

**NAVFAC  
SPECIFICATION**

**WO #5334213  
Reclaimed Water for the  
WWTP  
B-4376**

**AMENDMENT #0001**

## **IMPORTANT**

**This amendment should be acknowledged when your proposal is submitted. Failure to acknowledge the amendment may constitute grounds for rejection of the proposal.**

**If your proposal has been submitted prior to the receipt of this amendment, acknowledgement should be made by telegram, which should state whether the price contained in your proposal is to remain unchanged, is to be decreased by an amount, or is to be increased by an amount. The acknowledgement must be received prior to proposal opening time.**

<b>AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT</b>		1. CONTRACT ID CODE	PAGE	OF PAGES
			1	1

2. AMENDMENT/MODIFICATION NO. 0001	3. EFFECTIVE DATE 09/8/2011	4. REQUISITION/PURCHASE REQ. NO. 5334213	5. PROJECT NO. (If applicable) 5334213
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6. ISSUED BY <b>CG MCAS Cherry Point FACILITIES, ROICC B-163, CURTIS ROAD PSC BOX 8006 CHERRY POINT, NC 28533</b>	Code N40085	7. ADMINISTERED BY (If other than item 6.)	Code
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8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)  <b>AMENDMENT MUST BE ACKNOWLEDGED WITH YOUR PROPOSAL</b>	<input checked="" type="checkbox"/>	9A. AMENDMENT OF SOLICITATION <b>PROJECT #5334213</b>
		9B. DATED (SEE ITEM 11) 1/28/2010
	<input type="checkbox"/>	10A. MODIFICATION OF CONTRACT/ORDER NO.
		10B. DATED (SEE ITEM 13)

CODE FACILITY CODE

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

The above numbered solicitation is amended as set forth in item 14. The hour and date specified for receipt of Offers  is extended  is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing items 8 and 15, and returning 1 copy of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (if required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

- A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14. ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
- B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATION CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103 (b).
- C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
- D. OTHER: (specify type of modification and authority)

E. IMPORTANT: Contractor  is not  is required to sign this document and return **original** to the issuing office.

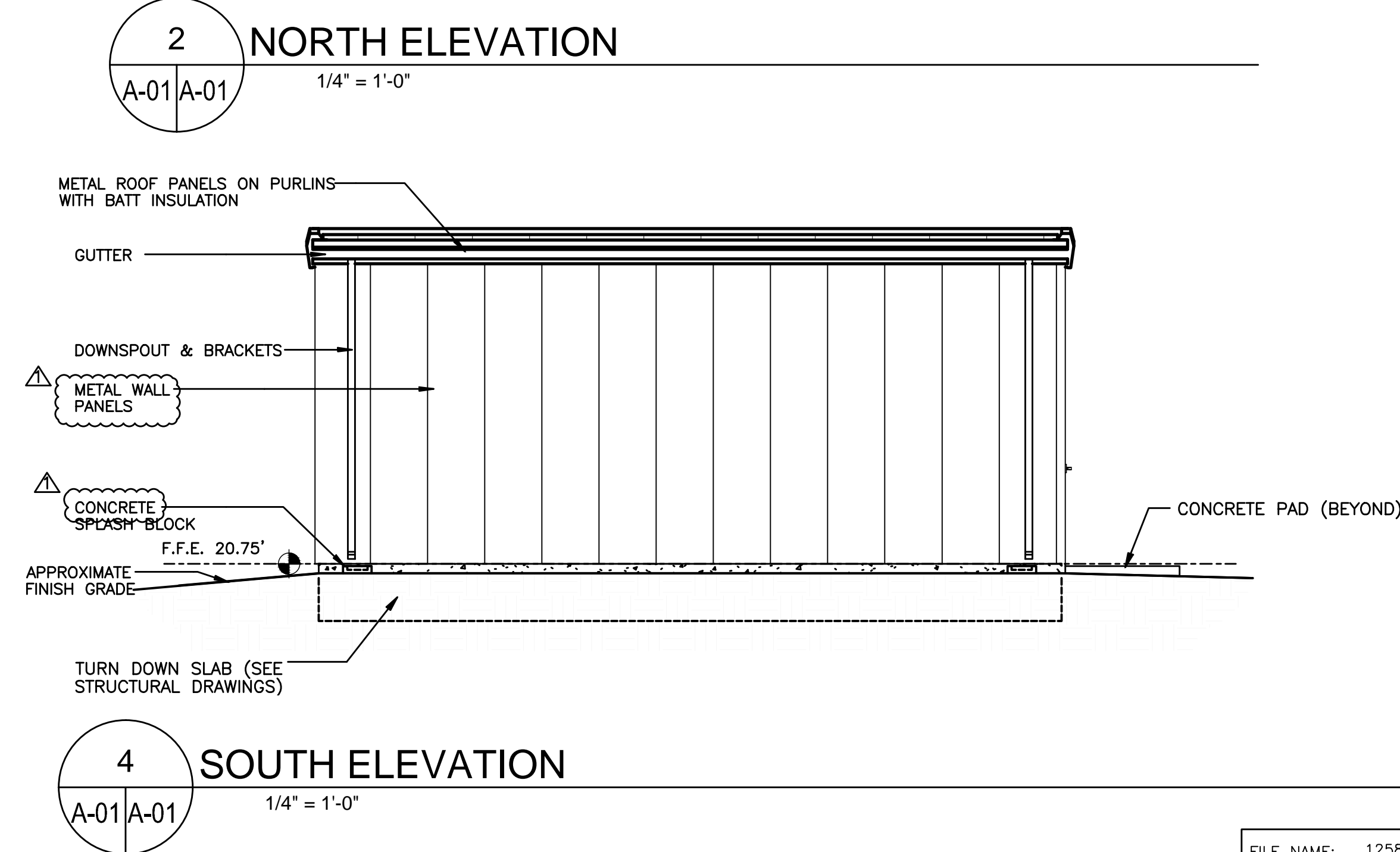
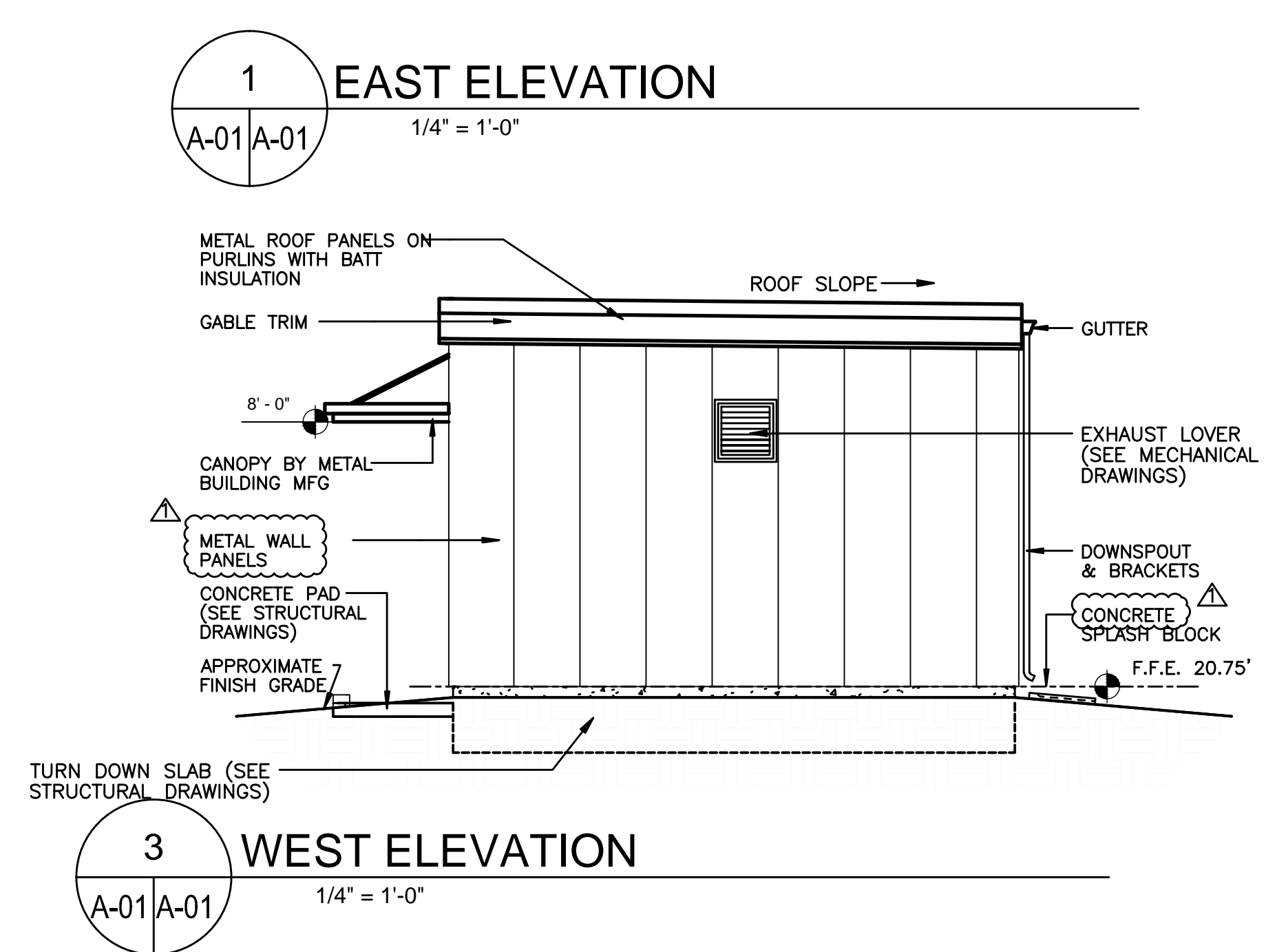
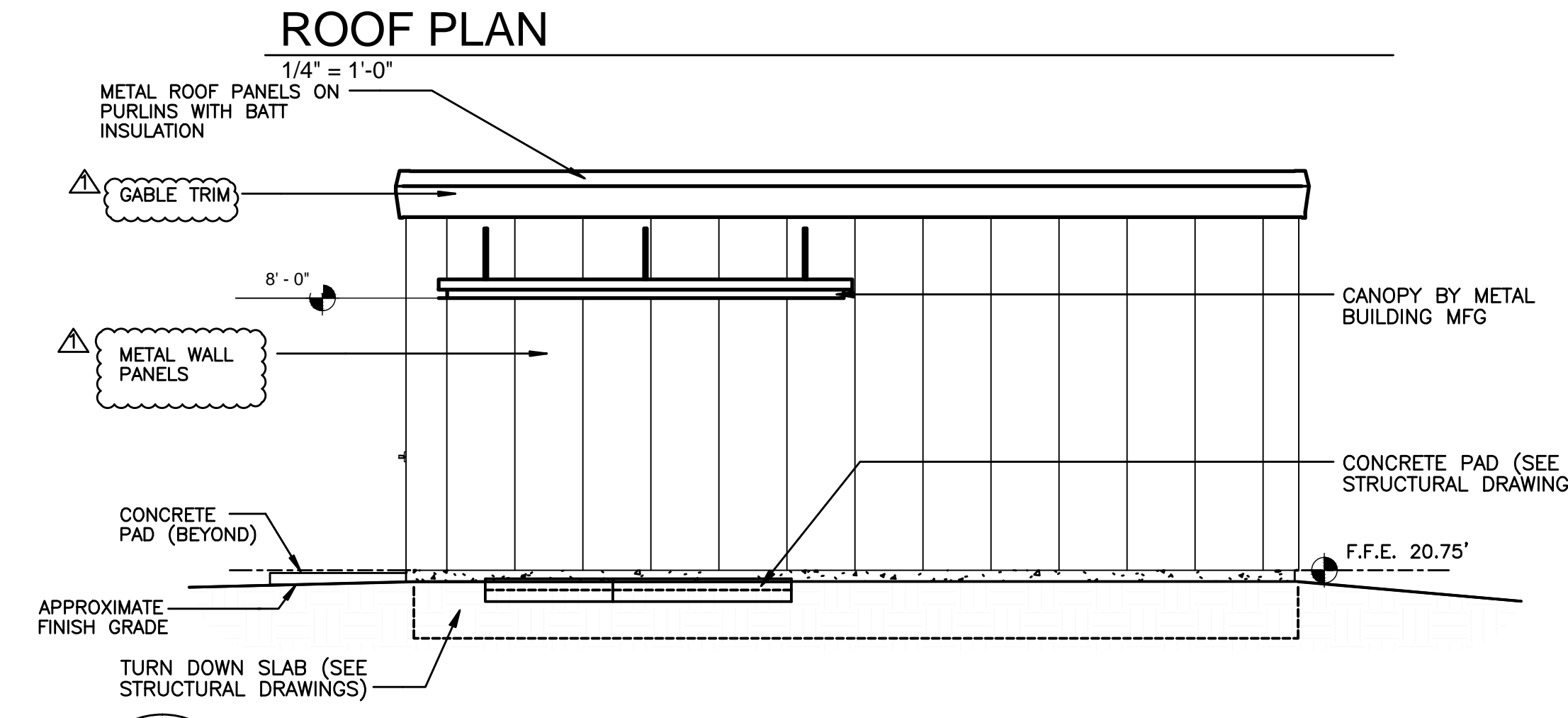
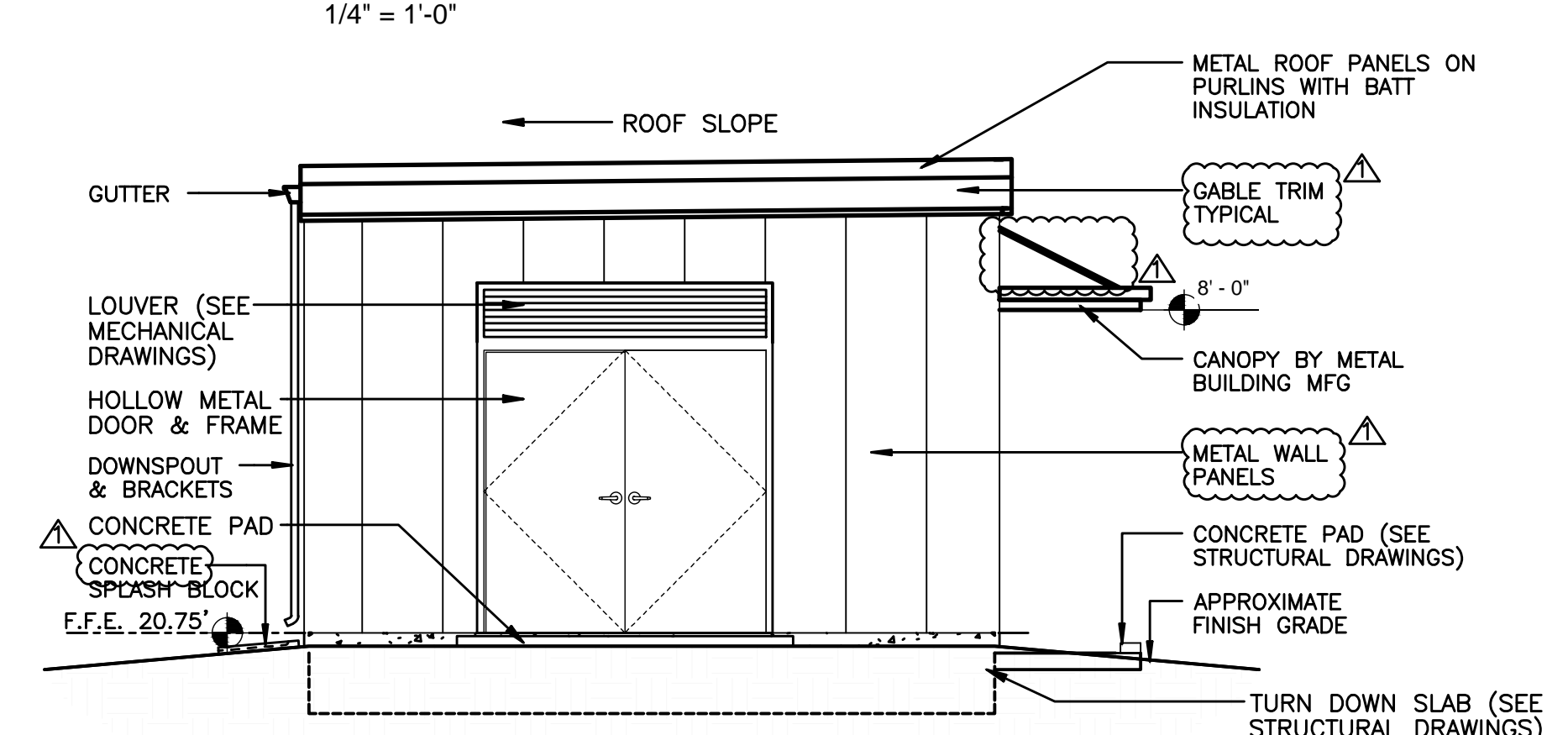
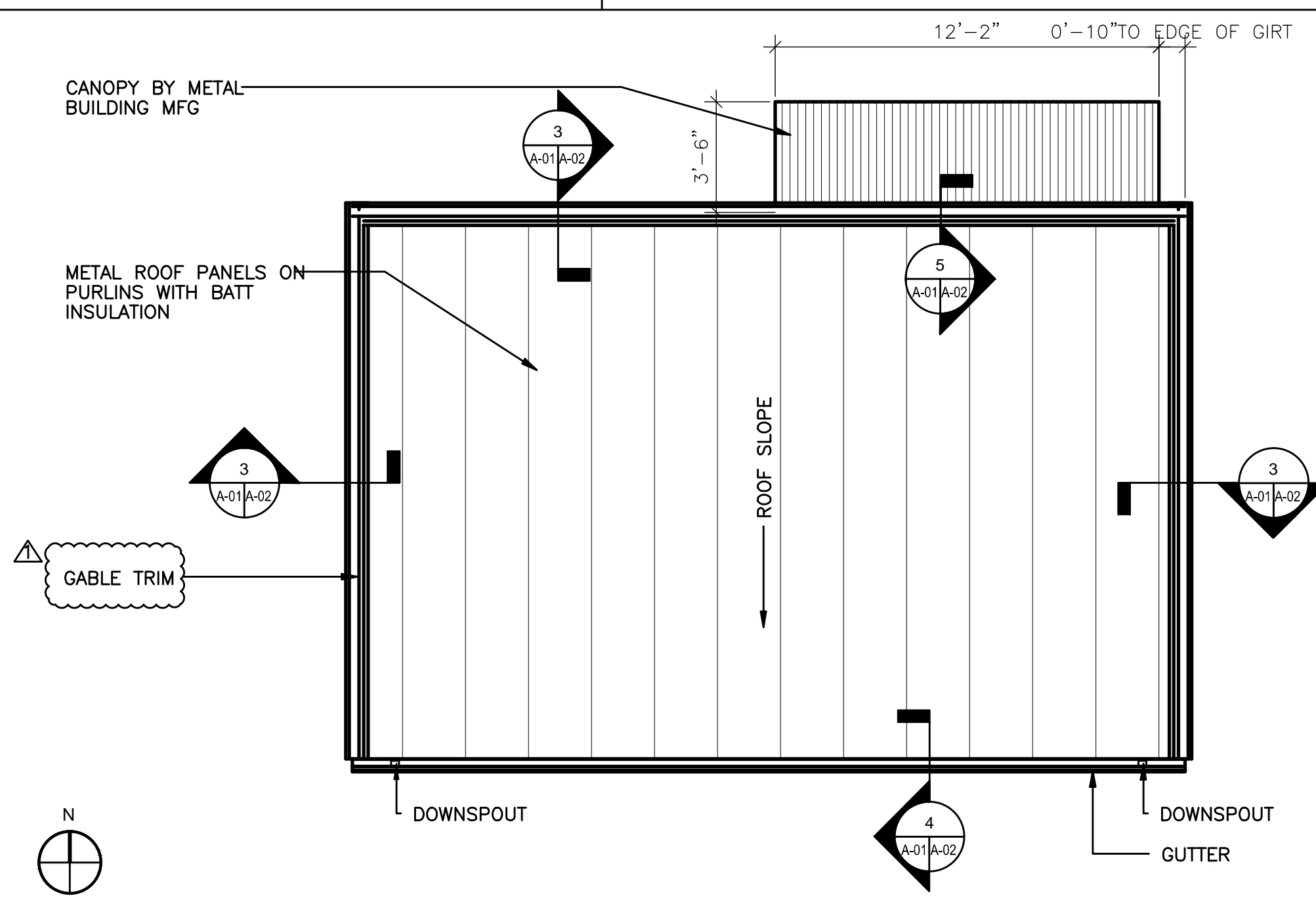
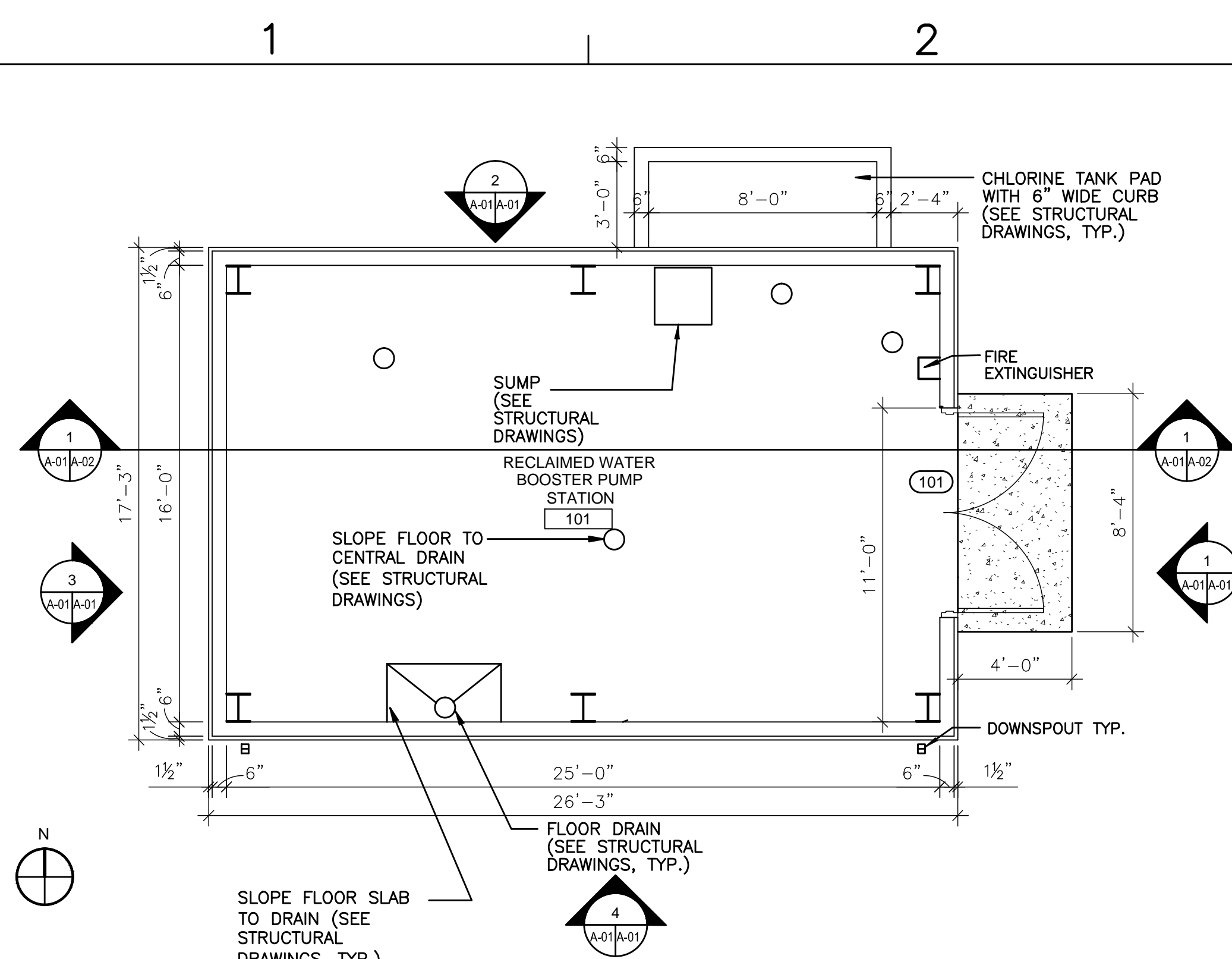
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

**5334213 Reclaimed Water For the WWTP B-4376, Marine Corps Air Station North Carolina**

The purpose of this amendment is to additional drawings and specifications to the subject RFP.

See Attached

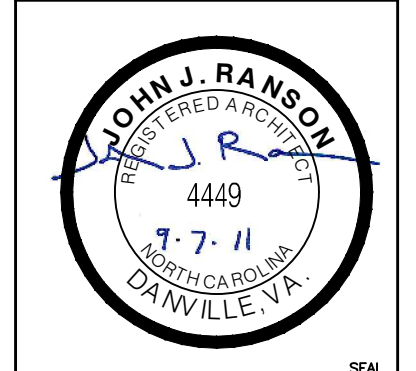
15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)	
15B. CONTRACTOR/OFFEROR (Same as Item 8)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY	16C. DATE SIGNED
(Signature of person authorized to sign)		(Signature of Contracting Officer)	



- GENERAL NOTES:**
- COORDINATE METAL WALL FINISH WITH CONTRACTING OFFICER.
  - COORDINATE COLUMN SIZE AND LOCATION WITH BUILDING MANUFACTURER.
  - METAL BUILDING ROOF SLOPED TO ALLOW WATER RUNOFF TOWARDS GUTTER.
  - SLOPE FLOOR SLAB TO INTERIOR SUMP. SEE STRUCTURAL DRAWINGS.

NO.	DATE	DESCRIPTION	APPR.

**NRW**  
CONSULTING STRUCTURAL ENGINEERS  
748 LORD DUNMORE DRIVE, SUITE 101  
VIRGINIA BEACH, VIRGINIA 23464  
PHONE: (757) 474-0812 FAX: (757) 474-0919

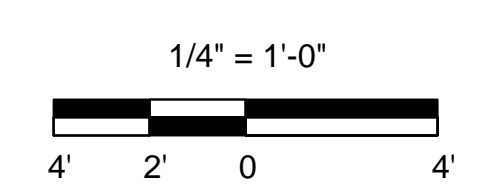


APPROVED	DATE
ACTIVITY - SATISFACTORY TO	APPROVED
FOR EFD FOR COMMANDER NAVFAC	DATE
A/E	EFD
HL	DESIGN
HL	DRAWN
JJR	REVIEW
CHB	QC
CHB	CHIEF ARCH/ ENGR.
PROJECT MANAGER	SDH
FIRE PROTECTION	
BRANCH MANAGER	
DESIGN DIRECTOR	

DEPARTMENT OF THE NAVY  
NAVAL FACILITIES ENGINEERING COMMAND  
MARINE CORPS AIR STATION, CHERRY POINT, N.C.  
**RECLAIMED WATER FOR WASTEWATER TREATMENT PLANT, B4376**  
FLOOR PLANS AND ELEVATIONS

CODE ID. NO. 80091 SIZE D  
SCALE: AS SHOWN  
FILE NO. 5334213  
ST. PRJ. NO. CP0932R  
SPEC. NO. -  
CONSTR. CONTR. NO. -  
NAVFAC DRAWING NO. 12588327  
SHEET 23 OF 37

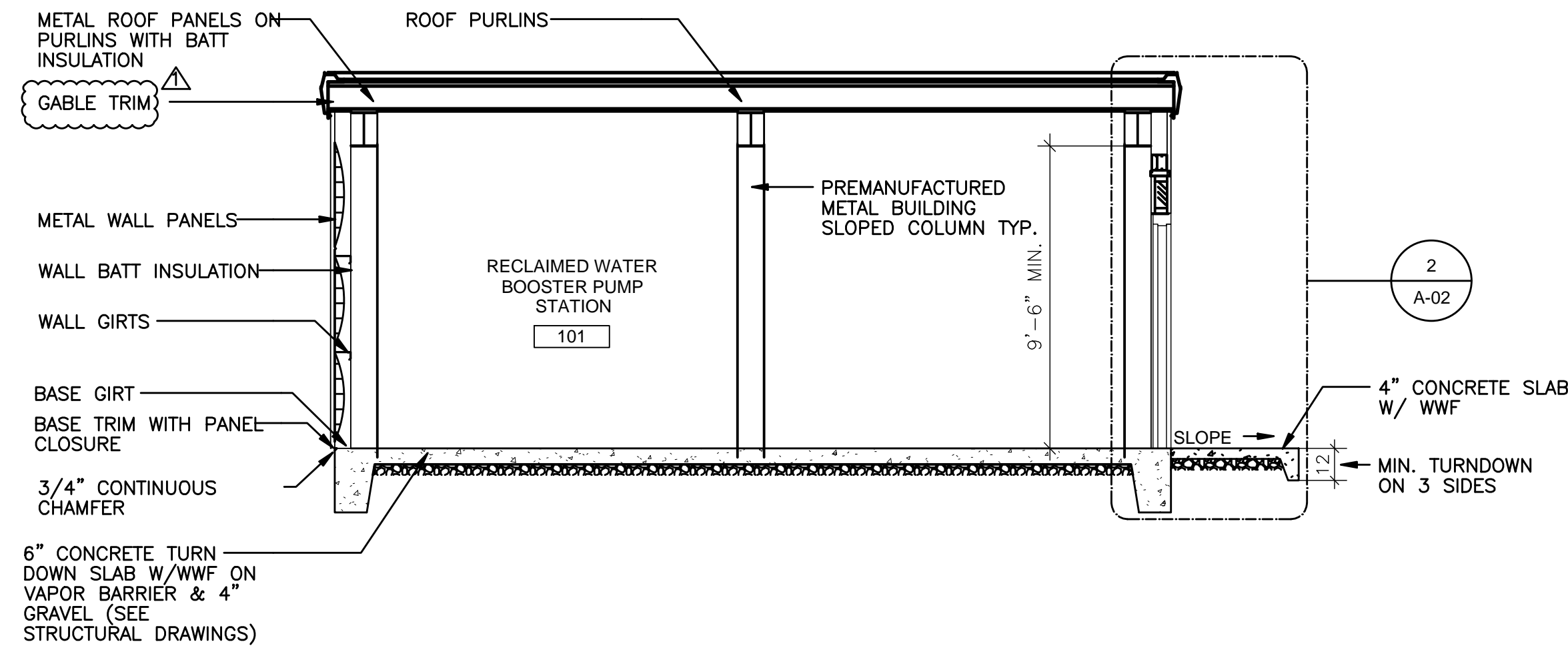
**A-01**



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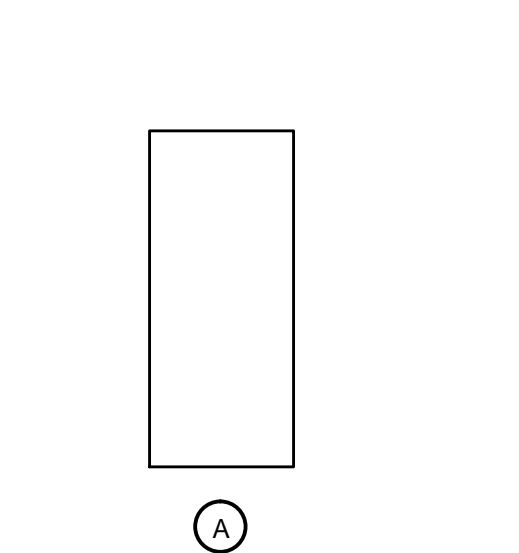
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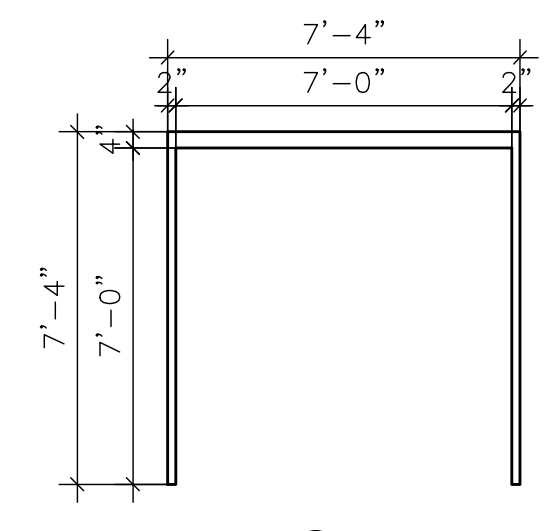
**1 LONGITUDINAL BUILDING SECTION**  
 SCALE: 1/4" = 1'-0"

ROOM NUMBER	DESCRIPTION	FLOOR		FINISH SCHEDULE		WALL		CEILING		REMARKS
		MATERIAL	FINISH	MATERIAL	FINISH	MATERIAL	HEIGHT	MATERIAL	HEIGHT	
101	RECLAIMED WATER BOOSTER PUMP STATION	CONCRETE	SEALED	---	---	METAL WALL PANEL	PREFINISHED	EXPOSED CONSTRUCTION	9'-6" MIN.	

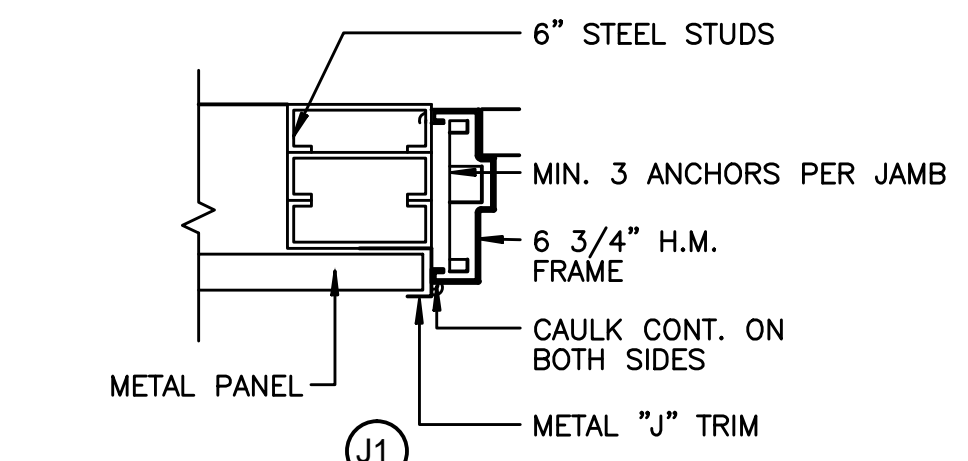
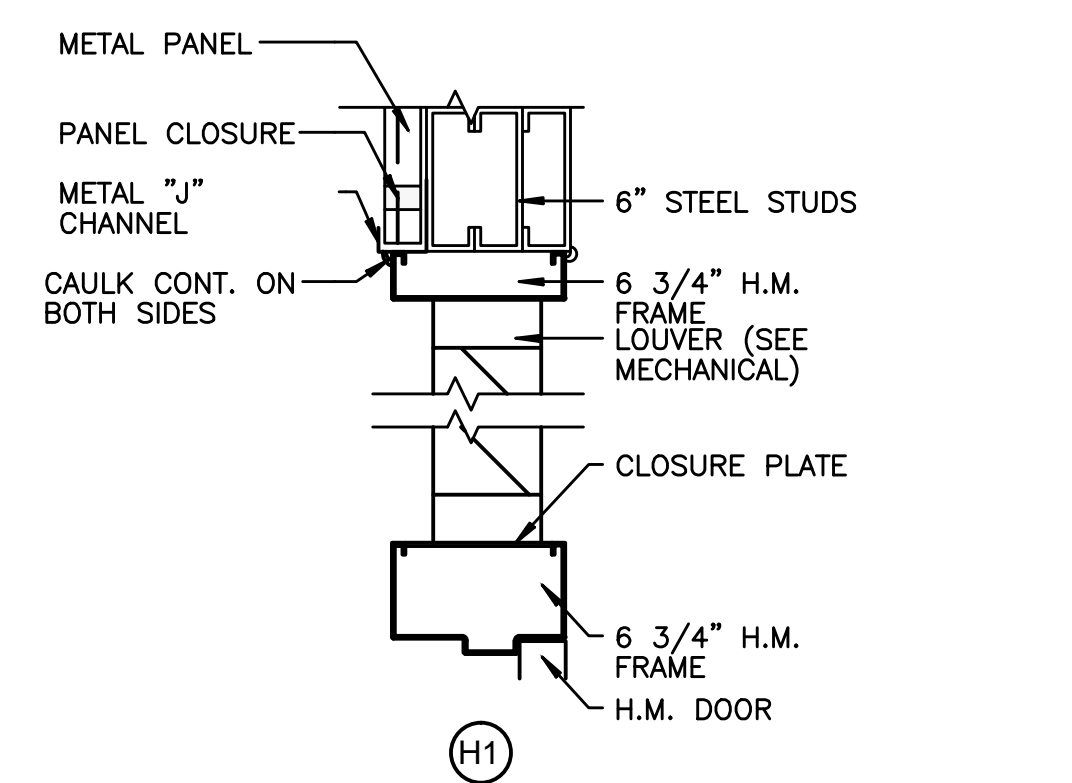
No.	SIZE	DOOR				FRAME						FIRE LABEL	REMARKS
		MATERIAL	FINISH	DES.	HDW.	GLAZING	MATERIAL	FINISH	HEAD	JAMB	ELEV.		
101	(2) 3'-0" X 7'-0"	H.M.	PAINT	A	1	---	H.M.	PAINT	H1	J1	1		



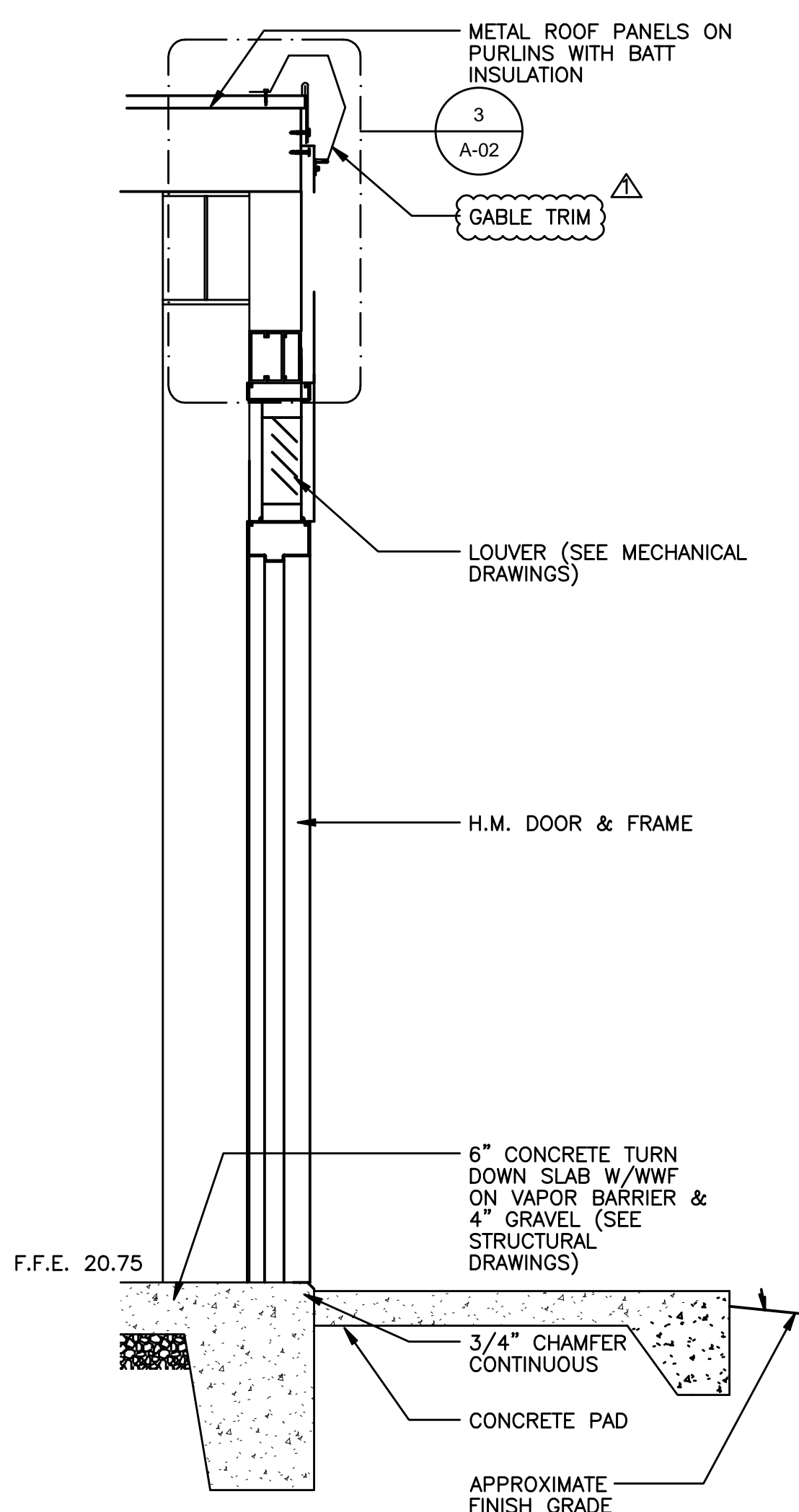
**DOOR DESIGN**  
 Scale: 1/4" = 1'-0"



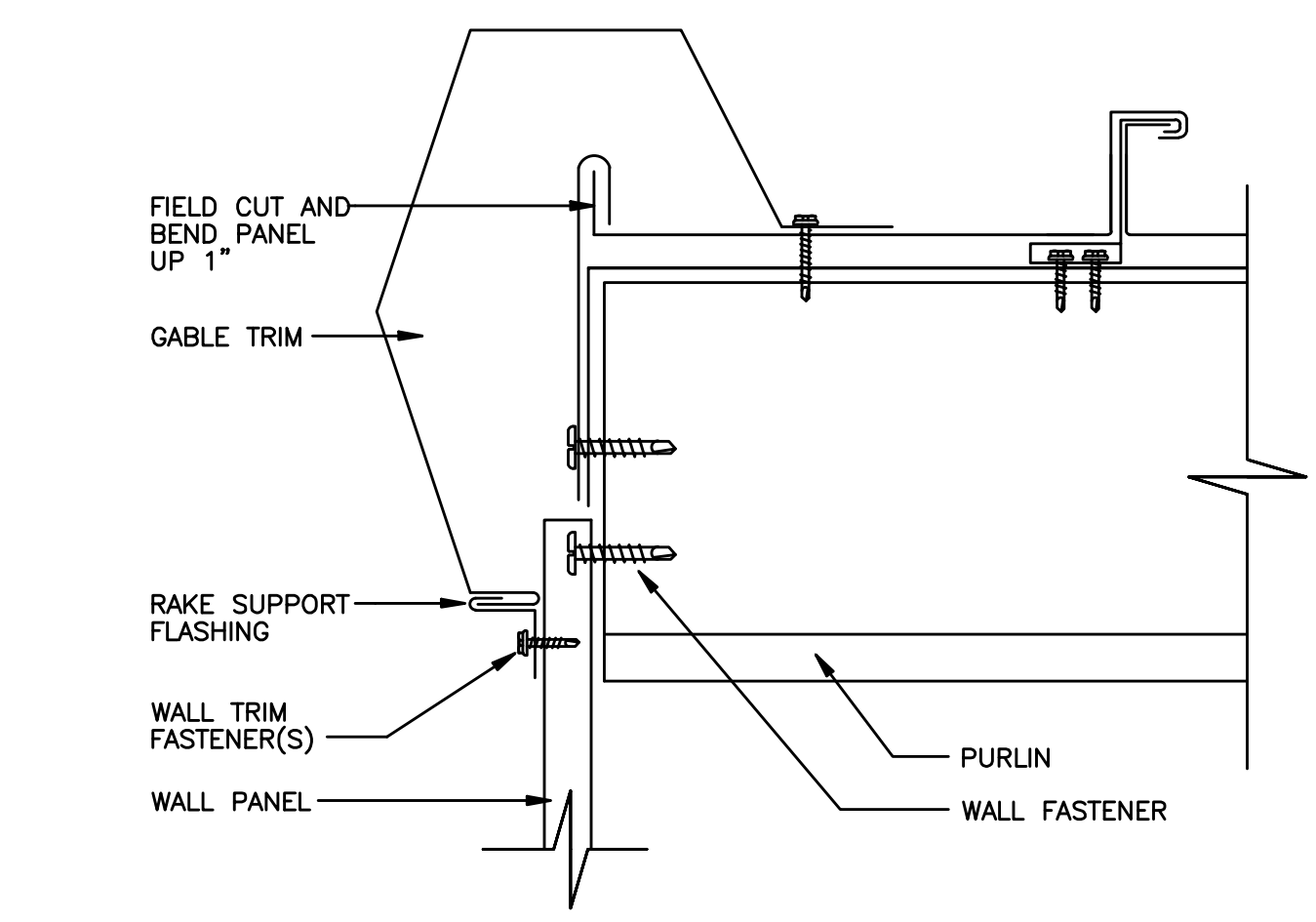
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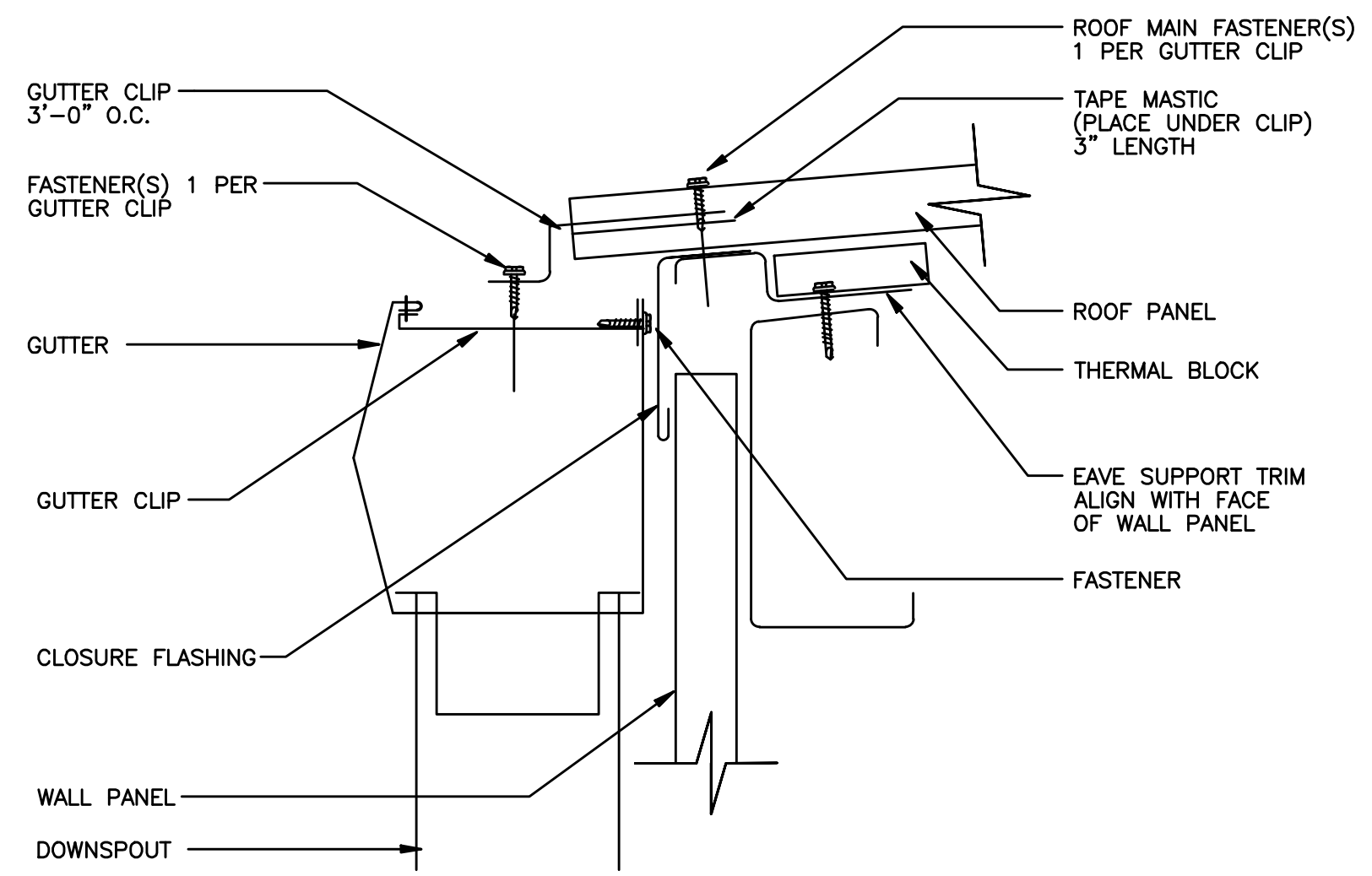
**HEAD & JAMB DETAILS**  
 Scale: 1 1/2" = 1'-0"



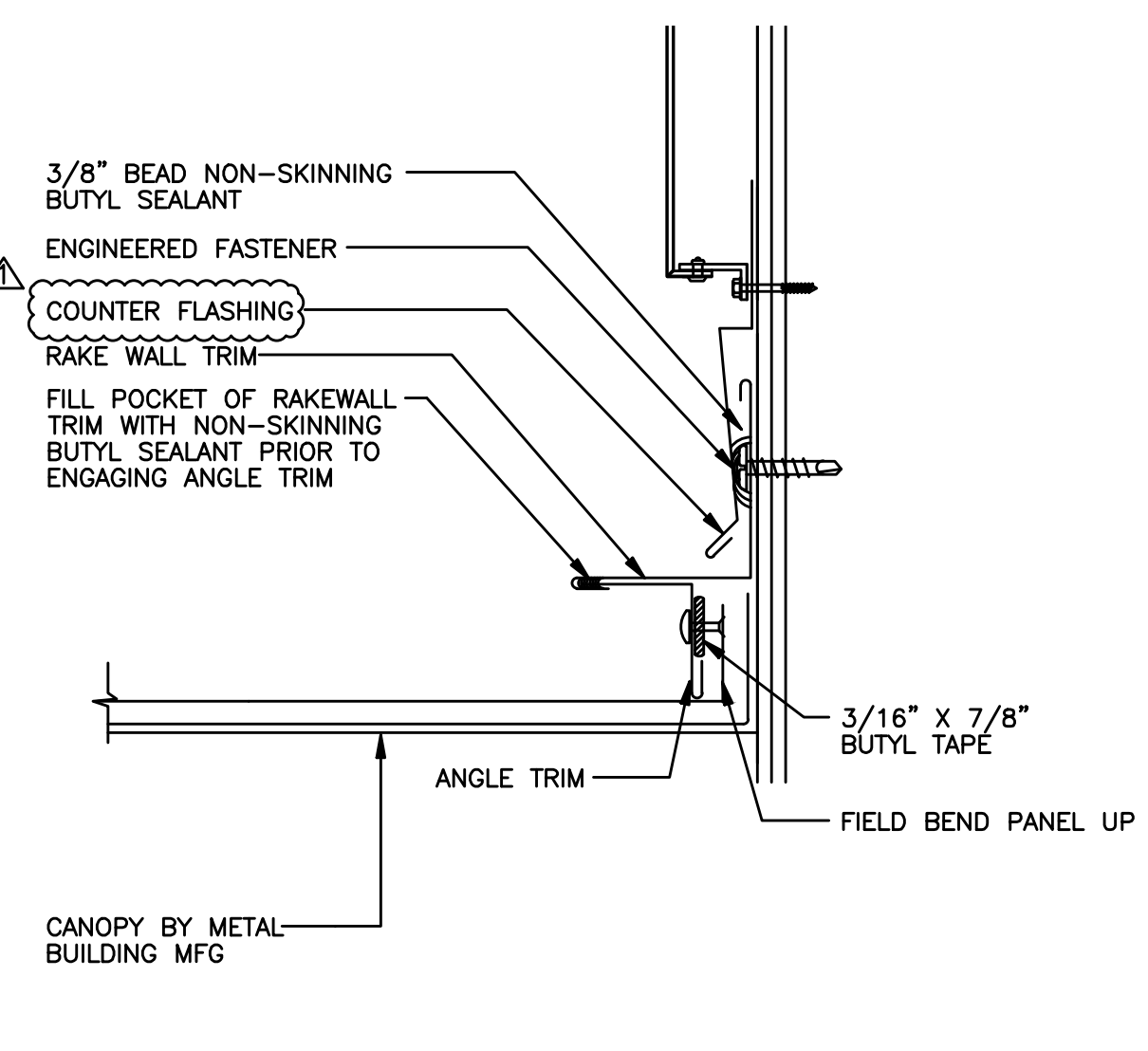
**2 WALL SECTION AT DOOR**  
 SCALE: 3/4" = 1'-0"



**3 FASCIA TRIM DETAIL**  
 SCALE: 3" = 1'-0"



**4 GUTTER DETAIL**  
 SCALE: 3" = 1'-0"



**5 RAKE WALL DETAIL**  
 SCALE: 3" = 1'-0"

ARCHITECTURAL REVISIONS

NO.	DATE	DESCRIPTION

**NRW**  
 CONSULTING STRUCTURAL ENGINEERS  
 748 LORD DUNMORE DRIVE, SUITE 101  
 VIRENA BEACH, VIRGINIA 23684  
 PHONE: (757) 474-0812 FAX: (757) 474-0919

**Dewberry**  
 Dewberry & Davis, Inc.  
 2001 HERRINGWOODS DRIVE  
 SUITE 200  
 FARMERSBURGH, VIRGINIA 23061  
 PHONE: 810-881-8600  
 FAX: 810-881-8602  
 NCEBLS #7-0276

**JOHN J. RANSOY**  
 REGISTERED ARCHITECT  
 4449  
 9-7-11  
 SOUTH CAROLINA  
 DANVILLE, VA.

APPROVED \_\_\_\_\_  
 ACTIVITY - SATISFACTORY TO \_\_\_\_\_  
 DATE APPROVED \_\_\_\_\_  
 FOR EFD FOR COMMANDER NAVFAC \_\_\_\_\_  
 DATE \_\_\_\_\_  
 A/E DESIGN EFD  
 HL DRAWN  
 JJR REVIEW  
 CHB QC  
 CHB CHIEF ARCH/ ENGR.  
 PROJECT MANAGER SDH  
 FIRE PROTECTION  
 BRANCH MANAGER  
 DESIGN DIRECTOR

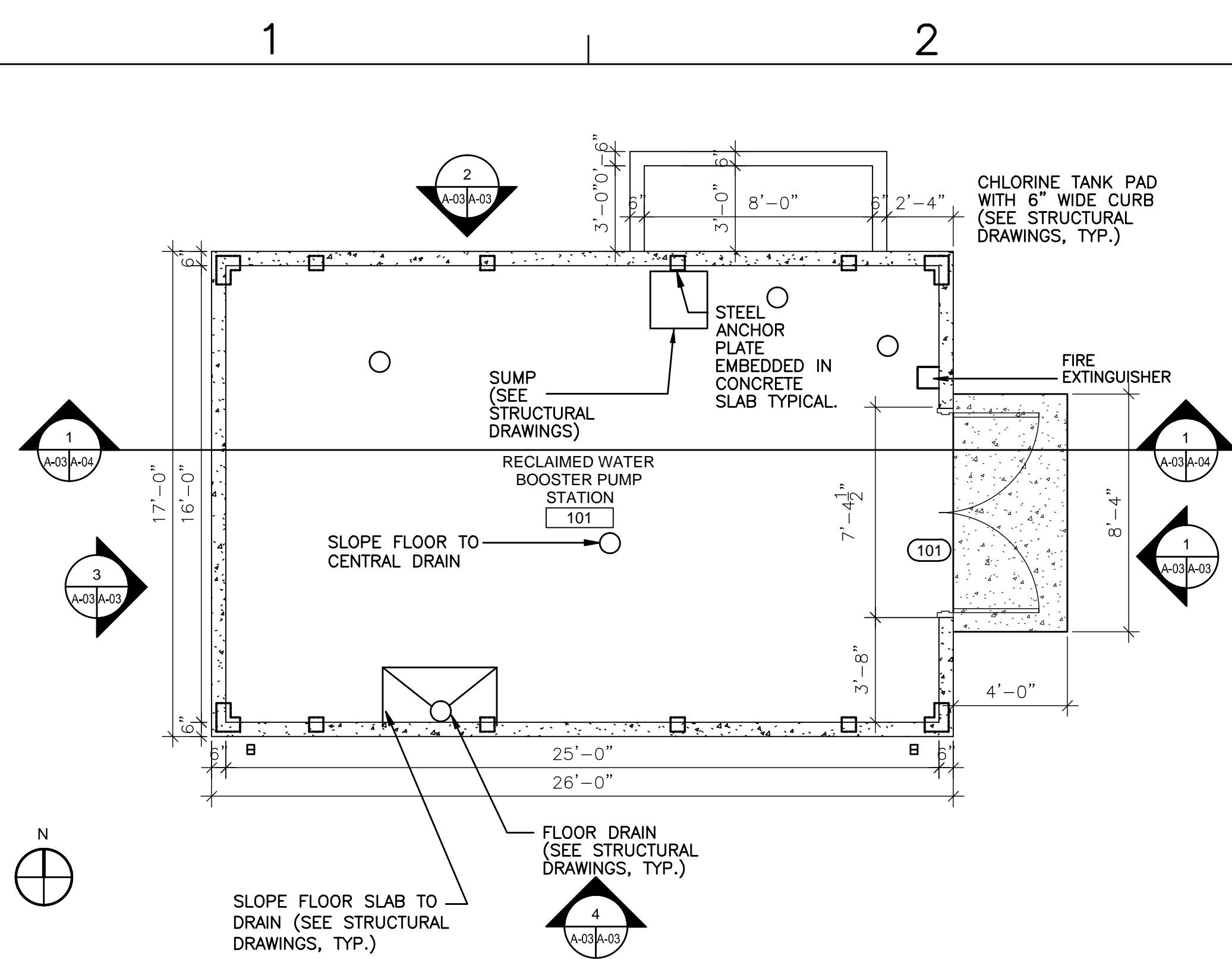
NAVAL FACILITIES ENGINEERING COMMAND  
 MARINE CORPS AIR STATION, CHERRY POINT, N.C.  
**RECLAIMED WATER FOR WASTEWATER TREATMENT PLANT, B4376**  
 SECTIONS & SCHEDULES AND DOOR & FRAME DETAILS

CODE ID. NO. 80091 SIZE D  
 SCALE: AS SHOWN  
 FILE NO. 5334213  
 ST. PRJ. NO. CP0932R  
 SPEC. NO. ---  
 CONSTR. CONTR. NO. ---  
 NAVFAC DRAWING NO. 12588328  
 SHEET 24 OF 37

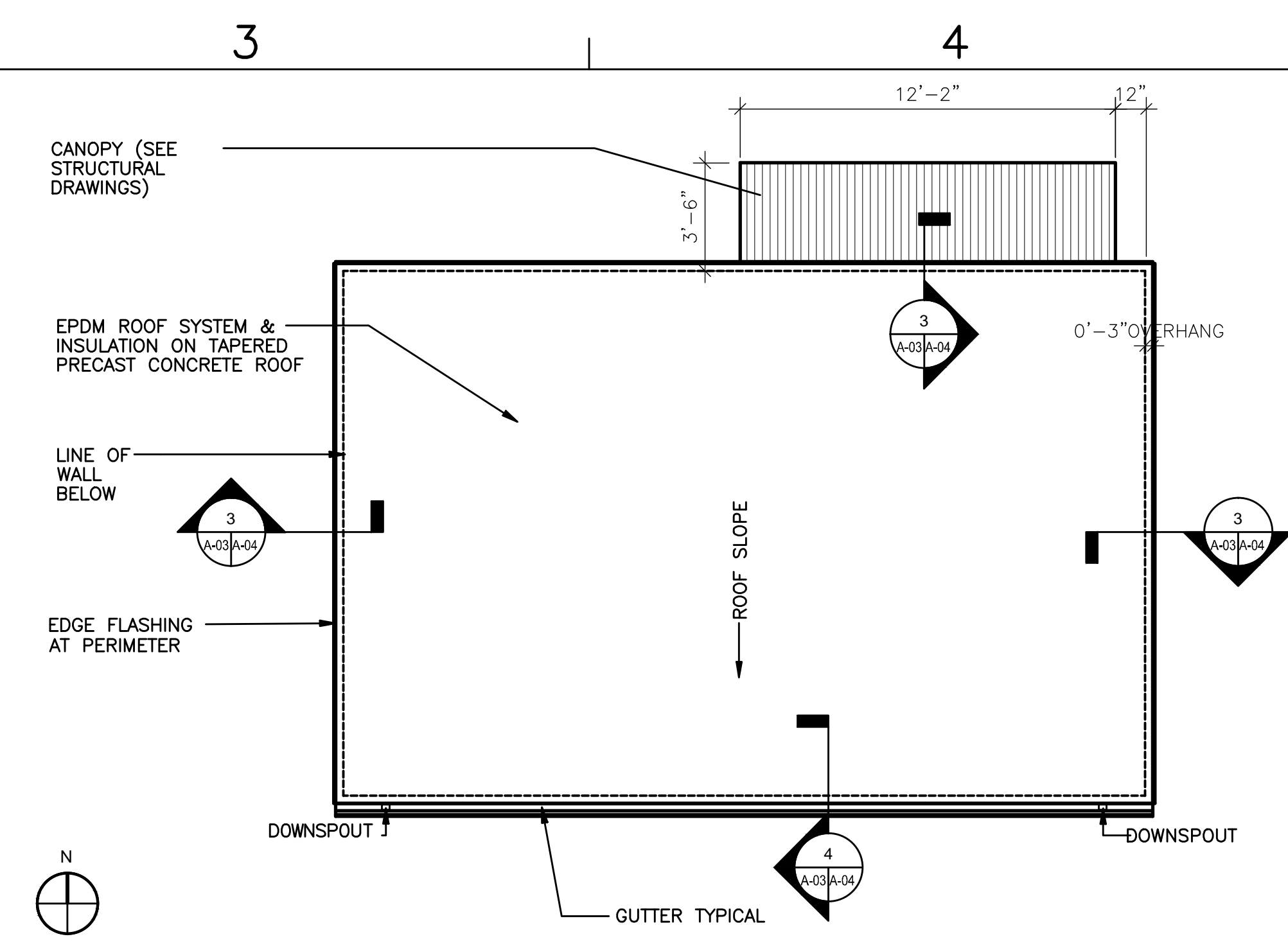
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**A-02**

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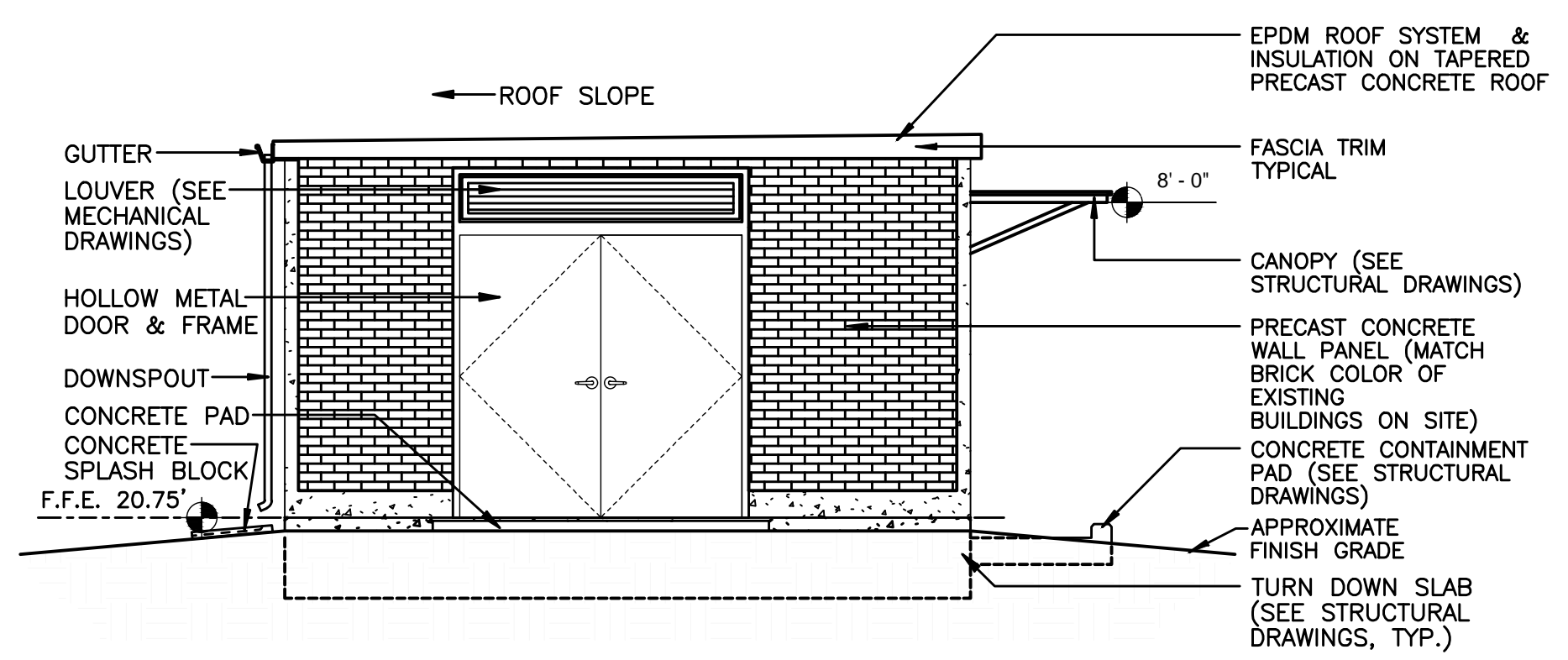
**FLOOR PLAN - BID ADDITIVE 0001A**  
1/4" = 1'-0"



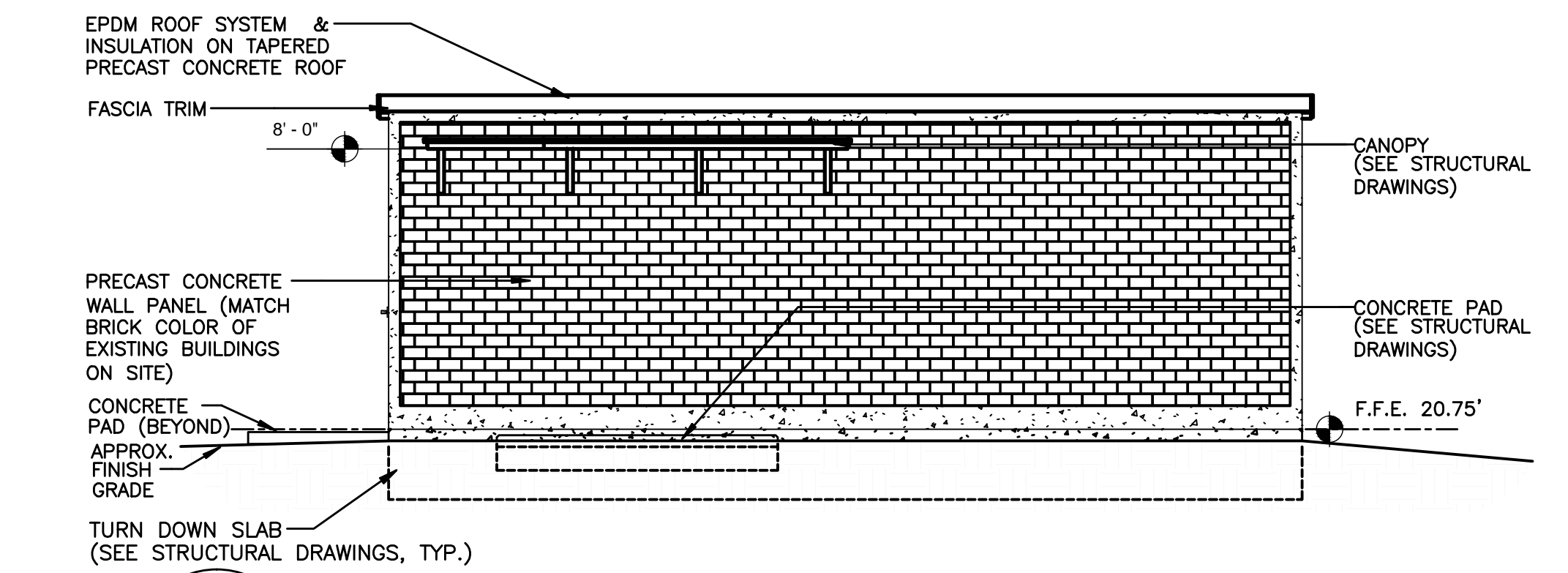
**ROOF PLAN - BID ADDITIVE 0001A**  
1/4" = 1'-0"

- GENERAL NOTES:**
1. PRECAST CONCRETE WALL PANEL FINISH TO MATCH BRICK COLOR OF EXISTING BUILDINGS ON SITE.
  2. COORDINATE QUANTITY AND LOCATION OF EMBEDDED STEEL ANCHOR PLATES IN SLAB WITH PRECAST BUILDING MANUFACTURER.
  3. PRECAST BUILDING ROOF TAPERED TO ALLOW WATER RUNOFF TOWARDS GUTTER.
  4. SLOPE FLOOR SLAB TO INTERIOR SUMP. SEE STRUCTURAL DRAWINGS.
  5. ROOF PANEL SHALL EXTEND A MINIMUM OF 3" BEYOND THE WALL PANEL AND SHALL INCORPORATE A TURN DOWN DESIGN WHICH EXTENDS 1/2" BELOW THE TOP EDGE OF THE WALL PANELS.

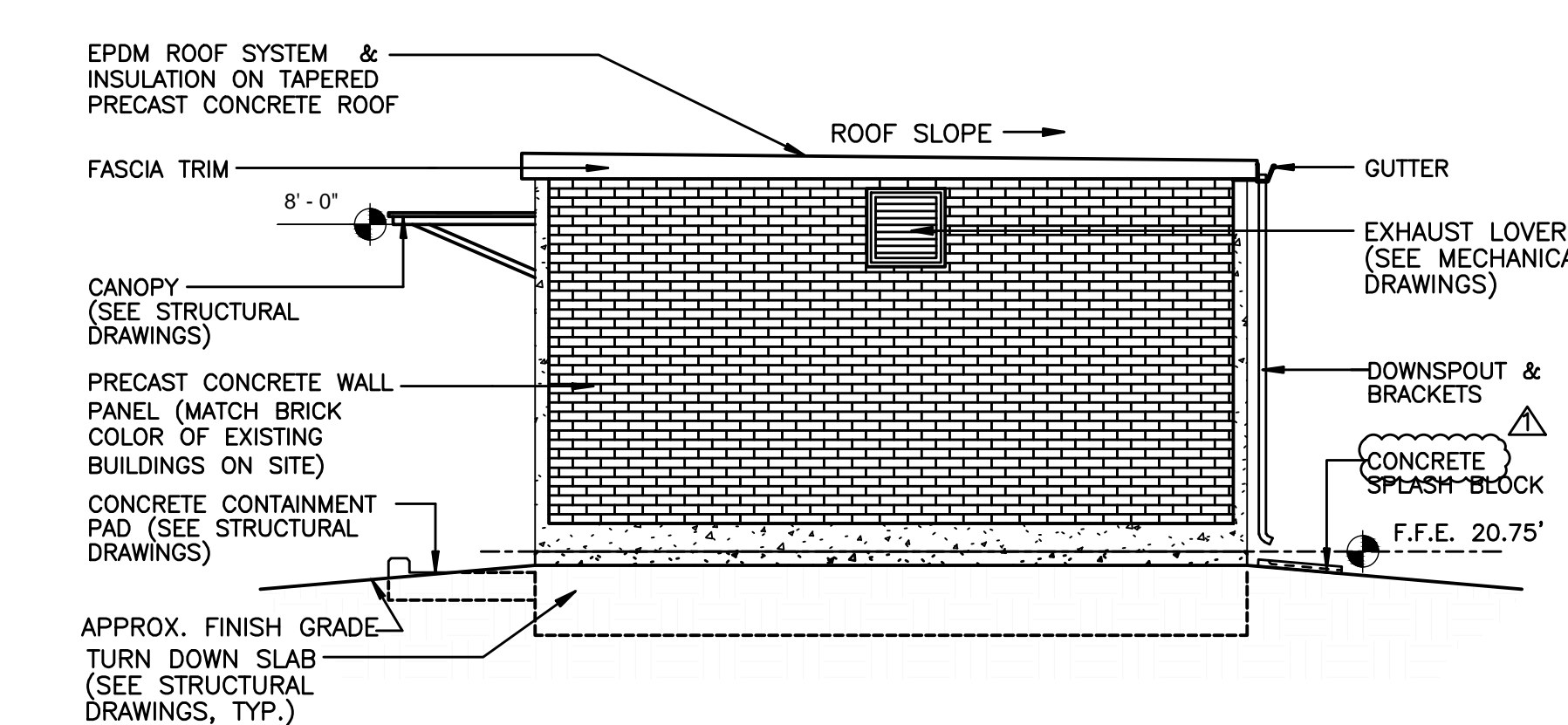
**BID ADDITIVE ITEM 0001A**  
PROVIDE PRECAST CONCRETE BUILDING IN LIEU OF PRE-ENGINEERED METAL BUILDING.



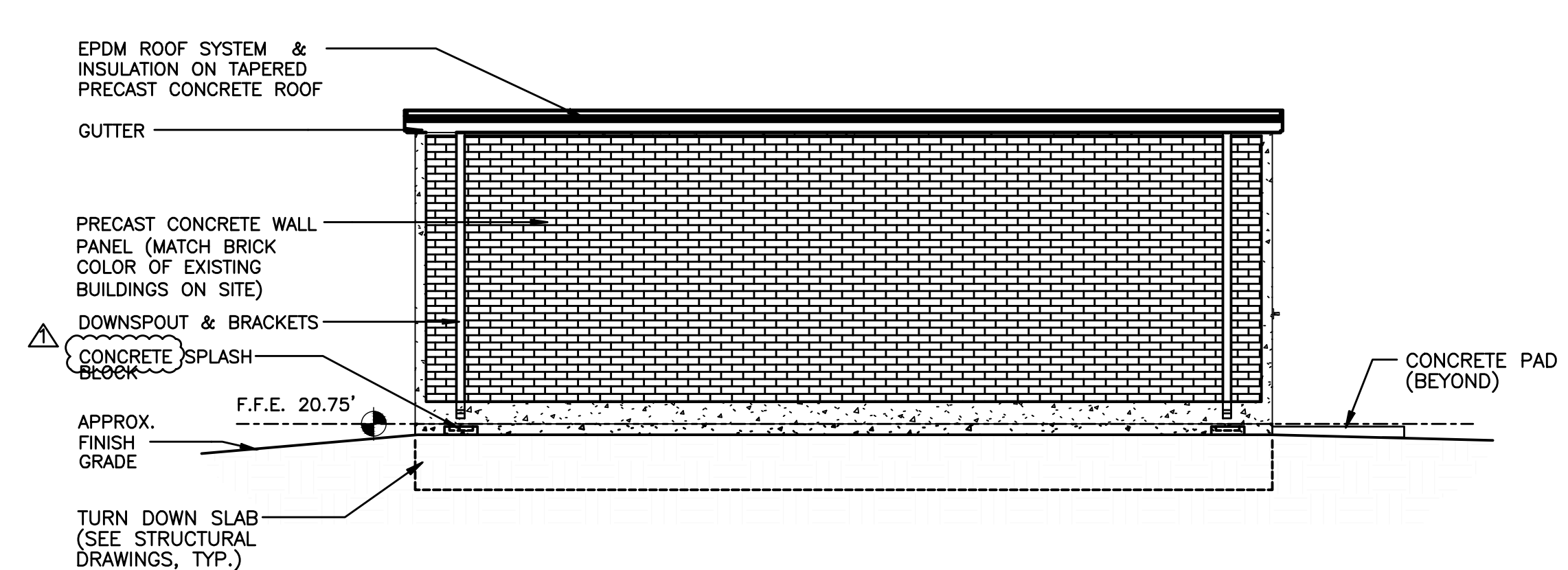
**1 EAST ELEVATION - BID ADDITIVE 0001A**  
1/4" = 1'-0"



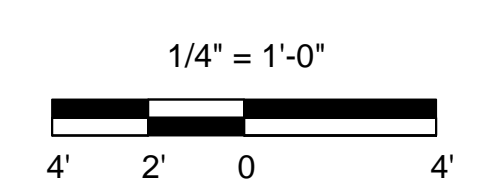
**2 NORTH ELEVATION - BID ADDITIVE 0001A**  
1/4" = 1'-0"



**3 WEST ELEVATION - BID ADDITIVE 0001A**  
1/4" = 1'-0"



**4 SOUTH ELEVATION - BID ADDITIVE 0001A**  
1/4" = 1'-0"



NO.	DATE	DESCRIPTION	APPR.

**NRW**  
CONSULTING STRUCTURAL ENGINEERS  
748 LORD DUNMORE DRIVE, SUITE 101  
WYOMING BEACH, VIRGINIA 23684  
PHONE: (757) 474-0812 FAX: (757) 474-0919

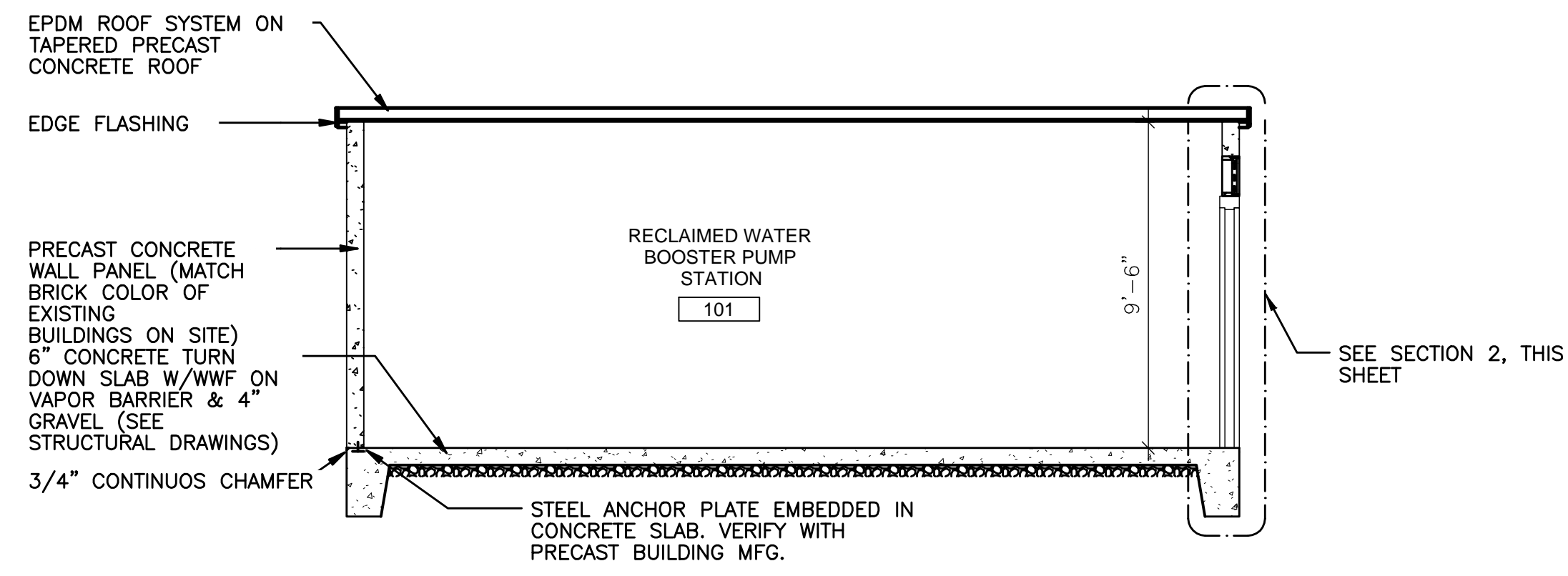


APPROVED	
ACTIVITY - SATISFACTORY TO	
DATE	
APPROVED	
FOR EFD FOR COMMANDER NAVFAC	
DATE	
A/E	EFD
HL	DESIGN
HL	DRAWN
JUR	REVIEW
CHB	QC
CHB	CHIEF ARCH/ ENGR.
PROJECT MANAGER	SDH
FIRE PROTECTION	
BRANCH MANAGER	
DESIGN DIRECTOR	

NAVAL FACILITIES ENGINEERING COMMAND  
MARINE CORPS AIR STATION, CHERRY POINT, N.C.  
**RECLAIMED WATER FOR WASTEWATER TREATMENT PLANT, B4376**  
FLOOR PLANS AND ELEVATIONS

CODE ID. NO. 80091 SIZE D  
SCALE: AS SHOWN  
FILE NO. 5334213  
ST. PROJ. NO. CP0932R  
SPEC. NO. -  
CONSTR. CONTR. NO. -  
NAVFAC DRAWING NO. 12588329  
SHEET 25 OF 37  
**A-03**

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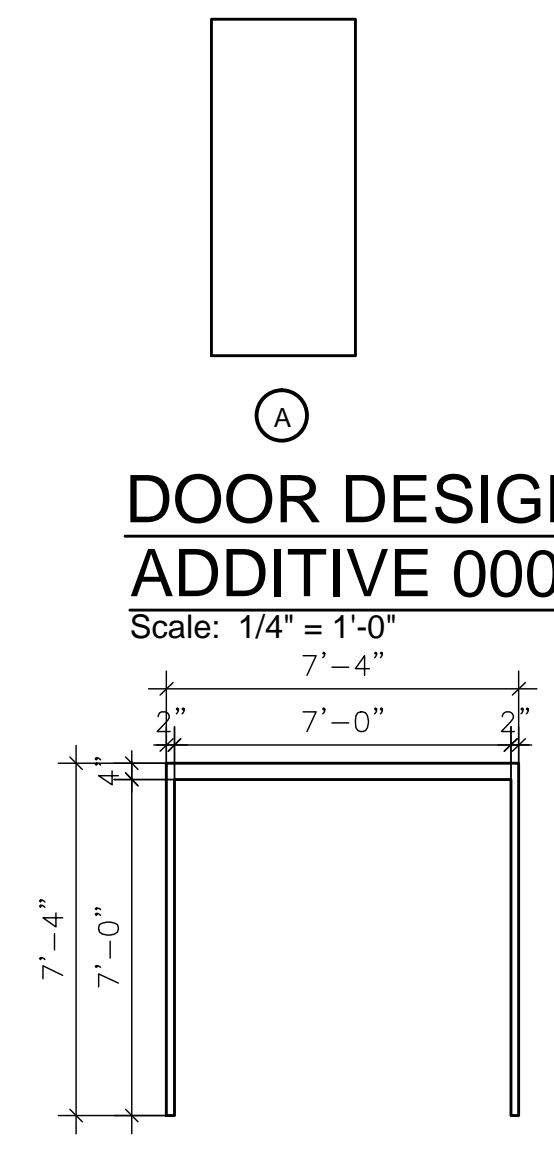


**1 LONGITUDINAL BUILDING SECTION - BID ADDITIVE 001A**  
 SCALE: 1/4" = 1'-0"

ROOM NUMBER	DESCRIPTION	FLOOR		BASE MATERIAL	WALL		CEILING		REMARKS
		MATERIAL	FINISH		MATERIAL	FINISH	MATERIAL	HEIGHT	
101	RECLAIMED WATER BOOSTER PUMP STATION	CONCRETE	SEALED	---	PRECAST CONCRETE	PAINT	PAINT EXPOSED STRUCTURE	9'-6"	

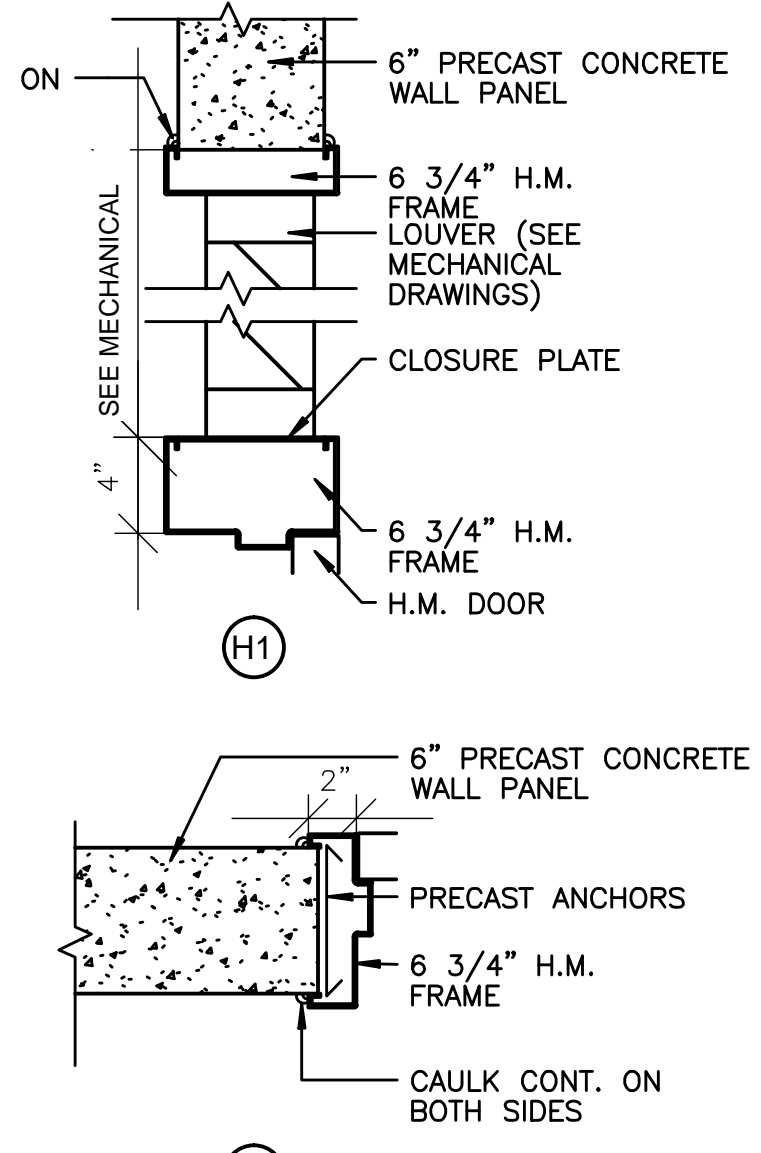
No.	SIZE	DOOR				FRAME				FIRE LABEL	REMARKS		
		MATERIAL	FINISH	DES.	HDW.	GLAZING	MATERIAL	FINISH	HEAD			JAMB	ELEV.
101	(2) 3'-6" X 7'-0"	H.M.	PAINT	A	1	---	H.M.	PAINT	H1	J1	1		

**BID ADDITIVE ITEM 0001A**  
 PROVIDE PRECAST CONCRETE BUILDING IN LIEU OF PRE-ENGINEERED METAL BUILDING.

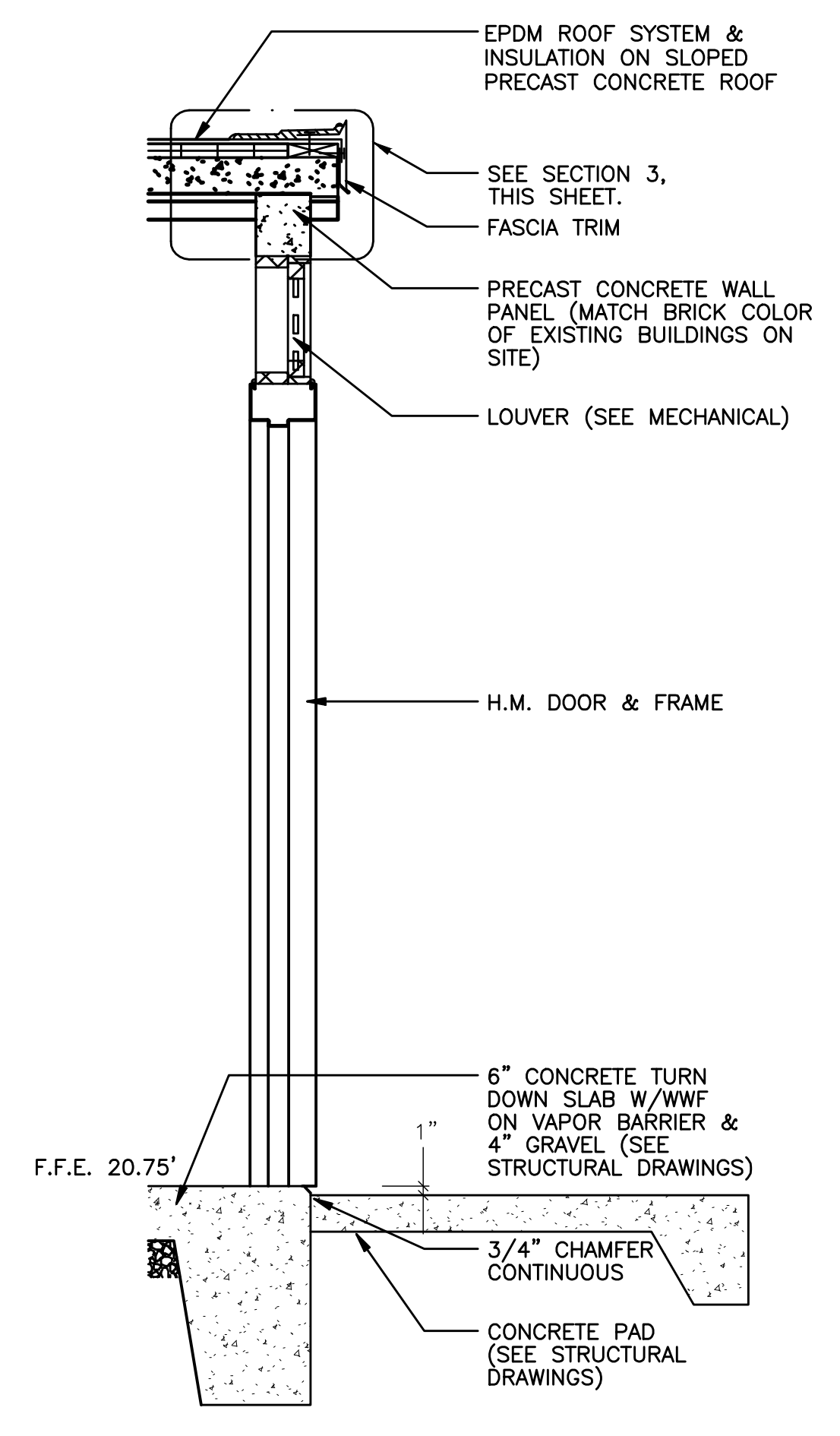


**DOOR DESIGN - BID ADDITIVE 0001A**  
 Scale: 1/4" = 1'-0"

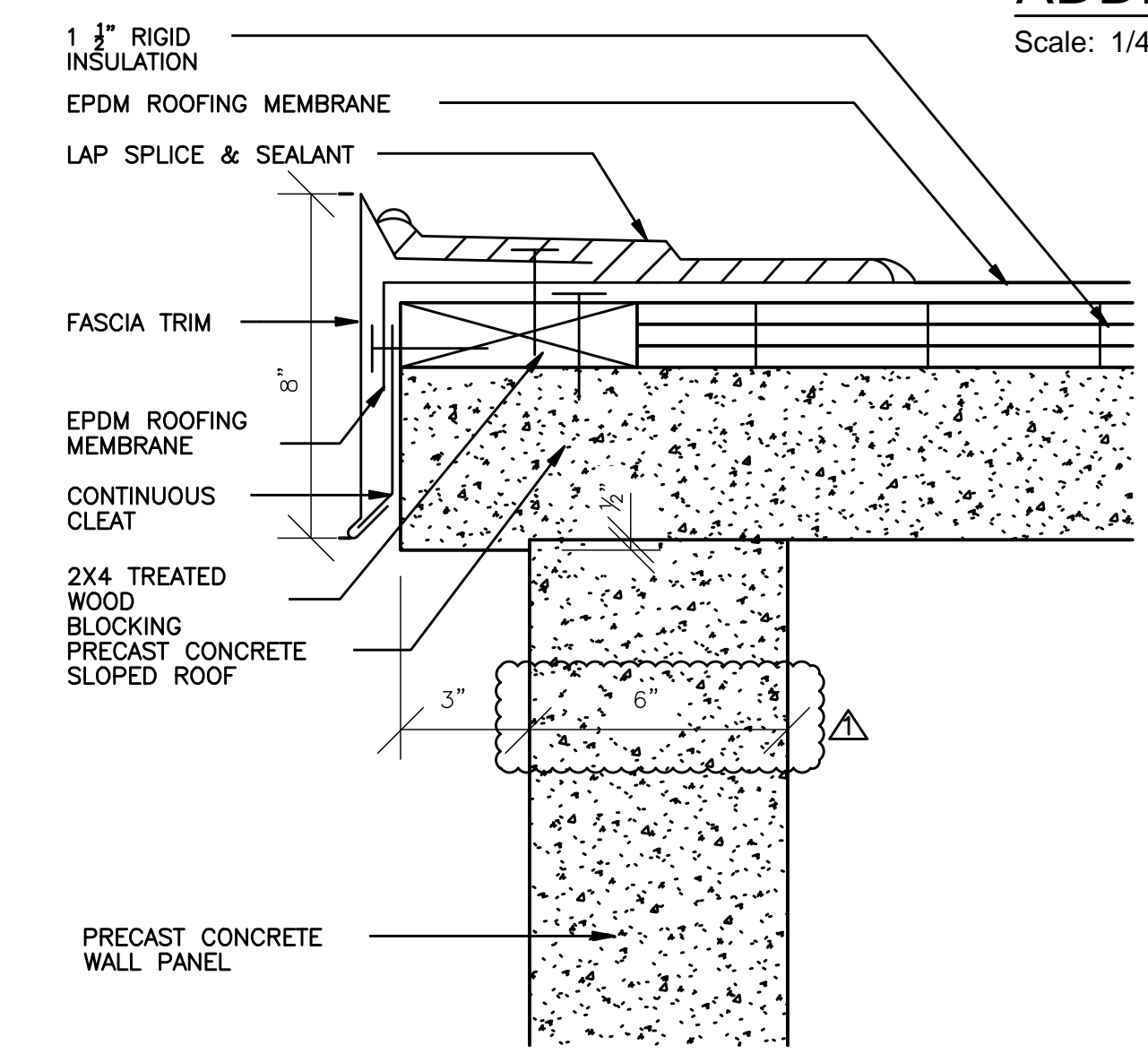
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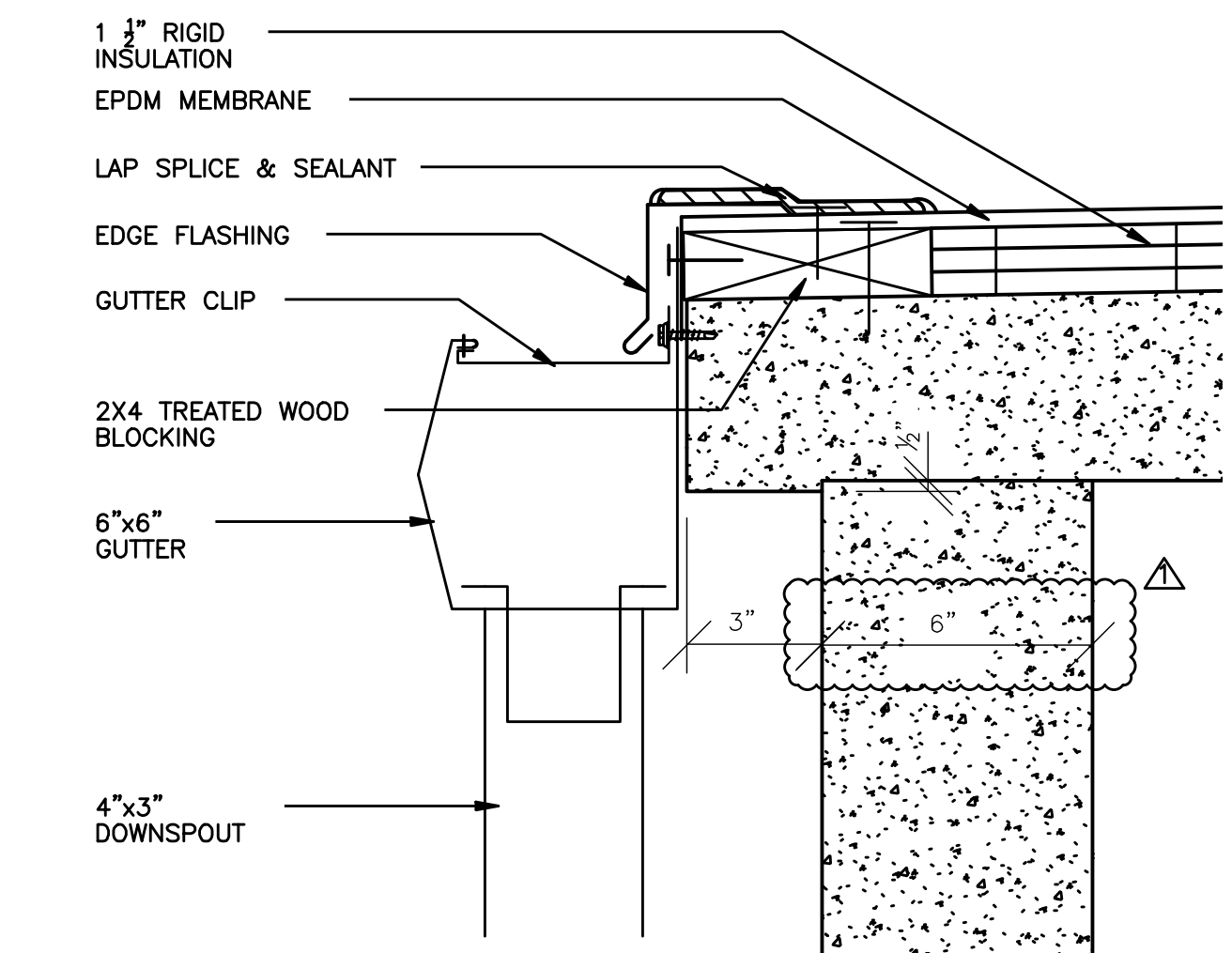
**HEAD & JAMB DETAILS - BID ADDITIVE 0001A**  
 Scale: 1 1/2" = 1'-0"



**2 WALL SECTION AT DOOR - BID ADDITIVE 0001A**  
 SCALE: 3/4" = 1'-0"



**3 FASCIA TRIM DETAIL - BID ADDITIVE 0001A**  
 SCALE: 3" = 1'-0"



**4 GUTTER DETAIL - BID ADDITIVE 0001A**  
 SCALE: 3" = 1'-0"

NO.	DATE	APPR.	DESCRIPTION

**NRW**  
 CONSULTING STRUCTURAL ENGINEERS  
 748 LORD DUNMORE DRIVE, SUITE 101  
 VIRGINIA BEACH, VIRGINIA 23464  
 PHONE: (757) 474-0812 FAX: (757) 474-0919

**Dewberry**  
 Dewberry & Davis, Inc.  
 2001 HERRINGWOODS DRIVE  
 SUITE 200  
 FARMERSBURGH, VIRGINIA 23061  
 PHONE: (804) 861-9600  
 FAX: (804) 861-9602  
 NCEBLS #17-0079

**JOHN J. RANSOY**  
 REGISTERED ARCHITECT  
 4449  
 9-7-11  
 CHARLOTTE, N.C.  
 DANVILLE, VA.

APPROVED \_\_\_\_\_  
 ACTIVITY - SATISFACTORY TO \_\_\_\_\_  
 DATE APPROVED \_\_\_\_\_  
 FOR EFD FOR COMMANDER NAVFAC \_\_\_\_\_  
 DATE \_\_\_\_\_  
 A/E \_\_\_\_\_ EFD \_\_\_\_\_  
 HL \_\_\_\_\_ DESIGN \_\_\_\_\_  
 HL \_\_\_\_\_ DRAWN \_\_\_\_\_  
 JUR \_\_\_\_\_ REVIEW \_\_\_\_\_  
 CHB \_\_\_\_\_ QC \_\_\_\_\_  
 CHB \_\_\_\_\_ CHIEF ARCH/ ENGR. \_\_\_\_\_  
 PROJECT MANAGER \_\_\_\_\_ SDH \_\_\_\_\_  
 FIRE PROTECTION \_\_\_\_\_  
 BRANCH MANAGER \_\_\_\_\_  
 DESIGN DIRECTOR \_\_\_\_\_

NAVY FACILITIES ENGINEERING COMMAND  
 MARINE CORPS AIR STATION, CHERRY POINT, N.C.  
**RECLAIMED WATER FOR WASTEWATER TREATMENT PLANT, B4376**  
 SECTIONS & SCHEDULES AND DOOR & FRAME DETAILS

DEPARTMENT OF THE NAVY

CODE ID. NO. 80091 SIZE D

SCALE: AS SHOWN

FILE NO. 5334213

ST. PRJ. NO. CP0932R

SPEC. NO. ---

CONSTR. CONTR. NO. ---

NAVFAC DRAWING NO. 12588330

SHEET 26 OF 37

**A-04**

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SECTION 03 45 33

PRECAST STRUCTURAL CONCRETE

04/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ACI INTERNATIONAL (ACI)

ACI 304R	(2000; R 2009) Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 305R	(2010) Specification for Hot Weather Concreting
ACI 306.1	(1990; R 2002) Standard Specification for Cold Weather Concreting
ACI 309R	(2005) Guide for Consolidation of Concrete
ACI 318	(2008; Errata 2010) Building Code Requirements for Structural Concrete and Commentary

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO HB-17	(2002; Errata 2003; Errata 2005, 17th Edition) Standard Specifications for Highway Bridges
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AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4	(1995; R 2004) Basic Hardboard
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AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2010) Structural Welding Code - Steel
AWS D1.4/D1.4M	(2005; Errata 2005) Structural Welding Code - Reinforcing Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 185/A 185M	(2007) Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM A 276	(2002) Standard Specification for Stainless Steel Bars and Shapes
ASTM A 416/A 416M	(2010) Standard Specification for Steel

	Strand, Uncoated Seven-Wire for Prestressed Concrete
ASTM A 496/A 496M	(2007) Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement
ASTM A 497/A 497M	(2007) Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete
ASTM A 615/A 615M	(2009b) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A 666	(2003) Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
ASTM A 706/A 706M	(2009b) Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A 82/A 82M	(2007) Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
ASTM C 1107/C 1107M	(2008) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C 1260	(2007) Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C 150/C 150M	(2009) Standard Specification for Portland Cement
ASTM C 260	(2006) Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C 33/C 33M	(2008) Standard Specification for Concrete Aggregates
ASTM C 494/C 494M	(2010a) Standard Specification for Chemical Admixtures for Concrete
ASTM C 618	(2008a) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C 94/C 94M	(2010) Standard Specification for Ready-Mixed Concrete
ASTM F 593	(2002) Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI)	
PCI MNL-116	(1999) Manual for Quality Control for Plants and Production of Structural Precast Concrete Products, 4th Edition

PCI MNL-120

(2004; Errata 2007) PCI Design Handbook -  
Precast and Prestressed Concrete, 6th  
Edition

## 1.2 SYSTEM DESCRIPTION

The work includes the provision of precast non-prestressed concrete herein referred to as precast members and precast, prestressed concrete herein referred to as prestressed members. Precast and Prestressed members shall be the product of a manufacturer specializing in the production of precast and prestressed concrete members.

### 1.2.1 Design Requirements

Design precast and prestressed members in accordance with ACI 318 and the PCI MNL-120. Design precast and prestressed members (including connections) for the design load conditions and spans indicated, and handling and erection stresses, and for additional loads imposed by openings and supports of the work of other trades. Design precast and prestressed members for handling without cracking in accordance with the PCI MNL-120.

#### 1.2.1.1 Precast Concrete Pump Station Building Requirements

- a. Inside clear dimensions of building shall be 25'-0" x 16'-0".
- b. Wall panel thickness shall be 6 inches.
- c. Interior wall height shall be a minimum of 9'-6".
- d. Roof panel thickness shall be tapered to allow water to run off towards gutter.
- e. Roof panel shall extend a minimum of 3 inches beyond the wall panel on each side and shall incorporate a turndown design which extends 1/2" below the top edge of the wall panels in order to prevent water migration into the building along the top of the wall panels.
- f. Roof and wall panels shall be produced as a single component monolithic panel. Joints in roof panel or vertical wall joints are not allowed, except at wall corners.

#### 1.2.1.2 Loads

Loadings for members and connections shall include all dead load, live load, applicable lateral loads such as wind and earthquake, applicable construction loads such as handling, erection loads, and other applicable loads.

#### 1.2.1.3 Drawing and Design Calculation Information

Submit drawings and design calculations indicating complete information for the fabrication, handling, and erection of the precast and prestressed member. Drawings shall not be reproductions of contract drawings. Design calculations, drawings of precast members, and drawings of precast prestressed concrete members (including connections) shall be made by a registered professional engineer experienced in the design of precast and prestressed concrete members and register in the state where the project is

located, and submitted for approval prior to fabrication. The drawings shall indicate, as a minimum, the following information:

- a. Plans, elevations and other drawing views showing the following:
  - (1) Member piece marks locating and defining products furnished by the manufacturer.
  - (2) Headers for openings.
  - (3) Location and size of openings that cut prestressing strands or require the location of prestressing strands to miss field cut openings.
  - (4) Relationships to adjacent material.
  - (5) Joints and openings between members and between members and other construction.
  - (6) Brick finish pattern and dimensions.
  - (7) Location of field installed anchors.
  - (8) Erection sequences and handling requirements
  - (9) Lifting and erection inserts
- b. Elevations, sections and other details for each member showing the following:
  - (1) Connections between members and connections between members and other construction.
  - (2) Connections for work of other trades and cast-in items and their relation to other trades.
  - (3) Dimensioned size and shape for each member with quantities, position and other details of reinforcing steel, anchors, inserts and other embedded items.
  - (4) Lifting, erection and other handling devices and inserts.
  - (5) Surface finishes of each member.
  - (6) Estimated cambers
  - (7) Brick finish pattern and dimensions.
- c. Strength properties for concrete, steel and other materials.
- d. Methods for storage and transportation.
- e. Description of loose, cast-in and field hardware.
- f. All dead, live, handling, erection and other applicable loads used in the design.

### 1.3 MODIFICATION TO REFERENCE

In the ACI publications, the advisory provisions shall be considered to be mandatory, as though the word "shall" has been substituted for "should" wherever it appears; reference to the "Building Official," the "Structural Engineer" and the "Architect/Engineer" shall be interpreted to mean the Contracting Officer.

### 1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

Drawings of precast members; G

Drawings of precast prestressed concrete members; G

#### SD-03 Product Data

Anchorage and lifting inserts and devices

Bearing pads

#### SD-04 Samples

Surface finish

Submit two 12 by 12 by 2 inch thick sample panels representative of the color and finish for each type of precast member.

#### SD-05 Design Data

Precast and Prestressed concrete members design calculations; G

Concrete mix design; G

#### SD-06 Test Reports

Submit copies of laboratory test reports showing that the mix has been successfully tested to produce concrete with the properties specified and that mix will be suitable for the job conditions. The laboratory test reports shall include mill test and all other test for cement, aggregates, and admixtures. Provide maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a graph of percentage retained versus sieve size. Test reports shall be submitted along with the concrete mix design. Obtain approval before concrete placement.

### 1.5 QUALITY ASSURANCE

#### 1.5.1 Qualifications

##### 1.5.1.1 Manufacturer Qualifications

PCI MNL-116. Plants shall be certified by the PCI Plant Certification Program for Category C1 work. At the Contracting Officer's option, PCI Plant quality control program records shall be available for review.

PCI MNL-116. Where panels are manufactured by specialists in plants not currently enrolled in the PCI "Quality Control Program," provide a product quality control system in accordance with PCI MNL-116 and perform concrete and aggregate quality control testing using an approved, independent commercial testing laboratory. Submit test results to the Contracting Officer.

#### 1.5.1.2 Designer Qualifications

The designer shall be a registered professional engineer in the state where the project is located experienced in the design of precast and prestressed concrete.

#### 1.5.1.3 Erector Qualifications

The erector shall be regularly engaged for at least three years in the erection of precast and prestressed structural concrete similar to the requirements of this project.

#### 1.5.1.4 Welding Qualifications

Provide AWS D1.1/D1.1M qualified welders who are currently certified at contract award date and have maintained their certificates over the past year.

#### 1.5.2 Regulatory Requirements

Provide precast and prestressed members in conformance with ACI 318 and AWS D1.4/D1.4M.

#### 1.5.3 Concrete Mix Design

Thirty days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Submit a complete list of materials including type; brand; source and amount of cement, fly ash, ground slag, and admixtures, and applicable reference specification. Provide mix proportion data using at least three different water-cement ratios for each class and type of concrete required. If source material changes, resubmit mix proportion data using revised source material. No material shall be provided unless proven by trial mix studies to meet the requirements of this specification, unless otherwise approved in writing by the Contracting Officer. The submittal shall clearly indicate where each mix design will be used when more than one mix design is submitted. Submit additional data regarding concrete aggregates if the source of aggregates changes.

#### 1.5.4 Certificates: Record Requirement

ASTM C 94/C 94M. Submit mandatory batch ticket information for each load of ready-mixed concrete.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

##### 1.6.1 Transportation

##### 1.6.1.1 Transporting Members

In transporting members by truck, railroad car, or barge, provision shall be made for supporting the members as described above, except battens can

be continuous over more than one stack of units, with adequate bracing to ensure their maintaining the vertical position and damping of dangerous vibrations. Trucks with double bolsters are satisfactory provided the members are fully seated on the outer bolsters at not more than 3 feet or the depth of the member from the end and the inner bolster is not more than 8 feet from the end of the member or the designated pickup point. Adequate padding material shall be provided between tie chains or cables to preclude chipping of concrete.

#### 1.6.1.2 Lateral Deflection or Vibration

Any noticeable indication of lateral deflection or vibration during transportation shall be corrected by rigid bracing between members or by means of lateral trussing.

#### 1.6.2 Storage

##### 1.6.2.1 Storage Areas

Storage areas for precast and prestressed members shall be stabilized, and suitable foundations shall be provided, so differential settlement or twisting of members will not occur.

##### 1.6.2.2 Stacked members

Stacked members shall be separated and supported by battens placed across the full width of each bearing point. Battens shall be arranged in vertical planes at a distance not greater than the depth of the member from designated pickup points. Battens shall not be continuous over more than one stack of precast units. Stacking of members shall be such that lifting devices will be accessible and undamaged. The upper members of a stacked tier shall not be used as storage areas for shorter members or equipment.

#### 1.6.3 Handling of Members

The location of pickup points for handling of the members and details of the pickup devices shall be shown in shop drawings. Members shall be handled only by means of approved devices at designated locations. Members shall be maintained in an upright position at all times and picked up and supported as shown in approved shop drawings.

## PART 2 PRODUCTS

### 2.1 CONTRACTOR-FURNISHED MIX DESIGN

ACI 318. The minimum compressive strength of concrete at 28 days shall be 5000 psi, unless otherwise indicated. Add air-entraining admixtures at the mixer to produce between 4 and 6 percent air by volume.

### 2.2 MATERIALS

#### 2.2.1 Cement

ASTM C 150/C 150M, Type I or II with a maximum alkali content of 0.40 percent. If no satisfactory test results are available (made within the past six months) to prove that the cement alkali content is less than 0.40 percent, then it shall be assumed that the cement contains greater than 0.40 percent alkali. Cement certificates shall include test results in accordance with ASTM C 150/C 150M, including equivalent alkalies indicated

in the optional chemical requirements. Use cement with a tricalcium aluminate (C3A) content of less than 8 percent. For exposed concrete, use one manufacturer for each type of cement, ground slag, fly ash, and pozzolan.

#### 2.2.1.1 Fly Ash and Pozzolan

ASTM C 618, Type N, F, or C, except that the maximum calcium oxide content shall be 8.0 percent, the maximum available alkalies shall be 1.5 percent, and the maximum allowable loss on ignition shall be 6 percent for Type N and F. Class C shall not be used with reactive aggregates.

#### 2.2.2 Water

Water shall be fresh, clean, and potable; free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete, ACI 318.

#### 2.2.3 Aggregates

##### 2.2.3.1 Aggregates Selection

ASTM C 33/C 33M, except as modified herein. Obtain aggregates for exposed concrete surfaces from one source. Aggregates shall not contain any substance which may be deleteriously reactive with the alkalies in the cement, nor in an amount sufficient to cause excessive expansion of concrete. Prior to fabrication, submit certified test reports for the following tests specified in ASTM C 33/C 33M:

- a. Grading
- b. Amount of material finer than No. 200 sieve
- c. Organic impurities
- d. Soundness
- e. Clay lumps and friable particles
- f. Coal and lignite
- g. Fineness modulus
- h. Reactive aggregates
- i. Freezing and thawing

##### 2.2.3.2 Alkali-Silica Reactivity

Evaluate and test fine and coarse aggregates to be used in all concrete for alkali-aggregate reactivity in accordance with ASTM C 1260. Test both coarse aggregate size groups if from different sources. Evaluate the fine and coarse aggregates separately and in combination, which matches the Contractor's proposed mix design proportioning, utilizing the modified version of ASTM C 1260. Test results of the combination must have a measured expansion equal to or less than 0.08 percent at 16 days after casting. Modify ASTM C 1260 as follows to included one of the following options:

a. Utilize the Contractor's proposed low alkali portland cement and Class F fly ash or Class N pozzolan in combination with the proposed aggregate percentage for the test proportioning. Use Class F fly ash or Class N pozzolan in the range of 25 percent to 40 percent of the total cementitious material by mass. Determine the quantity that will meet all the requirements of these specifications and that will lower the expansion equal to or less than 0.08 percent at 16 days after casting. Class C fly ash shall not be used with reactive aggregates.

b. Utilize the Contractor's proposed low alkali portland cement and a lithium nitrate admixture. The lithium nitrate admixture may be used in combination with either Class "F" fly ash, Class N pozzolan, or ground granulated blast furnace (GGBF) slag, at a dosage rate as recommended by the manufacturer.

If any of the above options does not lower the expansion to less than 0.08 percent at 16 days after casting, reject the aggregate(s) and submit new aggregate sources for retesting. Submit the results of testing to the Contracting Officer for evaluation and acceptance.

#### 2.2.4 Grout

##### 2.2.4.1 Nonshrink Grout

ASTM C 1107/C 1107M.

##### 2.2.4.2 Cementitious Grout

Shall be a mixture of portland cement, sand, and water. Proportion one part cement to approximately 2.5 parts sand, with the amount of water based on placement method. Provide air entrainment for grout exposed to the weather.

#### 2.2.5 Admixtures

##### 2.2.5.1 Air-Entraining

ASTM C 260.

##### 2.2.5.2 Accelerating

ASTM C 494/C 494M, Type C or E.

##### 2.2.5.3 Water Reducing

ASTM C 494/C 494M, Type A, E, or F.

#### 2.2.6 Reinforcement

##### 2.2.6.1 Reinforcing Bars

ASTM A 615/A 615M, Grade 60; ASTM A 706/A 706M, Grade 60.

##### 2.2.6.2 Wire

ASTM A 82/A 82M or ASTM A 496/A 496M.

2.2.6.3 Welded Wire Fabric

ASTM A 185/A 185M or ASTM A 497/A 497M.

2.2.7 Prestressing Strands

Uncoated, 7-wire strand stressed relieved, ASTM A 416/A 416M, Grade 270, strand diameter as shown.

2.2.8 Stainless Steel Connection Materials

2.2.8.1 Stainless-Steel Plate

ASTM A 666, Type 304, of grade suitable for application.

2.2.8.2 Stainless-Steel Bolts and Stud

ASTM F 593, Alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless-steel washers. Lubricate threaded parts of stainless-steel bolts with an antiseize thread lubricant during assembly.

2.2.8.3 Stainless-Steel-Headed Studs

ASTM A 276, with minimum mechanical properties of PCI MNL 116.

2.2.9 Bearing Pads

2.2.9.1 Elastomeric

AASHTO HB-17, for plain neoprene bearings.

2.2.9.2 Hardboard (Interior Only)

AHA A135.4, class as specified by the precast manufacturer.

2.2.10 Grout

2.2.10.1 Cementitious Grout

Shall be a mixture of portland cement, sand, and water. Proportion one part cement to approximately 2.5 parts sand, with the amount of water based on placement method. Provide air entrainment for grout exposed to the weather.

2.2.10.2 Nonshrink Grout

Nonshrink grout shall conform to ASTM C 1107/C 1107M and shall be a commercial formulation suitable for the application proposed.

2.3 PRODUCTION QUALITY CONTROL PROCEDURES

PCI MNL-116 unless specified otherwise.

2.3.1 Forms

Brace forms to prevent deformation. Forms shall produce a smooth, dense surface. Chamfer exposed edges of columns and beams 3/4 inch, unless otherwise indicated. Provide threaded or snap-off type form ties.

### 2.3.2 Reinforcement Placement

ACI 318 for placement and splicing. Reinforcement may be preassembled before placement in forms. Provide exposed connecting bars, or other approved connection methods, between precast and prestressed and cast-in-place construction. Remove any excess mortar that adheres to the exposed connections. Provide curvature or drape of the prestressing strands using approved hold-down devices.

### 2.3.3 Inserts

When the ends of the prestressed member will be exposed, recess the prestressing stands using inserts. After detensioning, remove inserts and fill the recess with nonshrink grout.

### 2.3.4 Concrete

#### 2.3.4.1 Concrete Mixing

ASTM C 94/C 94M. Mixing operations shall produce batch-to-batch uniformity of strength, consistency, and appearance.

#### 2.3.4.2 Concrete Placing

ACI 304R, ACI 305R for hot weather concreting , ACI 306.1 for cold weather concreting, and ACI 309R, unless otherwise specified.

#### 2.3.4.3 Concrete Curing

Commence curing immediately following the initial set and completion of surface finishing. Provide curing procedures to keep the temperature of the concrete between 50 and 190 degrees F. When accelerated curing is used, apply heat at controlled rate and uniformly along the casting beds. Monitor temperatures at various points in a product line in different casts.

### 2.3.5 Prestressing

Do not transfer prestressing forces during detensioning until the concrete has reached a minimum compressive strength of 3500 psi, unless a higher strength is required by the Contractor furnished design.

### 2.3.6 Surface Finish

Repairs located in a bearing area shall be approved by the Contracting Officer prior to repairs. Prestressed members which contain honeycombed sections deep enough to expose prestressing strands shall be rejected. Precast and prestressed members containing hairline cracks which are visible and are less than 0.01 inches in width, may be accepted, except that cracks larger than 0.005 inches in width for surfaces exposed to the weather shall be repaired. Defects that involve more than 36 square inches of concrete shall be grounds for rejection. Any precast and prestressed member that is structurally impaired or contains honeycombed section deep enough to expose stressing tendons or reinforcing shall be rejected. Defects shall be repaired or rejected as specified in paragraph "Defects."

#### 2.3.6.1 Unformed Surfaces

Provide a steel troweled finish.

### 2.3.6.2 Formed Surfaces

PCI MNL-116 (Appendix A - Commentary), Chapter 3, for grades of surface finishes.

- a. Unexposed Surfaces: Provide a standard grade surface finish.
- b. Exposed Surfaces: Provide a finish Grade B surface finish. The combined area of acceptable defective areas shall not exceed 0.2 percent of the exposed to view surface area, and the patches shall be indistinguishable from the surrounding surfaces when dry. In addition to a Grade B surface finish, members shall have a smooth rubbed finish.

### 2.3.6.3 Architectural Finish

#### 2.3.6.3.1 Wall Panel Interior Surface

Wall panel interior surfaces shall be smooth form finish

#### 2.3.6.3.2 Wall Panel Exterior Finish

Wall panel exterior finish shall be architectural precast concrete brick finish. Brick finish shall be imprinted in top face of panel while in form using an open grid impression tool similar to "EASI-Brick". Finished brick size shall be 2-3/8 inch by 7-5/8 inch with vertical steel float or light broom finish. Joints between each brick shall be 3/8 inch wide by 3/8 inch deep. Back of joint shall be concave to simulate hand-tooled joint. Each brick face shall be coated with H & C concrete stain by Sherwin-Williams (or approved equal). Stain color shall be brick red to match the brick color of existing buildings at WWTP site. Joints shall be kept substantially free of stain in order to maintain a gray concrete color.

#### 2.3.6.3.3 Joints Between Panels

All joints between panels shall be caulked on the exterior and interior surface of the joints. caulking shall be SIKAFLEX-1A elastic sealant or approved equal.

### 2.3.7 Acceptance/Rejection of Defects

#### 2.3.7.1 Minor Defects

All honeycombed areas, chipped corners, air pockets over 1/4 inch in diameter, and other minor defects involve less than 36 square inches of concrete shall be repaired. Form offsets of fins over 1/8 inch shall be ground smooth. All unsound concrete shall be removed from defective areas prior to repairing. All surfaces permanently exposed to view shall be repaired by a blend of portland cement and white cement properly proportioned so that the final color when cured will be the same as adjacent concrete.

#### 2.3.7.2 Major Defects

Major defects are those which involve more than 36 square inches of concrete or expose stressing tendons or reinforcing steel. If one or more major defects appear in a member, it shall be rejected. Cracks of a width of more than 0.01 inch shall be cause for rejection of the member.

## 2.4 TESTS, INSPECTIONS, AND VERIFICATIONS

### 2.4.1 Factory Inspection

At the option of the Contracting Officer, precast and prestressed units may be inspected by the Contracting Officer prior to being transported to the job site. The Contractor shall give notice 14 days prior to the time the units will be available for plant inspection. Neither the exercise nor waiver of inspection at the plant will affect the Government's right to enforce contractual provisions after units are transported or erected.

## PART 3 EXECUTION

### 3.1 EXAMINATION

Prior to erection, and again after installation, precast and prestressed members shall be checked for damage, such as cracking, spalling, and honeycombing. As directed by the Contracting Officer, precast and prestressed members that do not meet the surface finish requirements specified in Part 2 in paragraph entitled "Surface Finish" shall be repaired, or removed and replaced with new precast and prestressed members.

### 3.2 ERECTION

Precast and prestressed members shall be erected after the concrete has attained the specified compressive strength, unless otherwise approved by the precast and prestressing manufacturer. In addition, prestressed members shall not be rigidly fixed in position until the prestressed member has "aged" 90 days after detensioning. Erect in accordance with the approved shop drawings. PCI MNL-116 and PCI MNL-120 (Chapter 8), for tolerances. Provide a 1:500 tolerance, if no tolerance is specified. Brace precast and prestressed members, unless design calculations submitted with the shop drawings indicate bracing is not required. Follow the manufacturer's recommendations for maximum construction loads. Place precast and prestressed members level, plumb, square, and true within tolerances. Align member ends.

### 3.3 BEARING SURFACES

Shall be flat, free of irregularities, and properly sized. Size bearing surfaces to provide for the indicated clearances between the precast and prestressed member and adjacent precast and prestressed members or adjoining field placed surfaces. Correct bearing surface irregularities with nonshrink grout. Provide bearing pads where indicated or required. Do not use hardboard bearing pads in exterior locations. Place precast and prestressed members at right angles to the bearing surface, unless indicated otherwise, and draw-up tight without forcing or distortion, with sides plumb.

### 3.4 ANCHORAGE

Provide anchorage for fastening work in place. Conceal fasteners where practicable. Make threaded connections up tight and nick threads to prevent loosening.

### 3.5 WELDING

AWS D1.4/D1.4M for welding connections and reinforcing splices. Do not

weld prestressing strands. Protect the concrete and other reinforcing from heat during welding. Weld continuously along the entire area of contact. Grind smooth visible welds in the finished installation. Welding of epoxy-coated reinforcing is not allowed.

### 3.6 OPENINGS

Holes or cuts requiring reinforcing prestressing steel to be cut, which are not indicated on the approved shop drawing, shall only be made with the approval of the Contracting Officer and the precast manufacturer. Drill holes less than 12 inches in diameter with a diamond tipped core drill.

### 3.7 GROUTING

Clean and fill indicated keyways between precast and prestressed members, and other indicated areas, solidly with nonshrink grout or cementitious grout. Provide reinforcing where indicated. Remove excess grout before hardening.

### 3.8 CONSTRUCTION RECORDS

Complete construction records shall be kept of the manufacturing, handling, and erection of the precast-prestressed concrete members. Records shall be kept for, but not limited to, the following items:

- a. Specifications of material used in the manufacture of the members.
- b. Time-temperature history of the concrete members from casting to the transfer of the prestress force.
- c. Records of the tendon stressing operation including initial prestress force, measured elongation, how it was measured, and how the tendons were stressed and destressed.
- d. Records of inspection of the members before and after the prestress force is transferred to the members.
- e. Records of the inspection of the members each time they are moved.
- f. Records of any defects in the member and any corrective measures taken.

-- End of Section --

SECTION 06 10 00

ROUGH CARPENTRY

11/09

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)

ALSC PS 20 (2005) American Softwood Lumber Standard

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA BOOK (2009) AWPA Book of Standards

AWPA M2 (2007) Standard for Inspection of Treated Wood Products

AWPA M6 (2007) Brands Used on Forest Products

AWPA P18 (2007) Nonpressure Preservatives

AWPA P5 (2009) Standard for Waterborne Preservatives

ASTM INTERNATIONAL (ASTM)

ASTM A 307 (2007b) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

FM GLOBAL (FM)

FM 4435 (2004) Roof Perimeter Flashing

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-1923 (Rev A; Notice 2) Shield, Expansion (Lag, Machine and Externally Threaded Wedge Bolt Anchors)

CID A-A-1924 (Rev A; Notice 2) Shield, Expansion (Self Drilling Tubular Expansion Shell Bolt Anchors)

CID A-A-1925 (Rev A; Notice 2) Shield Expansion (Nail Anchors)

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

SD-05 Design Data

SD-06 Test Reports

### 1.3 DELIVERY AND STORAGE

Deliver materials to the site in an undamaged condition. Store, protect, handle, and install prefabricated structural elements in accordance with manufacturer's instructions and as specified. Store materials off the ground to provide proper ventilation, with drainage to avoid standing water, and protection against ground moisture and dampness. Store materials with a moisture barrier at both the ground level and as a cover forming a well ventilated enclosure. Remove defective and damaged materials and provide new materials.

### 1.4 GRADING AND MARKING

#### 1.4.1 Lumber

Mark each piece of framing and board lumber or each bundle of small pieces of lumber with the grade mark of a recognized association or independent inspection agency. Such association or agency shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Surfaces that are to be exposed to view shall not bear grademarks, stamps, or any type of identifying mark. Hammer marking will be permitted on timbers when all surfaces will be exposed to view.

#### 1.4.2 Preservative-Treated Lumber and Plywood

The Contractor shall be responsible for the quality of treated wood products. Each treated piece shall be inspected in accordance with AWPA M2 and permanently marked or branded, by the producer, in accordance with AWPA M6. The Contractor shall provide Contracting Officer's Representative (COR) with the inspection report of an approved independent inspection agency that offered products comply with applicable AWPA Standards. The appropriate Quality Mark on each piece will be accepted, in lieu of inspection reports, as evidence of compliance with applicable AWPA treatment standards.

### 1.5 SIZES AND SURFACING

ALSC PS 20 for dressed sizes of yard and structural lumber. Lumber shall be surfaced four sides. Size references, unless otherwise specified, are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which the product is produced. Other measurements are IP or SI standard.

### 1.6 MOISTURE CONTENT

Air-dry or kiln-dry lumber. Kiln-dry treated lumber after treatment. Maximum moisture content of wood products shall be as follows at the time of delivery to the job site:

- a. Materials other than lumber - Moisture content shall be in accordance with standard under which the product is produced

## 1.7 PRESERVATIVE TREATMENT

Treat wood products with waterborne wood preservatives conforming to AWPA P5. Pressure treatment of wood products shall conform to the requirements of AWPA BOOK Use Category System Standards U1 and T1. Pressure-treated wood products shall not contain arsenic, chromium, or other agents classified as carcinogenic, probably carcinogenic, or possibly carcinogenic to humans (compounds in Groups 1, 2A, or 2B) by the International Agency for Research on Cancer (IARC), Lyon, France. Pressure-treated wood products shall not exceed the limits of the U.S. EPA's Toxic Characteristic Leaching Procedure (TCLP), and shall not be classified as hazardous waste. Submit certification from treating plant stating chemicals and process used and net amount of preservatives retained are in conformance with specified standards.

a. 0.25 pcf intended for above ground use.

1. Plywood

2. Nailers and edge strips, for roof decks.

### 1.7.1 New Construction

Use a boron-based preservative conforming to AWPA P18, sodium silicate wood mineralization process, or Ammoniacal Copper Quaternary Compound to treat wood. Use boron-based preservatives for above-ground applications only.

## PART 2 PRODUCTS

### 2.1 PLYWOOD, STRUCTURAL-USE, AND ORIENTED STRAND BOARD (OSB) PANELS

#### 2.1.1 Plywood

Plywood for backer panels for electrical equipment. Plywood shall be FSC-certified.

### 2.2 ROUGH HARDWARE

Unless otherwise indicated or specified, rough hardware shall be of the type and size necessary for the project requirements. Rough hardware exposed to the weather or embedded in or in contact with preservative treated wood, or concrete walls or slabs shall be zinc-coated.

#### 2.2.1 Anchor Bolts

ASTM A 307, size as indicated, complete with nuts and washers.

#### 2.2.2 Expansion Shields

CID A-A-1923, CID A-A-1924, and CID A-A-1925. Except as shown otherwise, maximum size of devices shall be 3/8 inch.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Fit framing lumber and other rough carpentry, set accurately to the required lines and levels, and secure in place in a rigid manner.

3.1.1 Sills  
3.1.1.1 Anchors in Concrete

Except where indicated otherwise, Embed anchor bolts not less than 8 inches in poured concrete walls and provide each with a nut and a 2 inch diameter washer at bottom end. A bent end may be substituted for the nut and washer; bend shall be not less than 90 degrees. Powder-actuated fasteners spaced 3 feet o.c. may be provided in lieu of bolts for single thickness plates on concrete.

3.2 MISCELLANEOUS

3.2.1 Wood Roof Nailers, Edge Strips, Crickets, Curbs, and Cants

Provide sizes and configurations indicated or specified and anchored securely to continuous construction.

3.2.1.1 Roof Edge Strips and Nailers

Provide at perimeter of roof and around openings through roof. Except where indicated otherwise, nailers shall be 6 inches wide and the same thickness as the insulation. Anchor nailers securely to underlying construction. Anchor perimeter nailers in accordance with FM 4435.

SECTION 07 22 00

ROOF AND DECK INSULATION

08/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 1289 (2010) Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

ASTM E 84 (2010b) Standard Test Method for Surface Burning Characteristics of Building Materials

FM GLOBAL (FM)

FM P9513 (2002) Specialist Data Book Set for Roofing Contractors; contains 1-22 (2001), 1-28 (2002), 1-29 (2002), 1-28R/1-29R (1998), 1-30 (2000), 1-31 (2000), 1-32 (2000), 1-33 (2000), 1-34 (2001), 1-49 (2000), 1-52 (2000), 1-54 (2001)

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir (2010) Building Materials Directory

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Insulation; G

SD-08 Manufacturer's Instructions

Nails and Adhesive

Roof insulation, including field of roof and perimeter attachment requirements.

1.3 QUALITY ASSURANCE

1.3.1 Insulation on Concrete Decks

Roof insulation shall have a flame spread rating not greater than 75 and a smoke developed rating not greater than 150, exclusive of covering, when

tested in accordance with ASTM E 84. Insulation bearing the UL label and listed in the UL Bld Mat Dir as meeting the flame spread and smoke developed ratings will be accepted in lieu of copies of test reports.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

##### 1.4.1 Delivery

Deliver materials to site in manufacturer's unopened and undamaged standard commercial containers bearing the following legible information:

- a. Name of manufacturer;
- b. Brand designation;
- c. Specification number, type, and class, as applicable, where materials are covered by a referenced specification; and

Deliver materials in sufficient quantity to allow continuity of the work.

##### 1.4.2 Storage and Handling

Store and handle materials in a manner to protect from damage, exposure to open flame or other ignition sources, and from wetting, condensation or moisture absorption. Store in an enclosed building or trailer that provides a dry, adequately ventilated environment. Store felt rolls on ends. For the 24 hours immediately before application of felts, store felts in an area maintained at a temperature no lower than 50 degrees F above grade and having ventilation around all sides. Replace damaged material with new material.

#### 1.5 ENVIRONMENTAL CONDITIONS

Do not install roof insulation during inclement weather or when air temperature is below 40 degrees F and interior humidity is 45 percent or greater, or when there is visible ice, frost, or moisture on the roof deck.

## PART 2 PRODUCTS

### 2.1 INSULATION

#### 2.1.1 Insulation Types

Roof insulation shall be as follows and compatible with attachment methods for the specified insulation and roof membrane:

- a. Polyisocyanurate Board: ASTM C 1289 Type II, fibrous felt or glass mat membrane both sides, except minimum compressive strength shall be 20 pounds per square inch (psi).

### 2.2 ADHESIVE

Manufacturer's standard spray-applied, low rise, two component urethane based adhesive.

### 2.3 WOOD NAILERS

Pressure-preservative-treated as specified in Section 06 10 00 ROUGH CARPENTRY.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

3.1.1 Surface Inspection

Surfaces shall be clean, smooth, and dry. Check roof deck surfaces, including surfaces sloped to roof drains and outlets, for defects before starting work.

The Contractor shall inspect and approve the surfaces immediately before starting installation. Prior to installing insulation, perform the following:

- a. In the presence of the Contracting Officer perform the following surface-dryness test on concrete substrates:
  - (1) Foaming: When poured on the deck, one pint of asphalt when heated in the range of 350 to 400 degrees F, shall not foam upon contact.
  - (2) Strippability: After asphalt used in the foaming test application has cooled to ambient temperatures, test coating for adherence. Should a portion of the sample be readily stripped clean from surface, do not consider surface to be dry and do not start application. Should rain occur during application, stop work and do not resume until surface has been tested by method above and found dry.

3.1.2 Surface Preparation

Correct defects and inaccuracies in roof deck surface to eliminate poor drainage and hollow or low spots and perform the following:

- a. Install wood nailers the same thickness as insulation at eaves, edges, securing edge trims and gutters and flashing flanges. Space nailers in accordance with approved shop drawings.

3.2 INSULATION INSTALLATION

Lay insulation so that continuous longitudinal joints are perpendicular to direction of roofing, as specified in Section 07 53 23 ETHYLENE-PROPYLENE-DIENE-MONOMER-ROOFING, and end joints of each course are staggered with those of adjoining courses. When using multiple layers of insulation, joints of each succeeding layer shall be parallel and offset in both directions with respect to layer below.

3.2.1 Installation Using Adhesive

Secure total thickness of insulation with low rise urethane base foam adhesive in a bead application with beads at 4" O.C. max.

3.2.2 Special Precautions for Installation of Foam Insulation

3.3 PROTECTION

3.3.1 Protection of Applied Insulation

Completely cover each day's installation of insulation with the finished roofing specified in 07 53 23 on same day. Do not permit phased construction. Do not permit storing, walking, wheeling, or trucking directly on insulation or on roofed surfaces. Provide smooth, clean board or plank walkways, runways, and platforms near supports, as necessary, to distribute weight to conform to indicated live load limits of roof construction. Exposed edges of the insulation shall be protected by cutoffs at the end of each work day or whenever precipitation is imminent. Cutoffs shall be 2 layers of bituminous-saturated felt set in plastic bituminous cement or EPDM membrane set in roof cement. Fill all profile voids in cut-offs to prevent entrapping of moisture into the area below the membrane. Cutoffs shall be removed when work is resumed.

3.3.2 Damaged Work and Materials

Restore work and materials that become damaged during construction to original condition or replace with new materials.

3.4 INSPECTION

The Contractor shall establish and maintain an inspection procedure to assure compliance of the installed roof insulation with the contract requirements. Any work found not to be in compliance with the contract shall be promptly removed and replaced or corrected in an approved manner. Quality control shall include, but not be limited to, the following:

- a. Observation of environmental conditions; number and skill level of insulation workers; start and end time of work.
- b. Verification of certification, listing or label compliance with FM P9513.
- c. Verification of proper storage and handling of insulation and vapor retarder materials before, during, and after installation.
- d. Inspection of mechanical fasteners; type, number, length, and spacing.
- e. Coordination with other materials, cants, sleepers, and nailing strips.
- f. Inspection of insulation joint orientation and laps between layers, joint width and bearing of edges of insulation on deck.
- g. Installation of cutoffs and proper joining of work on subsequent days.
- h. Continuation of complete roofing system installation to cover insulation installed same day.

-- End of Section --

SECTION 08 71 00

DOOR HARDWARE  
08/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.1	(2006) Butts and Hinges
ANSI/BHMA A156.13	(2005) Mortise Locks & Latches Series 1000
ANSI/BHMA A156.15	(2006) Release Devices Closer Holder, Electromagnetic and Electromechanical
ANSI/BHMA A156.16	(2008) Auxiliary Hardware
ANSI/BHMA A156.18	(2006) Materials and Finishes
ANSI/BHMA A156.22	(2005) Door Gasketing and Edge Seal Systems
ANSI/BHMA A156.4	(2008) Door Controls - Closers
ANSI/BHMA A156.6	(2010) Architectural Door Trim
ANSI/BHMA A156.7	(2003; R 2009) Template Hinge Dimensions

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR A250.8	(2003; R2008) Recommended Specifications for Standard Steel Doors and Frames
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1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

SD-02 Shop Drawings

Hardware schedule; G

Keying system

SD-03 Product Data

Hardware items; G

SD-08 Manufacturer's Instructions

Installation

SD-10 Operation and Maintenance Data

Hardware Schedule items, Data Package 1; G

Submit data package in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.3 HARDWARE SCHEDULE

Prepare and submit hardware schedule in the following form:

Hard- ware Item	Quan- tity	Size	Reference		Mfr.	Key Con- trol Symbols	UL Mark	BHMA Finish Designa- tion
			Publi- cation Type No.	Finish	Name and Catalog No.		(If fire rated and listed)	
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1.4 DELIVERY, STORAGE, AND HANDLING

Deliver hardware in original individual containers, complete with necessary appurtenances including fasteners and instructions. Mark each individual container with item number as shown in hardware schedule. Deliver permanent keys and removable cores to the Contracting Officer, either directly or by certified mail. Deliver construction master keys with the locks.

PART 2 PRODUCTS

2.1 TEMPLATE HARDWARE

Provide hardware to be applied to metal manufactured to template. Promptly furnish template information or templates to door and frame manufacturers. Conform to ANSI/BHMA A156.7 for template hinges. Coordinate hardware items to prevent interference with other hardware.

2.2 HARDWARE ITEMS

Clearly and permanently mark with the manufacturer's name or trademark, hinges, pivots, locks, latches, exit devices, bolts and closers where the identifying mark will be visible after the item is installed. For closers with covers, the name or trademark may be beneath the cover.

2.2.1 Hinges

ANSI/BHMA A156.1, 4-1/2 by 4-1/2 inch unless otherwise indicated. Construct loose pin hinges for exterior doors and so that pins will be nonremovable when door is closed. Other antifriction bearing hinges may be provided in lieu of ball-bearing hinges.

2.2.2 Locks and Latches

2.2.2.1 Mortise Locks and Latches

ANSI/BHMA A156.13, Series 1000, Operational Grade 1, Security Grade 2. Provide mortise locks with escutcheons not less than 7 by 2-1/4 inch with a bushing at least 1/4 inch long. Cut escutcheons to suit cylinders and provide trim items with straight, beveled, or smoothly rounded sides,

corners, and edges.

### 2.2.3 Cylinders and Cores

Provide cylinders and cores with six pin tumblers. Provide cylinders from products of one manufacturer, and provide cores from the products of one manufacturer. Mortise cylinders have interchangeable cores which are removable by special control keys. Stamp each interchangeable core with a key control symbol in a concealed place on the core.

### 2.2.4 Keying System

Provide an extension of the existing keying system. Provide construction interchangeable cores.

### 2.2.5 Lock Trim

Cast, forged, or heavy wrought construction and commercial plain design.

#### 2.2.5.1 Lever Handles

Provide lever handles in lieu of knobs. Provide lever handle locks with a breakaway feature (such as a weakened spindle or a shear key) to prevent irreparable damage to the lock when force in excess of that specified in ANSI/BHMA A156.13 is applied to the lever handle. Provide lever handles return to within 1/2 inch of the door face.

#### 2.2.5.2 Texture

Provide knurled or abrasive coated knobs or lever handles for doors which are accessible to blind persons and which lead to dangerous areas.

### 2.2.6 Keys

Furnish one file key, one duplicate key, and one working key for each key change. Furnish one additional working key for each lock of each keyed-alike group. Furnish 2 control keys for removable cores. Stamp each key with appropriate key control symbol and "U.S. property - Do not duplicate."

### 2.2.7 Door Bolts

ANSI/BHMA A156.16. Provide dustproof strikes for bottom bolts, except for doors having metal thresholds.

### 2.2.8 Closers

ANSI/BHMA A156.4, Series C02000, Grade 1, with PT 4C. Provide with brackets, arms, mounting devices, fasteners, full size covers and other features necessary for the particular application. Size closers in accordance with manufacturer's recommendations, or provide multi-size closers, Sizes 1 through 6, and list sizes in the Hardware Schedule. Provide manufacturer's 10 year warranty.

#### 2.2.8.1 Identification Marking

Engrave each closer with manufacturer's name or trademark, date of manufacture, and manufacturer's size designation located to be visible after installation.

2.2.9 Closer Holder-Release Devices

ANSI/BHMA A156.15.

2.2.10 Door Protection Plates

ANSI/BHMA A156.6.

2.2.10.1 Sizes of Kick Plates

One inch less than door width for pairs of doors. Provide 8 inch kick plates for flush doors

2.2.11 Weather Stripping Gasketing

ANSI/BHMA A156.22. Provide the type and function designation where specified in paragraph entitled "Hardware Schedule". Provide a set to include head and jamb seals, sweep strips, and, for pairs of doors, astragals. Air leakage of weather stripped doors not to exceed 1.25 cubic feet per minute of air per square foot of door area. Provide weather stripping with one of the following:

2.2.11.1 Extruded Aluminum Retainers

Extruded aluminum retainers not less than 0.050 inch wall thickness with vinyl, neoprene, silicone rubber, or polyurethane inserts. Provide clear (natural) anodized aluminum.

2.2.12 Special Tools

Provide special tools, such as spanner and socket wrenches and dogging keys, required to service and adjust hardware items.

2.3 FASTENERS

Provide fasteners of proper type, quality, size, quantity, and finish with hardware. Provide stainless steel or nonferrous metal fasteners that are exposed to weather. Provide fasteners of type necessary to accomplish a permanent installation.

2.4 FINISHES

ANSI/BHMA A156.18. Provide hardware in BHMA 630 finish (satin stainless steel), unless specified otherwise. Provide items not manufactured in stainless steel in BHMA 626 finish (satin chromium plated) over brass or bronze, except aluminum paint finish for surface door closers. Provide hinges for exterior doors in stainless steel with BHMA 630 finish or chromium plated brass or bronze with BHMA 626 finish.

PART 3 EXECUTION

3.1 INSTALLATION

Install hardware in accordance with manufacturers' printed installation instructions. Shields for fastening hardware to solid concrete surfaces. Provide through bolts where necessary for satisfactory installation.

3.1.1 Weather Stripping Installation

Handle and install weather stripping to prevent damage. Provide full contact, weather-tight seals. Operate doors without binding.

3.1.1.1 Stop-Applied Weather Stripping

Fasten in place with color-matched sheet metal screws not more than 9 inch on center after doors and frames have been finish painted.

3.1.2 Threshold Installation

Extend thresholds the full width of the opening and notch end for jamb stops. Set thresholds in a full bed of sealant and anchor to floor with cadmium-plated, countersunk, steel screws in expansion sleeves.

3.2 HARDWARE LOCATIONS

SDI/DOOR A250.8, unless indicated or specified otherwise.

- a. Kick Plates: Push side of single-acting doors.

3.3 FIELD QUALITY CONTROL

After installation, protect hardware from paint, stains, blemishes, and other damage until acceptance of work. Submit notice of testing 15 days before scheduled, so that testing can be witnessed by the Contracting Officer. Adjust hinges, locks, latches, bolts, holders, closers, and other items to operate properly. Demonstrate that permanent keys operate respective locks, and give keys to the Contracting Officer. Correct, repair, and finish, as directed, errors in cutting and fitting and damage to adjoining work.

3.4 HARDWARE SETS

HW - 1 (Door 101)

3 Pair Hinges	A2112 by 626 by WRP
2 Locksets	F07 by 630
2 Closers	CO 2061
2 Kick plates	J102 by 630
I lever Extension Flush Bolt	L54081
1 Dust Proof Strike	L54021
1 Threshold	J32130
1 Set WEatherstripping	R34164

-- End of Section --

SECTION 09 90 00

PAINTS AND COATINGS

08/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH 0100Doc (2005) Documentation of the Threshold  
Limit Values and Biological Exposure  
Indices

ASTM INTERNATIONAL (ASTM)

ASTM D 2092 (1995; R 2001e1) Standard Guide for  
Preparation of Zinc-Coated (Galvanized)  
Steel Surfaces for Painting

ASTM D 523 (2008) Standard Test Method for Specular  
Gloss

MASTER PAINTERS INSTITUTE (MPI)

MPI 141 (Oct 2009) Interior High Performance Latex  
MPI Gloss Level 5

MPI 39 (Oct 2009) Interior Latex-Based Wood Primer

MPI 50 (Oct 2009) Interior Latex Primer Sealer

MPI 54 (Oct 2009) Interior Latex, Semi-Gloss, MPI  
Gloss Level 5

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PA 1 (2000; E 2004) Shop, Field, and  
Maintenance Painting of Steel

SSPC PA Guide 3 (1982; E 1995) A Guide to Safety in Paint  
Application

SSPC SP 1 (1982; E 2004) Solvent Cleaning

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2008; Change 1-2010; Change 3-2010;  
Errata 1-2010) Safety and Health  
Requirements Manual

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD-313

(Rev D; Am 1) Material Safety Data,  
Transportation Data and Disposal Data for  
Hazardous Materials Furnished to  
Government Activities

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.1000

Air Contaminants

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00  
SUBMITTAL PROCEDURES:

The current MPI, "Approved Product List" which lists paint by brand, label, product name and product code as of the date of contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use a subsequent MPI "Approved Product List", however, only one list may be used for the entire contract and each coating system is to be from a single manufacturer. All coats on a particular substrate must be from a single manufacturer. No variation from the MPI Approved Products List is acceptable.

Samples of specified materials may be taken and tested for compliance with specification requirements.

SD-02 Shop Drawings

SD-03 Product Data

SD-04 Samples

Color

Submit manufacturer's samples of paint colors. Cross reference color samples to color scheme as indicated.

SD-08 Manufacturer's Instructions

Mixing

Detailed mixing instructions, minimum and maximum application temperature and humidity, potlife, and curing and drying times between coats.

Manufacturer's Material Safety Data Sheets

Submit manufacturer's Material Safety Data Sheets for coatings, solvents, and other potentially hazardous materials, as defined in FED-STD-313.

SD-10 Operation and Maintenance Data

Coatings:

Preprinted cleaning and maintenance instructions for all coating systems shall be provided.

### 1.3 REGULATORY REQUIREMENTS

#### 1.3.1 Environmental Protection

In addition to requirements specified elsewhere for environmental protection, provide coating materials that conform to the restrictions of the local Air Pollution Control District and regional jurisdiction. Notify Contracting Officer of any paint specified herein which fails to conform.

#### 1.3.2 Lead Content

Do not use coatings having a lead content over 0.06 percent by weight of nonvolatile content.

#### 1.3.3 Chromate Content

Do not use coatings containing zinc-chromate or strontium-chromate.

#### 1.3.4 Asbestos Content

Materials shall not contain asbestos.

#### 1.3.5 Mercury Content

Materials shall not contain mercury or mercury compounds.

#### 1.3.6 Silica

Abrasive blast media shall not contain free crystalline silica.

#### 1.3.7 Human Carcinogens

Materials shall not contain ACGIH 0100Doc and ACGIH 0100Doc confirmed human carcinogens (A1) or suspected human carcinogens (A2).

### 1.4 PACKAGING, LABELING, AND STORAGE

Paints shall be in sealed containers that legibly show the contract specification number, designation name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name and address of manufacturer. Pigmented paints shall be furnished in containers not larger than 5 gallons. Paints and thinners shall be stored in accordance with the manufacturer's written directions, and as a minimum, stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors, and at temperatures between 40 to 95 degrees F.

### 1.5 SAFETY AND HEALTH

Apply coating materials using safety methods and equipment in accordance with the following:

Work shall comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis as specified in Section 01 35 29 SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS and in Appendix A of EM 385-1-1. The Activity Hazard

Analysis shall include analyses of the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

1.5.1 Safety Methods Used During Coating Application

Comply with the requirements of SSPC PA Guide 3.

1.5.2 Toxic Materials

To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:

- a. The applicable manufacturer's Material Safety Data Sheets (MSDS) or local regulation.
- b. 29 CFR 1910.1000.
- c. ACGIH 0100Doc, threshold limit values.

1.6 ENVIRONMENTAL CONDITIONS

Comply, at minimum, with manufacturer recommendations for space ventilation during and after installation.

1.6.1 Coatings

Do not apply coating when air or substrate conditions are:

- a. Less than 5 degrees F above dew point;
- b. Below 50 degrees F or over 95 degrees F, unless specifically pre-approved by the Contracting Officer and the product manufacturer. Under no circumstances shall application conditions exceed manufacturer recommendations.

1.7 COLOR SELECTION

Colors of finish coats shall be as indicated or specified. Where not indicated or specified, colors shall be selected by the Contracting Officer.

Tint each coat progressively darker to enable confirmation of the number of coats.

1.8 LOCATION AND SURFACE TYPE TO BE PAINTED

1.8.1 Painting Included

Where a space or surface is indicated to be painted, include the following unless indicated otherwise.

- a. Surfaces behind portable objects and surface mounted articles readily detachable by removal of fasteners, such as screws and bolts.
- b. New factory finished surfaces that require identification or color coding and factory finished surfaces that are damaged during performance of the work.

- c. Existing coated surfaces that are damaged during performance of the work.

1.8.1.1 Exterior Painting

Includes new surfaces of the buildings and appurtenances. Also included are existing coated surfaces made bare by cleaning operations.

1.8.1.2 Interior Painting

Includes new surfaces, existing uncoated surfaces, of the building and appurtenances as indicated and existing coated surfaces made bare by cleaning operations.

1.8.2 Painting Excluded

Do not paint the following unless indicated otherwise.

- a. Surfaces concealed and made inaccessible by panelboards, fixed ductwork, machinery, and equipment fixed in place.
- b. Steel to be embedded in concrete.
- c. Hardware, fittings, and other factory finished items.

1.8.3 Mechanical and Electrical Painting

Includes field coating of interior new surfaces.

- a. Where a space or surface is indicated to be painted, include the following items unless indicated otherwise.
  - (1) Exposed piping, conduit, and ductwork;
  - (2) Supports, hangers, air grilles, and registers;
  - (3) Miscellaneous metalwork and insulation coverings.
- b. Do not paint the following, unless indicated otherwise:
  - (1) New zinc-coated, aluminum, and copper surfaces under insulation.
  - (2) New aluminum jacket on piping
  - (3) New interior ferrous piping under insulation.

1.8.4 Definitions and Abbreviations

1.8.4.1 Batch Quality Conformance Testing

Batch quality conformance testing determines that the product provided is the same as the product qualified to the appropriate product specification. This testing shall only be accomplished by MPI testing lab.

1.8.4.2 DFT or dft

Dry film thickness, the film thickness of the fully cured, dry paint or coating.

1.8.4.3 DSD

Degree of Surface Degradation, the MPI system of defining degree of surface degradation. Five (5) levels are generically defined under the Assessment sections in the MPI Maintenance Repainting Manual.

1.8.4.4 EXT

MPI short term designation for an exterior coating system.

1.8.4.5 INT

MPI short term designation for an interior coating system.

1.8.4.6 micron / microns

The metric measurement for 0.001 mm or one/one-thousandth of a millimeter.

1.8.4.7 mil / mils

The English measurement for 0.001 in or one/one-thousandth of an inch, equal to 25.4 microns or 0.0254 mm.

1.8.4.8 mm

The metric measurement for millimeter, 0.001 meter or one/one-thousandth of a meter.

1.8.4.9 MPI Gloss Levels

MPI system of defining gloss. Seven (7) gloss levels (G1 to G7) are generically defined under the Evaluation sections of the MPI Manuals. Traditionally, Flat refers to G1/G2, Eggshell refers to G3, Semigloss refers to G5, and Gloss refers to G6.

Gloss levels are defined by MPI as follows:

Gloss Level	Description	Units at 60 degrees	Units at 85 degrees
G1	Matte or Flat	0 to 5	10 max
G2	Velvet	0 to 10	10 to 35
G3	Eggshell	10 to 25	10 to 35
G4	Satin	20 to 35	35 min
G5	Semi-Gloss	35 to 70	
G6	Gloss	70 to 85	
G7	High Gloss		

Gloss is tested in accordance with ASTM D 523. Historically, the Government has used Flat (G1 / G2), Eggshell (G3), Semi-Gloss (G5), and Gloss (G6).

1.8.4.10 MPI System Number

The MPI coating system number in each Division found in either the MPI Architectural Painting Specification Manual or the Maintenance Repainting Manual and defined as an exterior (EXT/REX) or interior system (INT/RIN). The Division number follows the CSI Master Format.

1.8.4.11 Paint

See Coating definition.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to the coating specifications and standards referenced in PART 3. Submit manufacturer's technical data sheets for specified coatings and solvents.

PART 3 EXECUTION

3.1 PROTECTION OF AREAS AND SPACES NOT TO BE PAINTED

Prior to surface preparation and coating applications, remove, mask, or otherwise protect, hardware, hardware accessories, machined surfaces, plates, lighting fixtures, public and private property, and other such items not to be coated that are in contact with surfaces to be coated. Following completion of painting, workmen skilled in the trades involved shall reinstall removed items. Restore surfaces contaminated by coating materials, to original condition and repair damaged items.

3.2 SURFACE PREPARATION

Remove dirt, loose particles, grease, oil, and other foreign matter and substances deleterious to coating performance as specified for each substrate before application of paint or surface treatments. Oil and grease shall be removed prior to mechanical cleaning. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces.

3.3 PREPARATION OF METAL SURFACES

3.3.1 Galvanized Surfaces

a. New Galvanized Surfaces With Only Dirt and Zinc Oxidation Products: Clean with solvent, or non-alkaline detergent solution in accordance with SSPC SP 1. If the galvanized metal has been passivated or stabilized, the coating shall be completely removed by brush-off abrasive blast. New galvanized steel to be coated shall not be "passivated" or "stabilized" If the absence of hexavalent stain inhibitors is not documented, test as described in ASTM D 2092, Appendix X2, and remove by one of the methods described therein.

3.4 PREPARATION OF CONCRETE AND CEMENTITIOUS SURFACE

3.4.1 Concrete

a. Curing: Concrete surfaces shall be allowed to cure at least 30 days before painting, except concrete slab on grade, which shall be allowed to cure 90 days before painting.

b. Surface Cleaning: Remove the following deleterious substances.

(1) Dirt, Grease, and Oil: Wash new surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, and 4 quarts of warm water. Then rinse thoroughly

with fresh water. For large areas, water blasting may be used.

(2) Fungus and Mold: Wash new surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, 1 quart 5 percent sodium hypochlorite solution and 3 quarts of warm water. Rinse thoroughly with fresh water.

(3) Paint and Loose Particles: Remove by wire brushing.

(4) Efflorescence: Remove by scraping or wire brushing followed by washing with a 5 to 10 percent by weight aqueous solution of hydrochloric (muriatic) acid. Do not allow acid to remain on the surface for more than five minutes before rinsing with fresh water. Do not acid clean more than 4 square feet of surface, per workman, at one time.

c. Cosmetic Repair of Minor Defects: Repair or fill mortar joints and minor defects, including but not limited to spalls, in accordance with manufacturer's recommendations and prior to coating application.

d. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not to surfaces with droplets of water. In all cases follow manufacturers recommendations. Allow surfaces to cure a minimum of 30 days before painting.

### 3.5 PREPARATION OF WOOD AND PLYWOOD SURFACES

### 3.6 APPLICATION

#### 3.6.1 Coating Application

Painting practices shall comply with applicable federal, state and local laws enacted to ensure compliance with Federal Clean Air Standards. Apply coating materials in accordance with SSPC PA 1. SSPC PA 1 methods are applicable to all substrates, except as modified herein.

At the time of application, paint shall show no signs of deterioration. Uniform suspension of pigments shall be maintained during application.

Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. Use trigger operated spray nozzles for water hoses. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated. Wear protective clothing and respirators when applying oil-based paints or using spray equipment with any paints.

Paints, except water-thinned types, shall be applied only to surfaces that are completely free of moisture as determined by sight or touch.

Thoroughly work coating materials into joints, crevices, and open spaces. Special attention shall be given to ensure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces.

Each coat of paint shall be applied so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete.

Touch up damaged coatings before applying subsequent coats. Interior areas shall be broom clean and dust free before and during the application of coating material.

- a. **Drying Time:** Allow time between coats, as recommended by the coating manufacturer, to permit thorough drying, but not to present topcoat adhesion problems. Provide each coat in specified condition to receive next coat.
- b. **Primers, and Intermediate Coats:** Do not allow primers or intermediate coats to dry more than 30 days, or longer than recommended by manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Each coat shall cover surface of preceding coat or surface completely, and there shall be a visually perceptible difference in shades of successive coats.
- c. **Finished Surfaces:** Provide finished surfaces free from runs, drops, ridges, waves, laps, brush marks, and variations in colors.

### 3.6.2 Mixing and Thinning of Paints

Reduce paints to proper consistency by adding fresh paint, except when thinning is mandatory to suit surface, temperature, weather conditions, application methods, or for the type of paint being used. Obtain written permission from the Contracting Officer to use thinners. The written permission shall include quantities and types of thinners to use.

When thinning is allowed, paints shall be thinned immediately prior to application with not more than 1 pint of suitable thinner per gallon. The use of thinner shall not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning shall not cause the paint to exceed limits on volatile organic compounds. Paints of different manufacturers shall not be mixed.

### 3.6.3 Coating Systems

- a. **Systems by Substrates:** Apply coatings that conform to the respective specifications listed in the following Tables:

Table

Division 5. Exterior Metal, Ferrous and Non-Ferrous Paint Table

Division 3. Interior Concrete Paint Table

Division 6. Interior Wood Paint Table

- b. **Minimum Dry Film Thickness (DFT):** Apply paints, primers, varnishes, enamels, undercoats, and other coatings to a minimum dry film thickness of 1.5 mil each coat unless specified otherwise in the Tables. Coating thickness where specified, refers to the minimum dry film thickness.
- c. **Coatings for Surfaces Not Specified Otherwise:** Coat surfaces which have not been specified, the same as surfaces having similar conditions of exposure.
- d. **Existing Surfaces Damaged During Performance of the Work, Including New**

Patches In Existing Surfaces: Coat surfaces with the following:

- (1) One coat of primer.
- (2) One coat of undercoat or intermediate coat.
- (3) One topcoat to match adjacent surfaces.

### 3.7 COATING SYSTEMS FOR METAL

Apply coatings of Tables in Division 5 for Exterior.

- a. Apply specified ferrous metal primer on the same day that surface is cleaned, to surfaces that meet all specified surface preparation requirements at time of application.
- b. Shop-primed Surfaces: Touch up exposed substrates and damaged coatings to protect from rusting prior to applying field primer.

### 3.8 COATING SYSTEMS FOR CONCRETE AND CEMENTITIOUS SUBSTRATES

Apply coatings of Tables in Division 3 for Exterior and Interior.

### 3.9 COATING SYSTEMS PLYWOOD

- a. Apply coatings of Tables in Division 6 for Interior.
- b. Prior to erection, apply two coats of specified primer to treat and prime plywood surfaces which will be inaccessible after erection.

### 3.10 INSPECTION AND ACCEPTANCE

In addition to meeting previously specified requirements, demonstrate mobility of moving components, including swinging and sliding doors, cabinets, and windows with operable sash, for inspection by the Contracting Officer. Perform this demonstration after appropriate curing and drying times of coatings have elapsed and prior to invoicing for final payment.

### 3.11 PAINT TABLES

All DFT's are minimum values. Acceptable products are listed in the MPI Green Approved Products List, available at <http://www.specifygreen.com/APL/ProductIdxByMPInum.asp>.

#### 3.11.1 EXTERIOR PAINT TABLES

##### EXTERIOR GALVANIZED SURFACES

##### F. New Galvanized surfaces:

1. MPI EXT 5.3A-G6 (Gloss)  
Primer:                    Intermediate:                    Topcoat:  
MPI 26                    MPI 119                    MPI 11  
System DFT:    4.5 mils

3.11.2 INTERIOR PAINT TABLES

DIVISION 3: INTERIOR CONCRETE PAINT TABLE

A. New Concrete, vertical surfaces, not specified otherwise:

1. MPI INT 3.1A-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 50	MPI 54	MPI 54
System DFT:	4 mils	

DIVISION 6: INTERIOR WOOD PAINT TABLE

A. New Wood and plywood not otherwise specified:

1. MPI INT 6.4S-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 39	MPI 141	MPI 141
System DFT:	4.5 mils	

SECTION 13 34 19

METAL BUILDING SYSTEMS

05/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

- |               |  |
|---------------|--|
| AISC 325      | (2005) Steel Construction Manual   |
| ANSI/AISC 341 | (2005; Suppl No. 1 2005) Seismic Provisions for Structural Steel Buildings |
| ANSI/AISC 360 | (2005) Specification for Structural Steel Buildings                        |

AMERICAN IRON AND STEEL INSTITUTE (AISI)

- |               |   |
|---------------|---|
| AISC/AISI 121 | (2004) Standard Definitions for Use in the Design of Steel Structures |
| AISI SG03-3   | (2002; Suppl 2001-2004; R 2008) Cold-Formed Steel Design Manual Set   |

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

- |           |  |
|-----------|--|
| ASCE 7-10 | (2010) Minimum Design Loads for Buildings and Other Structures |
|-----------|--|

AMERICAN WELDING SOCIETY (AWS)

- |                |   |
|----------------|---|
| AWS A5.1/A5.1M | (2004) Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding |
| AWS D1.1/D1.1M | (2010) Structural Welding Code - Steel  |
| AWS D1.3/D1.3M | (2008; Errata 2008) Structural Welding Code - Sheet Steel                       |

ASTM INTERNATIONAL (ASTM)

- |                   |  |
|-------------------|--|
| ASTM A1008/A1008M | (2010) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened |
| ASTM A1011/A1011M | (2010) Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved   |

Formability and Ultra-High Strength

ASTM A193/A193M	(2010a) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
ASTM A307	(2010) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A325	(2010) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A36/A36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A463/A463M	(2010) Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
ASTM A475	(2003; R 2009e1) Standard Specification for Zinc-Coated Steel Wire Strand
ASTM A500/A500M	(2010a) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A501	(2007) Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A529/A529M	(2005; R 2009) Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality
ASTM A53/A53M	(2010) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A563	(2007a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A563M	(2007) Standard Specification for Carbon and Alloy Steel Nuts (Metric)
ASTM A572/A572M	(2007) Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A606/A606M	(2009a) Standard Specification for Steel Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance
ASTM A653/A653M	(2010) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or

	Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A755/A755M	(2003; R 2008) Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products
ASTM A780/A780M	(2009) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A792/A792M	(2010) Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
ASTM A992/A992M	(2006a) Standard Specification for Structural Steel Shapes
ASTM B 117	(2009) Standing Practice for Operating Salt Spray (Fog) Apparatus
ASTM B 209	(2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 221	(2008) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B 221M	(2007) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
ASTM C 1136	(2010) Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
ASTM C 1363	(2005) Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
ASTM C 518	(2010) Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
ASTM C 920	(2011) Standard Specification for Elastomeric Joint Sealants
ASTM C 991	(2008e1) Flexible Glass Fiber Insulation for Metal Buildings
ASTM D 1056	(2007) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D 1308	(2002; R 2007) Effect of Household Chemicals on Clear and Pigmented Organic

Finishes

ASTM D 1667	(2005) Flexible Cellular Materials - Poly (Vinyl Chloride) Foam (Closed-Cell)
ASTM D 2244	(2009b) Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D 2247	(2010) Testing Water Resistance of Coatings in 100% Relative Humidity
ASTM D 2794	(1993; R 2010) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D 3363	(2005) Film Hardness by Pencil Test
ASTM D 4214	(2007) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D 522	(1993a; R 2008) Mandrel Bend Test of Attached Organic Coatings
ASTM D 523	(2008) Standard Test Method for Specular Gloss
ASTM D 714	(2002; R 2009) Evaluating Degree of Blistering of Paints
ASTM D 822	(2001; R 2006) Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
ASTM D 968	(2005; R 2010) Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM DEFONLINE	(2008) ASTM Online Dictionary of Engineering Science and Technology
ASTM E 1592	(2005) Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
ASTM E 1646	(1995; R 2003) Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Air Pressure Difference
ASTM E 168	(2006) General Techniques of Infrared Quantitative Analysis
ASTM E 283	(2004) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E 331	(2000; R 2009) Water Penetration of

	Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E 84	(2010b) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E 96/E 96M	(2005) Standard Test Methods for Water Vapor Transmission of Materials
ASTM F 1554	(2007a) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
ASTM F 436	(2010) Hardened Steel Washers
ASTM F 844	(2007a) Washers, Steel, Plain (Flat), Unhardened for General Use
ASTM G 152	(2006) Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G 153	(2004; R 2010) Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)	
MBMA MBSM	(2002) Metal Building Systems Manual
NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)	
NAAMM AMP 500	(2006) Metal Finishes Manual
NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)	
NRCA 0405	(2001; 5th Ed) Roofing and Waterproofing Manual
SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)	
SMACNA 1793	(2003) Architectural Sheet Metal Manual, 6th Edition
THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)	
SSPC Paint 15	(1999; E 2004) Steel Joist Shop Primer
SSPC Painting Manual	(2002) Good Painting Practice, Steel Structures Painting Manual, Volume 1
SSPC SP 2	(1982; E 2004) Hand Tool Cleaning
UNDERWRITERS LABORATORIES (UL)	
UL 580	(2006; Reprint Jul 2009) Tests for Uplift

Resistance of Roof Assemblies

1.2 GENERAL REQUIREMENTS

1.2.1 Structural Performance

Provide metal building systems capable of withstanding the effects of gravity loads and the following loads and stresses within the limits and conditions indicated.

1.2.1.1 Engineering

Design metal building systems conforming to procedures described in MBMA MBSM.

1.2.1.2 Design Loads

Conform to the requirements of MBMA MBSM, ASCE 7-10, and the building code applicable to the project geographical location.

1.2.1.3 Live Loads

Include all vertical loads induced by the building occupancy indicated on the drawings, as well as loads induced by maintenance workers, materials and equipment for roof live loads.

1.2.1.4 Roof Snow Loads

Include vertical loads induced by the weight of snow, as determined by 50 year Mean-Recurrence-Interval (MRI) ground snow load at the project site of Cherry Point, NC. Allow for unbalanced and drift loads.

1.2.1.5 Wind Loads

Include horizontal loads induced by a basic wind speed corresponding to a 50-year, mean-recurrence interval at Project site of Cherry Point, NC.

1.2.1.6 Collateral Loads

Include additional dead loads other than the weight of metal building system for permanent items such as sprinklers, mechanical systems, electrical systems, and ceilings.

1.2.1.7 Load Combinations

Design metal building systems to withstand the most critical effects of load factors and load combinations as required by MBMA MBSM, ASCE 7-10, and the building code applicable to the project location.

1.2.1.8 Deflection Limits

Engineer assemblies to withstand design loads with deflections no greater than the following:

- a. Purlins and Rafters; vertical deflection of 1/180 of the span.
- b. Girts; horizontal deflection of 1/180 of the span.
- c. Metal Roof Panels; vertical deflection of 1/180 of the span.

d. Metal Wall Panels; horizontal deflection of 1/180 of the span.

Design secondary framing system to accommodate deflection of primary building structure and construction tolerances, and to maintain clearances at openings. Provide metal panel assemblies capable of withstanding the effects of loads and stresses indicated, based on testing according to ASTM E 1592.

#### 1.2.2 Seismic Performance

Design and engineer metal building system capable of withstanding the effects of earthquake motions determined according to ASCE 7-10, ANSI/AISC 341, and the applicable portions of the building code in the geographic area where the construction will take place.

#### 1.2.3 Thermal Movements

Provide metal panel systems 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 joint sealants, 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 as follows:

Temperature Change (Range); 120 F, ambient; 180 F, material surfaces.

#### 1.2.4 Thermal Performance

Provide insulated metal panel assemblies with the following minimum R-values for opaque elements when tested according to ASTM C 1363 or ASTM C 518.

##### 1.2.4.1 Metal Roof Panel Assemblies

b. R-Value: 19

##### 1.2.4.2 Metal Wall Panel Assemblies

b. R-Value: 13

#### 1.2.5 Air Infiltration for Metal Roof Panels

Air leakage through assembly must not exceed 0.3 L/s per sq. m 0.06 cfm/sq.ft. of roof area when tested according to ASTM E 168 at negative test-pressure difference of 75 Pa 1.57 lb/sq.ft.

#### 1.2.6 Air Infiltration for Metal Wall Panels

Air leakage through assembly of not more than 0.3 L/s per sq. m 0.06 cfm/sq.ft. of wall area when tested according to ASTM E 283 at static-air-pressure difference of 300 Pa 6.24 lbf/sq.ft.

#### 1.2.7 Water Penetration for Metal Roof Panels

No water penetration when tested according to ASTM E 1646 at test-pressure difference of 137 Pa 2.86 lbf/sq.ft.

#### 1.2.8 Water Penetration for Metal Wall Panels

No water penetration when tested according to ASTM E 331 at a minimum differential pressure of 20 percent of inward-acting, wind-load design pressure of not less than 300 Pa/6.24 lbf/sq.ft. and not more than 12 lbf/sq. ft.

#### 1.2.9 Wind-Uplift Resistance

Provide metal roof panel assemblies that comply with UL 580 for Class 90.

#### 1.3 DEFINITIONS

ASTM DEFONLINE applies to this definition paragraph.

- a. Bay: Dimension between main frames measured normal to frame (at centerline of frame) for interior bays, and dimension from centerline of first interior main frame measured normal to end wall (outside face of end-wall girt) for end bays.
- b. Building Length: Dimension of the building measured perpendicular to main framing from end wall to end wall (outside face of girt to outside face of girt).
- c. Building Width: Dimension of the building measured parallel to main framing from sidewall to sidewall (outside face of girt to outside face of girt).
- d. Clear Span: Distance between supports of beams, girders, or trusses (measured from lowest level of connecting area of a column and a rafter frame or knee).
- e. Eave Height: Vertical dimension from finished floor to eave (the line along the sidewall formed by intersection of the planes of the roof and wall).
- f. Clear Height under Structure: Vertical dimension from finished floor to lowest point of any part of primary or secondary structure, not including crane supports, located within clear span.
- g. Terminology Standard: Refer to MBMA "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in referenced standards.

#### 1.4 SYSTEM DESCRIPTION

General: Provide a complete, integrated set of metal building system manufacturer's standard mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior. Include primary and secondary framing, metal roof panels, metal wall panels, and accessories complying with requirements indicated.

Provide metal building system of size and with spacing, slopes, and spans indicated.

1.4.1 Primary Frame Type

- a. Rigid Clear Span: Solid-member, structural-framing system without interior columns.

1.4.2 Fixed End-Wall Framing

Provide manufacturer's standard fixed end wall, for buildings not required to be expandable, consisting of primary frame, capable of supporting one-half of a bay design load, and end-wall columns.

1.4.3 Secondary Frame Type

Provide manufacturer's standard purlins and joists and exterior-framed (bypass) girts.

1.4.4 Eave Height

Eave height must be as indicated by nominal height on Drawings.

1.4.5 Bay Spacing

Bay Spacing must be 12'-2".

1.4.6 Roof Slope

Roof slope must be 1:24 1/2 inch per 12 inches.

1.4.7 Roof System

Provide manufacturer's standard vertical-rib, standing-seam metal roof panels.

1.4.8 Exterior Wall System

Provide manufacturer's standard metal wall panels complete with vapor barrier conforming to ASTM E 96/E 96M.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Manufacturer's Qualifications; G

SD-02 Shop Drawings

Detail Drawings; G

SD-03 Product Data

Manufacturer's catalog data ; G

SD-04 Samples

Coil Stock, 12 inches long by the actual panel width; G

Roof Panels, 12 inches long by actual panel width; G]

Wall Panels, 12 inches long by actual panel width; G]

Fasteners; G

Metal Closure Strips/ 250 mm 10 inches long of each type; G

Insulation, approximately 8 by 11 inches; G

Vapor Barrier; G

Manufacturer's color charts and chips, 4 by 4 inches; G

SD-05 Design Data

Manufacturer's descriptive and technical literature; G

Manufacturer's building design analysis; G]

SD-06 Test Reports

Factory Color Finish Performance Requirements; G

SD-07 Certificates

System Components ; G

Qualification of Manufacturer; G

Qualification of Erector; G

SD-08 Manufacturer's Instructions

Installation of Roof and Wall panels; G

shipping, handling, and storage; G

SD-11 Closeout Submittals

Manufacturer's Warranty; G

Contractor's Warranty for Installation; G

1.6 QUALITY ASSURANCE

1.6.1 Manufacturer's Technical Representative

The representative must have authorization from manufacturer to approve field changes and be thoroughly familiar with the products, erection of structural framing and installation of roof and wall panels in the geographical area where construction will take place.

#### 1.6.2 Manufacturer's Qualifications

Metal building system manufacturer must have a minimum of five (5) years experience as a qualified manufacturer of metal building systems and accessory products.

Provide engineering services by an authorized currently licensed engineer in the geographical area where construction will take place, having a minimum of four years experience as an engineer knowledgeable in building design analysis, protocols and procedures for the "Metal Building Systems Manual" (MBMA MBSM); ASCE 7-10, the building code in the geographic area where the construction will take place and ASTM E 1592.

Provide certified engineering calculations using the products submitted for:

- a. Roof and Wall Wind Loads with basic wind speed, exposure category, co-efficient, importance factor, designate type of facility, negative pressures for each zone, methods and requirements of attachment.
- b. Roof Dead and Live Loads
- c. Collateral Loads
- d. Foundation Loads
- e. Roof Snow Load
- f. Seismic Loads

#### 1.6.3 Qualification of Erection Contractor

An experienced erector who has specialized in erecting and installing work similar in material, design, and extent to that indicated for this Project and must be approved and certified by the metal building system manufacturer.

#### 1.6.4 Single Source

Obtain primary and secondary components and structural framing members, each type of metal roof, wall and liner panel assemblies, clips, closures and other accessories from the standard products of the single source from a single manufacturer to operate as a complete system for the intended use.

#### 1.6.5 Welding

Qualify procedures and personnel according to AWS A5.1/A5.1M, AWS D1.1/D1.1M, and AWS D1.3/D1.3M.

#### 1.6.6 Structural Steel

Comply with AISC 325/ANSI/AISC 341 for seismic impacted designs, ANSI/AISC 360, for design requirements and allowable stresses.

#### 1.6.7 Cold-Formed Steel

Comply with AISC/AISI 121 and AISI SG03-3 for design requirements and allowable stresses.

#### 1.6.8 Surface-Burning Characteristics

Provide metal panels having insulation and vapor barrier material with the following surface-burning characteristics as determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency showing:

- a. Flame-Spread Index: 25 or less.
- b. Smoke-Developed Index: 450 or less.

#### 1.6.9 Fabrication

Fabricate and finish metal panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles with dimensional and structural requirements

Provide metal panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel. Aluminum and aluminum-alloy sheet and plate must conform to ASTM B 209.

Fabricate metal panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weather-tight and minimize noise from movements within panel assembly.

Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA 1793 that apply to the design, dimensions, metal, and other characteristics of item indicated:

- a. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
- b. End Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
- c. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
- d. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
- e. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA or by metal building system manufacturer for application, but not less than thickness of metal being secured.

#### 1.6.10 Finishes

Comply with NAAMM AMP 500 for recommendations for applying and designating finishes.

Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 1.7 SHIPPING, HANDLING AND STORAGE

### 1.7.1 Delivery

Package and deliver components, sheets, metal panels, and other manufactured items so as not to be damaged or deformed and protected during transportation and handling.

Stack and store metal panels horizontally on platforms or pallets, covered with suitable weather-tight and ventilated covering to ensure dryness, with positive slope for drainage of water. Store in a manner to prevent bending, warping, twisting, and surface damage. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage. Retain strippable protective covering on metal panel for entire period up to metal panel installation.

## 1.8 PROJECT CONDITIONS

### 1.8.1 Weather Limitations

Proceed with installation preparation only when existing and forecasted weather conditions permit Work to proceed without water entering into existing panel system or building.

### 1.8.2 Field Measurements

#### 1.8.2.1 Established Dimensions for Foundations

Comply with established dimensions on approved anchor-bolt plans, established foundation dimensions, and proceed with fabricating structural framing. Do not proceed without verifying field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.

#### 1.8.2.2 Established Dimensions for Metal Panels

Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal panels without field measurements, or allow for field trimming metal panels. Coordinate construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

#### 1.8.2.3 Verification Record

Verify locations of all framing and opening dimensions by field measurements before metal panel fabrication and indicate measurements on Shop Drawings.

## 1.9 COORDINATION

Coordinate size and location of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.

Coordinate installation of piping and supports and accessories, which are specified in Division 22 - PLUMBING.

Coordinate installation of HVAC system equipment supports and accessories, which are specified in Division 23 - HEATING, VENTILATING AND AIR-CONDITIONING (HVAC).

Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leak-proof, secure, and non-corrosive installation.

1.10 WARRANTY

1.10.1 Building System Warranty

Furnish manufacturer's no-dollar-limit warranty for the metal building system. The warranty period is to be no less than 20 years from the date of acceptance of the work and be issued directly to the Government. The warranty must provide that if within the warranty period, the metal building system shows evidence of deterioration resulting from defective materials and/or workmanship, correcting of any defects is the responsibility of the metal building system manufacturer. Repairs that become necessary because of defective materials and workmanship while metal building system is under warranty are to be performed within 32 hours after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within 32 hours of notification will constitute grounds for having emergency repairs performed by others and will not void the warranty.

1.10.2 Roof System Weather-Tightness Warranty

Furnish manufacturer's no-dollar-limit warranty for the metal panel system. The warranty period is to be no less than 20 years from the date of acceptance of the work and be issued directly to the Government.

The warranty is to provide that if within the warranty period the roof panel system shows evidence of corrosion, perforation, rupture, lost of weather-tightness or excess weathering due to deterioration of the panel system resulting from defective materials and correction of the defective workmanship is to be the responsibility of the metal building system manufacturer.

Repairs that become necessary because of defective materials and workmanship while roof panel system is under warranty are to be performed within 24 hours after notification, unless additional time is approved by the Contracting Officer. Failure to perform [temporary] repairs within 24 hours of notification will constitute grounds for having emergency repairs performed by others and not void the warranty. Immediate follow-up and completion of permanent repairs must be performed within 7 days from date of notification.

1.10.3 Roof and Wall Panel Finish Warranty

Furnish manufacturer's no-dollar-limit warranty for the metal panel system. The warranty period is to be no less than 20 years from the date of acceptance of the work and be issued directly to the Government.

The warranty is to provide that if within the warranty period the metal panel system shows evidence of checking, delaminating cracking, peeling, chalk in excess of a numerical rating of eight, as determined by ASTM D 4214 test procedures; or change colors in excess of five CIE or Hunter units in accordance with ASTM D 2244 or excess weathering due to deterioration of

the panel system resulting from defective materials and finish or correction of the defective workmanship is to be the responsibility of the metal building system manufacturer.

Liability under this warranty is exclusively limited to replacing the defective coated materials.

Repairs that become necessary because of defective materials and workmanship while roof and wall panel system is under warranty are to be performed within 32 hours after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within 32 hours of notification will constitute grounds for having emergency repairs performed by others and not void the warranty.

## PART 2 PRODUCTS

### 2.1 STRUCTURAL FRAMING MATERIALS

#### 2.1.1 W-Shapes

ASTM A992/A992M; ASTM A572/A572M or ASTM A529/A529M.

#### 2.1.2 Channel, Angles, M-Shapes and S-Shapes

ASTM A36/A36M; ASTM A572/A572M or ASTM A529/A529M.

#### 2.1.3 Plate and Bar

ASTM A36/A36M, ASTM A572/A572M or ASTM A529/A529M.

#### 2.1.4 Steel Pipe

ASTM A36/A36M, ASTM A53/A53M, ASTM A572/A572M or ASTM A529/A529M.

#### 2.1.5 Cold-Formed and Hot Formed Hollow Structural Sections

Cold formed: ASTM A500/A500M or ASTM B 221, ASTM B 221M. Hot-formed: ASTM A501.

#### 2.1.6 Structural-Steel Sheet

Hot-rolled, ASTM A1011/A1011M or cold-rolled, ASTM A1008/A1008M.

#### 2.1.7 Metallic-Coated Steel Sheet

ASTM A653/A653M, ASTM A606/A606M.

#### 2.1.8 Metallic-Coated Steel Sheet Pre-painted with Coil Stock Coating

Steel sheet metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A755/A755M.

- a. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792/A792M, and ASTM A463/A463M.

#### 2.1.9 High-Strength Bolts, Nuts, and Washers

ASTM A325, heavy hex steel structural bolts; ASTM A563 heavy hex

carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

Finish: Plain

#### 2.1.10 Non-High-Strength Bolts, Nuts, and Washers

ASTM A307, ASTM A563, and ASTM F 844.

Finish: Plain

#### 2.1.11 Anchor Rods

ASTM F 1554

- a. Configuration: Straight.
- b. Nuts: ASTM A563 heavy hex carbon steel.
- c. Plate Washers: ASTM A36/A36M carbon steel.
- d. Washers: ASTM F 436 hardened carbon steel.
- e. Finish: Plain

#### 2.1.12 Threaded Rods

ASTM A193/A193M ASTM A572/A572M ASTM A36/A36M ASTM A307.

- a. Nuts: ASTM A563 heavy hex carbon steel.
- b. Washers: ASTM F 436 hardened carbon steel.
- c. Finish: Plain

#### 2.1.13 Primer

SSPC-Paint 15, Type I, red oxide.

### 2.2 FABRICATION

#### 2.2.1 General

Comply with MBMA MBSM - "Metal Building Systems Manual": Chapter IV, Section 9, "Fabrication and Erection Tolerances."

### 2.3 STRUCTURAL FRAMING

#### 2.3.1 General

Clean all framing members to remove loose rust and mill scale. Provide 1 shop coat of primer to an average dry film thickness of 1 mil according to SSPC SP 2. Balance of painting and coating procedures must conform to SSPC Paint 15 and SSPC Painting Manual.

#### 2.3.2 Primary Framing

Manufacturer's standard structural primary framing system includes transverse and lean-to frames; rafter, rakes, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing designed to withstand required loads and specified requirements. Provide frames with attachment plates, bearing plates, and splice members. Provide frame span and spacing indicated.

Shop fabricate framing components by welding or by using high-strength

bolts to the indicated size and section with base-plates, bearing plates, stiffeners, and other items required. Cut, form, punch, drill, and weld framing for bolted field erection.

- a. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.
- b. Frame Configuration: One-directional sloped.
- c. Exterior Column Type: Tapered.
- d. Rafter Type: Tapered.

### 2.3.3 Secondary Framing

Manufacturer's standard secondary framing members, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jamps, and other miscellaneous structural members. Fabricate framing from cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet pre-painted with coil coating, unless otherwise indicated.

Shop fabricate framing components by roll-forming or break-forming to the indicated size and section with base-plates, bearing plates, stiffeners, and other plates required for erection. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.

- a. Purlins: C or Z-shaped sections; fabricated from steel sheet, built-up steel plates, or structural-steel shapes; minimum depth as required to comply with system performance requirements.
- b. Girts: C or Z-shaped sections; fabricated from steel sheet, built-up steel plates, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees to flange minimum depth required to comply with system performance requirements.
- c. Eave Struts: Unequal-flange, C-shaped sections; fabricated from steel sheet, built-up steel plates, or structural-steel shapes; to provide adequate backup for metal panels.
- d. Flange Bracing: Structural-steel angles or cold-formed structural tubing to stiffen primary frame flanges.
- e. Sag Bracing: Structural-steel angles.
- f. Base or Sill Angles: Zinc-coated (galvanized) steel sheet.
- g. Purlin and Girt Clips: Steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
- h. Secondary End-Wall Framing: Manufacturer's standard sections fabricated from zinc-coated (galvanized) steel sheet .
- i. Framing for Openings: Channel shapes; fabricated cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings, and head, jamb, and sill of other openings.

- j. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.

#### 2.3.4 Bracing

Provide adjustable wind bracing as follows:

- a. Rods: ASTM A36/A36M; ASTM A572/A572M; or ASTM A529/A529M threaded full length or threaded a minimum of 6 in. at each end.
- b. Cable: ASTM A475, 1/4 in. diameter, extra-high-strength grade, zinc-coated, seven-strand steel; with threaded end anchors.
- c. Angles: Fabricated from structural-steel shapes to match primary framing, of size required to withstand design loads.
- d. Rigid Portal Frames: Fabricate from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
- e. Fixed-Base Columns: Fabricate from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
- f. Diaphragm Action of Metal Panels: Design metal building to resist wind forces through diaphragm action of metal panels.
- g. Bracing: Provide wind bracing using any method specified above, at manufacturer's option.

#### 2.4 PANEL MATERIALS

##### 2.4.1 Steel Sheet

Roll-form steel roof wall and liner panels to the specified profile, 24 gauge and depth as indicated. Material must be plumb and true, and within the tolerances listed:

- a. Aluminum-Zinc Alloy-coated Steel Sheet conforming to ASTM A792/A792M and AISI SG03-3.
- b. Individual panels to have continuous length to cover the entire length of any unbroken roof slope or wall area with no joints or seams and formed without warping, waviness, or ripples that are not part of the panel profile and free of damage to the finish coating system.
- c. Provide panels with thermal expansion and contraction consistent with the type of system specified; profile and coverage to be a minimum height and width from manufacturer's standard for the indicated roof slope wall area.
- d. Smooth, flat Surface Texture.

##### 2.4.2 Finish

All panels are to receive a factory-applied Kynar 500/Hylar 5000 finish consisting of a baked-on top-coat with a manufacturer's recommended prime

coat conforming to the following:

- a. Metal Preparation: All metal is to have the surfaces carefully prepared for painting on a continuous process coil coating line by alkali cleaning, hot water rinsing, application of chemical conversion coating, cold water rinsing, sealing with acid rinse, and thorough drying.
- b. Prime Coating: A base coat of epoxy paint, specifically formulated to interact with the top-coat, is to be applied to the prepared surfaces by roll coating to a dry film thickness of 0.20 plus 0.05 mils. This prime coat must be oven cured prior to application of finish coat.
- c. Exterior Finish Coating: Apply the finish coating over the primer by roll coating to dry film thickness of 0.80 plus 5 mils (3.80 plus 0.50 mils for Vinyl Plastisol) for a total dry film thickness of 1.00 plus 0.10 mils (4.00 plus 0.10 mils for Vinyl Plastisol). This finish coat must be oven-cured.
- d. Interior Finish Coating: Apply a wash-coat on the reverse side over the primer by roll coating to a dry film thickness of 0.30 plus 0.05 mils for a total dry film thickness of 0.50 plus 0.10 mils. The wash-coat must be oven-cured.
- e. Color: The exterior finish chosen from the manufacturer's color charts and chips.
- f. Physical Properties: Coating must conform to the industry and manufacturer's standard performance criteria as listed by the following certified test reports:

Chalking: ASTM DEFONLINE  
Color Change and Conformity: ASTM D 2244  
Weatherometer: ASTM G 152, ASTM G 153 and ASTM D 822  
Humidity: ASTM D 2247 and ASTM D 714  
Salt Spray: ASTM B 117  
Chemical Pollution: ASTM D 1308  
Gloss at 60 degrees: ASTM D 523  
Pencil Hardness: ASTM D 3363  
Reverse Impact: ASTM D 2794  
Flexibility: ASTM D 522  
Abrasion: ASTM D 968  
Flame Spread: ASTM E 84

#### 2.4.3 Repair Of Finish Protection

Repair paint for color finish enameled metal panel must be compatible paint of the same formula and color as the specified finish furnished by the metal panel manufacturer, conforming to ASTM A780/A780M.

#### 2.5 MISCELLANEOUS METAL FRAMING

##### 2.5.1 General

Cold-formed metallic-coated steel sheet conforming to ASTM A653/A653M and specified in Section 05 40 00 COLD-FORMED METAL FRAMING unless other wise indicated.

## 2.5.2 Fasteners for Miscellaneous Metal Framing

Refer to the following paragraph "FASTENERS".

## 2.6 FASTENERS

### 2.6.1 General

Type, material, corrosion resistance, size and sufficient length to penetrate the supporting member a minimum of 1 inch with other properties required to fasten miscellaneous metal framing members to substrates in accordance with the metal panel manufacturer's and ASCE 7-10 requirements.

### 2.6.2 Exposed Fasteners

Fasteners for metal panels to be corrosion resistant coated steel, aluminum, stainless steel, or nylon capped steel compatible with the sheet panel or flashing and of a type and size recommended by the manufacturer to meet the performance requirements and design loads. Fasteners for accessories to be the manufacturer's standard. Provide an integral metal washer matching the color of attached material with compressible sealing EPDM gasket approximately 3/32 inch thick.

### 2.6.3 Screws

Screws to be corrosion resistant coated steel, aluminum and/or stainless steel being the type and size recommended by the manufacturer to meet the performance requirements.

### 2.6.4 Rivets

Rivets to be closed-end type, corrosion resistant coated steel, aluminum or stainless steel where watertight connections are required.

### 2.6.5 Attachment Clips

Fabricate clips from steel hot-dipped galvanized in accordance with ASTM A653/A653M or Series 300 stainless steel. Size, shape, thickness and capacity as required meeting the insulation thickness and design load criteria specified.

## 2.7 ACCESSORIES

### 2.7.1 General

All accessories to be compatible with the metal panels; sheet metal flashing, trim, metal closure strips, caps and similar metal accessories must not be less than the minimum thickness specified for the metal panels. Exposed metal accessories/finishes to match the panels furnished, except as otherwise indicated. Molded foam rib, ridge and other closure strips to be non-absorbent closed-cell or solid-cell synthetic rubber or pre-molded neoprene to match configuration of the panels.

### 2.7.2 Insulation

Faced Metal Building Insulation: ASTM C 991, Type II, glass-fiber-blanket insulation; 0.5 lb/cu.ft. density; 2-inch wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.

#### 2.7.2.1 Vapor Retarder Facing

Composition: White vinyl film facing, having fiberglass scrim reinforcement and metallized-polyester film backing and complying with ASTM C 1136, with permeance not greater than 0.02 perm when tested according to ASTM E 96/E 96M

#### 2.7.2.2 Retainer Strips

0.025-inch nominal-thickness, formed, metallic-coated steel or PVC retainer clips colored to match insulation facing.

#### 2.7.2.3 Vapor-Retarder Tape

Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

#### 2.7.2.4 Wall Liner

Securely fasten wall liner into place in accordance with the manufacturer's recommendation and in a neatly presented appearance.

#### 2.7.3 Rubber Closure Strips

Closed-cell, expanded cellular rubber conforming to ASTM D 1056 and ASTM D 1667; extruded or molded to the configuration of the specified metal panel and in lengths supplied by the metal panel manufacturer.

#### 2.7.4 Metal Closure Strips

Factory fabricated steel closure strips to be the same gauge, color, finish and profile of the specified roof and wall panel.

#### 2.7.5 Joint Sealants

##### 2.7.5.1 Sealants

Sealants are to be an approved gun type for use in hand or air-pressure caulking guns at temperatures above 40 degrees F (or frost-free application at temperatures above 10 degrees F with minimum solid content of 85 percent of the total volume. Sealant is to dry with a tough, durable surface skin which permits it to remain soft and pliable underneath, providing a weather-tight joint. No migratory staining is permitted on painted or unpainted metal, stone, glass, vinyl, or wood.

Prime all joints to receive sealants with a compatible one-component or two-component primer as recommended by the metal panel manufacturer.

##### 2.7.5.2 Shop-Applied

Sealant for shop-applied caulking must be an approved gun grade, non-sag one component polysulfide or silicone conforming to ASTM C 920, Type II, and with a curing time to ensure the sealant's plasticity at the time of field erection.

##### 2.7.5.3 Field-Applied

Sealant for field-applied caulking must be an approved gun grade, non-sag one component polysulfide or two-component polyurethane with an initial

maximum Shore A durometer hardness of 25, and conforming to ASTM C 920, Type II. Color to match panel colors.

#### 2.7.5.4 Tape Sealant

Pressure sensitive, 100 percent solid with a release paper backing; permanently elastic, non-sagging, non-toxic and non-staining as approved by the metal panel manufacturer.

#### 2.7.6 Thermal Spacer Blocks

Where metal roof panels attach directly to purlins, provide thermal spacer blocks of thickness required to provide 1-inch standoff; fabricated from extruded polystyrene.

### 2.8 SHEET METAL FLASHING AND TRIM

#### 2.8.1 Fabrication

Shop fabricate sheet metal flashing and trim where practicable to comply with recommendations in SMACNA 1793 that apply to design, dimensions, metal, and other characteristics of item indicated. Obtain field measurements for accurate fit before shop fabrication.

Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

### 2.9 FINISHES

#### 2.9.1 General

Comply with NAAMM AMP 500 for recommendations for applying and designating finishes.

#### 2.9.2 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 not acceptable. 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.

## PART 3 EXECUTION

### 3.1 EXAMINATION

Before erection proceeds examine with the erector present the concrete foundation dimensions, concrete and/or masonry bearing surfaces, anchor bolt size and placement, survey slab elevation, locations of bearing plates, and other embedment's to receive structural framing with the metal building manufacturer's templates and drawings before erecting any steel components for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

Examine primary and secondary framing to verify that rafters, purlins, angles, channels, and other structural and metal panel support members and anchorages have been installed within alignment tolerances required by metal building manufacturer, UL, ASTM, ASCE 7-10 and as required by the

building code for the geographical area where construction will take place.

Examine roughing-in for components and systems penetrating metal roof or wall panels to verify actual locations of penetrations relative to seam locations of metal panels before metal roof or wall panel installation.

Submit to the Contracting Officer a written report, endorsed by Erector, listing conditions detrimental to performance of the Work.

Proceed with erection only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

Provide temporary shoring, guys, braces, and other supports during erection to keep the structural framing secure, plumb, and in alignment against temporary construction loading or loads equal in intensity of the building design loads. Remove temporary support systems when permanent structural framing, connections, and bracing are in place, unless otherwise indicated.

Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment and performance.

Miscellaneous Framing: Install sub-purlins, girts, angles, furring, and other miscellaneous support members or anchorage for the metal roof or wall panels, doors, windows, roof curbs, ventilators and louvers according to metal building manufacturer's written instructions.

### 3.3 ERECTION OF STRUCTURAL FRAMING

Erect metal building system according to manufacturer's written erection instructions, approved shop drawings and other erection documents in accordance with MBMA MBSM - "Metal Building Systems Manual".

Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer and the Contracting Officer.

Set structural framing accurately in locations and to elevations indicated and according to AISC 325 specifications. Maintain structural stability of frame during erection.

Clean and roughen concrete and masonry bearing surfaces prior to setting plates. Clean bottom surface of plates.

Align and adjust structural framing before permanent bolt-up and connections. Perform necessary adjustments and alignment to compensate for changes or discrepancies in elevations.

Maintain erection tolerances of structural framing in accordance with ANSI/AISC 360.

### 3.4 METAL WALL PANEL INSTALLATION

Provide metal wall panels of full length from sill to eave as indicated, unless otherwise indicated or restricted by shipping limitations. Anchor metal wall panels and other components of the Work securely in place, in accordance with MBMA MBSM.

Erect wall panel system in accordance with the approved erection drawings, the printed instructions and safety precautions of the metal building manufacturer.

Sheets are not to be subjected to overloading, abuse, or undue impact. Do not install bent, chipped, or defective sheets.

Sheets must be erected true and plumb and in exact alignment with the horizontal and vertical edges of the building, securely anchored, and with the indicated eave, and sill.

Work is to allow for thermal movement of the wall panel, movement of the building structure, and to provide permanent freedom from noise due to wind pressure.

Field cutting metal wall panels by torch is not permitted.

### 3.5 ROOF PANEL INSTALLATION

Provide metal roof panels of full length from eave to ridge or eave to wall as indicated, unless otherwise indicated or restricted by shipping limitations. Anchor metal roof panels and other components of the Work securely in place in accordance with NRCA 0405 and MBMA MBSM.

Erect roofing system in accordance with the approved erection drawings, the printed instructions and safety precautions of the metal building manufacturer.

Sheets are not to be subjected to overloading, abuse, or undue impact. Do not install bent, chipped, or defective sheets.

Sheets must be erected true and plumb and in exact alignment with the horizontal and vertical edges of the building, securely anchored, and with the indicated rake and eave overhang.

Work must allow for thermal movement of the roofing, movement of the building structure, and provide permanent freedom from noise due to wind pressure.

Field cutting metal roof panels by torch is not permitted.

Roofing sheets must be laid with corrugations in the direction of the roof slope. End laps of exterior roofing must not be less than 8 inches; the side laps of standard exterior corrugated sheets must not be less than 2-1/2 corrugations.

Do not permit storage, walking, wheeling, and trucking directly on applied roofing materials. Provide temporary walkways, runways, and platforms of smooth clean boards or planks as necessary to avoid damage to the installed roofing materials, and to distribute weight to conform to the indicated live load limits of roof construction.

### 3.6 METAL PANEL FASTENER INSTALLATION

Anchor metal panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

### 3.7 FLASHING, TRIM AND CLOSURE INSTALLATION

- a. Comply with performance requirements, manufacturer's written installation instructions, and SMACNA 1793. Provide concealed 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 weather resistant.
- b. Sheet metalwork is to be accomplished to form weather-tight construction without waves, warps, buckles, fastening stresses or distortion, and allow for expansion and contraction. Cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades is to be performed by sheet metal mechanics.

### 3.8 ACCESSORY INSTALLATION

#### 3.8.1 General

Install accessories with positive anchorage to building and weather-tight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

#### 3.8.2 Dissimilar Metals

Where dissimilar metals contact one another or corrosive substrates are present, protect against galvanic action by painting dissimilar metal surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each surface, or by other permanent separation techniques as recommended by the metal building manufacturer.

#### 3.8.3 Gutters and Downspouts

Comply with performance requirements, manufacturer's written installation instructions, and install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA 1793 recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

#### 3.8.4 Insulation

Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.

- a. Set vapor-retarder-faced units with vapor retarder toward warm side of construction unless otherwise indicated.
- b. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.
- c. Install factory-laminated, vapor-retarder-faced blankets straight and true in one-piece lengths, with both sets of facing tabs sealed, to provide a complete vapor barrier.

##### 3.8.4.1 Blanket Roof Insulation:

- a. Over-Purlin-with-Spacer-Block Installation: Extend insulation and

vapor retarder over and perpendicular to top flange of secondary framing. Install layer of filler insulation over first layer to fill space formed by metal roof panel standoffs. Hold in place by panels fastened to standoffs.

b. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.

c. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

3.8.4.2 Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal wall panels fastened to secondary framing.

a. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taught, nexting with secondary framing to hold insulation in place.

### 3.9 CLEAN-UP AND PROTECTION

#### 3.9.1 Structural Framing

Clean all exposed structural framing at completion of installation. Remove metal shavings, filings, bolts, and wires from work area. Remove grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings and drilling debris and scrub the work clean. Exposed metal surfaces to be free of dents, creases, waves, scratch marks, solder or weld marks, and damage to the finish coating.

#### 3.9.2 Metal Panels

Clean all exposed sheet metal work at completion of installation. Remove metal shavings, filings, nails, bolts, and wires from work area. Remove protective coverings/films, grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings and drilling debris and scrub the work clean. Exposed metal surfaces to be free of dents, creases, waves, scratch marks, solder or weld marks, and damage to the finish coating.

#### 3.9.3 Touch-Up Painting

After erection, promptly clean, prepare, and prime or re-prime field connections, rust spots, and abraded surfaces of prime-painted structural framing and accessories. Clean and touch-up paint with manufacturer's touch-up paint.

### 3.10 WARRANTY

#### 3.10.1 MANUFACTURER'S WARRANTY

Submit all manufacturers' signed warranties to Contracting Officer prior to final commissioning and acceptance.

#### 3.10.2 CONTRACTOR'S WARRANTY for INSTALLATION

Submit contractor's warranty for installation to the Contracting Officer prior to final commissioning and acceptance.

3.10.3 CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY

CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY  
FOR  
METAL BUILDING SYSTEM

FACILITY DESCRIPTION: \_\_\_\_\_

BUILDING NUMBER: \_\_\_\_\_

CORPS OF ENGINEERS CONTRACT NUMBER: \_\_\_\_\_

CONTRACTOR

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

ADDRESS: \_\_\_\_\_

POINT OF CONTACT: \_\_\_\_\_

TELEPHONE NUMBER: \_\_\_\_\_

OWNER

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

ADDRESS: \_\_\_\_\_

POINT OF CONTACT: \_\_\_\_\_

TELEPHONE NUMBER: \_\_\_\_\_

CONSTRUCTION AGENT

CONSTRUCTION AGENT: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

POINT OF CONTACT: \_\_\_\_\_

TELEPHONE NUMBER: \_\_\_\_\_

CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY  
FOR  
METAL BUILDING SYSTEM  
(continued)

THE METAL BUILDING SYSTEM INSTALLED ON THE ABOVE NAMED BUILDING IS WARRANTED BY \_\_\_\_\_ FOR A PERIOD OF FIVE 5 YEARS AGAINST WORKMANSHIP AND MATERIAL DEFICIENCIES, WIND DAMAGE AND STRUCTURAL FAILURE WITHIN PROJECT SPECIFIED DESIGN LOADS, AND LEAKAGE. THE METAL BUILDING SYSTEM COVERED UNDER THIS WARRANTY INCLUDES, BUT IS NOT LIMITED TO, THE FOLLOWING:

FRAMING AND STRUCTURAL MEMBERS, ROOFING AND SIDING PANELS AND SEAMS, INTERIOR OR EXTERIOR GUTTERS AND DOWNSPOUTS, ACCESSORIES, TRIM, FLASHINGS AND MISCELLANEOUS BUILDING CLOSURE ITEMS SUCH AS DOORS AND WINDOWS (WHEN FURNISHED BY THE MANUFACTURER), CONNECTORS, COMPONENTS, AND FASTENERS, AND OTHER SYSTEM COMPONENTS AND ASSEMBLIES INSTALLED TO PROVIDE A WEATHERTIGHT SYSTEM; AND ITEMS SPECIFIED IN OTHER SECTIONS OF THESE SPECIFICATIONS THAT BECOME PART OF THE METAL BUILDING SYSTEM.

ALL MATERIAL AND WORKMANSHIP DEFICIENCIES, SYSTEM DETERIORATION CAUSED BY EXPOSURE TO THE ELEMENTS AND/OR INADEQUATE RESISTANCE TO SPECIFIED SERVICE DESIGN LOADS, WATER LEAKS AND WIND UPLIFT DAMAGE MUST BE REPAIRED AS APPROVED BY THE CONTRACTING OFFICER.

ALL MATERIAL DEFICIENCIES, WIND DAMAGE, STRUCTURAL FAILURE AND LEAKAGE ASSOCIATED WITH THE METAL BUILDING SYSTEM COVERED UNDER THIS WARRANTY MUST BE REPAIRED AS APPROVED BY THE CONTRACTING OFFICER.

THIS WARRANTY COVERS THE ENTIRE COST OF REPAIR OR REPLACEMENT, INCLUDING ALL MATERIAL, LABOR, AND RELATED MARKUPS. THE ABOVE REFERENCED WARRANTY COMMENCED ON THE DATE OF FINAL ACCEPTANCE ON [\_\_\_\_\_] AND WILL REMAIN IN EFFECT FOR STATED DURATION FROM THIS DATE.

SIGNED, DATED, AND NOTARIZED (BY COMPANY PRESIDENT)

\_\_\_\_\_  
(Company President)

\_\_\_\_\_  
(Date)

CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY  
FOR  
METAL BUILDING SYSTEM  
(continued)

THE CONTRACTOR HEREBY SUPPLEMENTS THIS WARRANTY WITH WRITTEN WARRANTIES FROM THE MANUFACTURER AND/OR INSTALLER OF THE METAL BUILDING SYSTEM, WHICH IS SUBMITTED ALONG WITH THE CONTRACTOR'S WARRANTY. HOWEVER, THE CONTRACTOR IS ULTIMATELY RESPONSIBLE FOR THIS WARRANTY AS OUTLINED IN THE SPECIFICATIONS AND AS INDICATED IN THIS WARRANTY.

EXCLUSIONS FROM COVERAGE

1. NATURAL DISASTERS, ACTS OF GOD (LIGHTNING, FIRE, EXPLOSIONS, SUSTAINED WIND FORCES IN EXCESS OF THE DESIGN CRITERIA, EARTHQUAKES, AND HAIL).
2. ACTS OF NEGLIGENCE OR ABUSE OR MISUSE BY GOVERNMENT OR OTHER PERSONNEL, INCLUDING ACCIDENTS, VANDALISM, CIVIL DISOBEDIENCE, WAR, OR DAMAGE CAUSED BY FALLING OBJECTS.
3. DAMAGE BY STRUCTURAL FAILURE, SETTLEMENT, MOVEMENT, DISTORTION, WARPAGE, OR DISPLACEMENT OF THE BUILDING STRUCTURE OR ALTERATIONS MADE TO THE BUILDING.
4. CORROSION CAUSED BY EXPOSURE TO CORROSIVE CHEMICALS, ASH OR FUMES GENERATED OR RELEASED INSIDE OR OUTSIDE THE BUILDING FROM CHEMICAL PLANTS, FOUNDRIES, PLATING WORKS, KILNS, FERTILIZER FACTORIES, PAPER PLANTS, AND THE LIKE.
5. FAILURE OF ANY PART OF THE BUILDING SYSTEM DUE TO ACTIONS BY THE OWNER WHICH INHIBIT FREE DRAINAGE FROM THE ROOF, GUTTERS AND DOWNSPOUTS; OR CONDITIONS WHICH CREATE PONDING WATER ON THE ROOF OR AGAINST THE BUILDING SIDING.
6. THIS WARRANTY APPLIES TO THE METAL BUILDING SYSTEM. IT DOES NOT INCLUDE ANY CONSEQUENTIAL DAMAGE TO THE BUILDING INTERIOR OR CONTENTS WHICH IS COVERED BY THE WARRANTY OF CONSTRUCTION CLAUSE INCLUDED IN THIS CONTRACT.
7. THIS WARRANTY CANNOT BE TRANSFERRED TO ANOTHER OWNER WITHOUT WRITTEN CONSENT OF THE CONTRACTOR AND THIS WARRANTY AND THE CONTRACT PROVISIONS TAKE PRECEDENCE OVER ANY CONFLICTS WITH STATE STATUTES. REPORTS OF LEAKS AND BUILDING SYSTEM DEFICIENCIES MUST BE RESPONDED TO WITHIN 48 HOURS OF RECEIPT OF NOTICE BY TELEPHONE OR IN WRITING FROM EITHER THE OWNER, OR CONTRACTING OFFICER. EMERGENCY REPAIRS, TO PREVENT FURTHER ROOF LEAKS, MUST BE INITIATED IMMEDIATELY; A WRITTEN PLAN MUST BE SUBMITTED FOR APPROVAL TO REPAIR OR REPLACE THIS SSSMR SYSTEM WITHIN SEVEN CALENDAR DAYS. ACTUAL WORK FOR PERMANENT REPAIRS OR REPLACEMENT MUST BE STARTED WITHIN 30 DAYS AFTER RECEIPT OF NOTICE, AND COMPLETED WITHIN A REASONABLE TIME FRAME. IF THE CONTRACTOR FAILS TO ADEQUATELY RESPOND TO THE WARRANTY PROVISIONS, AS STATED

CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY  
FOR  
METAL BUILDING SYSTEM  
(Exclusions from Coverage Continued)

IN THE CONTRACT AND AS CONTAINED HEREIN, THE CONTRACTING OFFICER MAY HAVE THE METAL BUILDING SYSTEM REPLACED OR REPAIRED BY OTHERS AND CHARGE THE COST TO THE CONTRACTOR. IN THE EVENT THE CONTRACTOR DISPUTES THE EXISTENCE OF A WARRANTABLE DEFECT, THE CONTRACTOR MAY CHALLENGE THE OWNER'S DEMAND FOR REPAIRS AND/OR REPLACEMENT DIRECTED BY THE OWNER OR CONTRACTING OFFICER EITHER BY REQUESTING A CONTRACTING OFFICER'S DECISION, UNDER THE CONTRACT DISPUTES ACT, OR BY REQUESTING THAT AN ARBITRATOR RESOLVE THE ISSUE. THE REQUEST FOR AN ARBITRATOR MUST BE MADE WITHIN 48 HOURS OF BEING NOTIFIED OF THE DISPUTED DEFECTS. UPON BEING INVOKED THE PARTIES MUST, WITHIN 10 DAYS JOINTLY REQUEST A LIST OF FIVE (5) ARBITRATORS FROM THE FEDERAL MEDIATION AND CONCILIATION SERVICE. THE PARTIES MUST CONFER WITHIN 10 DAYS AFTER RECEIPT OF THE LIST TO SEEK AGREEMENT ON AN ARBITRATOR. IF THE PARTIES CANNOT AGREE ON AN ARBITRATOR, THE CONTRACTING OFFICER AND THE PRESIDENT OF THE CONTRACTOR'S COMPANY WILL STRIKE ONE (1) NAME FROM THE LIST ALTERNATIVELY UNTIL ONE NAME REMAINS. THE REMAINING PERSON WILL BE THE DULY SELECTED ARBITRATOR. THE COSTS OF THE ARBITRATION, INCLUDING THE ARBITRATOR'S FEE AND EXPENSES, COURT REPORTER, COURTROOM OR SITE SELECTED ETC., MUST BE BORNE EQUALLY BETWEEN THE PARTIES. EITHER PARTY DESIRING A COPY OF THE TRANSCRIPT MUST PAY FOR THE TRANSCRIPT. A HEARING WILL BE HELD AS SOON AS THE PARTIES CAN MUTUALLY AGREE. A WRITTEN ARBITRATOR'S DECISION WILL BE REQUESTED NOT LATER THAN 30 DAYS FOLLOWING THE HEARING. THE DECISION OF THE ARBITRATOR WILL NOT BE BINDING; HOWEVER, IT WILL BE ADMISSIBLE IN ANY SUBSEQUENT APPEAL UNDER THE CONTRACT DISPUTES ACT.

POST A FRAMED COPY OF THIS WARRANTY IN THE MECHANICAL ROOM OR OTHER APPROVED LOCATION DURING THE ENTIRE WARRANTY PERIOD.

-- End of Section --