Joints. *Journal AWWA*, 84 (7): 92–100.

Olson, A.J., D. Goodman, and J.P. Pfau. 1987. Evaluation of Permeation of Organic Solvents Through PVC, Asbestos/Cement, and Ductile Iron Pipes. *Journal of Vinyl Technology* 9(3): 114–118.

Vonk, M.W. 1985. Permeation of Organic Compounds Through Pipe Materials. Publication No. 85, Neuwegein, NL: Netherlands Waterworks' Testing and Research Institute (KIWA).

III. Use of This Standard. It is the responsibility of the user of an AWWA standard to determine that the products described in that standard are suitable for use in the particular application being considered.

III.A. *Purchaser Options and Alternatives.* The following items should be provided by the purchaser.

1. Standard used—that is, ANSI/AWWA C605, Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings, of latest revision.

2. Reference to applicable plans, drawings, specifications, and other contract documents (all sections).

3. Whether compliance with NSF/ANSI 61, Drinking Water Treatment Chemicals—Health Effects, is required.

4. Details of other federal, state or provincial, and local requirements (Sec. 4.1).

5. Materials inspection and acceptance requirements (Sec. 5.1).

6. Affidavit of compliance for materials used (Sec. 5.1.1).

7. Special provisions for conflicting utilities and responsibility for facilities and responsibility for the location, relocation, and repair of the conflicting facility or relocation of the pipeline if necessary (Sec. 6.1.3 and Sec. 6.2).

8. Notification requirements (Sec. 6.3).

9. Open trench, trench water, and trench stability requirements (Sec. 7.1).

10. Requirements for the protection of workers and the safety of the general public (Sec. 7.1.1).

11. Special provisions for excavation and trenching requirements (Sec. 7.2).

12. Trench width, depth, bottom preparation, rock conditions, previous excavation, blasting, unstable subgrade, dewatering, and excavated material requirements (Sec. 7.2).

13. Special trench foundations (Sec. 7.2.7).

14. Special embedment materials (Sec. 8.3).

15. Thrust restraint requirements (Sec. 8.7).

16. Backfill requirements. (Sec. 8.8).

17. Type, number, and installation requirements for valves and fittings (Sec. 9.2).

18. Hydrant requirements (Sec. 9.3).

19. Special provisions for testing, including the assignment of responsibility for providing and conveying water for flushing, testing, disinfection, and provisions for disposal of disinfection water. Assignment of responsibility for providing equipment for testing witnessing and required recording of test results (Sec. 10.3.1).

20. Special requirements for the method of disinfection, sampling, and analysis (Sec. 10.4). See ANSI/AWWA C651, Standard for Disinfecting Water Mains, of latest revision.

21. System design pressure, required test pressure, and test duration (Sec. 10.3.5 and Sec. 10.3.4).

22. If delivery of an affidavit of compliance from the constructor is not required (Sec. 10.6).

III.B. *Modification to Standard.* Any modification of the provisions, definitions, or terminology in this standard must be provided by the purchaser.

IV. Major Revisions. Major changes made to the standard in this revision include the following:

1. Permeation requirements were moved to the Special Issues section of the foreword.
2. Molecularly Oriented Polyvinyl Chloride (PVCO) pipe has been included (Sec. 1.1).
3. Soil classification requirements were added to Figure 1.
4. Trenchless construction requirements were added (Sec. 7.3).
5. Fused Joints are addressed (Sec. 8.5.6).
6. Tapping sleeves and valve requirements were added (Sec. 9.4.3).
7. Notice was added to bring the user's attention to the possibility that compliance with this standard may require use of an invention covered by patent rights (Sec 8.5.6).
8. Butt Fusion Inspection Requirements are addressed (Sec. 8.5.6.1).
9. Hydrostatic pressure testing requirements were changed to include the following: "not less than 1.5 times the stated sustained working pressure at the lowest elevation of the test section" shall be required (Sec. 10.3.5).
10. Notice of Nonconformance requirements was added (Sec. 10.5).
11. Delivery of an affidavit of compliance from the constructor is required (Sec. 10.6).

V. Comments. If you have any comments or questions about this standard, please call AWWA Engineering and Technical Services at 303.794.7711, FAX 303.795.7603, or write to the department at 6666 West Quincy Avenue, Denver, CO 80235-3098, or email standards@awwa.org.

ANSI/AWWA C605-13
(Revision of ANSI/AWWA C605-05)

American Water Works Association

Dedicated to the World's Most Important Resource™

AWWA Standard

Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes underground installation and hydrostatic testing procedures for polyvinyl chloride (PVC) or molecularly oriented polyvinyl chloride (PVCO) pressure pipe and fittings that comply with either ANSI*/AWWA C900, ANSI/AWWA C905, ANSI/AWWA C907, or ANSI/AWWA C909. These plastic components are installed in piping systems that may contain components made from other materials. It may be necessary to supplement this standard with provisions for special requirements not included in this standard (see foreword, Sec. III). Such special requirements should be specified by the purchaser with input from the purchaser's engineering consultant(s), product manufacturer(s), and/or supplier(s).

Sec. 1.2 Purpose

The purpose of this standard is to provide the minimum requirements for underground installation and hydrostatic testing procedures for PVC or PVCO

* American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

pressure pipe and fittings used to transport potable water, reclaimed water, irrigation water, or wastewater, or for the conveyance of any fluid compatible with PVC or PVCO.

Sec. 1.3 Application

This standard can be referenced in specifications for underground installation and hydrostatic testing procedures for PVC or PVCO pressure pipe and fittings used in the applications listed in Sec. 1.2.

SECTION 2: REFERENCES

This standard references the following documents. In their latest editions, they form a part of this standard to the extent specified within the standard. In any case of conflict, the requirements of this standard shall prevail.

ANSI/AWWA C110/A21.10—Ductile-Iron and Gray-Iron Fittings.

ANSI/AWWA C111/A21.11—Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

ANSI/AWWA C153/A21.53—Ductile-Iron Compact Fittings for Water Service.

ANSI/AWWA C219—Bolted, Sleeve-Type Couplings for Plain-End Pipe.

ANSI/AWWA C651—Disinfecting Water Mains.

ANSI/AWWA C800—Underground Service Line Valves and Fittings.

ANSI/AWWA C900—Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution.

ANSI/AWWA C905—Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm).

ANSI/AWWA C907—Injection-Molded Polyvinyl Chloride (PVC) Pressure Fittings for Water—4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution.

ANSI/AWWA C909—Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 In. Through 24 In. (100 mm Through 600 mm), for Water, Wastewater, and Reclaimed Water Service.

ASME B36.10M—Welded and Seamless Wrought Steel Pipe.

ASTM* D698—Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft^3 [600 kN-m/m^3]).

ASTM D4832—Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.

ASTM F1674—Standard Test Method for Joint Restraint Products for Use with PVC Pipe.

ASTM F2331—Standard Test Method for Determining Chemical Compatibility of Thread Sealants with Thermoplastic Threaded Pipe and Fittings Materials.

AWWA Manual M3, *Safety Practices for Water Utilities*. AWWA, Denver, Colo.

AWWA Manual M12, *Simplified Procedures for Water Examination*. AWWA, Denver, Colo.

AWWA Manual M17, *Installation, Field Testing, and Maintenance of Fire Hydrants*. AWWA, Denver, Colo.

AWWA Manual M23, *PVC Pipe—Design and Installation*. AWWA, Denver, Colo.

UNI†-B-8—Recommended Practice for the Direct Tapping of Polyvinyl Chloride (PVC) Pressure Water Pipe (Nominal Diameters 6–12 Inch).

UNI-PUB-8—Tapping Guide for PVC Pressure Pipe. Uni-Bell PVC Pipe Association, 2711 LBJ Freeway, Suite 1000, Dallas, Texas 75234.

SECTION 3: DEFINITIONS

The following definitions shall apply in this standard:

1. *Constructor:* The party that furnishes the work and materials for placement or installation.

2. *Controlled Low-Strength Material (CLSM):* A mixture of soil or aggregates, cementitious material, fly ash, water, and sometimes chemical admixtures, that hardens into a material with a higher soil stiffness E' than the soil, but less than 1,200 psi. Used as a replacement for compacted backfill, CLSM can be placed as a slurry, a mortar, or a compacted material that typically has unconfined compressive strengths of 50 to 100 psi for most applications.

* ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428.
† Uni-Bell PVC Pipe Association, 2711 LBJ Freeway, Suite 1000, Dallas, Texas 75234.

3. *Day:* A day is defined as a 24-hr period.

4. *Fused joints:* Joining two pieces of plastic by heating and melting the mating surfaces of the pipe components to be joined and pressing them together so that they form a homogeneous bond. When the mating surfaces are pipe ends, the fusion process is referred to as *butt fusion* or *butt heat fusion*.

5. *Manufacturer:* The party that manufactures, fabricates, or produces materials or products.

6. *Purchaser:* The person, company, or organization that purchases any materials or work to be performed.

7. *PVC pressure pipe:* Polyvinyl chloride (PVC) pressure pipe manufactured in accordance with ANSI/AWWA C900, ANSI/AWWA C905, or ANSI/AWWA C909. NOTE: Pipe manufactured in accordance with ANSI/AWWA C909 is PVCO pipe. Unless otherwise noted, the requirements of this standard for PVC pipe shall also apply to PVCO pipe.

8. *PVCO pressure pipe:* Molecularly oriented polyvinyl chloride (PVCO) pressure pipe manufactured in accordance with ANSI/AWWA C909. Molecular orientation is achieved through the controlled expansion of conventionally extruded PVC pipe.

9. *Restrained joint:* A pipe to pipe (or fitting or appurtenance) connection that is joined mechanically or heat-fused so that it does not separate or leak in pressure applications under specified load conditions and does not require thrust blocking.

10. *Supplier:* The party that supplies materials or services. A supplier may or may not be the manufacturer.

SECTION 4: REQUIREMENTS

Sec. 4.1 Materials

Materials shall comply with the requirements of the Safe Drinking Water Act and other federal regulations for potable water, wastewater, and reclaimed water systems as applicable.

SECTION 5: RECEIVING, HANDLING, AND STORAGE

Sec. 5.1 Receiving

5.1.1 *Inspection for damage and defects.* The purchaser may require that materials furnished by the constructor or supplier be subject to inspection and acceptance by the purchaser at the manufacturer's plant or at the point of delivery. The purchaser may request additional tests' results or affidavits of compliance as specified in ANSI/AWWA C900, ANSI/AWWA C905, ANSI/AWWA C907, or ANSI/AWWA C909 to ensure conformance. Inspection by the purchaser does not relieve the constructor of responsibility to inspect and accept materials.

5.1.2 *Responsibility.* The constructor or supplier shall be responsible for materials provided. The constructor shall replace at no additional expense to the purchaser provided materials found to be defective in manufacture or damaged in transport, jobsite handling, or placement. This shall include the providing of materials, equipment, and labor required for replacement of installed defective material.

5.1.2.1 Purchaser-provided materials. The constructor's responsibility for materials provided by the purchaser shall begin at the point of delivery to the constructor. Materials already on the site shall, on acceptance by the constructor, become the constructor's responsibility on the day work commences or the day designated by the purchaser. However, latent defects not identifiable by physical inspection shall remain the responsibility of the purchaser even after acceptance by the constructor. Defective material provided by the purchaser shall be replaced by the purchaser.

5.1.3 *Rejection.* On receipt, material found to be defective due to manufacture or damage in shipment shall be rejected and recorded on the Bill of Lading and removed from the jobsite. The constructor shall inspect materials provided by the purchaser and shall reject defective materials at the time of receipt. Any observed gouges or scratches that extend 10 percent or more into the pipe wall shall justify rejection of that pipe. The constructor may use the undamaged portion of a pipe by cutting off the damaged section. Defective materials shall be clearly marked, segregated, and removed from the site.

Sec. 5.2 Handling

5.2.1 *Unloading and loading.* The constructor shall be responsible for unloading and loading of materials at the jobsite. To avoid damage, pipe and appurtenances shall be loaded and unloaded with care and in accordance with the manufacturer's published recommendations. Adherence to the pipe manufacturer's published unloading recommendations is particularly important when temperatures are below 32°F (0°C). Under no circumstances shall such material be dropped.

5.2.1.1 Padding. Slings (other than nylon straps), hooks, or pipe tongs shall be padded and used properly to prevent damage to pipe and appurtenances.

5.2.2 *Hauling.* When hauling materials at the jobsite, care shall be exercised to prevent damage. If possible, pipe shall be hauled in unit packages with proper supports.

Sec. 5.3 Storage

5.3.1 *Stacking.* Stored materials shall be kept safe from damage. The interior as well as sealing surfaces of pipe and appurtenances shall be kept free from dirt and foreign matter per ANSI/AWWA C651. Pipe stored outdoors and expected to be exposed to direct sunlight for periods of one year or more after delivery shall be covered with canvas or other opaque material with provision for adequate air circulation. PVC pipe shall not be stored close to heat sources, such as heaters, boilers, steamlines, or engine exhaust.

5.3.1.1 Packaging. When possible, pipe shall be stored in unit packages on flat surfaces to avoid bending. When unit packages are stacked, care shall be exercised to ensure the weight of the upper units does not cause deformation to pipe in lower units. Unit packages shall be supported by racks or dunnage to prevent damage or bending of the pipe. When unit packages are stacked, care shall be exercised to ensure the height of the stack does not result in instability that could cause stack collapse, pipe damage, or personal injury. Generally, stack height should not exceed 8 ft (2.4 m). Safe stack height will vary by unit package configuration.

5.3.1.2 Protecting gaskets. Gaskets shall be protected from excessive exposure to heat, direct sunlight, ozone (from electric motors and equipment), oil, grease, or other contaminants.

5.3.2 *Stringing.* In preparation for installation, distribution (stringing) of pipe and appurtenances shall be as close to the trench as practical and, if possible,

on the opposite side from the excavated earth stockpile. Pipe shall be protected from traffic and secured to prevent rolling. Bell ends on pipe should be pointed in the direction of work progress. Caution shall be exercised to minimize the contamination of pipe interiors and joint components. For trenchless installations, the pipe shall be staged for appropriate joining and insertion at a location as close as reasonably possible to the installation following manufacturer's/supplier's instructions.

SECTION 6: PRELIMINARY SITE INFORMATION

Sec. 6.1 Alignment and Grade

6.1.1 *Pipe placement.* Pipe shall be installed and maintained at required lines and grades, within tolerances specified by the purchaser.

6.1.2 *Appurtenance placement.* Fittings, valves, air vents, and hydrants shall be installed at required locations with valve and hydrant stems properly set. The axis of fittings shall align with the longitudinal axis of the pipe.

6.1.3 *Obstructions.* It shall be the responsibility of the constructor to provide adequate protection and maintenance of underground and surface utility structures, drains, sewers, and other obstructions encountered in the progress of work. When the required grade or alignment of the pipe is obstructed by existing utility structures (such as conduits, ducts, pipes, branch connections to main sewers, or main drains), the obstruction shall be permanently supported, relocated, removed, reconstructed, or bypassed by the constructor in cooperation with the owners of such utility structures.

Sec. 6.2 Investigation

The constructor shall determine the location of existing underground utility structures in the vicinity of the pipe installation. In addition to the examination of available records, explorations and excavations shall be performed if required by the purchaser.

Sec. 6.3 Notifications

Unless otherwise specified by the purchaser, the constructor shall notify owners of private property, public traffic authorities, and other utilities prior to commencement of construction.

SECTION 7: EXCAVATION

Sec. 7.1 Preparation

7.1.1 *General.* The constructor shall comply with federal regulations for the protection of workers and the safety of the general public. (Refer to AWWA Manual M3, *Safety Practices for Water Utilities.*)

7.1.1.1 Open trench. Trench excavation shall proceed in advance of pipe installation only so far as can be backfilled the same day, or as permitted by the purchaser.

7.1.1.2 Water removal. The discharge from any trench dewatering pumps or directional drilling operations shall be conveyed to natural drainage channels, storm sewers, or proper reservoirs as approved by regulatory authorities having jurisdiction. Such discharge shall be in a manner that prevents property damage, erosion, or siltation.

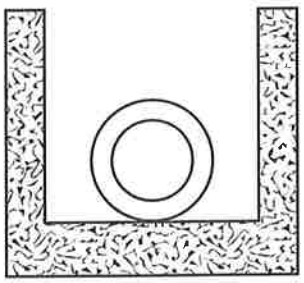
7.1.1.3 Trench stability. Where necessary to prevent caving, trench excavations in unstable soils shall be adequately supported with steel sheeting or trench boxes. Before sheeting is withdrawn, or trench boxes moved forward, they shall be raised, in place, just above the pipe crown to safely allow the constructor to completely fill any voids left in the pipe zone.

Sec. 7.2 Trench Construction

7.2.1 *Trench width.* The trench width at the ground surface may vary with the trench depth, the nature of soils encountered, existence of any pavement, and the proximity of adjacent structures. The minimum clear width of an unsupported or supported trench measured at the centerline of the pipe shall be at least 18 in. (450 mm) or the pipe outside diameter plus 12 in. (300 mm), whichever is greater. Where embedment compaction is required, the trench shall be wide enough to accommodate the compaction equipment.

7.2.2 *Trench depth.* The trench shall be excavated to the depth that permits pipe to be laid at the elevations shown on the engineering drawings or with the required depth of cover specified by the purchaser. The depth of cover shall be measured from the finished grade or the surface of the permanent improvement to the top of the pipe barrel.

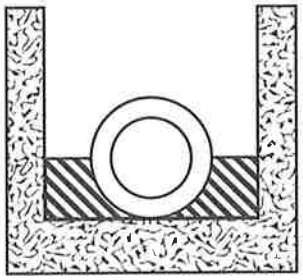
7.2.3 *Preparation of trench bottom.* The trench bottom shall be constructed to provide a firm, stable, and uniform support for the full length of the pipe. Blocking shall not be used to change pipe grade or to intermittently support pipe across excavated sections. When embedment Type 4 or 5 (See Figure 1) is



Type 1

Loose embedment.

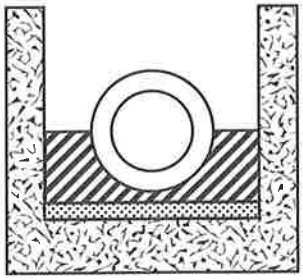
E' = 60 psi (410 kPa), K = 0.110*



Type 2

Class II, III, or IV material from trench excavation, lightly compacted to pipe centerline.

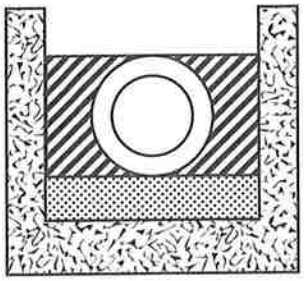
E' = 200 psi (1,380 kPa), K = 0.110



Type 3

Pipe bedded on 4-in. (100-mm) minimum of loose Class II, III, or IV material. Class II, III, or IV material from trench excavation lightly compacted to pipe centerline.

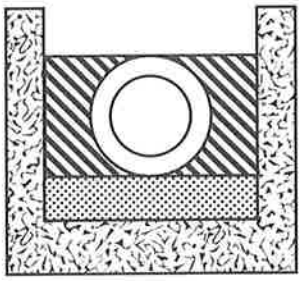
E' = 600 psi (4,140 kPa), K = 0.102



Type 4

Pipe placed on Class I or II bedding having a depth of 1/8 pipe diameter or 4-in. minimum. Class II, II, or IV material from trench excavation compacted to >80% SPD to top of pipe.

E' = 1,000 psi (6,900 kPa), K = 0.096



Type 5

Same as Type 4 except Class II, III, or IV bedding shall be compacted >90% SPD to top of pipe.

E' = 2,000 psi (18,300 kPa), K = 0.083

*See Sec. 8.3.

Figure 1 Typical embedment types

NOTES:

1. See Table 1 for descriptions of Class I, II, III, IV, and V soils.
2. Do not use Class V soils for bedding, embedment, or backfill.
3. SPD is Standard Proctor Density, AASHTO T-99 or ASTM D 698.
4. Required embedment type will depend on the pipe's dimension.

specified, bell holes at each bell and spigot joint shall be provided that conform to the shape of the pipe bell.

7.2.4 *Rock conditions.* Ledge rock, boulders, cobbles, and large stones shall be removed from the trench to provide at least 4 in. (100 mm) of embedment cushion on each side of and below pipe and appurtenances (see Figure 1). The excavation shall be sufficiently wide to enable proper placement of the embedment specified by the purchaser. When excavation is completed, embedment material shall be placed, leveled, and compacted to provide a proper cushion for the pipe. Such embedment shall be granular material graded in particle size so that the embedment material supporting the pipe shall be retained in place under all conditions, including the rapid movement of water through the pipe embedment and the surrounding material.

7.2.5 *Previous excavations.* If the trench passes over another pipeline or other previous excavation, the trench bottom shall (1) be compacted to provide support equal to that of the undisturbed native soil or (2) conform to specific regulatory requirements that preclude damage to the existing installed facility.

7.2.6 *Blasting.* Blasting for excavation shall be permitted only when specified by the purchaser and when proper precautions have been taken for the protection of persons and property. Hours permitted for blasting shall be specified by the purchaser. Damage caused by blasting shall be repaired by the constructor at no additional expense to the purchaser. Blasting procedures shall conform with applicable laws, ordinances, and regulations imposed by federal, state or provincial, and local authorities.

7.2.7 *Unstable subgrade.* Where an unstable trench subgrade condition exists that, in the opinion of the purchaser, cannot support the pipe, an alternative foundation shall be provided. At the discretion of the purchaser, an additional depth shall be excavated and refilled to pipe foundation grade with embedment material or special pipe foundation material in accordance with the purchase documents. Any part of the trench excavated below grade shall be backfilled to grade and compacted to the required density. Such embedment material shall have a gradation that inhibits migration of soil particles.

7.2.8 *Dewatering.* Where running or standing water occurs in the trench bottom or where the soil in the trench bottom displays a "quick" tendency, the water shall be removed by pumps. The trench shall be kept free from water during installation operations by suitable means, such as well points or pervious under-

Table 1 Soil Classes

Soil Class	Description	USCS* Symbol
I	Crushed rock: 100% passing 1½-in. sieve, ≤ 15% passing #4 sieve, ≤ 25% passing ⅜-in. sieve, ≤ 12% passing #200 sieve	
II	Clean, coarse-grained soils: or any soil beginning with one of these symbols (can contain fines up to 12%) uniform fine sands (SP) with more than 50% passing a #100 sieve should be treated as Class III material	GW, GP, SW, SP
III	Coarse-grained soils with fines: or any soil beginning with one of these symbols	GM, GC, SM, SC
	Sandy or gravelly fine-grained soils: or any soil beginning with one of these symbols with > 30% retained on #200 sieve	ML, CL
IV	Fine-grained soils: or any soil beginning with one of these symbols with ≤ 30% retained on #200 sieve	ML, CL
V	Fine-grained soils, organic soils: high-compressibility silts and clays, organic soil	MH, CH, OL, OH, Pt

*USCS—Unified Soil Classification System

NOTES:

1. Soil Classification descriptions and symbols are in accordance with ASTM D2487 and ASTM D2488.
2. For Class I, all particle faces shall be fractured.
3. Materials such as broken coral, shells, slag, and recycled concrete (with less than 12% passing a No 200 sieve) should be treated as Class II soils.

drain bedding, until the pipe has been installed and backfill placed and compacted to a sufficient height to prevent pipe flotation. A cover depth of 1.5 pipe diameters will normally prevent flotation. For pipes having a dimension ratio (DR) greater than 32.5, a cover minimum of 2.0 pipe diameters is recommended. Soil migration in the pipe zone shall be prevented through the use of geotextile fabric or embedment material gradation.

7.2.9 *Excavated material.* Excavated material shall be placed in a manner that will not obstruct work or endanger personnel or the public. Excavated material shall not obstruct sidewalks or driveways for extended periods unless provided for in the contract documents. Hydrants under pressure, valve-pit covers, valve boxes, curb-stop boxes, fire and police call boxes, or other utility controls shall remain unobstructed and accessible. Gutters shall remain clear unless other satisfactory

provisions have been made for street drainage. Natural water courses shall not be obstructed. Surplus excavated material shall be disposed of in a suitable manner.

7.2.10 *Steep slopes.* Where steep slopes approximately 20 percent or greater are encountered, special considerations must be taken to control subsequent sliding or settlement of trench material in the pipe environment that would result in additional spigot penetration into the socket of the completed joint (overbelling).

7.2.11 *Encasements.* When specified, skids or casing spacers must provide sufficient height to permit clearance between bell joints or couplers and casing walls. Skids shall be fastened securely to pipe with strapping, cables, or clamps as specified. If the pipe will be pushed into the casing, the end of the skids or casing spacers shall be secured at the assembly reference mark on the spigot end of the pipe to avoid over-insertion during installation.

Sec. 7.3 Trenchless Construction

7.3.1 *Insertion and exit excavations.* Insertion and exit trenches, pits, and/or approaches shall be in accordance with manufacturer/supplier recommendations and excavated in accordance with Sec. 7.1 and Sec. 7.2. Backfilling shall be done in accordance with Sec. 8.8.

7.3.2 *Excavated and evacuated material.* Excavated and evacuated material shall be placed and disposed of in accordance with Sec. 7.2.9.

SECTION 8: PIPE INSTALLATION

Sec. 8.1 Material Inspection

Pipe and appurtenances shall be inspected for defects prior to installation. Defective, damaged, or unsound material shall be marked and held for inspection by the purchaser, who may prescribe corrective repairs or reject the material.

Sec. 8.2 Precautions

Proper equipment, tools, and facilities shall be provided and used by the constructor for the safe execution of work. Pipe and appurtenances shall be lowered carefully into the trench using suitable equipment and methods to prevent material damage or personnel injury. Under no circumstances shall pipe or appurtenances be rolled, dropped, or dumped into the trench. For trenchless installations, the manufacturer's or supplier's instructions for safe handling and installation shall be followed.

Sec. 8.3 Pipe Trench Embedment

Selection of the required laying condition and the method of embedment shall be made in accordance with the requirements specified by the purchaser. Common embedment types are shown in Figure 1, with the bedding constant (K) and typical soil modulus (E') values associated with each. These values, along with other embedment design parameters specified by the purchaser, should be used to calculate pipe deflection per the design information provided in AWWA Manual M23. The purchaser may also specify embedment types other than those shown in Figure l. The type of pipe embedment should be selected so as to prevent a vertical cross-section long-term ring deflection of more than 7.5 percent.* Maximum embedment particle size shall not exceed ¾ in. (20 mm) for angular rock or 1½ in. (40 mm) for rounded rock and shall be no larger than 10 percent of the pipe diameter. Embedment shall be selected and placed to prevent gouges, crimping, or puncture of pipe, joints, or appurtenances. If flowable fill or controlled low-strength material (CLSM) is used for embedment, the maximum particle size should not exceed one-eighth of the distance between the pipe and the trench wall. When using CLSM, care shall be taken to maintain the specified line and grade and to avoid floating the pipe.

Sec. 8.4 Pipe Installation

8.4.1 *Potable pipe cleaning.* Prior to installation, all dirt and foreign material shall be removed from pipe and fittings that will be used for the transport of drinking water. Dirt and foreign matter that cannot be removed by normal flushing shall be cleaned by mechanical means. The purchaser shall determine when such mechanical cleaning is required. During installation operations, no debris, hand tools, clothing, or other materials shall be placed in the pipe. Pipe shall be kept clean during and after installation.

8.4.2 *Pipe placement in trench.* Pipe shall be installed to required line and grade within tolerances specified by the purchaser. The pipe and joint shall be uniformly supported and secured in place with the specified embedment material. Bell and spigot pipe joints shall be assembled after placement in the trench and shall be installed with the bell end pointing in the direction of work progress.

8.4.3 *Interrupted operations.* When installation is interrupted or terminated at the end of a day, all potable water pipe ends shall be sealed temporarily to

* Pipe embedment type shall be selected solely on the basis of the pipe stiffness and the anticipated external load. Internal pipe pressure shall not be included in the embedment selection evaluation.

prevent the entry of water, debris, small animals, and similar types of contamination. Precautions shall be taken to prevent flotation of the sealed pipe during work stoppages. (See Sec. 4.2.8.)

8.4.4 *Trenchless operations.* Trenchless installation by pulling and/or pushing the pipe into position shall be permitted when specified. All joints must be capable of safely withstanding the projected installation pulling and pushing forces. The maximum safe pulling/pushing forces and minimum bending radius shall be provided by the manufacturer or supplier and followed during installation.

Sec. 8.5 Pipe Joining

8.5.1 *Gasket-seal joint preparation.* The sealing surface of the pipe spigot end, the pipe bell, the coupler or fitting, and the elastomeric gaskets shall be cleaned immediately before assembly. Factory-installed gaskets should not be removed.* An approved lubricant shall be applied in accordance with the pipe manufacturer's published recommendations. Application of a nonapproved lubricant or too much lubricant can result in a pipeline that is difficult to disinfect and cause temporary taste and odor problems.

8.5.2 *Field cuts.* Circular saws, handsaws, or similar equipment may be used for cutting PVC pipe. Abrasive disc saws should be used for cutting and beveling PVCO pipe. Cuts shall provide a smooth end at right angles to the longitudinal axis of the pipe. Pipe spigot ends shall be marked to match the manufacturer's insertion line and beveled to match factory supplied bevel prior to joining with another PVC pipe bell end.

8.5.3 *Gasket-seal joint assembly.* Joints shall be assembled under conditions that allow for the clean mating and sealing of joining surfaces using equipment, materials, and procedures in accordance with recommendations published by the pipe and fitting manufacturers. The elastomeric gasket will have been factory installed in most bell joints. If the gasket is not preinstalled, position the gasket in the annular groove of the bell or coupling. To assure compatibility, only gaskets supplied by the particular pipe and fitting manufacturer(s) shall be used.

8.5.4 *Spigot insertion.* Pipe spigot ends are premarked with a circumferential insertion line. This line references how far the spigot should be inserted into the adjoining PVC pipe bell. Field-cut pipe spigot ends shall be marked to match

* In very cold installation conditions, the manufacturer or producer may permit the constructor to remove factory-installed gaskets and take them to a heated truck cab or shelter to restore their flexibility prior to joint assembly. Always check with the pipe and fittings manufacturers before attempting to remove the gasket, because not all factory-installed gaskets are removable.

the manufacturer's insertion line and beveled to match factory-supplied bevel (see Sec. 8.5.2). Pipe-to-pipe joints shall be assembled only to the insertion line. After assembly, the insertion line shall remain visible and be nearly flush with the lip of the adjoining PVC pipe bell. Joints assembled beyond the insertion line shall be considered overassembled and may result in damaging stresses or leakage. The bell or coupler shall be in straight alignment with the pipe spigot end before and during joint assembly.

8.5.5 *Types of gasket seal joints.* Unless otherwise specified by the purchaser, gasketed joints shall be the push-on type. PVC pressure pipe shall be assembled using the following types of joints:

8.5.5.1 Pipe to pipe. Gasket seal bell joints integral with the pipe (ANSI/AWWA C900, ANSI/AWWA C905, and ANSI/AWWA C909 may be used).

8.5.5.2 Pipe-to-couplings PVC fittings. Double-gasketed couplings and PVC fittings (ANSI/AWWA C900, ANSI/AWWA C905, ANSI/AWWA C907, and ANSI/AWWA C219) may be used. The procedures of Sec. 8.5.1 and Sec. 8.5.2 shall be followed except the factory-applied insertion line may not provide for proper depth of assembly. The constructor shall determine the proper insertion depth by measuring the inside depth of the fitting bell or coupler and subtracting no less than 0.5 in. while also ensuring full engagement of the gasket with the joined pipe spigot will occur. The constructor shall mark new insertion line(s) on the pipe spigot(s) to be joined. After assembly, the new insertion line shall be nearly flush with the lip of the adjoining coupler or PVC fitting bell.

8.5.5.3 Pipe-to-iron fittings. Any of several joint designs that have gaskets and are manufactured in accordance with ANSI/AWWA C110/A21.10, ANSI/AWWA C111/A21.11, and ANSI/AWWA C153/A21.53 may be used. For pipe assembly commonly found with fittings, valves, hydrants, or other appurtenances, the insertion depths of these joints are significantly less than those of PVC pipe and fittings. The procedures of Sec. 8.5.1 and Sec. 8.5.2 shall be followed, except the insertion depths for these joints are generally less than those with PVC pipe or PVC fittings. Before assembly or insertion, the constructor shall make sure the pipe spigot end is squarely cut, deburred, and given only a slight outer bevel. If the pipe spigot end has the factory bevel, the factory bevel shall be removed or shortened to ensure that, when assembled, the gasket will be in full contact with the nonbeveled portion of the pipe outside diameter. Additionally, the published assembly recommendations of the fitting or appurtenance manufacturer shall be followed. Joints

may be either mechanical or push-on as described in ANSI/AWWA C110/A21.10, ANSI/AWWA C111/A21.11, or ANSI/AWWA C153/A21.53.

8.5.5.4 Pipe-to-steel fittings. Any of several push-on joint designs that have gaskets and are manufactured in accordance with ANSI/AWWA C200 may be used. The procedures of Sec. 8.5.1 and Sec. 8.5.2 shall be followed except the insertion depths for these joints are generally less than those with PVC pipe or PVC fittings. Before assembly or insertion the constructor shall make sure the pipe spigot end is squarely cut, deburred, and given only a slight outer bevel. If the pipe spigot end has the factory bevel, the factory bevel shall be removed or shortened to ensure that, when assembled, the gasket will be in full contact with the nonbeveled portion of the pipe outside diameter. Additionally, the published assembly recommendations of the fitting manufacturer shall be followed.

8.5.5.5 Mechanical joint. The mechanical joint shall be assembled in accordance with the fittings manufacturer's published recommendations. Pipe spigot bevels may require shortening for use with mechanical joints or fitting joints. Special consideration must be given to the recommended tightening of bolts and technique of appurtenance installation in accordance with manufacturer's recommendations.

8.5.6 *Fused joints.* Fused joints shall be used when specified. PVC pipe fusion requires heat, pressure, and proper alignment. The heat plate temperature, gauge pressure, and time duration required are dependent on the equipment used, pipe diameter, pipe wall thickness, and ambient conditions. Fused joints shall be assembled in accordance with the manufacturer's or process licensor's recommendations. NOTE: The user's attention is called to the possibility that compliance with this standard may require use of an invention covered by patent rights.

By publication of this standard, no position is taken with respect to the validity of any such claim(s) or of any patent rights in connection therewith. If a patent holder has filed a statement of willingness to grant a license under these rights on reasonable and nondiscriminatory terms and conditions to applicants desiring to obtain such a license, details may be obtained from the standards developer.

8.5.6.1 Butt fusion inspection requirements. The pipe provider shall provide the following information to the owner so that the owner's inspector can witness the procedures and visually inspect the joint and the joining procedures for quality.

1. Equipment requirements.
2. Operator qualification.

3. Cleanliness conditions on site (wind and rain protection).
4. Pipe end preparation requirements.
5. Fusion temperature requirements.
6. Interfacial pressure or contact pressure between the pipe end surfaces during heat soak time and after joining.
7. Cooling time required before pipe can be removed from the machine and before the pipe can be pulled on the ground and installed.
8. Acceptable bead configurations.
9. Examples of visual appearance of the bead, and/or examples of acceptable data loggers plot.

Sec. 8.6 Pipe Bending and Gradual Alignment Change

8.6.1 *Longitudinal bending of gasket-joined pipe.* If permitted by the purchaser, gasket-joined pipe may accommodate longitudinal bending (Figure 2) with the following limitations.

8.6.1.1 Blocking. The constructor shall block or brace pipe joints to ensure bending of pipe does not result in joint offset (Figure 3) that exceeds the

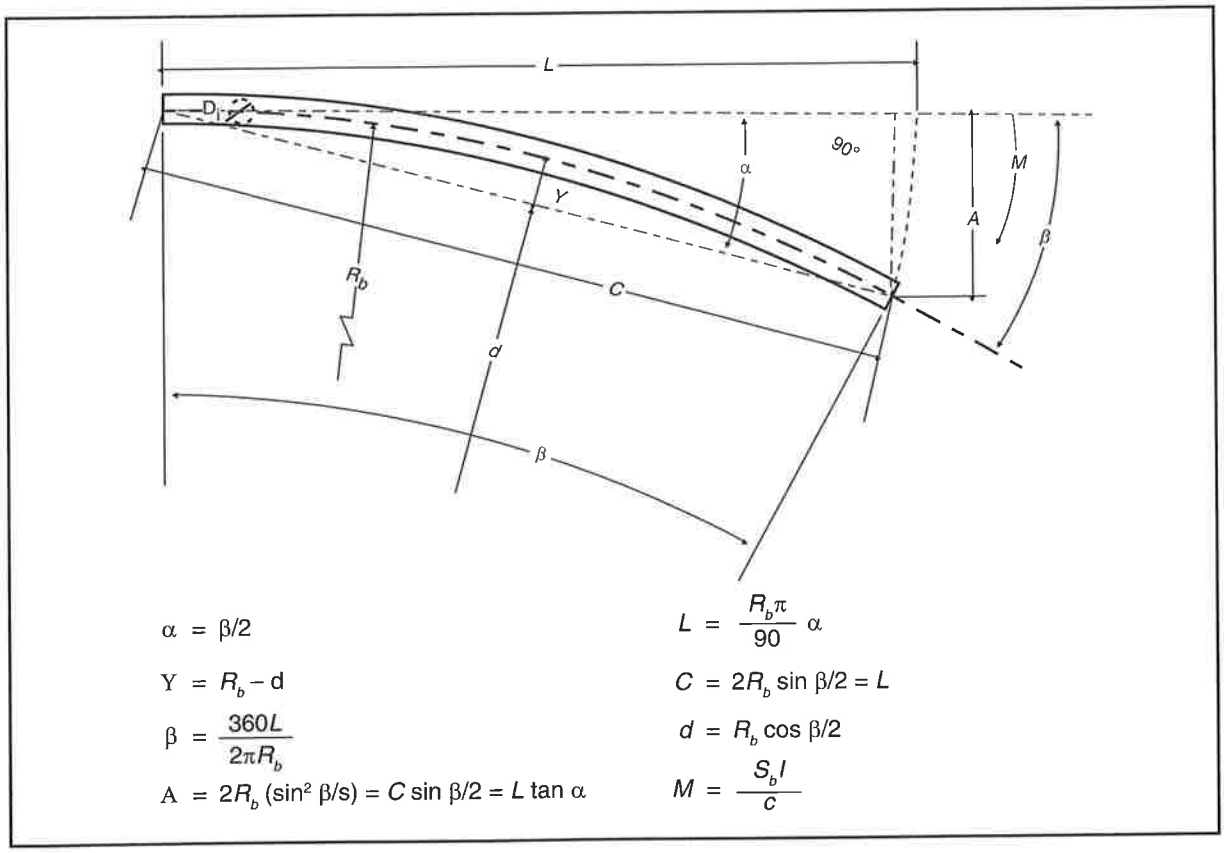


Figure 2 Measurements in relation to the allowable longitudinal bending radius *(R_b)**

*M23, *PVC Pipe—Design and Installation*, Fig. 4-4.

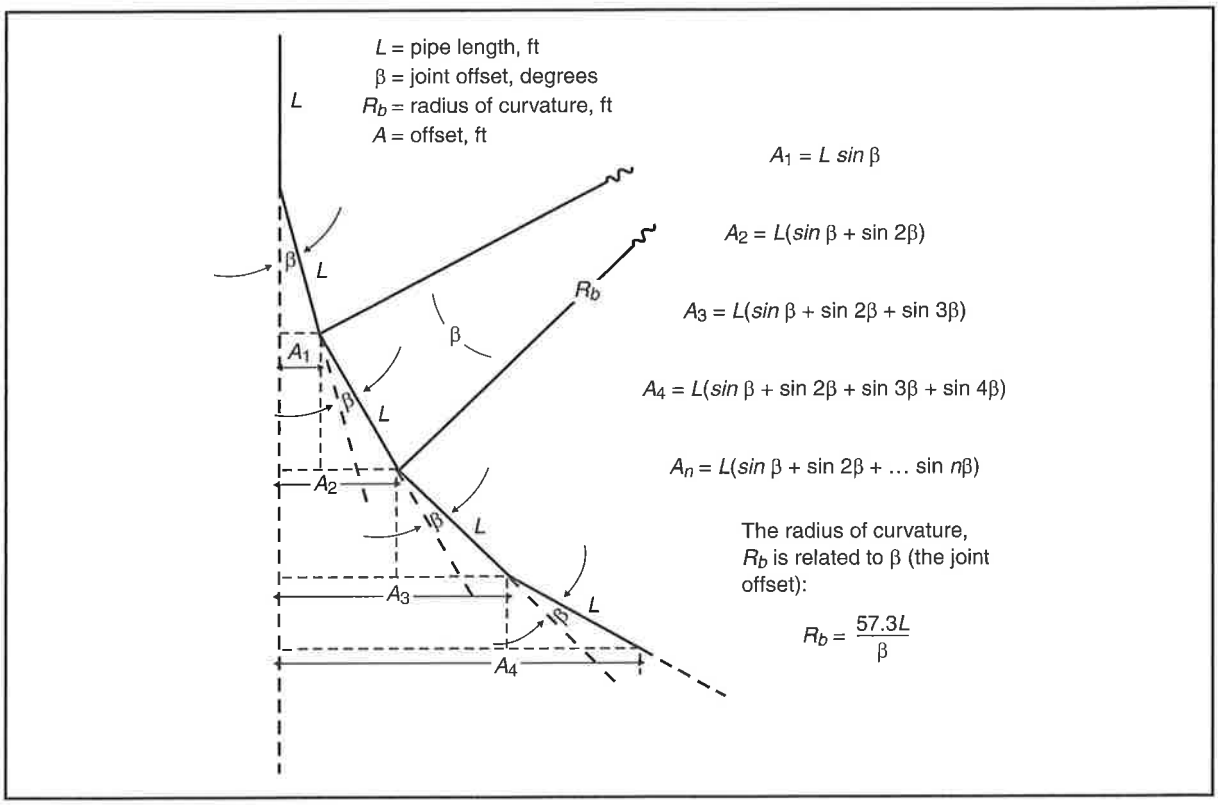


Figure 3 Measurements in relation to the allowable PVC pipe joint offset (β)*

* Adapted from M23, *PVC Pipe—Design and Installation*, Fig. 4-5.

manufacturer's published limits. Excessive joint offset may result in damaging stresses or leakage.

8.6.1.2 Embedment restrictions. Embedment Types 1 and 2 found in Figure 1 shall not be permitted for longitudinally bent pipe segments.

8.6.1.3 Longitudinal bending in the PVC pipe barrel for gasket-joined pipe shall not result in a bending radius (R_b) less than the minimum listed in Table 2.

8.6.1.4 Gasket-joined pipe, 10 in. and larger. Longitudinal bending of 10-in. (250-mm) diameter and larger gasket-joined pipe is not recommended because of the required forces.

8.6.1.4.1 The curved alignment of pipelines larger than 10 in. (250 mm) in diameter shall be determined by the pipe manufacturer's published joint offset limits (Figure 3).

8.6.2 *Longitudinal bending of fused-joined pipe.* The minimum longitudinal bending radii for fused-joined PVC pressure pipe are listed in Table 3 and shall not be exceeded during handling, installation, or final alignment.

Table 2 Allowable Longitudinal Bending for Gasket-Joined PVC and PVCO Pressure Pipe

Nominal Size		Minimum Bending Radius (R_b)	
in.	*(mm)*	*ft*	*(m)*
4	(100)	100	(30.5)
6	(150)	144	(43.9)
8	(200)	189	(57.6)
10	(250)	231	(70.4)

Table 3 Allowable Longitudinal Bending for Fused-Joined PVC Pipe

Nominal Size		Minimum Bending Radius (R_b) CIOD*		Minimum Bending Radius (R_b) IPS†	
in.	*(mm)*	*ft*	*(m)*	*ft*	*(m)*
4	(100)	100	(30.5)		
6	(150)	144	(43.9)		
8	(200)	189	(57.6)		
10	(250)	231	(70.4)		
12	(300)	275	(83.8)		
14	(350)	319	(97.2)	292	(89.0)
16	(400)	363	(110.6)	333	(101.5)
18	(450)	406	(123.7)	375	(114.3)
20	(500)	450	(137.2)	417	(127.1)
24	(600)	538	(164.0)	500	(152.4)
30	(750)	667	(203.3)	620	(189.0)
36	(900)	798	(243.2)	742	(226.2)
42	(1,050)	927	(282.6)		
48	(1,200)	1,058	(322.5)		

*CIOD (Cast Iron Outside Diameter): Outside diameters that are equivalent to iron pipes and fittings, in accordance with the ductile-iron or cast-iron (CIOD) sizing system (ANSI/AWWA C110/A21.10).

†IPS (Iron Pipe Size): Outside diameters that are equivalent to steel pipes and fittings, in accordance with the steel (IPS) sizing system (ASME B36.10M).

8.6.3 *Deflection fittings and couplers.* Fittings, bends, or couplings that allow additional joint offset shall be used to achieve gradual alignment changes that exceed the pipe manufacturer's published limits or, in the case of fused-joined pipe, the allowable bend radius minimums in Table 3.

8.6.3.1 Default limits. In absence of the manufacturer's published joint offset limits, one degree per joint shall be considered the maximum.

Sec. 8.7 Thrust Restraint

Reaction or thrust restraint shall be provided for each dead end, valve, bend, T-connector, and unrestrained hydrant; at reducers or fittings otherwise unrestrained; and where changes in pipe diameters or directions occur. The size and shape of concrete thrust blocks shall be as specified by the purchaser. The length of restrained-joint piping and details of joint-restraint glands, clamps, friction slabs, or other anchors shall be as specified by the purchaser. Restraining mechanisms for PVC pipe and fittings shall be tested and meet the requirements of ASTM F1674.

Sec. 8.8 Backfill

Trench backfill above the pipe shall be specified by the purchaser. If the purchaser plans to use metal-detection equipment to assist in locating the water line after installation, a tracer wire or coated metal strip should be placed immediately above the initial backfill material and directly over the pipe. The tracer wire shall be insulated for protection from corrosion and be at least 12 gauge. Alternatively, plastic-coated metal strips that have been specifically designed for this purpose may be used.

8.8.1 *Material.* The initial backfill material immediately above the top of the pipe shall be free of refuse, cobbles, boulders, large rocks or stones, frozen soil, or other similarly unsuitable material. The balance of the backfill shall be free of debris and contain no stones or rocks larger than 8 in. (200 mm). Additional backfill material shall be supplied by the constructor if needed to reestablish the surface grade or to completely fill in ground surface depressions at the top of the trench.

8.8.2 *Placement.* After the embedment material has been placed in accordance with Figure 1, initial backfill material shall be placed to a depth of 6 to 12 in. (150 to 300 mm) over the top of the pipe in a manner that will fill the remaining voids and avoid damage to the pipe. Backfilling shall follow pipe laying as closely as possible. In general, backfilling should be no further than 100 ft (30 m) behind pipe installation. Backfill shall be mounded in unpaved areas to allow for future settlement.

8.8.2.1 Remaining backfill. The balance of the backfill shall contain no stones or rocks larger than 8 in. (200 mm), frozen material, or debris. Backfilling shall follow pipe installation as closely as possible. In general, backfilling should be no further than 100 ft (30 m) behind pipe laying. Backfill shall be mounded in unpaved areas to allow for future settlement.

8.8.3 *Compaction.* Trench backfill that will be under paved surfaces, such as sidewalks or roads, shall be compacted in layers to the density required

by the governmental agency having jurisdiction over the road or sidewalk. Trench backfill in locations other than to-be-surfaced areas shall be compacted to a density equivalent to that of the surrounding soil.

8.8.3.1 Nonsurfaced areas. Trenches in locations other than surfaced areas shall be compacted as required by the contract specifications or, if not specified, in accordance with local requirements.

8.8.3.2 Additional material. Additional backfill material shall be supplied by the constructor if needed to backfill trenches completely or to fill depressions caused by subsequent settlement.

8.8.4 *Partial backfilling during testing.* Newly installed pipelines are normally tested after backfilling. When the purchaser requires that pressure and leakage testing be accomplished before completion of backfilling or with pipe joints exposed for examination, sufficient backfill material shall be placed over the pipe barrel between the joints to prevent movement, and consideration shall be given to restraining thrust forces. In particular, pipes connected to restrained joints, which derive their stability from the interaction of the pipe and soil, should be backfilled prior to testing.

SECTION 9: APPURTENANCE PLACEMENT

Sec. 9.1 Examination of Material

Prior to installation, valves, fittings, and hydrants shall be inspected by the constructor to ensure proper function, cleanliness, proper sealing surfaces, and compliance with purchaser requirements. Appurtenances displaying damage from handling, cracks, or other defects shall be repaired or replaced to the satisfaction of the purchaser.

Sec. 9.2 Fittings and Valves

9.2.1 *General.* Fittings and valves shall be provided and installed as specified by the purchaser. Valves shall be placed with operating stems vertical, except gear-operated butterfly valves shall be placed with the operating stems horizontal.

9.2.2 *Placement.* The pipe shall not carry the full weight of valves and fittings. Such appurtenances shall be provided with proper support, such as crushed stone, concrete pads, or a well-compacted trench bottom.

Sec. 9.3 Hydrants

9.3.1 *General.* Hydrants shall be installed as specified by the purchaser.

9.3.2 *Placement.* The full weight of hydrants shall not be carried by the pipe. Hydrants, hydrant lead valves, fittings, and branch T-connectors shall be provided with proper support, such as crushed stone, concrete pads, or a well-compacted trench bottom. Hydrants shall stand plumb, be properly located and oriented, and be set to proper elevation. The constructor shall provide a coarse-aggregate drain pocket or drain pit for dry-barrel hydrants. The installation recommendations of AWWA Manual M17 shall be followed.

Sec. 9.4 Service Connections

9.4.1 *Direct tapping.* Direct tapping involves the tapping of threads into the pipe wall and the insertion of a corporation stop.

9.4.1.1 Tapping conditions. Direct tapping shall require that the following conditions are met:

1. Approval by the purchaser.
2. Taps shall be 1 in. (25 mm) or smaller, that is, ⅝, ¾, and 1 in. (16, 20, and 25 mm).
3. Pipes shall meet the requirements of ANSI/AWWA C900 with a DR of 18 or 14.
4. Tapping appurtenances typically require 2–3 threads for sealing the appurtenance to the pipe wall. Some jurisdictions successfully tap sizes through 16 in., however, direct tapping is generally not allowed for the external bending radii (see Sec. 8.6.1), for 4-in. C900 pipe, for DR25 C900 pipe, for all C905 and C909 pipe, and for fused joined pipe. Direct tapping is common for DR 14 and DR 18 nominal pipe sizes 6, 8, 10, and 12 in. (150, 200, 250, and 300 mm).
5. Corporation stops shall be threaded and conform to ANSI/AWWA C800.
6. A combination core drill and tap manufactured specifically for PVC pipe, which cuts ANSI/AWWA C800 tapered threads, shall be used. The core drill must retain the plug of material removed from the pipe wall and must have a throat depth sufficient to accommodate walls as thick as DR 14. Single-tooth, core-drill cutters shall not be used.
7. The tapping machine shall be of a design in which the feed rate of the boring bar is controlled and accomplished with a feed nut or feed screw and yoke.
8. The maximum allowable pressure in the pipe when tapping shall be the pressure class of the pipe.*

* When easily practicable, a reduction of line pressure during tapping is suggested.

9.4.1.2 Tap spacing. No direct tap shall be made closer than 2 ft (600 mm) from the ends of the pipe. Multiple taps in a single pipe shall be staggered around the circumference and at least 18 in. (450 mm) apart when measured along the longitudinal axis of the pipe. Refer to safety precautions 9.4.4.

9.4.1.3 Tapping procedure. The following procedures shall be followed when making a direct tap:*

1. The tapping machine shall be placed firmly on the pipe in accordance with recommendations of the machine manufacturer, but not in a way that distorts the pipe.

2. Before tapping, the cutter shall be lubricated with a cutting grease recommended by the cutter manufacturer.

3. Cutting the hole shall require only finger-pull effort, allowing the cutter to work without forcing it through the pipe wall. Excessive effort indicates that the cutter is either being advanced too rapidly or that the cutter has become dull. The number of taps made with a core drill cutter should be limited to the recommendations published by the cutter manufacturer. The ratchet handle shall be rotated at least one complete turn for every ⅛ turn of the feed yoke.

4. The feed yoke shall be engaged to cut the first few threads in the pipe wall. After this, the tapping bit should be self-feeding and the feed yoke can be disengaged from the boring bar.

5. Tapping to the correct depth is important and should be determined by performing one or more bench taps in advance. During the bench tap, the operator should carefully note the position of the top of the threaded feed sleeve relative to the thrust collar or other datum point, when the corporation stop is correctly inserted. The "cast-iron" mark on the boring bar is not a reliable indicator of how deep to tap.

6. As the tapping tool is reversed out of the hole, the feed yoke shall be reengaged or the boring bar held until the tap clears the threads. The bar shall be released slowly so as not to damage the threads or injure the machine operator.

7. Two spiral wraps of 3-mil PTFE† tape shall be applied clockwise to the inlet threads on the closed corporation stop. Below freezing temperatures where an acceptable liquid thread sealant is desired, sealants recommended for use with PVC and that are prequalified in accordance with ASTM F2331 may be used.

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* For more information concerning direct tapping, refer to AWWA Manual M23, UNI-B-8, and UNI-PUB-8.

† Polytetrafluorethylene, nonstick coated.

8. The boring-bar assembly shall be replaced in the machine and used to insert the stop into the main. Care shall be taken when starting the first few threads in the hole so that they are not forced or punched into the pipe.

9. The feed yoke shall be disengaged and the ratchet handle removed as soon as the corporation stop has firmly engaged the threads in the pipe wall. The insertion shall be completed using a torque wrench and tightening to 27 ft-lb (36.6 N m).

10. Following the removal of the tapping machine, the corporation stop shall be inspected for leakage. If there is leakage past the threads, the corporation stop should be tightened to no more than 35 ft-lb (47.5 N m) using a torque wrench. At correct insertion, one to three threads should be visible.

11. If leaking past the threads persists, the line shall be depressurized and the corporation stop unscrewed. Pipe-wall threads shall be cleared of any cuttings, and new PTFE tape shall be applied to the corporation-stop threads. The corporation stop shall then be reinstalled to 27 ft-lb (36.6 N m) using a torque wrench. The previous step shall be repeated if necessary.

9.4.2 *Saddle tapping.* Saddle tapping involves making a service connection through the use of a service clamp or saddle. All sizes and classes of PVC pipe may be tapped using a service clamp or saddle. The maximum outlet size with a service clamp or saddle shall be 2 in. (50 mm). If a tap larger than 2 in. (50 mm) is required, a tapping sleeve and valve shall be used.

9.4.2.1 Clamps and saddles. Service clamps or saddles shall provide full support around the circumference of the pipe. Because the outside-diameter manufacturing tolerances for PVC pipes are tighter than those for compatible ductile-iron pipes, only tapping saddles manufactured specifically for PVC pipe shall be used.

Service clamps or saddles shall provide a sufficient bearing area. A minimum of 2 in. (50 mm) total width along the pipe's axis shall be required for taps up to 1 in. (25 mm) in size to prevent pipe distortion when the saddle is tightened to manufacturer's torque specifications. Taps 1¼ in. (32 mm) through 2 in. (50 mm) should have a minimum of 3 in. (75 mm) total band width with full circumferential support. Narrow U-bolt-type straps and saddles having lugs that dig into the pipe wall shall be prohibited.

9.4.2.2 Cutting tool. The drilling machine shall operate with a cutting tool classified as a core-cutting tool of the shell (hole) design that retains the coupon cut while penetrating the pipe wall. The drilling machine shall be provided with a ratchet handle on the boring bar. The drilling machine shall also be of a design where the

cutting tool's feed rate is controlled and accomplished with a feed nut or feed screw and yoke. The cutting tool should have a minimum of two cutting edges and slots to minimize stress and facilitate easier flow of shavings during the cutting process.

9.4.2.3 Throat depth. The shell-type (hole) cutting tool shall have a throat depth that exceeds the PVC pipe wall thickness. Twist-drill bits and auger bits shall be prohibited.

9.4.2.4 Saddle tapping procedure. The following procedures shall be followed when making a saddle tap:

1. The service clamp or saddle shall be evenly tightened on the pipe. Visible distortion of the pipe indicates overtightening and shall be prohibited. The inlet side of the main stop or corporation stop shall be screwed into the saddle threads. The main-stop valve shall then be opened.
2. The drilling machine shall be attached to the main-stop outlet threads.
3. The boring bar shall be lowered to the main and rotated using finger-pull pressure on the feed handle. Cutting the hole shall require only finger-pull effort, allowing the cutter to work without being forced through the pipe wall. The ratchet handle shall be rotated at least one complete turn for every ⅛ turn of the feed yoke.
4. After the hole has been cut, the cutter should be advanced through the hole with two or more full turns. The cutter shall then be withdrawn, the main stop closed, and the drilling machine removed from the pipe. If leakage is observed past the threads, the main stop should be tightened.

9.4.3 *Tapping sleeve and valve.* Tapping sleeves are used when making a service connection larger than 2 in. (50 mm). Tapping sleeves may be used for making large taps under pressure. The use of tapping sleeves and valves is recommended for all sizes and classes of PVC pressure pipe. When making this type of connection, equipment is used that attaches to the valve and permits a cutting tool to be fed through the valve to cut a hole in the PVC pressure pipe.

9.4.3.1 Tapping sleeve. Tapping sleeves should provide full support around the circumference of the pipe. The tapping sleeve should be well supported independently from the pipe during the tapping operation. Support used should be left in place after tapping. Thrust restraint shall be provided with tapping sleeves as it would with any other fitting or appurtenance.

9.4.3.2 Cutting tool. The tapping machine shall use a cutting tool that is a toothed core cutter that retains the coupon cut from the pipe. The cutting tool shall have a throat depth that exceeds the PVC pipe wall thickness.

9.4.3.3 Tapping sleeve procedure. The following procedures shall be followed when making a sleeve tap:

1. The tapping sleeve shall be installed on the pipe to be tapped in accordance with the sleeve manufacturer's instructions. The mounting bolts shall be tightened to manufacturer's requirements. Over-tightened bolts can induce stress into the pipe being tapped. Failure to use lubrication on mat-type gaskets can induce stress into the pipe being tapped.

2. The tapping valve shall be attached to the tapping sleeve. The tapping valve is typically a specialty valve with a gasket-flanged connection to the outlet side and an MJ-type connection to the tapping machine side.

3. Provide a low-pressure (5-psi) pressure test to the tapping sleeve and tapping valve to verify a pressure-tight seal between the tapping sleeve and the pipeline to be tapped. The application of a soapy water solution to the outside of the pipe at the pipe-gasket interface can facilitate the detection of an air leak.

4. The tapping sleeve and valve shall be supported independently from the pipe. Supports shall be left in place after tapping.

5. The required PVC cutter and support hardware shall be installed.

6. The drilling machine shall be attached to the tapping valve.

7. Temporary supports shall be installed under the tapping machine to support it independently from the pipe, sleeve, and valve.

8. The tapping valve shall be opened.

9. The cutter shall be advanced to the pipe being tapped.

10. The cutter shall be engaged and the tapping hole cut. On power-operated tapping machines, the advance rate, the cutting rate, and the travel distance shall be set per manufacturer's recommendations. If using a hand-operated model, the proper advance rate, cutting rate, and travel distance shall be ensured.

11. After the hole has been cut, the cutter shall be retracted, the tapping valve closed, and the tapping machine removed.

12. The new line shall be attached.

9.4.3.4 Tap spacing. Placement restrictions vary by the diameter of the pipe that is being cut into, as follows:

9.4.3.4.1 Tap not closer than 24 in. (600 mm) from both the back of the bell and the spigot insertion line for pipes with diameters of 12 in. or less.

9.4.3.4.2 Tap not closer than 36 in. (900 mm) from both the back of the bell and the spigot insertion line for pipes with diameters of 14 in. or more.

9.4.4 *Safety precautions.* The following safety precautions are always recommended when tapping a pressurized pipe:

1. Personnel on the surface should have a clear understanding of the valve location(s) and operation necessary to isolate the tapping site in the event of a problem.
2. At least one worker should remain on the surface (out of the trench) during the tapping operation.
3. The tapping-machine operator should wear protective goggles and be provided with a ladder or other appropriate means to exit the trench quickly and safely.
4. The pipe adjacent to the tap should be covered with a protective blanket.

SECTION 10: PREPARATION FOR USE

Sec. 10.1 Potable Water Pipe Cleaning

Before filling, testing, and disinfecting the installed line, the constructor shall ensure the line is clean in conformance with ANSI/AWWA C651. To facilitate effective disinfection and minimize the chlorine dosage needed, when practicable, predisinfection flushing should continue until the discharge turbidity drops below 5 ntu, using measurement procedures described in AWWA Manual M12.

Sec. 10.2 Filling and Flushing

Lines shall be filled slowly with potable water at a maximum velocity of 1 ft/sec (0.3 m/sec) while venting air. Precautions shall be taken to prevent entrapping air in the lines. After filling, lines shall be flushed at blowoffs and dead ends at a minimum velocity of 3 ft/sec (0.9 m/sec). A minimum of three changes of treated water shall be used in flushing operations. Valves shall be closed slowly to prevent excessive surges while maintaining positive pressure at all times throughout the new line. Flushing water shall be discharged without causing erosion damage, nuisance, or interruption of traffic. Disposal of flushing water shall be in accordance with Sec. 7.1.1.2. A special pipeline pig may be required when the required flushing velocity cannot be achieved or when needed to conserve water. The constructor shall make provisions for launching and retrieving the pig.

Sec. 10.3 Hydrostatic Testing

WARNING: Hydrostatic testing described in this section shall be conducted with water or other environmentally safe, incompressible fluids, because of the

inherent safety hazard potential associated with testing components and systems with compressed air or other compressed gases.

10.3.1 *General.* The constructor shall provide measurement gauges and recording devices for the test, including pump, pipe, connections, and other necessary apparatus, unless otherwise specified by the purchaser, and shall provide the necessary assistance to conduct the test. Before testing, the constructor shall place sufficient backfill to prevent pipe movement. When local conditions require that the trenches be backfilled immediately after the pipe has been laid, the testing may be carried out after backfilling has been completed but before placement of permanent surfacing. The constructor shall ensure thrust-blocking or other types of restraining systems will provide adequate restraint before pressurizing the pipeline. Refer to Sec. 8.8.4 for backfilling requirements.

10.3.2 *Cross-connection control.* When existing water mains are used to supply test water, they should be protected from backflow contamination by temporarily installing a double-check-valve assembly between the test and supply main or by other means approved by the purchaser. Before pressure and leakage testing, the temporary backflow protection should be removed and the main under test isolated from the supply main.

10.3.3 *Procedure.* Tests shall be performed only after the pipeline has been properly filled, flushed, and purged of air. The specified test pressure shall be applied by means of an approved pumping assembly connected to the pipe in a manner satisfactory to the purchaser. The test pressure shall not exceed the design pressure of the pipe, fittings, valves, or thrust restraints. If necessary, the test pressure shall be maintained by additional pumping for the specified time. During tests, the system and exposed pipe, fittings, valves, and hydrants shall be carefully examined for leakage. Visible leaks shall be stopped. Defective elements shall be repaired or removed and replaced and the test repeated until the test requirements have been met.

10.3.4 *Test duration.* The duration of the hydrostatic test shall be 2 hr.

10.3.5 *Test pressure.* The hydrostatic test pressure shall not be less than 1.25 times the stated anticipated maximum sustained working pressure of the pipeline measured at the highest elevation along the test section and not less than 1.5 times the stated sustained working pressure at the lowest elevation of the test section. However, in no case shall the test pressure exceed the rated working pressure for any joint, thrust restraint, valve, fitting, or other connected appurtenance of the test section.

10.3.6 *Test allowance.* The testing allowance shall be defined as the quantity of water that must be supplied to the pipe section being tested to maintain a pressure within 5 psi (34 kPa) of the specified hydrostatic test pressure. No installation will be accepted if the quantity of makeup water is greater than that determined by the formula:

$$Q = \frac{LD\sqrt{P}}{148{,}000} \qquad \text{(Eq 1)}$$

Where:

Q = quantity of makeup water, in gallons per hour
L = length of pipe section being tested, in ft
D = nominal diameter of the pipe, in in.
P = average test pressure during the hydrostatic test, in pounds per square in. (gauge)

In metric units,

$$Q_m = \frac{LD\sqrt{P}}{795{,}000} \qquad \text{(Eq 2)}$$

Where:

Q_m = quantity of makeup water, in liters per hour
L = length of pipe section being tested, in meters
D = nominal diameter of the pipe, in millimeters
P = average test pressure during the leakage test, in kilopascals

These formulas are based on a testing allowance of 10.5 gpd/mi/in. (0.978 L/day/km/mm) of nominal diameter at a pressure of 150 psi (1,030 kPa).

10.3.6.1 Allowance tables. Makeup water allowances for various pipe diameters and test pressures are provided in Tables 4a and 4b.

10.3.6.2 Metal-seated valves. When testing against closed metal-seated valves, an additional allowance per closed valve of 0.0078 gph/in. (0.0012 L/hr/mm) of nominal valve size shall be allowed.

10.3.6.3 Hydrant. When hydrants are in the test section, the test shall be made against closed hydrant valves.

10.3.6.4 Visible leaks. Visible leaks shall be repaired, regardless of the amount of leakage.

Sec. 10.4 Disinfecting Potable Water Lines

Prior to placing any installed potable water line in service, the new pipe and exposed sections and appurtenances of existing pipelines shall be cleaned and

Table 4a Hydrostatic test makeup water allowances per 1,000 ft (50 joints) of PVC pipe, (US gal/hr)

Avg. Test Pressure		Nominal Pipe Diameter, *in. (mm)*													
psi	*(kPa)*	4	6	8	10	12	14	16	18	20	24	30	36	42	48
300	(2,070)	0.47	0.70	0.94	1.17	1.40	1.64	1.87	2.11	2.34	2.81	3.51	4.21	4.92	5.62
275	(1,900)	0.45	0.67	0.90	1.12	1.34	1.57	1.79	2.02	2.24	2.69	3.36	4.03	4.71	5.38
250	(1,720)	0.43	0.64	0.85	1.07	1.28	1.50	1.71	1.92	2.14	2.56	3.21	3.85	4.49	5.13
225	(1,550)	.041	.061	.081	1.01	1.22	1.42	1.62	1.82	2.03	2.43	3.04	3.65	4.26	4.86
200	(1,380)	0.38	0.57	0.76	0.96	1.15	1.34	1.53	1.72	1.91	2.29	2.87	3.44	4.01	4.59
175	(1,210)	0.36	0.54	0.72	0.89	1.07	1.25	1.43	1.61	1.79	2.15	2.68	3.22	3.75	4.29
150	(1,030)	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.99	2.48	2.98	3.48	3.97
125	(860)	0.30	0.45	0.60	0.76	0.91	1.06	1.21	1.36	1.51	1.81	2.27	2.72	3.17	3.63
100	(690)	0.27	0.41	0.54	0.68	0.81	0.95	1.08	1.22	1.35	1.62	2.03	2.43	2.84	3.24
75	(520)	0.23	0.35	0.47	0.59	0.70	0.82	0.94	1.05	1.17	1.40	1.76	2.11	2.46	2.81
50	(340)	0.19	0.29	0.38	0.48	0.57	0.67	0.76	0.86	0.96	1.15	1.43	1.72	2.01	2.29

Table 4b Hydrostatic test makeup water allowance per 305 m (50 joints) of PVC pipe (L/hr)

Average Test Pressure	Nominal Pipe Diameter *(mm)*													
(kPa)	100	150	200	250	300	350	400	450	500	600	750	900	1,050	1,200
2,200	1.8	2.7	3.6	4.5	5.4	6.3	7.2	8.1	9.0	10.8	13.5	16.2	18.9	21.6
2,000	1.7	2.6	3.4	4.3	5.1	6.0	6.9	7.7	8.6	10.3	12.9	15.4	18.0	20.6
1,800	1.6	2.4	3.3	4.1	4.9	5.7	6.5	7.3	8.1	9.8	12.2	14.6	17.1	19.5
1,600	1.5	2.3	3.1	3.8	4.6	5.4	6.1	6.9	7.7	9.2	11.5	13.8	16.1	18.4
1,400	1.4	2.2	2.9	3.6	4.3	5.0	5.7	6.5	7.2	8.6	10.8	12.9	15.1	17.2
1,200	1.3	2.0	2.7	3.3	4.0	4.7	5.3	6.0	6.6	8.0	10.0	12.0	14.0	15.9
1,000	1.2	1.8	2.4	3.0	3.6	4.2	4.9	5.5	6.1	7.3	9.1	10.9	12.7	14.6
800	1.1	1.6	2.2	2.7	3.3	3.8	4.3	4.9	5.4	6.5	8.1	9.8	11.4	13.0
600	0.9	1.4	1.9	2.3	2.8	3.3	3.8	4.2	4.7	5.6	7.0	8.5	9.9	11.3
400	0.8	1.2	1.5	1.9	2.3	2.7	3.1	3.5	3.8	4.6	5.8	6.9	8.1	9.2
200	0.5	0.8	1.1	1.4	1.6	1.9	2.2	2.4	2.7	3.3	4.1	4.9	5.7	6.5

disinfected in accordance with ANSI/AWWA C651, unless otherwise specified. Pipelines shall be flushed following completion of disinfection procedures. Disposal or neutralization of disinfection water shall comply with applicable regulations (refer to appendix B of ANSI/AWWA C651).

Sec. 10.5 Notice of Nonconformance

If the installation does not meet the requirements of this standard, the constructor shall be notified by the purchaser promptly and the installation shall be made satisfactory by the constructor.

Sec. 10.6 Affidavit of Compliance

The constructor shall provide a sworn statement that the installation complies with the requirements of this standard.

APPENDIX L

PPI – HANDBOOK OF PE PIPE – CHAPTER 2

CHAPTER 2

Inspections, Tests and Safety Considerations

Scope

Once a polyethylene piping system has been selected and designed for an application, the design is implemented by securing the pipe, fittings and other necessary appurtenances, installing the system, and placing it in service. Piping installation involves setting various parts, people, and machines in motion to obtain, assemble, install, inspect and test the piping system. Whenever machinery, piping parts, and personnel are engaged in piping system construction, safety must be a primary consideration.

This chapter presents some of the inspections, tests and safety considerations related to installing polyethylene piping, placing an installed system into service, and operating a polyethylene piping system.

This chapter does not purport to address all of the product applications, inspections, tests, or construction practices that could be used, nor all of the safety practices necessary to protect persons and property. It is the responsibility of the users of this chapter, and the installers, inspectors and operators of piping systems to establish appropriate safety and health practices, and to determine the applicability of regulatory limitations before any use, installation, inspection, test or operation.

Introduction

Generally, piping system installation begins with obtaining the pipe, fittings, and other goods required for the system. Assembly and installation follow, then system testing and, finally, release for operation. Throughout the installation process, various inspections and tests are performed to ensure installed system quality, and that the system when completed is capable of functioning according to its design specifications. In the selection, design, and installation of polyethylene piping systems, professional engineering services and qualified installers should be used.

Handling and Storage

After the piping system has been designed and specified, the piping system components must be obtained. Typically, project management and purchasing personnel work closely together so that the necessary components are available when they are needed for the upcoming construction work.

Receiving Inspection

Few things are more frustrating and time consuming than not having what you need, when you need it. Before piping system installation begins, an important initial step is a receiving inspection of incoming products. Construction costs can be minimized, and schedules maintained, by checking incoming goods to be sure the parts received are the parts that were ordered, and that they arrived in good condition and are ready for installation.

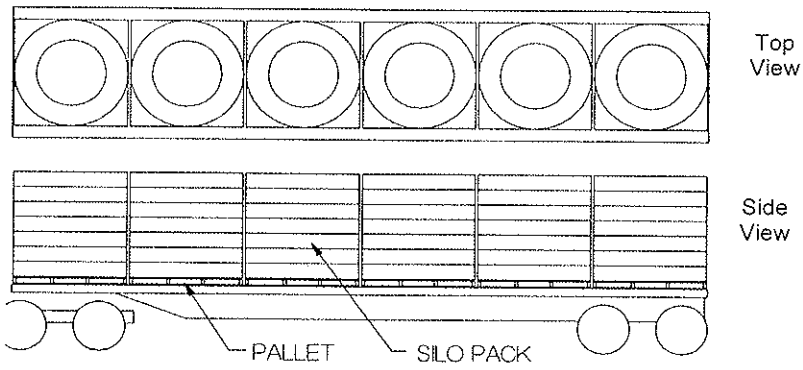


Figure 1 Typical Silo Bulk Pack Truckload

Polyethylene pipe, fittings, and fabrications are usually shipped by commercial carriers who are responsible for the products from the time they leave the manufacturing plant until they are accepted by the receiver. Pipe and fabricated fittings and structures are usually shipped on flatbed trailers. Smaller fittings may be shipped in enclosed vans, or on flatbed trailers depending upon size and packaging. Molded fittings are usually boxed, and shipped by commercial parcel services.

Product Packaging

Depending on size, polyethylene piping is produced in coils or in straight lengths. Coils are stacked together into silo packs. Straight lengths are bundled together in bulk packs or loaded on the trailer in strip loads. Standard straight lengths for conventionally extruded pipe are 40′ long; however, lengths up to 60′ long may be produced. Profile extruded pipes are typically produced in 20′ lengths. State

transportation restrictions on length, height and width usually govern allowable load configurations. Higher freight costs will apply to loads that exceed length, height, or width restrictions. Although polyethylene pipe is lightweight, weight limitations may restrict load size for very heavy wall or longer length pipe.

Extruded profile pipe lengths are usually shipped on standard 40′ flatbed trailers. Pipes are commonly packaged in strip loads. Pipes 96″ ID (2438 mm ID) and 120″ ID (3048 mm ID) will exceed 8′ overall width, and are subject to wide load restrictions.

Figures 1 through 3 are general illustrations of truckload and packaging configurations. Actual truckloads and packaging may vary from the illustrations.

Small fittings are packaged in cartons which may be shipped individually by package carriers. Large orders may be palletized and shipped in enclosed vans. Large fittings and custom fabrications may be packed in large boxes on pallets, or secured to pallets.

Occasionally, when coiled pipe silos and boxed fittings are shipped together, fitting cartons are placed in the center of the silo packs. Tanks, manholes, and large fittings and custom fabrications are usually loaded directly onto flatbed trailers.

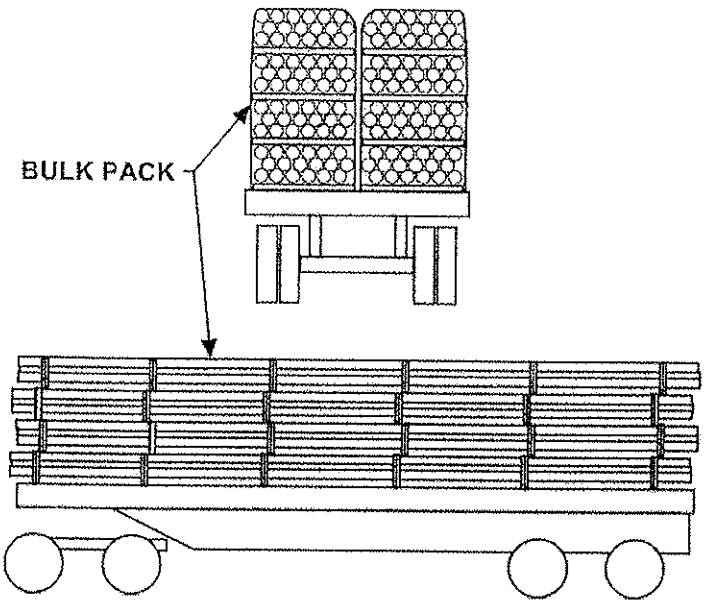


Figure 2 Typical Bulk Pack Truckload

Checking the Order

When a shipment is received, it should be checked to see that the correct products and quantities have been delivered. Several documents are used here. The **Purchase Order** or the **Order Acknowledgment** lists each item by its description, and the required quantity. The incoming load will be described in a **Packing List** which is attached to the load. The descriptions and quantities on the Packing List should match those on the Purchase Order or the Order Acknowledgment.

The carrier will present a Bill of Lading that generally describes the load as the number of packages the carrier received from the manufacturing plant. The Order Acknowledgment, Packing List, and Bill of Lading should all be in agreement. Any discrepancies must be reconciled between the shipper, the carrier, and the receiver. The receiver should have a procedure for reconciling any such discrepancies.

Load Inspection

There is no substitute for visually inspecting an incoming shipment to verify that the paperwork accurately describes the load. Products are usually identified by markings on each individual product. These markings should be checked against the Order Acknowledgment and the Packing List. The number of packages and their descriptions should be checked against the Bill of Lading.

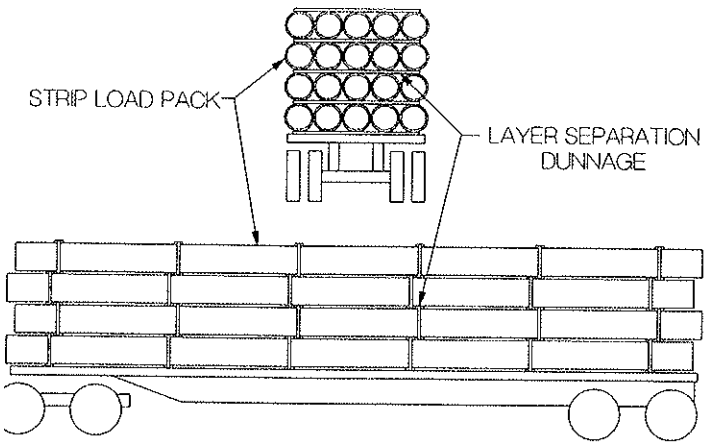


Figure 3 Typical Strip Load Truckload

This is the time to inspect for damage which may occur anytime products are handled. Obvious damage such as cuts, abrasions, scrapes, gouges, tears, and punctures should be carefully inspected.

Receiving Report and Reporting Damage

The delivering truck driver will ask the person receiving the shipment to sign the Bill of Lading, and acknowledge that the load was received in good condition. Any damage, missing packages, etc. should be noted on the bill of lading at that time.

Shipping problems such as damage, missing packages, document discrepancies, incorrect product, etc. should be reported to the product supplier immediately. Shipping claims must be filed as soon as possible as required by trade practice.

Unloading Instructions

Before unloading the shipment, there must be adequate, level space to unload the shipment. The truck should be on level ground with the parking brake set and the wheels chocked. Unloading equipment must be capable of safely lifting and moving pipe, fittings, fabrications or other components.

WARNING: Unloading and handling must be performed safely. Unsafe handling can result in damage to property or equipment, and be hazardous to persons in the area. Keep unnecessary persons away from the area during unloading.

WARNING: Only properly trained personnel should operate unloading equipment.

Unloading Site Requirements

The unloading site must be relatively flat and level. It must be large enough for the carrier's truck, the load handling equipment and its movement, and for temporary load storage. Silo packs and other palletized packages should be unloaded from the side with a forklift. Non-palletized pipe, fittings, fabrications, manholes, tanks, or other components should be unloaded from above with lifting equipment and wide web slings, or from the side with a forklift. The lifting slings/cables must be capable of safely carrying the weight of the product being unloaded. Damaged slings/cables must not be used.

Handling Equipment

Appropriate unloading and handling equipment of adequate capacity must be used to unload the truck. Safe handling and operating procedures must be observed.

Pipe must not be rolled or pushed off the truck. Pipe, fittings, fabrications, tanks, manholes, and other components must not be pushed or dumped off the truck, or dropped.

Although polyethylene piping components are lightweight compared to similar components made of metal, concrete, clay, or other materials, larger components can be heavy. Lifting and handling equipment including cables and slings must have

adequate rated capacity to lift and move components from the truck to temporary storage. Equipment such as a forklift, a crane, a side boom tractor, or an extension boom crane may be used for unloading.

When using a forklift, or forklift attachments on equipment such as articulated loaders or bucket loaders, lifting capacity must be adequate at the load center on the forks. Forklift equipment is rated for a maximum lifting capacity at a distance from the back of the forks. (See Figure 4.) If the weight-center of the load is farther out on the forks, lifting capacity is reduced.

Before lifting or transporting the load, forks should be spread as wide apart as practical, forks should extend completely under the load, and the load should be as far back on the forks as possible.

WARNING: During transport, a load on forks that are too short or too close together, or a load too far out on the forks, may become unstable and pitch forward or to the side, and result in damage to the load or property, or hazards to persons.

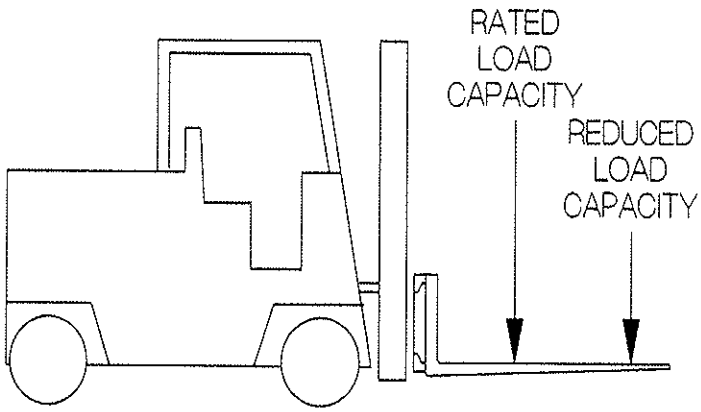


Figure 4 Forklift Load Capacity

Lifting equipment such as cranes, extension boom cranes, and side boom tractors, should be hooked to wide web choker slings that are secured around the load or to lifting lugs on the component. Only wide web slings should be used. Wire rope slings and chains can damage components, and should not be used. Spreader bars should be used when lifting pipe or components longer than 20'.

WARNING: Before use, inspect slings and lifting equipment. Equipment with wear or damage that impairs function or load capacity should not be used.

Unloading Large Fabrications, Manholes and Tanks

Large fabrications, manholes and tanks should be unloaded using a wide web choker sling and lifting equipment such as an extension boom crane, crane or lifting

boom. The choker sling is fitted around the manhole riser or near the top of the tank. Do not use stub outs, outlets, or fittings as lifting points, and avoid placing slings where they will bear against outlets or fittings. Larger diameter manholes and tanks are typically fitted with lifting lugs.

WARNING: All lifting lugs must be used. The weight of the manhole or tank is properly supported only when all lugs are used for lifting. Do not lift tanks or manholes containing liquids.

Pre-Installation Storage

The size and complexity of the project and the components will determine pre-installation storage requirements. For some projects, several storage or staging sites along the right-of-way may be appropriate, while a single storage location may be suitable for another job.

The site and its layout should provide protection against physical damage to components. General requirements are for the area to be of sufficient size to accommodate piping components, to allow room for handling equipment to get around them, and to have a relatively smooth, level surface free of stones, debris, or other material that could damage pipe or components, or interfere with handling. Pipe may be placed on 4-inch wide wooden dunnage, evenly spaced at intervals of 4 feet or less.

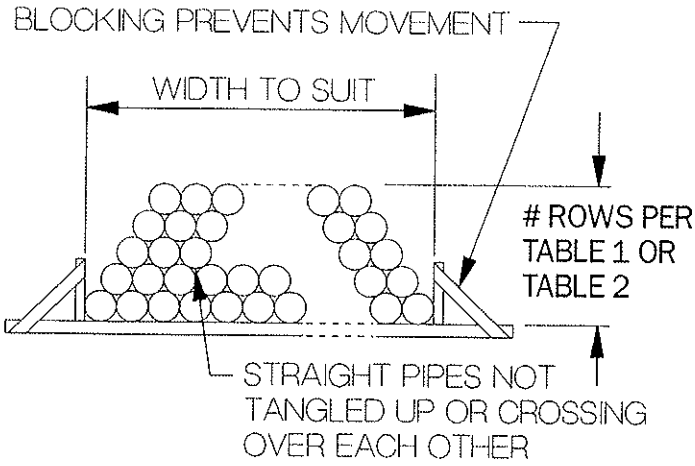


Figure 5 Loose Pipe Storage

TABLE 1

Suggested Jobsite Loose Storage Stacking Heights for Conventionally Extruded Pipe Lengths[1]

Pipe Size	Suggested Stacking Height* - Rows	
	DR Above 17	DR 17 & Below
4	15	12
5	12	10
6	10	8
8	8	6
10	6	5
12	5	4
14	5	4
16	4	3
18	4	3
20	3	3
22	3	2
24	3	2
26	3	2
28	2	2
30	2	2
32	2	2
36	2	1
42	1	1
48	1	1
54	1	1
63	1	1

* Stacking heights based on 6' for level terrain and 4' for less level terrain.

Pipe received in bulk packs or strip load packs should be stored in the same package. If the storage site is flat and level, bulk packs or strip load packs may be stacked evenly upon each other to an overall height of about 6'. For less flat or less level terrain, limit stacking height to about 4'.

Before removing individual pipe lengths from bulk packs or strip load packs, the pack must be removed from the storage stack, and placed on the ground.

Individual pipes may be stacked in rows. Pipes should be laid straight, not crossing over or entangled with each other. The base row must be blocked to prevent sideways movement or shifting. (See Figure 5, Table 1, and Table 2.) The interior of stored pipe should be kept free of debris and other foreign matter.

TABLE 2

Suggested Jobsite Loose Storage Stacking Heights for Extruded Profile Pipe[2]

Pipe Size	Suggested Stacking Height* Rows
18	4
21	3
27	2
30	2
33	2
36	1
42	1
48	1
54	1
60	1
66	1
72	1
84	1
96	1
120	1

*Suggested stacking heights based on 6' for level terrain and 4' for less level terrain.

Exposure to UV and Weather

Polyethylene pipe products are protected against deterioration from exposure to ultraviolet light and weathering effects. Color and black products are compounded with antioxidants, thermal stabilizers, and UV stabilizers. Color products use sacrificial UV stabilizers that absorb UV energy and are eventually depleted. In general, non-black products should not remain in unprotected outdoor storage for more than 2 years; however, some manufacturers may allow longer unprotected outside storage. Black products contain at least 2% carbon black to protect the material from UV deterioration. Black products with and without stripes are generally suitable for unlimited outdoor storage and for service on the surface or above grade.[11, 12, 13, 14]

Cold Weather Handling

Temperatures near or below freezing will affect polyethylene pipe by reducing flexibility and increasing vulnerability to impact damage. Care should be taken not to drop pipe, or fabricated structures, and to keep handling equipment and other things from hitting pipe. Ice, snow, and rain are not harmful to the material, but may make storage areas more troublesome for handling equipment and personnel. Unsure footing and traction require greater care and caution to prevent damage or injury.

Walking on pipe can be dangerous. Inclement weather can make pipe surfaces especially slippery.

WARNING: Keep safety first on the jobsite; do not walk on pipe.

General Considerations During Installation

Joining and Connections

For satisfactory material and product performance, system designs and installation methods rely on appropriate, properly made connections. An inadequate or improperly made field joint may cause installation delays, may disable or impair system operations, or may create hazardous conditions.

Polyethylene piping products are connected using heat fusion, electrofusion, thermal welding, and mechanical methods such as gasketed bell-and-spigot joints, flanges, and compression couplings. Joining and connection methods will vary depending upon requirements for internal or external pressure, leak tightness, restraint against longitudinal movement (thrust load capacity), gasketing requirements, construction and installation requirements, and the product.

Connection design limitations and manufacturer's joining procedures must be observed. Otherwise, the connection or products adjacent to the connection may leak or fail, which may result in property damage or hazards to persons.

The tools and components required to construct and install joints in accordance with manufacturer's recommendations should always be used. However, field connections are controlled by, and are the responsibility of, the field installer.

Field Joining

All field connection methods and procedures require that the component ends to be connected must be clean, dry, and free of detrimental surface defects before the connection is made. Contamination and unsuitable surface conditions usually produce an unsatisfactory connection. Gasketed joints may require appropriate lubrication.

Cleaning

Before joining, and before any special surface preparation, surfaces must be clean and dry. General dust and light soil may be removed by wiping the surfaces with clean, dry, lint-free cloths. Heavier soil may be washed or scrubbed off with soap and water solutions, followed by thorough rinsing with clear water, and drying with dry, clean, lint-free cloths.

WARNING: Before using chemical cleaning solvents, the potential risks and hazards to persons should be known by the user, and appropriate safety precautions must be taken. Chemical solvents may be hazardous substances that may require special handling and personal protective equipment.

The manufacturer's instructions for use, and the material safety data sheet (MSDS) for the chemical should be consulted for information on risks to persons and for safe handling and use procedures. Some solvents may leave a residue on the pipe, or may be incompatible with the material. See PPI Technical Report TR-19, Thermoplastics Piping for the Transport of Chemicals for additional information on chemical compatibility of polyethylene materials.[4]

Field Fusion Joining

Heat fusion joining requires specialized equipment for socket, saddle, or butt fusion, or electrofusion. Heat fusion joining may be performed in any season. During inclement weather, a temporary shelter should be set up over the joining operation to shield heat fusion operations from rain, frozen precipitation and cold winds. It is strongly recommended that installers consult with the manufacturer's recommended joining procedures before installation begins.

WARNING: Most heat fusion equipment is not explosion-proof. The fusion equipment manufacturer's safety instructions must be observed at all times and especially when heat fusion is to be performed in a potentially volatile atmosphere.

WARNING: When installing large diameter polyethylene pipe in a butt fusion machine, do not bend the pipe against an open fusion machine collet or clamp. The pipe may suddenly slip out of the open clamp, and cause injury or damage.

Field Handling

Polyethylene pipe is tough, lightweight, and flexible. Installation does not usually require high capacity lifting equipment. See "Handling and Storage" for information on handling and lifting equipment.

WARNING: To prevent injury to persons or property, safe handling and construction practices must be observed at all times. The installer must observe all applicable Local, State, and Federal Safety Codes, and any safety requirements specified by the owner or the project engineer.

Pipe up to about 8" (219 mm) diameter and weighing roughly 6 lbs per foot (20 kg per m) or less can usually be handled or placed in the trench manually. Heavier, larger diameter pipe will require appropriate handling equipment to lift, move and lower the pipe. Pipe must not be dumped, dropped, pushed, or rolled into a trench.

WARNING: Appropriate safety precautions must be observed whenever persons are in or near a trench.

Coiled lengths and long strings of heat-fused polyethylene pipe may be cold bent in the field. Field bending usually involves sweeping or pulling the pipe string into the desired bend radius, then installing permanent restraint such as embedment around a buried pipe, to maintain the bend.

WARNING: Considerable force may be required to field bend the pipe, and the pipe may spring back forcibly if holding devices slip or are inadvertently released while bending. Observe appropriate safety precautions during field bending.

These paragraphs have attempted to convey the primary safety and handling considerations associated with joining and connecting polyethylene pipe. For a more thorough discussion on the joining methods used with polyethylene pipe, the reader is referred to the joining procedures chapter in this Handbook, and PPI's TR-33 Generic Fusion Procedures.

Inspection and Testing

Pre-Construction

Inspections and tests begin before construction. Jobsite conditions dictate how piping may be installed and what equipment is appropriate for construction. Soil test borings and test excavations may be useful to determine soil bearing stress and whether or not native soils are suitable as backfill materials.

In slipline rehabilitation applications, the deteriorated pipeline should be inspected by remote TV camera to locate structurally deteriorated areas, obstructions, offset and separated joints, undocumented bends, and service connections. In some cases, a test pull, drawing a short section of slipliner through the line, may be conducted to ensure that the line is free of obstructions.

The installer should carefully review contract specifications and plans. It is important that the specifications and plans fit the job. Different piping materials require different construction practices and procedures. These differences should be accurately reflected in the contract documents. Good plans and specifications help protect all parties from unnecessary claims and liabilities. Good documents also set minimum installation quality requirements, and the testing and inspection requirements that apply during the job.

All incoming materials should be inspected to be sure that sufficient quantities of the correct products for the job are at hand, and that they arrived in good condition, ready for installation.

During Construction

Tests and inspections performed during construction include butt fusion joint quality tests, soil compaction and density tests, pipe deflection tests, pressure tests, and other relevant inspections. Fusion joint qualification and inspection guidelines for butt, socket and saddle fusions should be obtained from the pipe or fitting manufacturer.

Butt Fusion Joint Quality

Visual inspection is the most common joint evaluation method for all sizes of conventionally extruded polyethylene pipe. Visual inspection criteria for butt fusion joints should be obtained from the pipe manufacturer. Computer controlled ultrasonic inspection equipment is available for 12″ IPS and smaller pipes with walls 1″ or less in thickness. Equipment for larger diameters and wall thickness is being developed. X-ray inspection is generally unreliable because x-ray is a poor indicator of fusion quality.

When butt fusion is between pipe and molded fittings, the fitting-side bead may exhibit shape irregularities which are caused by the fitting manufacturing process. A slightly irregular fitting-side bead may not indicate an improper joint, provided that the pipe-side bead is properly shaped, and the v-groove between the beads is correct. Contact the pipe or fitting manufacturer if assistance is required.

Fusion joining may be destructively tested to confirm joint integrity, operator procedure, and fusion machine set-up. A field-performed destructive test is a bent strap test.

The bent strap test specimen is prepared by making a trial butt fusion, usually the first fusion of the day, and allowing it to cool to ambient temperature. A test strap that is at least 6″ or 15 pipe wall thicknesses long on each side of the fusion, and about 1″ or 1-½ wall thicknesses wide, is cut out of the trial fusion pipe. (See Figure 6.) The strap is then bent so that the ends of the strap touch. Any disbondment at the fusion is unacceptable, and indicates poor fusion quality. If failure occurs, fusion procedures and/or machine set-up should be changed, and a new trial fusion and bent strap test specimen should be prepared and tested. Field fusion should not proceed until a test joint has passed the bent strap test.

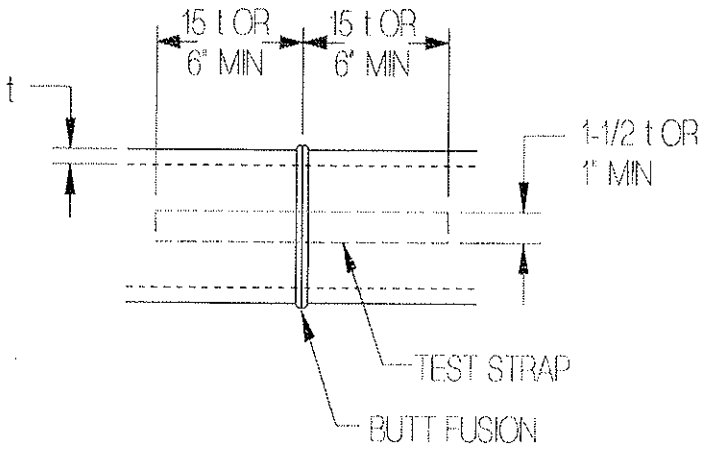


Figure 6 Bent Strap Test Specimen

WARNING: A test strap from thick wall pipe may require considerable effort to bend. Further, the test strap may spring back if the ends are inadvertently released while bending. Appropriate personnel safety precautions should be observed.

Soil Tests

During buried pipe installation, work should be checked throughout the construction period by an inspector who is thoroughly familiar with the jobsite, contract specifications, materials, and installation procedures. Inspections should reasonably ensure that significant factors such as trench depth, grade, pipe foundation (if required), quality and compaction of embedment backfill, and safety are in compliance with contract specifications and other requirements. To evaluate soil stability, density and compaction, appropriate ASTM tests may be required in the contract specifications.

Pipe Surface Damage

Surface damage may occur during construction handling and installation. Significant damage may impair the future performance of the pipeline. The following guidelines may be used to assess surface damage significance.

For polyethylene pressure pipelines, damage or butt fusion misalignment should not exceed 10% of the minimum wall thickness required for the pipeline's operating pressure.[5] Deep cuts, abrasions or grooves cannot be field repaired by hot gas or extrusion welding. Excessive damage may require removal and replacement of the damaged pipe section, or reinforcement with a full encirclement repair clamp. Severely misaligned butt fusions (>10% wall offset) should be cut out and redone.

If damage is not excessive, the shape of the damage may be a consideration. Sharp notches and cuts should be dressed smooth so the notch is blunted. Blunt scrapes or gouges should not require attention. Minor surface abrasion from sliding on the ground or insertion into a casing should not be of concern.

Deflection Tests

Buried flexible pipes rely on properly installed backfill to sustain earthloads and other loads. Proper installation requires using the backfill materials specified by the designer, and installing the pipe as specified by the designer.

Large diameter extruded profile pipes, and larger diameter, high DR conventionally extruded pipes are inherently flexible. Pipe deflection can be used to monitor the installation quality. Improperly embedded pipe can develop significant deflection in a short time, thus alerting the installer and the inspector to investigate the problem. Inspection should be performed as the job progresses, so errors in the installation procedure can be identified and corrected.

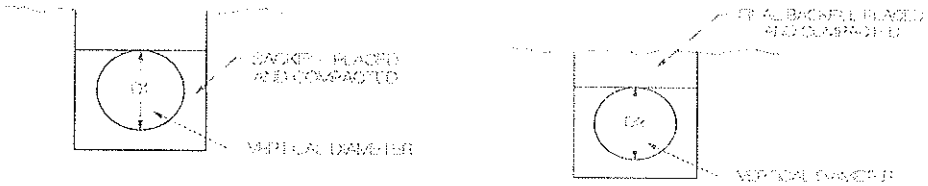


Figure 7 Determining Initial Deflection

Initial deflection checks of extruded profile pipe may be performed after embedment materials have been placed and compacted. The inside diameter of the pipe is measured after backfill materials have been placed to the pipe crown, and compacted. This is D1. Then final backfill materials are placed and compacted, and the pipe inside diameter is measured again at the exact location where the prior measurement was taken. This is D2. (See Figure 7.)

Percent initial deflection is calculated using the following:

$$\%Deflection = \left(\frac{D1 - D2}{D1}\right)100$$

Where D1 and D2 are as defined above and depicted in Figure 7.

Another method to measure deflection is to pull a pre-sized mandrel through the pipe. The mandrel should be sized so that if the pipe exceeds allowable deflection, the mandrel is blocked. (Calculations for mandrel sizing must include some allowance for fusion joint bead size and its reduction of the internal clearance.)

To properly size the mandrel, the allowable vertical diameter of the pipe must be established. It is necessary to account for pipe ID manufacturing tolerances and any ovality that may occur during shipping. Pipe base ID dimensions and tolerances should be obtained from the manufacturer. The maximum mandrel diameter is calculated as follows:

$$D_M = D - \left(\frac{Dy}{100}\right)$$

WHERE
DM = maximum mandrel diameter, in
D = base pipe ID, in

$$D = D_i - \sqrt{A^2 + B^2}$$

Di = nominal pipe ID, in
A = ID manufacturing tolerance, in
B = shipping ovality, in

$$B = 0.03\, D_i$$

y = allowable deflection, percent

Deflection tests of conventionally extruded pipe may be performed in the same manner. However, conventionally extruded pipe is manufactured to a controlled outside diameter, so the inside diameter is subject to the combined tolerances of the outside diameter and the wall thickness.

Post Installation

Leak Testing

The intent of leak testing is to find unacceptable faults in a piping system. If such faults exist, they may manifest themselves by leakage or rupture.

Leakage tests may be performed if required in the Contract Specifications. Testing may be conducted in various ways. Internal pressure testing involves filling the test section with a nonflammable liquid or gas, then pressurizing the medium. Hydrostatic pressure testing with water is the preferred and recommended method. Other test procedures may involve paired internal or end plugs to pressure test

individual joints or sections, or an initial service test. Joints may be exposed to allow inspection for leakage.

Liquids such as water are preferred as the test medium because less energy is released if the test section fails. During a pressure test, energy (internal pressure) is applied to stress the test section. If the test medium is a compressible gas, then the gas is compressed and absorbs energy while applying stress to the pipeline. If a failure occurs, both the pipeline stress energy and the gas compression energy are suddenly released. However, with an incompressible liquid such as water as the test medium, the energy release is only the energy required to stress the pipeline.

This testing methodology may not apply to gas distribution polyethylene piping systems. The municipal gas utility should be contacted to obtain their protocol for pressure testing of gas distribution pipelines. Additional guidance for testing gas pipelines may also be found in ANSI/GPTC Z380, "Guide for Gas Transmission and Distribution Piping Systems.

WARNING: Pipe system pressure testing is performed to discover unacceptable faults in a piping system. Pressure testing may cause such faults to fail by leaking or rupturing. This may result in failure. Piping system rupture may result in sudden, forcible, uncontrolled movement of system piping or components, or parts of components.

WARNING: Pipe Restraint - The pipe system under test and any closures in the test section should be restrained against sudden uncontrolled movement from failure. Test equipment should be examined before pressure is applied to insure that it is tightly connected. All low pressure filling lines and other items not subject to the test pressure should be disconnected or isolated.

WARNING: Personal Protection - Take suitable precautions to eliminate hazards to personnel near lines being tested. Keep personnel a safe distance away from the test section during testing.

Pressure Testing Precautions

The piping section under test and any closures in the test section should be restrained or otherwise restricted against sudden uncontrolled movement in the event of rupture. Expansion joints and expansion compensators should be temporarily restrained, isolated or removed during the pressure test.

Testing may be conducted on the system, or in sections. The limiting test section size is determined by test equipment capability. If the pressurizing equipment is too small, it may not be possible to complete the test within allowable testing time limits. If so, higher capacity test equipment, or a smaller test section may be necessary.

If possible, test medium and test section temperatures should be less than 100°F (38°C). At temperatures above 100°F (38°C), reduced test pressure is required. Before

applying test pressure, time may be required for the test medium and the test section to temperature equalize. Contact the pipe manufacturer for technical assistance with elevated temperature pressure testing.

References

The following reference publications provide pressure testing information:

ASME B31.1 Power Piping, Section 137, "Pressure Tests."[6]

PPI TR-31 Underground Installation of Polyolefin Piping, Section 7, "System Testing."[1]

ASTM F 1417, Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.[7]

Uni-Bell PVC Pipe Association Standard, Uni-b-6-90 Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe.

The piping manufacturer should be consulted before using pressure testing procedures other than those presented here. Other pressure testing procedures may or may not be applicable depending upon piping products and/or piping applications.

Test Pressure

Test pressure may be limited by valves, or other devices, or lower pressure rated components. Such components may not be able to withstand the required test pressure, and should be either removed from, or isolated from, the section being tested to avoid possible damage to, or failure of, these devices. Isolated equipment should be vented.

- For continuous pressure systems where test pressure limiting components or devices have been isolated, or removed, or are not present in the test section, the maximum allowable test pressure is 1.5 times the system design pressure at the lowest elevation in the section under test.
- If the test pressure limiting device or component cannot be removed or isolated, then the limiting section or system test pressure is the maximum allowable test pressure for that device or component.
- For non-pressure, low pressure or gravity flow systems, consult the piping manufacturer for the maximum allowable test pressure.

Test Duration

For any test pressure from 1.0 to 1.5 times the system design pressure, the total test time including initial pressurization, initial expansion, and time at test pressure, must not exceed eight (8) hours. If the pressure test is not completed due to leakage,

equipment failure, etc., the test section should be de-pressurized, and allowed to "relax" for at least eight (8) hours before bringing the test section up to test pressure again.

Pre-Test Inspection

Test equipment and the pipeline should be examined before pressure is applied to ensure that connections are tight, necessary restraints are in-place and secure, and components that should be isolated or disconnected are isolated or disconnected. All low pressure filling lines and other items not subject to the test pressure should be disconnected or isolated.

Hydrostatic Testing

Hydrostatic pressure testing is preferred and is strongly recommended. The preferred testing medium is clean water. The test section should be completely filled with the test medium, taking care to bleed off any trapped air. Venting at high points may be required to purge air pockets while the test section is filling. Venting may be provided by loosening flanges, or by using equipment vents. Re-tighten any loosened flanges before applying test pressure.

Monitored Make-up Water Test

The test procedure consists of initial expansion, and test phases. During the initial expansion phase, the test section is pressurized to the test pressure, and sufficient make-up water is added each hour for three (3) hours to return to test pressure.[1]

TABLE 3
Test Phase Make-up Amount

Nominal Pipe Size, in	Make-Up Water Allowance (U.S. Gallons per 100 ft of Pipe)		
	1 Hour Test	2 Hour Test	3 Hour Test
1-14	0.06	0.10	0.16
1-1/2	0.07	0.10	0.17
2	0.07	0.11	0.19
3	0.10	0.15	0.25
4	0.13	0.25	0.40
5	0.19	0.38	0.58
5-3/8	0.21	0.41	0.62
6	0.3	0.6	0.9
7-1/8	0.4	0.7	1.0
8	0.5	1.0	1.5
10	0.8	1.3	2.1
12	1.1	2.3	3.4
13-3/8	1.2	2.5	3.7
14	1.4	2.8	4.2
16	1.7	3.3	5.0
18	2.0	4.3	6.5
20	2.8	5.5	8.0
22	3.5	7.0	10.5
24	4.5	8.9	13.3
26	5.0	10.0	15.0
28	5.5	11.1	16.8
30	6.3	12.7	19.2
32	7.0	14.3	21.5
34	8.0	16.2	24.3
36	9.0	18.0	27.0
42	12.0	23.1	35.3
48	15.0	27.0	43.0
54	18.5	31.4	51.7
63	–	–	–

After the initial expansion phase, about four (4) hours after pressurization, the test phase begins. The test phase may be one (1), two (2), or three (3) hours, after which a measured amount of make-up water is added to return to test pressure. If the amount of make-up water added does not exceed Table 3 values, leakage is not indicated.

Non-Monitored Make-Up Water Test

The test procedure consists of initial expansion, and test phases. For the initial expansion phase, make-up water is added as required to maintain the test pressure

for four (4) hours. For the test phase, the test pressure is reduced by 10 psi. If the pressure remains steady (within 5% of the target value) for an hour, no leakage is indicated.

Pneumatic Testing

WARNING: Compressed air or any pressurized gas used as a test medium may present severe hazards to personnel in the vicinity of lines being tested. Extra personnel protection precautions should be observed when a gas under pressure is used as the test medium.

WARNING: Explosive Failure - Piping system rupture during pneumatic pressure testing may result in the explosive, uncontrolled movement of system piping, or components, or parts of components. Keep personnel a safe distance away from the test section during testing.

Pneumatic testing should not be used unless the Owner and the responsible Project Engineer specify pneumatic testing or approve its use as an alternative to hydrostatic testing.

Pneumatic testing (testing with a gas under pressure) should not be considered unless one of the following conditions exists:

- when the piping system is so designed that it cannot be filled with a liquid; or
- where the piping system service cannot tolerate traces of liquid testing medium.

The testing medium should be non-flammable and non-toxic. The test pressure should not exceed the maximum allowable test pressure for any non-isolated component in the test section.

Leaks may be detected using mild soap solutions (strong detergent solutions should be avoided), or other non-deleterious leak detecting fluids applied to the joint. Bubbles indicate leakage. After leak testing, all soap solutions or leak detecting fluids should be rinsed off the system with clean water.

High Pressure Procedure

For continuous pressure rated pipe systems, the pressure in the test section should be gradually increased to not more than one-half of the test pressure, then increased in small increments until the required test pressure is reached. Test pressure should be maintained for ten (10) to sixty (60) minutes, then reduced to the design pressure rating, and maintained for such time as required to examine the system for leaks.

Low Pressure Procedure

For components rated for low pressure service, the specified rated test pressure should be maintained for ten (10) minutes to one (1) hour, but not more than one (1) hour. **Test pressure ratings must not be exceeded.**

Leakage inspections may be performed during this time. If the test pressure remains steady (within 5% of the target value) for the one (1) hour test time, no leakage is indicated.

Pressure testing of gravity-flow sewer lines should be conducted in accordance with ASTM F 1417, Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.(7)

Initial Service Testing

An initial service test may be acceptable when other types of tests are not practical, or where leak tightness can be demonstrated by normal service, or when initial service tests of other equipment are performed. An initial service test may apply to systems where isolation or temporary closures are impractical, or where checking out pumps and other equipment affords the opportunity to examine the system for leakage prior to full-scale operations.

Test Procedure

The piping system should be gradually brought up to normal operating pressure, and held at operating pressure for at least ten (10) minutes. During this time, joints and connections should be examined for visual evidence of leakage.

Non-Testable Systems

Some systems may not be suitable for pressure testing. These systems may contain non-isolatable components, or temporary closures may not be practical. Such systems should be carefully inspected during and after installation. Inspections such as visual examination of joint appearance, mechanical checks of bolt or joint tightness, and other relevant examinations should be performed.

Considerations for Post Start-Up and Operation

Disinfecting Water Mains

Applicable procedures for disinfecting new and repaired potable water mains are presented in standards such as ANSI/AWWA C651, *Disinfecting Water Mains.*(8) ANSI/AWWA C651 uses liquid chlorine, sodium hypochlorite, or calcium

hypochlorite to chemically disinfect the main. Disinfecting solutions containing chlorine should not exceed 12% active chlorine, because greater concentration can chemically attack and degrade polyethylene.

Warning/Caution: After disinfection, all strong concentrations of disinfection solution must be purged from the main pipeline, lateral pipelines, and even service lines. All strong solutions must be flushed with purified potable water prior to isolation or commissioning. Leave no disinfection solution in stagnant or deadend pipe runs.

Cleaning

Pipelines operating at low flow rates (around 2 ft/sec or less) may allow solids to settle in the pipe invert. Polyethylene has a smooth, non-wetting surface that resists the adherence of sedimentation deposits. If the pipeline is occasionally subject to higher flow rates, much of the sedimentation will be flushed from the system during these peak flows. If cleaning is required, sedimentation deposits can usually be flushed from the system with high pressure water.

Water-jet cleaning is available from commercial services. It usually employs high-pressure water sprays from a nozzle that is drawn through the pipe system with a cable.

Pressure piping systems may be cleaned with the water-jet process, or may be pigged. Pigging involves forcing a resilient plastic plug (soft pig) through the pipeline. Usually, hydrostatic or pneumatic pressure is applied behind the pig to move it down the pipeline. Pigging should employ a pig launcher and a pig catcher.

A pig launcher is a wye or a removable spool. In the wye, the pig is fitted into the branch, then the branch behind the pig is pressurized to move the pig into the pipeline and downstream. In the removable pipe spool, the pig is loaded into the spool, the spool is installed into the pipeline, and then the pig is forced downstream.

WARNING: A pig may discharge from the pipeline with considerable velocity and force. The pig catcher is a basket or other device at the end of the line designed to receive the pig when it discharges from the pipeline. The pig catcher provides a means of safe pig discharge from the pipeline.

WARNING: Soft pigs must be used with polyethylene pipe. Scraping finger type or bucket type pigs may severely damage a polyethylene pipe and must not be used.

Commercial pigging services are available if line pigging is required.

Squeeze-Off

Squeeze-off (or pinch-off) is a means of controlling flow in smaller diameter polyethylene pipe and tubing by flattening the pipe between parallel bars. Flow control does not imply complete flow stoppage in all cases. For larger pipes,

particularly at higher pressures, some seepage is likely. If the situation will not allow seepage, then it may be necessary to vent the pipe between two squeeze-offs.

Polyethylene gas pipe manufactured to ASTM D 2513 is suitable for squeeze-off; however, squeeze-off practices are not limited to gas applications. Squeeze-off is applicable to polyethylene PE3408 and PE2406 pressure pipe up to 24" IPS, and up to 100 psi internal pressure. Larger sizes and higher pressures may be possible, but suitable commercial equipment is not widely available, so there is limited experience with larger sizes or higher pressures.

WARNING: Squeeze-off is applicable ONLY to PE2406 and PE3408 polyethylene pipe and tubing. The pipe or tubing manufacturer should be consulted to determine if squeeze-off is applicable to his product, and for specific squeeze-off procedures.

Tools[9]

Squeeze-off tools should have:

- parallel bars that are shaped to avoid pipe damage,
- mechanical stops to prevent over-squeeze pipe damage,
- safety mechanisms to prevent accidental release, and
- a mechanism that controls the rate of closure, and the rate of release.

Typical bar shapes are single round bars, twin round bars, or flat bars with rounded edges. Other bar shapes may also be suitable as long as edge radius requirements are met. See Table 4.

Positive mechanical stops between the bars are essential to prevent over-squeeze and pipe damage. The stops limit bar closure to 70% of twice the maximum wall thickness.[9] For DR or SDR sized polyethylene pipe ONLY, (not tubing or schedule sized pipe), stop distance may be determined by:

$$g = 1.568\left(\frac{D}{DR}\right)$$

WHERE

g = stop gap, in

D = pipe outside diameter, in

DR = pipe dimension ratio

TABLE 4
Squeeze Tool Bar Radius

Pipe Diameter	Minimum Bar Radius
≤ 0.750	0.50
> 0.750 ≤ 2.375	0.63
> 2.375 ≤ 4.500	0.75
> 4.500 ≤ 8.625	1.00
> 8.625 ≤ 16.000	1.50

Consult the pipe manufacturer for stopgap dimensions for tubing sizes.

Typical squeeze-off tools use either a manual mechanical screw or hydraulic cylinders. In either case, a mechanism to prevent accidental bar separation is an essential safety feature of the tool.

Key Elements

Closing and opening rates are key elements to squeezing-off without damaging the pipe. It is necessary to close slowly and release slowly, with slow release being more important. The release rate for squeeze-off should be 0.50 inches/minute or less as specified in ASTM F1041[10] or ASTM F1563.[9] The pipe must be allowed sufficient time to adjust to the high compressive and tensile stresses applied to the pipe's inside wall during squeeze-off.

Research work performed under contract to the Gas Research Institute indicates that the greatest damage potential is during release, especially with heavier wall pipes. Flattening places high compressive stress on the inside wall at the outer edges of the squeeze. Then releasing and opening applies high tensile stress to the same area. The material must be given ample time to accommodate these stresses. Opening too fast may cause excessive strain, and may damage the inside wall.

Lower temperatures will reduce material flexibility and ductility, so in colder weather, closure and opening time must be slowed further.

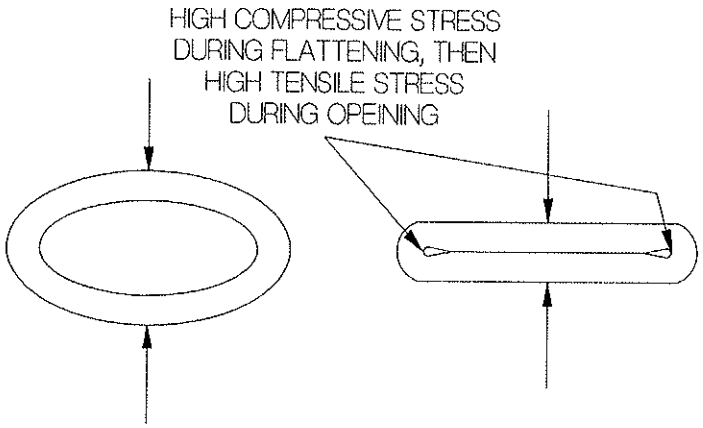


Figure 8 Squeeze-off Stresses

Testing of PE2406 and PE3408 polyethylene piping has shown that when proper procedures and tools are used, squeeze-off can be performed without compromising the expected service life of the system. However, pipe can be damaged during squeeze-off:

- if the manufacturer's recommended procedures are not followed, or
- if the squeeze is held closed too long, or
- from static electric discharge, or
- by altering or circumventing the closure stops, or
- by squeezing-off more than once in the same location.

WARNING: Pipe damaged during squeeze-off could leak or fail at the squeeze-off point. Pipe known or suspected to have been damaged during squeeze-off should be removed from the system, or should be reinforced at the squeeze-off point using a full encirclement clamp.

Procedure

From the installation of the squeeze-off tool to its removal, the total time should not exceed 8 hours. Excessive time may damage the pipe.

1. Select the correct size squeeze tool for the pipe being squeezed. Squeeze bar closure stops must be in place, and must be the correct size for the pipe's diameter and wall thickness or DR.
2. Fit the tool on the pipe so the pipe is centered in the tool, and the tool is square to the pipe. The squeeze-off tool must be at least 3 pipe diameters, or 12 inches, whichever is greater, away from any butt fusion, or any socket, saddle, or mechanical fitting.

WARNING: Static electricity control - When pipe conveying a compressed gas is being flattened, the gas flow velocity through the flattened area increases. High velocity, dry gas, especially with particles present in the flow, can generate a static electric charge on pipe surfaces which can discharge to ground. Before flattening the pipe, the tool should be grounded and procedures to control static charge build-up on pipe surfaces should be employed. Grounding and static control procedures should remain in place for the entire procedure.

3. Operate the bar closing mechanism and, at a controlled rate, flatten the pipe between the bars.

3.1 For 3" IPS and larger pipe, pause at least 1 minute when the pipe is flattened halfway and another minute when 3/4 closed. For all pipe sizes, pause 1 minute when the pipe inside walls make contact.

3.2 After pausing 1 minute when the pipe inside walls make contact, continue closing at about half the prior closing rate until the tool bars contact the closure stops.

3.3 If temperatures are near freezing or lower, closure rates should be halved and pauses should be doubled.

4. If necessary, engage the accidental release prevention mechanism.

5. Perform the necessary work downstream of the squeeze-off.

WARNING: Venting may be required for 100% shut-off. Squeeze-off may not stop all flow. If 100% shut-off is required, it may be necessary to install two squeeze-off tools at two points along the line, and vent between them. Any work performed must be downstream of the second squeeze-off. Do not remove or alter the closure stops, or place anything (rags, sticks, etc.) between the bars and the pipe.

6. When work is complete, disengage the accidental release mechanism (if required), and open the squeeze-off tool bars at a controlled rate no faster than the Step 3 closure rate. Opening must include a 1 minute pause at the wall contact point, and 1 minute pauses at 1/4 open (3/4 closed) and 1/2 open points for 3" IPS and larger pipes.

7. Open the bars, and remove the squeeze-off tool.

8. Identify the squeezed-off area by wrapping tape around the pipe, or installing a full encirclement clamp over the area.

WARNING: Do not squeeze off more than once in the same place. Doing so may damage the pipe.

Additional information on squeeze-off may be found in ASTM F 1041, *Standard Guide for Squeeze-off of Polyolefin Gas Pressure Pipe and Tubing.*[10]

Routine or Emergency?

Squeeze-off procedures may be used for routine, scheduled changes to piping systems, or as an emergency procedure to control gasses or liquids escaping from a damaged pipe. For scheduled piping changes, the above procedure should be followed, and if followed, the pipe's service life is not expected to be compromised.

However, an emergency situation may require quickly flattening the pipe and controlling flow because the escaping fluid may be an immediate hazard of greater concern than damaging the pipe.

WARNING: If an emergency situation requires rapid flattening, then the pipe or tubing will probably be damaged.

Repairs

Repair situations may arise if a polyethylene pipe has been damaged. Damage may occur during shipping and handling, during installation, or after installation. Damage may include scrapes or abrasions, breaks, punctures, kinks or emergency squeeze-off. Permanent repair usually involves removing and replacing the damaged pipe or fitting. In some cases, temporary repairs may restore sufficient serviceability and allow time to schedule permanent repairs in the near future.

Refer to TN-35, Repair of HDPE Pipelines, at www.plasticpipe.org for more information.

Damage Assessment

Damaged pipe or fittings should be inspected and evaluated. Pipe, fittings, fabrications or structures with excessive damage should not be installed. Damage that occurs after installation may require that the damaged pipe or component be removed and replaced.

WARNING: Scrapes or gouges in pressure pipe cannot be repaired by filling-in with extrusion or hot air welding. The damaged section should be removed and replaced.

WARNING: Improperly made fusion joints cannot be repaired.

Improper butt fusions must be cut out and re-done from the beginning. Poorly joined socket or electrofusion fittings must be removed and replaced. Poorly joined saddle fittings must be removed by cutting out the main pipe section, or, if the main is undamaged, made unusable by cutting the branch outlet or chimney off the saddle fitting, and installing a new saddle fitting on a new section of main.

WARNING: Broken or damaged fittings cannot be repaired and, as such, should be removed and replaced.

WARNING: Kinked pipe must not be installed and cannot be repaired.

Kinked pipe must be removed and replaced.

WARNING: Pipe damaged during an emergency squeeze-off cannot be repaired.

Squeeze-off damaged pipe must be removed and replaced.

Permanent Repairs

For buried large diameter polyethylene pipe that has been poorly backfilled, excessive deflection may be correctable using point excavation to remove backfill, then reinstalling embedment materials in accordance with recommended procedures.

Where replacement is required, any joining method appropriate to the product and service requirements is generally acceptable. Butt and socket fusion joining procedures require that one of the components move longitudinally. However, constrained installations, such as buried pipes, may not allow such movement.

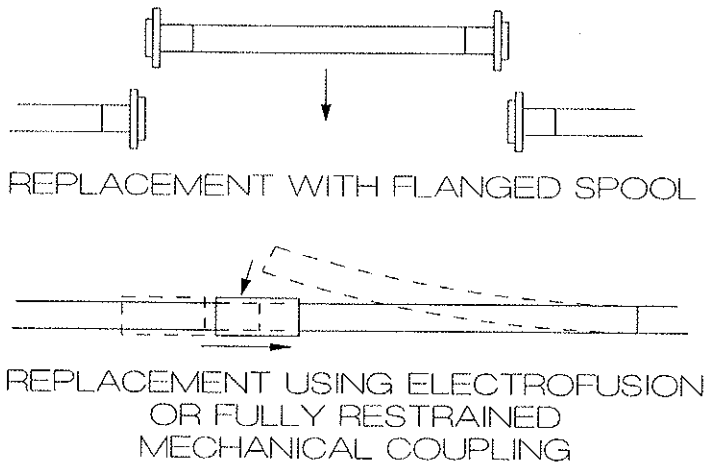


Figure 9 Constrained Pipe Repair

Permanent repair of constrained pipe typically employs techniques that do not require longitudinal movement of one or both pipe ends. Techniques include deflecting one pipe end to the side, using a mechanical or electrofusion coupling, or installing a flanged spool. See Figure 9. Typical methods for joining repair pipe sections include flanges, electrofusion couplings, and fully restrained mechanical couplings.

To repair using a flanged spool, cut out, remove and discard the damaged pipe section. Install flanges on the two pipe ends. Measure the distance between the flange sealing surfaces, and prepare a flanged pipe spool of the same length. Install the flanged spool.

Repair using an electrofusion coupling or a fully restrained mechanical coupling is limited to pipe sizes for which such couplings are available. Mechanical or electrofusion coupling repairs are made by deflecting one pipe end to the side for the coupling body to be slipped on. The pipe ends are then realigned, and the coupling joint fitted up. To allow lateral deflection, a length of about 10 times the pipe outside diameter is needed.

Temporary Repair

Until permanent repairs can be effected, temporary repairs may be needed to seal leaks or punctures, to restore pressure capacity, or to reinforce damaged areas. Temporary repair methods include, but are not limited to, mechanical repair couplings and welded patches.

Conclusion

A successful piping system installation is dependent on a number of factors. Obviously, a sound design and the specification and selection of the appropriate quality materials are paramount to the long-term performance of any engineered installation. The handling, inspection, testing, and safety considerations that surround the placement and use of these engineered products is of equal importance.

In this chapter, we have attempted to provide fundamental guidelines regarding the receipt, inspection, handling, storage, testing and repair of polyethylene piping products. While this chapter cannot address all of the product applications, test and inspection procedures, or construction practices, it does point out the need to exercise responsible care in planning out these aspects of any job site. It is the responsibility of the contractor, installer, site engineer or other users of these materials to establish appropriate safety and health practices specific to the job site and in accordance with the local prevailing codes that will result in a safe and effective installation.

References

1. Plastics Pipe Institute, *Handbook of Polyethylene Pipe*, chapter on Underground Installation of Polyethylene Pipe, Washington, DC.
2. Gilroy, H.M. (1985). Polyolefin Longevity for Telephone Service, Antec Proceedings.
3. Plastics Pipe Institute, *Handbook of Polyethylene Pipe*, chapter on Polyethylene Joining Procedures, Washington, DC.
4. Plastics Pipe Institute, TR-19, Thermoplastics Piping for the Transport of Chemicals, Washington, DC.
5. American Gas Association. (1994). *AGA Plastic Pipe Manual for Gas Service*, AGA.
6. American Society of Mechanical Engineers, B31.1, Section 137.
7. American Society for Testing and Materials. (1998). ASTM F1417, Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low Pressure Air, West Conshohocken, PA.
8. American Water Works Association. (1992). AWWA Standard for Disinfecting Water Mains, Denver, CO.
9. American Society for Testing and Materials. (1998). ASTM F1563, Standard Specification for Tools to Squeeze-off Polyethylene (PE) Gas Pipe or Tubing, West Conshohocken, PA.

10. American Society for Testing and Materials. (1998). ASTM F1041, Standard Guide for Squeeze-off of Polyethylene Gas Pressure Pipe or Tubing, West Conshohocken, PA.
11. American Society for Testing and Materials.(1998). ASTM D2104, Standard Specification for Polyethylene (PE) Plastic Pipe, Schedule 40, West Conshohocken, PA.
12. American Society for Testing and Materials. (1998). ASTM D2239, Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter, West Conshohocken, PA.
13. American Society for Testing and Materials. (1998). ASTM D2447, Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter, West Conshohocken, PA.
14. American Society for Testing and Materials. (1998). ASTM D3035, Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter, West Conshohocken, PA.