

**ARKANSAS STATE HIGHWAY COMMISSION
ARDOT - EQUIPMENT AND PROCUREMENT DIVISION
BID INVITATION**

Bid Number: M-19-021P

BID OPENING LOCATION:
ARDOT-Equipment and
Procurement Division
11302 W. Baseline Road
Little Rock, AR 72209

MAIL TO:
ARDOT-Equipment and
Procurement Division
P.O. Box 2261
Little Rock, AR 72203

DELIVER TO:
ARDOT-Equipment and
Procurement Division
11302 W. Baseline Road
Little Rock, AR 72209

Bid Opening Date: December 18, 2018 Time: 11:00 a.m.

Sealed bids for furnishing the commodities and/or services described below, subject to the Conditions on Page 2 of this Bid Invitation will be received at the above-noted mail and delivery locations until the above-noted bid opening date and time, and then publicly opened at the above-noted bid opening location. **Bids must be submitted on this form, with attachments when appropriate, or bids will be rejected. Late bids and unsigned bids will not be considered.**

In compliance with this Bid Invitation and subject to all the Conditions thereof, the undersigned offers and agrees to furnish any and all items upon which prices are quoted, at the price set opposite each item.

Company Name: _____

Name (Type or Print): _____

Address: _____

Title: _____

Phone: _____ Fax: _____

City: _____ State: _____ Zip: _____

E-mail Address: _____

Federal Tax ID or Social Security No.: _____

Signature: _____

Signature must be legible, original (not photocopied) and in ink.
Unsigned bids will be rejected.

Item No.	Description	Quantity	Unit	Unit Price	Amount
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1. Construction of Grounds Crew Building/Shop – approximately 2,100 Square Foot. Building shall include all labor, materials, site work, and utilities. Structure to be located at Arkansas Department of Transportation, 9003 Baseline Rd., Little Rock, AR 72209 (Job #42-56)

LUMP SUM _____

To meet the requirements of Arkansas Department of Transportation Specifications and Drawings attached to and made a part of this bid.

A mandatory pre-bid meeting is scheduled for all potential bidders on December 11, 2018. Contact Phillip Watkins, Project Coordinator (501-569-2627) for time and location.

All bidders should complete and return the Eligible Bidder Certification (Attachment A), Disclosure Form (see Page 2 of Standard Bid Conditions – Item 18), Restriction of Boycott of Israel Certification and Illegal Immigrant Certification (see Page 2 of Standard Bid Conditions – Item 17) issued with this bid. These forms are kept on file and remain current for one year from date of submission. Forms do not need to be submitted again, during that time, unless there is a status change.

Bid price shall include all labor, materials, and equipment necessary to perform the work as specified, and shall further include all licenses, fees, permits, royalties, and all taxes. Bid price shall represent full compensation for completion of the work. This provision supersedes Condition 5 on page 1 of Standard Bid Conditions. Payment will be made in accordance with Arkansas State Highway & Transportation Department Standard Specifications and Applicable Special Provisions.

Subsection 105.04, 108.07, 109.01 and 109.02 of the Arkansas Department of Transportation Standard Specifications for Highway Construction, Edition of 2014, will be in effect. (Specifications are accessible on our web site at www.arkansashighways.com.)

Bid Bond in the amount of 5% of total bid price required of all bidders at time of bid opening or bid will be rejected. **Personal and company checks are not acceptable as Bid Bonds.** See Condition 5 on page 1 of Standard Bid Conditions. **Performance Bond only** (no checks of any kind allowed) in the amount of 100% of total bid price will be required of successful bidder prior to providing goods/services. See Condition 5 on page 1 of Standard Bid Conditions.

The successful bidder will be required to begin within 15 days after notice to begin and complete within 180 calendar days after notice to begin.

Arkansas Contractor's License No. _____.

Current Arkansas Contractor's License Number must be listed or bid will be rejected (A.C.A. ¶17-25-101 *et seq.*).

ARDOT - STANDARD BID CONDITIONS

1. **GENERAL:** Any special terms and conditions included in the invitation for bid override these standard terms and conditions. The standard terms and conditions and any special terms and conditions become part of any contract entered into if any or all parts of the bid are accepted by the Arkansas Department of Transportation (ArDOT).
2. **ACCEPTANCE AND REJECTION:** ArDOT reserves the right to reject any or all bids, to accept bids in whole or in part (unless otherwise indicated by bidder), to waive any informalities in bids received, to accept bids on materials or equipment with variations from specifications where efficiency of operation will not be impaired, and to award bids to best serve the interest of the State.
3. **PRICES:** Unless otherwise stated in the Bid Invitation, the following will apply: (1) unit prices shall be bid, (2) prices should be stated in units of quantity specified (feet, each, lbs., etc.), (3) prices must be F.O.B. destination specified in bid, (4) prices must be firm and not subject to escalation, (5) bid must be firm for acceptance for 30 days from bid opening date. In case of errors in extension, unit prices shall govern. Discounts from bid price will not be considered in making awards.
4. **BID BONDS AND PERFORMANCE BONDS:** If required, a **Bid Bond** in the form of a cashier's check, certified check, or surety bond issued by a surety company, in an amount stated in the Bid Invitation, must accompany bid. **Personal and company checks are not acceptable as Bid Bonds.** Failure to submit a Bid Bond as required will cause a bid to be rejected. The Bid Bond will be forfeited as liquidated damages if the successful bidder fails to provide a required Performance Bond within the period stipulated by ArDOT or fails to honor their bid. When a bidder claims and can show clear and convincing evidence that a material mistake was made in the bid and was not the bid intended, the bidder may be permitted to withdraw their bid prior to award without forfeiture of bid bond. Cashier's checks and certified checks submitted as Bid Bonds will be returned to unsuccessful bidders; surety bonds will be retained. The successful bidder will be required to furnish a **Performance Bond** in an amount stated in the Bid Invitation and in the form of a cashier's check, certified check, or surety bond issued by a surety company, unless otherwise stated in the Bid Invitation, as a guarantee of delivery of goods/services in accordance with the specifications and within the time established in the bid. **Personal and company checks are not acceptable as Performance Bonds.** In some cases, a cashier's check or certified check submitted as a Bid Bond will be held as the Performance Bond of the successful bidder. Cashier's checks or certified checks submitted as Performance Bonds will be refunded shortly after payment has been made to the successful bidder for completion of all terms of the bid; surety bonds will be retained. Surety bonds must be issued by a surety company authorized to do business in Arkansas, and must be signed by a Resident Local Agent licensed by the Arkansas State Insurance Commissioner to represent that surety company. Resident Agent's Power-of-Attorney must accompany the surety bond. Certain bids involving labor will require Performance Bonds in the form of surety bonds only (no checks of any kind allowed). These bonds shall not only serve to guarantee the completion of the work, but also to guarantee the excellence of both workmanship and material until the work is finally accepted and the provisions of the Plans, Specifications, and Special Provisions fulfilled. In such cases, the company issuing the surety bond must comply with all stipulations herein and must be named in the U. S. Treasury listing of companies holding Certificates of Authority as acceptable sureties on Federal Bonds and as acceptable reinsuring companies. Any excess between the face amount of the bond and the underwriting limitation of the bonding company shall be protected by reinsurance provided by an acceptable reinsuring company. Annual Bid and Performance Bonds on file with E & P Division must have sufficient unencumbered funds to meet current bonding requirements, or the bid will be rejected, unless the balance is submitted as set forth above, prior to bid opening.
5. **TAXES:** The ArDOT is not exempt from Arkansas State Sales and Use Taxes, or local option city/county sales taxes, when applicable, and bidders are responsible to the State Revenue Department for such taxes. These taxes should not be included in bid prices, but where required by law, will be paid by the ArDOT as an addition thereto, and should be added to the billing to the ArDOT. The ArDOT is exempt from Federal Excise Taxes on all commodities except motor fuels; and excise taxes should not be included in bid prices except for motor fuels. Where applicable, tax exemption certificates will be furnished by the ArDOT.
6. **"ALL OR NONE" BIDS:** Bidders who wish to bid "All or None" on two or more items shall so stipulate on the face of bid sheet; otherwise, bid may be awarded on an individual item basis.
7. **SPECIFICATIONS:** Complete specifications should be attached for any substitution or alternate offered, or where amplification is necessary. Bidder's name must be placed on all attachments to the bid.
8. **EXCEPTIONS TO SPECIFICATIONS:** Any exceptions to the bid specifications must be stated in the bid. Any exceptions to manufacturer's published literature must be stated in the bid, or it will be assumed that bidder is bidding exactly as stated in the literature.
9. **BRAND NAME REFERENCES:** All brand name references in bid specifications refer to that commodity or its equivalent, unless otherwise stated in Bid Invitation. Bidder should state brand or trade name of item being bid, if such name exists.
10. **FREIGHT:** All freight charges should be included in bid price. Any change in common carrier rates authorized by the Interstate Commerce Commission will be adjusted if such change occurs after the bid opening date. Receipted common carrier bills that reflect ICC authorized rate changes must be furnished.

11. **SAMPLES, LITERATURE, DEMONSTRATIONS:** Samples and technical literature must be provided free of any charge within 14 days of ArDOT request, and free demonstrations within 30 days, unless ArDOT extends time. Failure to provide as requested within this period may cause bid to be rejected. Samples, literature and demonstrations must be substantially the same as the item(s) being bid, unless otherwise agreed to by ArDOT. Samples that are not destroyed will be returned upon request at bidders expense. Samples from successful bidders may be retained for comparison with items actually furnished.
12. **GUARANTY:** Unless otherwise indicated in Bid Invitation, it is understood and agreed that any item offered or shipped on this bid shall be newly manufactured, latest model and design, and in first class condition; and that all containers shall be new, suitable for storage or shipment and in compliance with all applicable laws relating to construction, packaging, labeling and registration.
13. **BACKORDERS OR DELAY IN DELIVERY:** Backorders or failure to deliver within the time required may constitute default. Vendor must give written notice to the ArDOT, as soon as possible, of the reason for any delay and the expected delivery date. The ArDOT has the right to extend delivery if reasons appear valid. If reason or delivery date is not acceptable, vendor is in default.
14. **DEFAULT:** All commodities furnished will be subject to inspection and acceptance by ArDOT after delivery. Default in promised delivery or failure to meet specifications authorizes the ArDOT to cancel award or any portion of same, to reasonably purchase commodities or services elsewhere and to charge full increase, if any, in cost and handling to defaulting vendor. Applicable bonds may be forfeited.
15. **ETHICS:** *"It shall be a breach of ethical standards for a person to be retained, or to retain a person, to solicit or secure a State contract upon an agreement of understanding for a commission, percentage, brokerage, or contingent fee, except for retention of bona fide employees or bona fide established commercial selling agencies maintained by the contractor for the purpose of securing business."* (Arkansas Code, Annotated, Section 19-11-708).
16. **NOTICE OF NONDISCRIMINATION:** The Arkansas State Highway Commission, through ArDOT, complies with all civil rights provisions of federal statutes and related authorities that prohibit discrimination in programs and activities receiving federal financial assistance. Therefore, ArDOT does not discriminate on the basis of race, sex, color, age, national origin, religion (not applicable as a protected group under the Federal Motor Carrier Safety Administration Title VI Program), disability, Limited English Proficiency (LEP), or low-income status in the admission, access to and treatment in the ArDOT's programs and activities, as well as the ArDOT's hiring or employment practices. Complaints of alleged discrimination and inquiries regarding the ArDOT's nondiscrimination policies may be directed to Joanna P. McFadden Section Head – EEO/DBE (ADA/504/Title VI Coordinator), P. O. Box 2261, Little Rock, AR 72203, (501)569-2298, (Voice/TTY 711), or the following email address: joanna.mcfadden@ardot.gov. Free language assistance for Limited English Proficient individuals is available upon request. This notice is available from the ADA/504/Title VI Coordinator in large print, on audiotape and in Braille.
17. **PROHIBITION OF EMPLOYMENT OF ILLEGAL IMMIGRANTS:** Pursuant to Arkansas Code Annotated 19-11-105, all bidders must certify prior to award of a contract that they **do not** employ or contract with any illegal immigrant(s) in its contract with the state.
18. **DISCLOSURE:** Failure to make any disclosure required by Governor's Executive Order 98-04, or any violation of any rule, regulation, or policy adopted pursuant to that order, **shall** be a material breach of the terms of this contract. Any contractor, whether an individual or entity, who fails to make the required disclosure or who violates any rule, regulation, or policy **shall** be subject to all legal remedies available to the agency.

Bids and Specifications are available on-line by going to the ARDOT Web Site – www.arkansashighways.com and clicking on "Commodities and Services Bids/Contracts Information". Tabulations will also be available at this site after award of bid/contract. If you have any questions, call this office at 501-569-2667

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT

SPECIAL PROVISION

LIQUIDATED DAMAGES

As specified in the Contract, liquidated damages for this project will be as shown in the following table:

WORKING DAY PROJECTS

ORIGINAL CONTRACT AMOUNT		RATE
FROM MORE THAN	TO AND INCLUDING	-----
\$ 0	\$ 50,000	\$ 400
50,000	100,000	700
100,000	500,000	800
500,000	1,000,000	1,100
1,000,000	2,000,000	1,300
2,000,000	5,000,000	1,500
5,000,000	10,000,000	1,900
10,000,000	15,000,000	2,000
15,000,000	20,000,000	2,100
20,000,000	-----	2,500

FIXED DATE PROJECTS

ORIGINAL CONTRACT AMOUNT		RATE
FROM MORE THAN	TO AND INCLUDING	-----
\$ 0	\$ 50,000	\$ 90
50,000	100,000	100
100,000	500,000	200
500,000	1,000,000	250
1,000,000	2,000,000	320
2,000,000	5,000,000	400
5,000,000	10,000,000	600
10,000,000	-----	750

ATTACHMENT A

ELIGIBLE BIDDER CERTIFICATION

The Bidder represents and warrants for itself, its employees and its subcontractors and certifies they:

1. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
2. Have not within a three-year period preceding thus Bid been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
3. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph two (2) of this Certification;
4. Have not within a one-year period preceding this application/Bid had one or more public transactions (Federal, State, or local) terminated for cause or default; and

The Bidder represents, warrants and acknowledges the understanding that restrictions placed on the employment of labor or on the scale of pay for the work on a contract will be the requirements of the Fair Labor Standards Act (Federal Wage-Hour Law) of 1938, 28 USC §201 et seq., and other applicable labor laws.

The person executing this Certification further represents, warrants and affirms the truthfulness and accuracy of the contents of the statements submitted on or with this Certification and understands that the provisions of 31 USC §3801 et seq. are applicable thereto.

BIDDER NAME

BY: _____

Signature

TITLE: _____

CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM

Failure to complete all of the following information may result in a delay in obtaining a contract, lease, purchase agreement, or grant award with any Arkansas State Agency.

SUBCONTRACTOR: _____ SUBCONTRACTOR NAME: _____

Yes No

BIDDER INFORMATION: _____

IS THIS FOR:

TAXPAYER ID NAME: _____

Goods? Services? Both?

YOUR LAST NAME: _____

FIRST NAME: _____

M.I.: _____

ADDRESS: _____

CITY: _____

STATE: _____

ZIP CODE: _____

COUNTY: _____

AS A CONDITION OF OBTAINING, EXTENDING, AMENDING, OR RENEWING A CONTRACT, LEASE, PURCHASE AGREEMENT, OR GRANT AWARD WITH ANY ARKANSAS STATE AGENCY, THE FOLLOWING INFORMATION MUST BE DISCLOSED:

FOR INDIVIDUALS*

Indicate below if: you, your spouse or the brother, sister, parent, or child of you or your spouse is a current or former: member of the General Assembly, Constitutional Officer, State Board or Commission Member, or State Employee:

Position Held	Mark (✓)		Name of Position of Job Held <small>(senator, representative, name of board/ commission, data entry, etc.)</small>	For How Long?		What is the person(s) name and how are they related to you? <small>(i.e., Jane Q. Public, spouse, John Q. Public, Jr., child, etc.)</small>	
	Current	Former		From MM/YY	To MM/YY	Person's Name(s)	Relation
General Assembly							
Constitutional Officer							
State Board or Commission Member							
State Employee							

None of the above applies

FOR AN ENTITY (BUSINESS)*

Indicate below If any of the following persons, current or former, hold any position of control or hold any ownership interest of 10% or greater in the entity: member of the General Assembly, Constitutional Officer, State Board or Commission Member, State Employee, or the spouse, brother, sister, parent, or child of a member of the General Assembly, Constitutional Officer, State Board or Commission Member, or State Employee. Position of control means the power to direct the purchasing policies or influence the management of the entity.

Position Held	Mark (✓)		Name of Position of Job Held <small>(senator, representative, name of board/ commission, data entry, etc.)</small>	For How Long?		What is the person(s) name and what is his/her % of ownership interest and/or what is his/her position of control?		
	Current	Former		From MM/YY	To MM/YY	Person's Name(s)	Ownership Interest (%)	Position of Control
General Assembly								
Constitutional Officer								
State Board or Commission Member								
State Employee								

None of the above applies

Contract and Grant Disclosure and Certification Form

Failure to make any disclosure required by Governor's Executive Order 98-04, or any violation of any rule, regulation, or policy adopted pursuant to that Order, shall be a material breach of the terms of this contract. Any contractor, whether an individual or entity, who fails to make the required disclosure or who violates any rule, regulation, or policy shall be subject to all legal remedies available to the agency.

As an additional condition of obtaining, extending, amending, or renewing a contract with a state agency I agree as follows:

1. Prior to entering into any agreement with any subcontractor, prior or subsequent to the contract date, I will require the subcontractor to complete a **CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM**. Subcontractor shall mean any person or entity with whom I enter an agreement whereby I assign or otherwise delegate to the person or entity, for consideration, all, or any part, of the performance required of me under the terms of my contract with the state agency.

2. I will include the following language as a part of any agreement with a subcontractor:

Failure to make any disclosure required by Governor's Executive Order 98-04, or any violation of any rule, regulation, or policy adopted pursuant to that Order, shall be a material breach of the terms of this subcontract. The party who fails to make the required disclosure or who violates any rule, regulation, or policy shall be subject to all legal remedies available to the contractor.

3. No later than ten (10) days after entering into any agreement with a subcontractor, whether prior or subsequent to the contract date, I will mail a copy of the **CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM** completed by the subcontractor and a statement containing the dollar amount of the subcontract to the state agency.

Signature _____	Title _____	Date _____
Vendor Contact Person _____	Title _____	Phone No. _____

Agency Use Only				
Agency Number _____	Agency Name _____	Agency Contact Person _____	Contact Phone No. _____	Contract or Grant No. _____

RESTRICTION OF BOYCOTT OF ISRAEL CERTIFICATION

Pursuant to Arkansas Code Annotated § 25-1-503, a public entity **shall not** enter into a contract valued at \$1,000 or greater with a company unless the contract includes a written certification that the person or company is not currently engaged in, and agrees for the duration of the contract not to engage in, a boycott of Israel.

By signing below, the Contractor agrees and certifies that they do not boycott Israel and will not boycott Israel during the remaining aggregate term of the contract.

If a company does boycott Israel, see Arkansas Code Annotated § 25-1-503.

Bid Number/Contract Number	M-19-021P
Description of product or service	Construction of Grounds Crew Building/Shop
Contractor name	

Contractor Signature: _____
Signature must be hand written, in ink

Date: _____

ILLEGAL IMMIGRANT CERTIFICATION

Pursuant to Arkansas Code Annotated § 19-11-105, Contractor(s) **shall** certify with OSP that they do not employ or contract with illegal immigrants.

By signing below, the Contractor agrees and certifies that they do not employ illegal immigrants and will not employ illegal immigrants during the remaining aggregate term of the contract.

Bid Number/Contract Number	M-19-021P
AASIS Number	N/A
Description	Construction of Grounds Crew Building/Shop
Contractor name	

Contractor Signature: _____

Date: _____

Signature must be hand written, in ink

**ARKANSAS DEPARTMENT OF TRANSPORTATION
JOB NO. 42-56
GROUNDS CREW BUILDING
PROJECT MANUAL**

October 18, 2018

**JOB NO. 42-56
GROUNDS CREW BUILDING
LITTLE ROCK
PULASKI COUNTY**

ARKANSAS DEPARTMENT OF TRANSPORTATION

10324 Interstate 30 P.O. Box 2261
Little Rock, Arkansas 72203

**ARKANSAS DEPARTMENT OF TRANSPORTATION
JOB NO. 42-56
GROUNDS CREW BUILDING
PROJECT MANUAL**

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**ARKANSAS DEPARTMENT OF TRANSPORTATION
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PROJECT MANUAL**

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 PROJECT INFORMATION

- A. Project Identification: **GROUNDS CREW BUILDING**
 - 1. Project Location: **9003 Baseline Road, Little Rock, AR 72209**
- B. Owner: **Arkansas Department of Transportation.**
 - 1. Owner's Representative: **Phillip Watkins, Project Coordinator,
9003 Baseline Road, Little Rock, AR. 72209
Ph: (501) 569-4950 Fax: (501) 569-2011**

1.2 WORK COVERED BY THE CONTRACT DOCUMENTS

- A. Construction of a Grounds Crew Building for the Arkansas Department of Transportation as indicated on the Plans, and as called for in these Specifications, or as directed by the Owner.
- B. The work shall include all labor, materials, equipment, construction tools, machines, services, utilities, and fuel, required to construct the work and place the facilities constructed into operation to form a complete, operating system.
- C. Project shall be constructed under a single prime contract and shall include provision for a complete one (1) year warranty period for all aspects of the project with the exception of damage due to normal wear conditions. The warranty period shall commence upon acceptance of the work following a Semi-Final Inspection (as defined in Section 01 77 00). With partial acceptance of work, only the warranty applicable to that portion of the work shall be deemed to be in effect. This warranty will be in addition to specific product or installation warranties from suppliers or subcontractors.

1.3 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

**ARKANSAS DEPARTMENT OF TRANSPORTATION
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GROUNDS CREW BUILDING
PROJECT MANUAL**

1.4 WORK RESTRICTIONS

- A. Contractor's Use of Premises: During construction, Contractor will have full use of site indicated. Contractor's use of premises is limited only by Owner's right to perform work or employ other contractors on portions of Project.
- B. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- C. On-Site Work Hours: Limit work to Monday through Friday, unless otherwise indicated. Coordinate with Owner for work outside of normal business hours.
- D. Nonsmoking Building: Once building is "in the dry", smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.
- E. Controlled Substances: Use of controlled substances on Project site is not permitted.
- F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
 - 1. Maintain list of approved screened personnel with Owner's representative.

1.5 OWNER FURNISHED PRODUCTS

- A. The following products will be furnished by Owner and shall be installed by Contractor as part of the Work:
 - 1. Cook Stove
 - 2. Refrigerator

1.6 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon(:) is used within a sentence or phrase.
 - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

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PROJECT MANUAL**

- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
 - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

**ARKANSAS DEPARTMENT OF TRANSPORTATION
JOB NO. 42-56
GROUNDS CREW BUILDING
PROJECT MANUAL**

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUBSTITUTION PROCEDURES

- A. Substitutions include changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use CSI Form 13.1A.
 - 2. Submit requests within 10 days after the Notice to Proceed.
 - 3. Identify product to be replaced and show compliance with requirements for substitutions. Include a detailed comparison of significant qualities of proposed substitution with those of the Work specified, a list of changes needed to other parts of the Work required to accommodate proposed substitution, and any proposed changes in the Contract Sum or the Contract Time should the substitution be accepted.
- C. Owner will review proposed substitutions and notify Contractor of their acceptance or rejection. If necessary, Owner will request additional information or documentation for evaluation.
 - 1. Owner will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- D. Do not submit unapproved substitutions on Shop Drawings or other submittals.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

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SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 CONTRACT MODIFICATION PROCEDURES

- A. Owner will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.
- B. Owner-Initiated Proposal Requests: Owner will issue a detailed description of proposed changes in the Work.
 - 1. Proposal Requests are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time.
- C. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Owner.
- D. On Owner's approval of a Proposal Request, Owner will issue a Change Order for signatures of Owner and Contractor, for all changes to the Contract Sum or the Contract Time.
- E. Owner may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- F. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

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SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 PROJECT MANAGEMENT AND COORDINATION

- A. Subcontract List: Submit a written summary identifying individuals or firms proposed for each portion of the Work. Use CSI Form 1.5A.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. List e-mail addresses and telephone numbers.
- C. Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work.
- D. Requests for Information (RFIs): On discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI. Use forms acceptable to Owner.
- E. Schedule and conduct progress meetings at Project site at weekly intervals. Notify Owner of meeting dates and times. Require attendance of each subcontractor or other entity concerned with current progress or involved in planning, coordination, or performance of future activities.
 - 1. Record minutes and distribute to everyone concerned, including Owner and Owner.

1.2 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Owner's Digital Data Files: Electronic digital data files of the Contract Drawings will not be provided by Owner for Contractor's use in preparing submittals.
- B. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 1. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 2. Submit three copies of each action submittal. Owner will return two copies.
 - 3. Submit one copy of each informational submittal. Owner will not return copies.
 - 4. Owner will discard submittals received from sources other than Contractor.
- C. Paper Submittals: Place a permanent label or title block on each submittal for identification. Provide a space approximately 6 by 8 inches on label or beside title block

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to record Contractor's review and approval markings and action taken by Owner. Include the following information on the label:

1. Project name.
 2. Date.
 3. Name and address of Contractor.
 4. Name and address of subcontractor or supplier.
 5. Number and title of appropriate Specification Section.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with unique identifier, including project identifier, Specification Section number, and revision identifier.
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Owner.
- E. Identify options requiring selection by Owner.
- F. Identify deviations from the Contract Documents on submittals.
- G. Contractor's Construction Schedule Submittal Procedure:
1. Submit required submittals in the following format:
 - a. Working electronic copy of schedule file, where indicated.
 - b. PDF electronic file.
 2. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - a. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
 3. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

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PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections.
 - 1. Submit electronic submittals via email as PDF electronic files.
 - a. Owner will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2.2 ACTION SUBMITTALS

- A. Submit three paper copies of each submittal unless otherwise indicated. Owner will return two copies.
- B. Product Data: Mark each copy to show applicable products and options. Include the following:
 - 1. Manufacturer's written recommendations, product specifications, and installation instructions.
 - 2. Wiring diagrams showing factory-installed wiring.
 - 3. Printed performance curves and operational range diagrams.
 - 4. Testing by recognized testing agency.
 - 5. Compliance with specified standards and requirements.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. Submit on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches. Include the following:
 - 1. Dimensions and identification of products.
 - 2. Fabrication and installation drawings and roughing-in and setting diagrams.
 - 3. Wiring diagrams showing field-installed wiring.
 - 4. Notation of coordination requirements.
 - 5. Notation of dimensions established by field measurement.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture and for a comparison of these characteristics between submittal and actual component as delivered and installed. Include name of manufacturer and product name on label.
 - 1. If variation is inherent in material or product, submit at least three sets of paired units that show variations.

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2.3 INFORMATIONAL SUBMITTALS

- A. Informational Submittals: Submit one paper copy of each submittal unless otherwise indicated. Owner will not return copies.
- B. Qualification Data: Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

2.4 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Owner.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

2.5 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type schedule within 10 days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
- C. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
- D. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule.

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Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and indicate date by which recovery will be accomplished.

PART 3 - EXECUTION

3.1 SUBMITTAL REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Owner.
- B. Owner will review each action submittal, make marks to indicate corrections or modifications required, will stamp each submittal with an action stamp, and will mark stamp appropriately to indicate action.
- C. Informational Submittals: Owner will review each submittal and will not return it, or will return it if it does not comply with requirements. Owner will forward each submittal to appropriate party.
- D. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

3.2 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribute copies of approved schedule to Owner, subcontractors, testing and inspecting agencies, and parties identified by Contractor with a need-to-know schedule responsibility. When revisions are made, distribute updated schedules to the same parties.

END OF SECTION 01 30 00

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SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
- B. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements, comply with the most stringent requirement. Refer uncertainties to Owner for a decision.
- C. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum. The actual installation may exceed the minimum within reasonable limits. Indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Owner for a decision.
- D. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Owner.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Owner.
- E. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.

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- F. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, notices, receipts for fee payments, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.
- G. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.
- H. Testing Agency Qualifications: An independent agency with the experience and capability to conduct testing and inspecting indicated; and where required by authorities having jurisdiction, that is acceptable to authorities.
- I. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- J. Testing Agency Responsibilities: Cooperate with Owner and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Owner and Contractor of irregularities or deficiencies in the Work observed during performance of its services.
 - 2. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
 - 3. Do not perform any duties of Contractor.
- K. Associated Services: Cooperate with testing agencies and provide reasonable auxiliary services as requested. Provide the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 - 4. Facilities for storage and field curing of test samples.
 - 5. Security and protection for samples and for testing and inspecting equipment.
- L. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- M. Special Tests and Inspections: Engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction.
- N. Special Tests and Inspections: Conducted by a qualified testing agency or special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
- B. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

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SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Use Charges: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated.
- B. Erosion- and Sedimentation-Control Plan: Submit plan showing compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- C. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- D. Accessible Temporary Egress: Comply with applicable provisions in ICC A117.1.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts and top and bottom rails.
- B. Wood Enclosure Fence: Plywood, 6 feet high, framed with four 2-by-4-inch rails, with preservative-treated wood posts spaced not more than 8 feet apart.

2.2 TEMPORARY FACILITIES

- A. Provide field offices, storage and fabrication sheds, and other support facilities as necessary for construction operations. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

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1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction.

PART 3 - EXECUTION

3.1 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
- C. Heating and Cooling: Provide temporary heating and cooling required for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- D. Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

3.2 SUPPORT FACILITIES INSTALLATION

- A. Install project identification and other signs in locations approved by Owner to inform the public and persons seeking entrance to Project.
- B. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

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- B. Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- C. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- D. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- E. Furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
- F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- G. Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
- H. Install and maintain temporary fire-protection facilities. Comply with NFPA 241.

3.4 MOISTURE AND MOLD CONTROL

- A. Before installation of weather barriers, protect materials from water damage and keep porous and organic materials from coming into prolonged contact with concrete.
 - 1. Protect stored and installed material from flowing or standing water.
 - 2. Remove standing water from decks.
 - 3. Keep deck openings covered or dammed.
- B. After installation of weather barriers but before full enclosure and conditioning of building, protect as follows:
 - 1. Do not load or install drywall or porous materials into partially enclosed building.
 - 2. Discard water-damaged material.
 - 3. Do not install material that is wet.
 - 4. Discard, replace, or clean stored or installed material that begins to grow mold.
 - 5. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

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3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion.
- C. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period.

END OF SECTION 01 50 00

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SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
- B. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced.
 - 1. Show compliance with requirements for comparable product requests.
 - 2. Owner will review the proposed product and notify Contractor of its acceptance or rejection.
- C. Basis-of-Design Product Specification Submittal: Show compliance with requirements.
- D. Compatibility of Options: If Contractor is given option of selecting between two or more products, select product compatible with products previously selected.
- E. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Deliver products to Project site in manufacturer's original sealed container or packaging, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 3. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 - 4. Store materials in a manner that will not endanger Project structure.
 - 5. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
- F. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

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PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. Provide products that comply with the Contract Documents, are undamaged, and, unless otherwise indicated, are new at the time of installation.
1. Provide products complete with accessories, trim, finish, and other devices and components needed for a complete installation and the intended use and effect.
 2. Where products are accompanied by the term "as selected," Owner will make selection.
 3. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Where the following headings are used to list products or manufacturers, the Contractor's options for product selection are as follows:
1. Products:
 - a. Where requirements include "one of the following," provide one of the products listed that complies with requirements.
 - b. Where requirements do not include "one of the following," provide one of the products listed that complies with requirements or a comparable product.
 2. Manufacturers:
 - a. Where requirements include "one of the following," provide a product that complies with requirements by one of the listed manufacturers.
 - b. Where requirements do not include "one of the following," provide a product that complies with requirements by one of the listed manufacturers or another manufacturer.
 3. Basis-of-Design Product: Provide the product named, or indicated on the Drawings, or a comparable product by one of the listed manufacturers.
- C. Where Specifications require "match Owner's sample," provide a product that complies with requirements and matches Owner's sample. Owner's decision will be final on whether a proposed product matches.
- D. Where Specifications include the phrase "as selected by Owner from manufacturer's full range" or similar phrase, select a product that complies with requirements. Owner will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

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2.2 COMPARABLE PRODUCTS

- A. Owner will consider Contractor's request for comparable product when the following conditions are satisfied:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications.
 3. List of similar installations for completed projects, if requested.
 4. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

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SECTION 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 EXECUTION REQUIREMENTS

- A. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- B. Cutting and Patching:
 - 1. Structural Elements: When cutting and patching structural elements, notify Owner of locations and details of cutting and await directions from Owner before proceeding. Shore, brace, and support structural elements during cutting and patching.
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 - 3. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Owner's opinion, reduce the building's aesthetic qualities.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

1.2 CLOSEOUT SUBMITTALS

- A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- B. Certified List of Incomplete Items: Final submittal at Final Completion.
- C. Operation and Maintenance Data: Submit one copy of manual.
- D. PDF Electronic File: Assemble manual into a composite electronically indexed file. Submit on digital media.
- E. Record Drawings: Submit one set(s) of marked-up record prints.
- F. Record Digital Data Files: Submit data file and one set(s) of plots.
- G. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

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1.3 SUBSTANTIAL COMPLETION PROCEDURES

- A. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
- B. Submittals Prior to Substantial Completion: Before requesting Substantial Completion inspection, complete the following:
 - 1. Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other sections, including project record documents, operation and maintenance manuals, property surveys, similar final record information, warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 3. Submit maintenance material submittals specified in other sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner.
 - 4. Submit test/adjust/balance records.
 - 5. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Before requesting Substantial Completion inspection, complete the following:
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner.
 - 3. Complete startup and testing of systems and equipment.
 - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - 5. Advise Owner of changeover in heat and other utilities.
 - 6. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 - 7. Remove temporary facilities and controls.
 - 8. Complete final cleaning requirements, including touchup painting.
 - 9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Owner will proceed with inspection or advise Contractor of unfulfilled requirements. Owner will prepare the Certificate of Substantial Completion after inspection or will advise Contractor of items that must be completed or corrected before certificate will be issued.

1.4 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting inspection for determining final completion, complete the following:

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1. Submit a final Application for Payment.
 2. Submit certified copy of Owner's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Owner. Certified copy of the list shall state that each item has been completed or otherwise resolved.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
- B. Submit a written request for final inspection for acceptance. On receipt of request, Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner will prepare final Certificate for Payment after inspection or will advise Contractor of items that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

"Cleaning Agents" Paragraph below contains basic requirements. Revise to suit Project or to accommodate unusual situations.

- B. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

Requirements in subparagraph below are from the USGBC's "LEED 2009 for Existing Buildings: Operation and Maintenance." Revise if Owner requirements differ.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

2.2 OPERATION AND MAINTENANCE DOCUMENTATION

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.

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- B. Organization: Unless otherwise indicated, organize manual into separate sections for each system and subsystem, and separate sections for each piece of equipment not part of a system.
- C. Organize data into three-ring binders with identification on front and spine of each binder, and envelopes for folded drawings. Include the following:
 - 1. Manufacturer's operation and maintenance documentation.
 - 2. Maintenance and service schedules.
 - 3. Maintenance service contracts. Include name and telephone number of service agent.
 - 4. Emergency instructions.
 - 5. Spare parts list and local sources of maintenance materials.
 - 6. Wiring diagrams.
 - 7. Copies of warranties. Include procedures to follow and required notifications for warranty claims

2.3 RECORD DRAWINGS

- A. Record Prints: Maintain a set of prints of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued. Mark to show actual installation where installation varies from that shown originally. Accurately record information in an acceptable drawing technique.
 - 1. Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Owner. When authorized, prepare a full set of corrected digital data files of the Contract Drawings.
 - 1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
- B. Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance.

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1. Verify compatibility with and suitability of substrates.
 2. Examine roughing-in for mechanical and electrical systems.
 3. Examine walls, floors, and roofs for suitable conditions.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Take field measurements as required to fit the Work properly. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication.
- E. Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- F. Surface and Substrate Preparation: Comply with manufacturer's written recommendations for preparation of substrates to receive subsequent work.

3.2 CONSTRUCTION LAYOUT AND FIELD ENGINEERING

- A. Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks.
- B. Engage a land surveyor to lay out the Work using accepted surveying practices.

Retain first paragraph below if Contractor is required to provide final property survey.

- C. Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project.

Delete subparagraph below if Owner will record survey.

1. At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.3 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
 2. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 3. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations.

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- C. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- D. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed.
- E. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Owner.
- F. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- G. Use products, cleaners, and installation materials that are not considered hazardous.

3.4 CUTTING AND PATCHING

- A. Provide temporary support of work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Cutting: Cut in-place construction using methods least likely to damage elements retained or adjoining construction.
 - 1. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
- D. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
 - 1. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - 2. Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance.
 - 3. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

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3.5 CLEANING

- A. Clean Project site and work areas daily, including common areas. Dispose of materials lawfully.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
 - 3. Remove debris from concealed spaces before enclosing the space.

- B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion:
 - 1. Clean Project site, yard, and grounds, in areas disturbed by construction activities. Sweep paved areas; remove stains, spills, and foreign deposits. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - 2. Sweep paved areas broom clean. Remove spills, stains, and other foreign deposits.
 - 3. Remove labels that are not permanent.
 - 4. Clean transparent materials, including mirrors. Remove excess glazing compounds.
 - 5. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. Sweep concrete floors broom clean.
 - 6. Vacuum carpeted surfaces and wax resilient flooring.
 - 7. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and foreign substances. Clean plumbing fixtures. Clean light fixtures, lamps, globes, and reflectors.
 - 8. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

3.6 OPERATION AND MAINTENANCE MANUAL PREPARATION

- A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

- B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are unavailable and where the information is necessary for proper operation and maintenance of equipment or systems.

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- C. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams.

3.7 DEMONSTRATION AND TRAINING

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system. Include a detailed review of the following:
 - 1. Include instruction for basis of system design and operational requirements, review of documentation, emergency procedures, operations, adjustments, troubleshooting, maintenance, and repairs.

END OF SECTION 01 70 00

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SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, concrete mix designs and submittals required by ACI 301.
- B. Ready-Mixed Concrete Producer Qualifications: ASTM C 94/C 94M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ACI 301, "Specification for Structural Concrete," and with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

2.2 MATERIALS

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain Steel Wire: ASTM A 82/A 82M, as drawn.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, as drawn, flat sheet.
- D. Portland Cement: ASTM C 150, Type I.
- E. Fly Ash: ASTM C 618, Class C or F.
- F. Fine Aggregate - All Fine Aggregate shall consist of natural fresh water sand to conform to ASTM Designation C33. Fine aggregate for concrete shall be graded uniformly to conform to Paragraph 4, ASTM Designation C33.
- G. Coarse Aggregate - All Coarse Aggregate shall conform to the requirements of ASTM C33, standard grading 1" to #4.
- H. Water - Water shall be clean, free from acids, alkalis or organic materials and shall conform to the requirements of ASTM C94/C94M.
- I. Air-Entraining Admixture: ASTM C 260.
- J. Chemical Admixtures: ASTM C 494, Admixtures will only be allowed to achieve proper slump. Do not use calcium chloride or admixtures containing calcium chloride.

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- K. Vapor Retarder: Reinforced sheet, ASTM E 1745, Class A.
- L. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- M. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- N. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- O. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

2.3 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301.
- B. Normal-Weight Concrete:
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.40.
 - 3. Slump Limit: 6 inches, plus or minus 1 inch.
 - 4. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of floor slabs to receive troweled finishes to exceed 3 percent.
 - 5. Use fly ash as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
 - 6. For exterior concrete, limit use of fly ash to 25 percent replacement of portland cement by weight.
- C. Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M.
 - 1. When air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 CONCRETING

- A. Construct formwork according to ACI 301 and maintain tolerances and surface irregularities within ACI 347R limits of Class A, 1/8 inch for concrete exposed to view and Class B, 1/4 inch for other concrete surfaces.
- B. Place vapor retarder on prepared subgrade, with joints lapped 6 inches and sealed.

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- C. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- D. Install construction, isolation, and contraction joints where indicated. Install full-depth joint-filler strips at isolation joints.
- E. Place concrete in a continuous operation and consolidate using mechanical vibrating equipment.
- F. Protect concrete from physical damage, premature drying, and reduced strength due to hot or cold weather during mixing, placing, and curing.
- G. Formed Surface Finish: Smooth-formed finish for concrete exposed to view, coated, or covered by waterproofing or other direct-applied material; rough-formed finish elsewhere.
- H. Slab Finishes: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces. Provide the following finishes:
 - 1. Float finish for surfaces to receive waterproofing, roofing, or other direct-applied material.
 - 2. Troweled finish for floor surfaces and floors to receive floor coverings, paint, or other thin film-finish coatings.
 - 3. Nonslip-broom finish to exterior concrete.
- I. Cure formed surfaces by moisture curing for at least seven days.
- J. Begin curing concrete slabs after finishing. Apply membrane-forming curing and sealing compound to concrete.
- K. Owner will engage a testing agency to perform field tests and to submit test reports.
- L. Protect concrete from damage. Repair and patch defective areas.

END OF SECTION 03 30 00

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SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Shop Drawings.

PART 2 - PRODUCTS

2.1 METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), black finish.
- C. Slotted Channel Framing: Cold-formed steel channels complying with MFMA-4, 1-5/8 by 1-5/8 inches by 0.067-inch minimum thickness, coated with rust-inhibitive, baked-on, acrylic enamel.

2.2 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.
 - 3. Provide bronze fasteners for fastening bronze.

2.3 GROUT

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107; recommended by manufacturer for exterior applications.

2.4 FABRICATION

- A. General: Shear and punch metals cleanly and accurately. Remove burrs and ease exposed edges. Form bent-metal corners to smallest radius possible without impairing work.

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- B. Welding: Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. At exposed connections, finish welds and surfaces smooth, with contour of welded surface matching those adjacent.
- C. Fabricate loose lintels from steel angles and shapes. Size to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches.

2.5 STEEL AND IRON FINISHES

- A. Hot-dip galvanized steel fabrications at exterior locations.
- B. Prepare uncoated ferrous metal surfaces to comply with SSPC-SP 3 and paint with a fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide anchorage devices and fasteners where needed to secure items to in-place construction.
- B. Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation, with edges and surfaces level, plumb, true, and free of rack.
- C. Fit exposed connections accurately together to form hairline joints or, where indicated, with uniform reveals and spaces for sealants and joint fillers.

END OF SECTION 05 50 00

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SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: ICC-ES evaluation reports for wood-preservative treated wood engineered wood products and metal framing anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: Provide dressed lumber, S4S, marked with grade stamp of inspection agency.
- B. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
 - 1. Allowable Design Stresses: Engineered wood products shall have allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be demonstrated by comprehensive testing.

2.2 TREATED MATERIALS

- A. Preservative-Treated Materials: AWWA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
 - 1. Use treatment containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
 - 2. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
 - 3. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- B. Provide preservative-treated materials for items as follows:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing members that are less than 18 inches above the ground.

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4. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FRAMING

A. Dimension Lumber:

1. Maximum Moisture Content: 19 percent.
2. Non-Load-Bearing Interior Partitions: Construction or No. 2: Mixed southern pine: SPIB; or Western woods: WCLIB or WWPA.
3. Framing Other Than Non-Load-Bearing Interior Partitions: No. 2: Southern pine: SPIB Douglas fir-larch: WCLIB, or WWPA; Spruce-pine-fir: NLGA; Douglas fir south: WWPA; or Spruce-pine-fir (south): NeLMA, WCLIB, or WWPA.
4. Exposed Framing: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.
 - a. Species: As specified for framing other than non-load-bearing interior partitions.
 - b. Grade: Select Structural.

B. Laminated-Veneer Lumber: Manufactured with exterior-type adhesive complying with ASTM D 2559. Allowable design values determined according to ASTM D 5456.

C. Wood Floor Joists: Prefabricated units complying with material requirements of and with structural capacities established and monitored according to ASTM D 5055.

1. Manufacturer: Provide products by the following:
 - a. Trim Joist.
2. Structural Properties: Provide units with depths and design values not less than those indicated.
3. Provide units complying with APA PRI-400, factory marked with nominal joist depth, joist class, span ratings, mill identification, and compliance with APA standard.

D. Rim Boards: Product designed to be used as a load-bearing member and to brace wood floor joists at bearing ends, complying with research/evaluation report for floor joists.

1. Material: glued-laminated wood or product made from any combination solid lumber, wood strands, and veneers.
2. Thickness: 1-1/4 inches.

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2.4 MISCELLANEOUS LUMBER

- A. Miscellaneous Dimension Lumber: Construction, or No. 2 grade with 19 percent maximum moisture content of any species. Provide for nailers, blocking, and similar members.
- B. Concealed Boards: Mixed southern pine, No. 2: SPIB; or Western woods, Standard: WCLIB; or No. 3 Common: WWPA; with 19 percent maximum moisture content.

2.5 MISCELLANEOUS PRODUCTS

- A. Fasteners: Size and type indicated. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
 - 1. Power-Driven Fasteners: CABO NER-272.
 - 2. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- B. Metal Framing Anchors: Structural capacity, type, and size indicated.
 - 1. Use anchors made from hot-dip galvanized steel complying with ASTM A 653/A 653M, G60 coating designation for interior locations where stainless steel is not indicated.
 - 2. Use anchors made from stainless steel complying with ASTM A 666, Type 304 for exterior locations and where indicated.
- C. Sill Sealer: Closed-cell neoprene foam, 1/4 inch thick.
- D. Flexible Flashing: Self-adhesive product consisting of a butyl rubber or rubberized-asphalt compound, bonded to a backing sheet to produce an overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Do not splice structural members between supports unless otherwise indicated.

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- D. Securely attach rough carpentry to substrates, complying with the following:
1. CABO NER-272 for power-driven fasteners.
 2. Published requirements of metal framing anchor manufacturer.
 3. Table 2304.9.1, "Fastening Schedule," in the IBC.

END OF SECTION 06 10 00

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SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and Shop Drawings.

PART 2 - PRODUCTS

2.1 HOLLOW METAL DOORS AND FRAMES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ceco Door; ASSA ABLOY.
 2. Curries Company; ASSA ABLOY.
 3. Kewanee Corporation (The).
 4. Pioneer Industries.
- B. Doors: Complying with SDI A250.8 for level and model and SDI A250.4 for physical-endurance level indicated, 1-3/4 inches thick unless otherwise indicated.
1. Interior Doors: Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).
 2. Exterior Doors: Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless), metallic-coated steel sheet faces.
 - a. Thermal-Rated (Insulated) Doors: Where indicated, provide doors with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
 3. Hardware Reinforcement: Fabricate according to SDI A250.6 with reinforcement plates from same material as door face sheets.
- C. Frames: ANSI A250.8; conceal fastenings unless otherwise indicated.
1. Steel Sheet for Interior Frames: 0.053-inch-minimum thickness.
 2. Steel Sheet for Exterior Frames: 0.067-inch-minimum thickness, metallic coated.
 3. Interior Frame Construction: Full profile welded.
 4. Exterior Frame Construction: Full profile welded.
 5. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.
 6. Frame Anchors: Not less than 0.042 inch thick.

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- D. Glazing Stops: Nonremovable stops on outside of exterior doors and on secure side of interior doors; screw-applied, removable, glazing stops on inside, fabricated from same material as door face sheet in which they are installed.
- E. Door Louvers: Sight Light proof per SDI 111C.
- F. Door Silencers: Three on strike jambs of single-door frames and two on heads of double-door frames.
- G. Grout Guards: Provide where mortar might obstruct hardware operation.
- H. Prepare doors and frames to receive mortised and concealed hardware according to SDI A250.6 and BHMA A156.115.
- I. Reinforce doors and frames to receive surface-applied hardware.
- J. Prime Finish: Manufacturer's standard, factory-applied coat of lead- and chromate-free primer complying with SDI A250.10 acceptance criteria.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, free of scale, pitting, or surface defects.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, G60 or A60.
- D. Frame Anchors: ASTM A 879/A 879M, 4Z coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, sheet steel complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install hollow metal frames to comply with SDI A250.11.
 - 1. Fire-Rated Frames: Install according to NFPA 80.
- B. Install doors to provide clearances between doors and frames as indicated in SDI A250.11.

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- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying rust-inhibitive primer. Use galvanizing repair paint for metallic coated surfaces.

END OF SECTION 08 11 13

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SECTION 08 36 13 - SECTIONAL DOORS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, Shop Drawings, manufacturer's color charts.

PART 2 - PRODUCTS

2.1 DOOR ASSEMBLY

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Fimbel Architectural Door Specialties.
 2. Haas Door.
 3. Overhead Door Corporation.
 4. Raynor.
- B. Description: Steel sectional door according to DASMA 102 unless otherwise indicated.
1. Operation Cycles: Not less than 50,000.
 2. Installed R-Value: 4.5 deg F x h x sq. ft./Btu.
- C. Structural Performance, Exterior Doors: Capable of withstanding 20 lbf/sq. ft. wind-loading pressure without requiring temporary installation of reinforcing components.
- D. Steel Sections: Galvanized steel with ribbed face sheets.
1. Finish: Baked enamel or powder coat.
- E. Glazed Panels: Clear insulating glass.
- F. Interior Facing Material: Galvanized steel or manufacturer's standard material complying with DASMA 107.
- G. Manual Door Operator: Chain-hoist operator.
- H. Electric Door Operator: Heavy-duty operator with control station interior mounted.
1. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
 2. Emergency Manual Operation: Chain type.

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- 3. Obstruction Detection Device: Automatic electric sensor edge on bottom bar.
- I. Tracks and Supports: Galvanized steel, sized for door size and weight.
- J. Hardware: Heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.
- K. Locks: Slide bolt, operable from inside only, with provision for padlocking.
- L. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install door, track, and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports.
- B. Accessibility: Install doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
- C. Power-Operated Doors: Install automatic garage door openers according to UL 325.
- D. Test and adjust controls and safeties.

END OF SECTION 08 36 13

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SECTION 08 51 13 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, Shop Drawings, and color Samples.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. All Seasons Window & Door Mfg.; All Seasons Commercial Division, Inc.
 - 2. EFCO Corporation.
 - 3. Graham Architectural Products Corporation.
 - 4. Kawneer North America; an Alcoa company.
 - 5. Quaker Windows Products Co.
 - 6. Thermal Windows, Inc.
 - 7. TRACO.

2.2 PERFORMANCE REQUIREMENTS

- A. Product Standard: AAMA/WDMA/CSA 101/I.S.2/A440.
 - 1. Window Certification: AMMA certified with label attached to each window.
 - 2. Performance Class: LC.
 - 3. Performance Grade: 25.
- B. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.31 Btu/sq. ft. x h x deg F.
- C. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.30.

2.3 ALUMINUM WINDOWS

- A. Window Types: As indicated on Drawings.
- B. Construction: Provide units with a concealed, thermal break.

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- C. Finish: Baked-enamel finish, complying with AAMA 2603.
- D. Trim: Provide indicated trim, matching material and finish of frame members.
- E. Equip units with charcoal-gray, coated-aluminum mesh insect screens at operable sashes.
- F. Glaze units with, low-E-coated, sealed insulating glass, complying with Section 08 80 00 "Glazing."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set units level, plumb, and true to line, without warp or rack of frames and panels. Provide proper support and anchor securely in place.
- B. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- C. Set sill members in bed of sealant or with gaskets, as indicated, to provide weathertight construction.
- D. Adjust operating panels, screens, and hardware to provide a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.
- E. Clean glass and aluminum surfaces immediately after installing windows. Remove nonpermanent labels from glass surfaces.

END OF SECTION 08 51 13

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SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Hardware schedule and keying schedule.

PART 2 - PRODUCTS

2.1 HARDWARE

- A. Hinges:
1. Stainless-steel hinges with stainless-steel pins for exterior.
 2. Nonremovable hinge pins for exterior and public interior exposure.
 3. Ball-bearing hinges for doors with closers and entry doors.
 4. Three hinges for 1-3/4-inch-thick doors 90 inches or less in height; four hinges for doors more than 90 inches in height.
- B. Locksets and Latchsets:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Schlage; an Allegion brand.
 2. BHMA A156.2, Series 4000, Grade 1 for bored locks and latches.
 3. BHMA A156.3, Grade 1 for exit devices.
 4. BHMA A156.5, Grade 1 for auxiliary locks.
 5. BHMA A156.12, Series 5000, Grade 1 for interconnected locks and latches.
 6. Lever handles on locksets and latchsets, Schlage Saturn Series.
 7. Provide trim on exit devices matching locksets.
- C. Key locks to Owner's new master-key system.
1. Cylinders with six-pin tumblers.
 2. Provide cylinders for overhead doors, and other locking doors that do not require other hardware.
 3. Provide construction keying.
 4. Provide key control system, including cabinet.
- D. Closers:

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1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Falcon; an Allegion Brand.
 2. Mount closers on interior side (room side) of door opening. Provide regular-arm, parallel-arm, or top-jamb-mounted closers as necessary.
 3. Adjustable delayed opening (accessible to people with disabilities) feature on closers.
- E. Provide wall stops or floor stops for doors without closers.
- F. Provide continuous weatherstripping at each edge of every exterior door leaf. Provide non-corrosive fasteners as recommended by manufacturer for application indicated.
- G. Hardware Finishes:
1. Hinges: Matching finish of lockset/latchset.
 2. Locksets, Latchsets, and Exit Devices: Satin chrome plated.
 3. Closers: Matching finish of lockset/latchset.
 4. Other Hardware: Matching finish of lockset/latchset.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mount hardware in locations required to comply with governing regulations and according to SDI A250.8 and DHI WDHS.3.
- B. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet.
- C. Deliver keys to Owner.

3.2 HARDWARE SCHEDULE

- A. Hardware Set No. 1:
 1. Hinges.
 2. Entry lock.
 3. Closer.
 4. Threshold and weather stripping.
- B. Hardware Set No. 2:
 1. Hinges.

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2. Entry lock.
3. Pair manual flush bolts with dustproof strike.
4. Two closers.
5. Coordinator.
6. Astragal.
7. Threshold and weather stripping.

C. Hardware Set No. 3

1. Hinges.
2. Entry lock.
3. Pair manual flush bolts with dustproof strike.
4. Coordinator.
5. Astragal.

D. Hardware Set No. 4:

1. Hinges.
2. Entry lock.

E. Hardware Set No. 5:

1. Hinges.
2. Passage Set.

F. Hardware Set No. 6:

1. Hinges.
2. Privacy Set.

G. Hardware Set No. 7:

1. Cylinder.

END OF SECTION 08 71 00

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SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 GLASS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
 - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- C. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- D. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

2.2 GLASS PRODUCTS

- A. Annealed Float Glass: ASTM C 1036, Type I, Quality-Q3.
- B. Fully Tempered Float Glass: ASTM C 1048, Kind FT; Type I; Quality-Q3.
- C. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

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2.3 GLAZING SEALANTS

- A. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 - c. Polymeric Systems, Inc.
 - d. Sika Corporation.
- B. Low-Emitting Materials: Sealants shall have a VOC content of not more than 250 g/L.
- C. Low-Emitting Materials: Sealants shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are contained in GANA's "Glazing Manual."
- B. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- C. Remove nonpermanent labels, and clean surfaces immediately after installation.

3.2 INSULATING-GLASS TYPES

- A. Glass Type: Low-E-coated, clear insulating glass.
 - 1. Overall Unit Thickness: 1 inch.
 - 2. Thickness of Each Glass Lite: 6 mm.
 - 3. Outdoor Lite: Fully tempered float glass.
 - 4. Interspace Content: Argon.
 - 5. Indoor Lite: Fully tempered float glass.

END OF SECTION 08 80 00

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SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to those tested in assemblies per ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- B. STC-Rated Assemblies: Provide materials and construction identical to those tested in assemblies per ASTM E 90 and classified per ASTM E 413 by a qualified independent testing and inspecting agency.

2.2 PANEL PRODUCTS

- A. Provide in maximum lengths available to minimize end-to-end butt joints.
- B. Interior Gypsum Board: ASTM C 1396/C 1396M, in thickness indicated, with manufacturer's standard edges. Regular type unless otherwise indicated and Sag-resistant type for ceiling surfaces.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum
 - b. Certain Teed Corporation
 - c. Georgia-Pacific Building Products
 - d. National Gypsum Company
 - e. United States Gypsum Company
- C. Water-Resistant Gypsum Backing Board: Fiberock Aqua-Tough.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. United States Gypsum Company.

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2.3 ACCESSORIES

- A. Trim Accessories: ASTM C 1047, formed from galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
 - 1. Provide cornerbead at outside corners unless otherwise indicated.
 - 2. Provide LC-bead (J-bead) at exposed panel edges.
 - 3. Provide control joints where indicated.

- B. Aluminum Accessories: Extruded-aluminum accessories indicated with baked-enamel finish, AA-C12C42R1x.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fry Reglet Corporation
 - b. Gordon, Inc.
 - c. Pittcon Industries

- C. Joint-Treatment Materials: ASTM C 475/C 475M.
 - 1. Joint Tape: Paper unless otherwise recommended by panel manufacturer.
 - 2. Joint Compounds: Setting-type taping compound and drying-type, ready-mixed, compounds for topping.
 - 3. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

- D. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

- E. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant complying with ASTM C 834.

- F. Sound-Attenuation Blankets: ASTM C 665, Type I (unfaced).

- G. Textured Finish: Acoustical orange peel finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install gypsum board to comply with ASTM C 840.
 - 1. Isolate gypsum board assemblies from abutting structural and masonry work. Provide edge trim and acoustical sealant.
 - 2. Single-Layer Fastening Methods: Fasten gypsum panels to supports with screws.
 - 3. Multilayer Fastening Methods: Fasten base layers and face layer separately to supports with screws.

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- B. Finishing Gypsum Board: ASTM C 840.
 - 1. At concealed areas, unless a higher level of finish is required for fire-resistance-rated assemblies, provide Level 1 finish: Embed tape at joints.
 - 2. Where indicated, provide Level 5 finish: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges. Apply skim coat to entire surface.

- C. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.

END OF SECTION 09 29 00

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SECTION 09 51 13 – ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and Samples.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Standard: Acoustical panel ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to those tested in assemblies per ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

2.2 MANUFACTURERS

- A. Ceiling Panels
 - 1. Armstrong World Industries, Inc.
 - 2. Or approved equal.
- B. Suspension System
 - 1. Armstrong World Industries, Inc.
 - 2. Or approved equal.
- C. Perimeter Systems
 - 1. Armstrong World Industries, Inc.
 - 2. Or approved equal.

2.3 ACOUSTICAL PANELS

- A. Acoustical Ceiling Panels Type AP
 - 1. Surface Texture: Medium
 - 2. Composition: Mineral Fiber
 - 3. Color: White

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4. Size: 24IN x 24IN
5. Edge Profile: Angled Tegular 15/16IN for interface with Prelude XL 15/16" Exposed Tee grid.
6. Noise Reduction Coefficient(NRC): ASTM C 423; Classified with UL label on product carton 0.55.
7. Ceiling Attenuation Class (CAC) : ASTM C 1414; Classified with UL label on product carton 33.
8. Flame Spread: ASTM E 1264; Class A (UL)
9. Light Reflectance White Panel: ASTM E 1477; 0.82
10. Dimensional Stability: Standard
11. Recycle Content: Post-Consumer - 1% - 8% Pre-Consumer Waste - 22% - 40%.
12. Acceptable Product: Cortega Lay-In, 704 as manufactured by Armstrong World Industries.

2.4 METAL SUSPENSION SYSTEMS

- A. Components: Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.
1. Structural Classification: ASTM C 635 Intermediate Duty
 2. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
 3. Acceptable Product: Prelude XL 15/16" Exposed Tee as manufactured by Armstrong World Industries
- B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least time three design load, but not less than 12 gauge.
- D. Edge Moldings and Trim:
1. 7800 - 12ft Wall Molding

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (Exception: HumiGuard Max Ceilings)

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3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

3.3 INSTALLATION

- A. Follow manufacturer installation instructions.
- B. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.
- C. Suspend main beam from overhead construction with hanger wires spaced 4'-0" on center along the length of the main runner. Install hanger wires plumb and straight.
- D. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.
- E. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
- F. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

- A. Replace damaged and broken panels.
- B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove any ceiling products that cannot be successfully cleaned and or repaired. Replace with attic stock or new product to eliminate evidence of damage.
- C. Before disposing of ceilings, contact the Armstrong Recycling Center at 877-276-7876, select option #1 then #8 to review with a consultant the condition and location of building where the ceilings will be removed. The consultant will verify the condition of the material and that it meets the Armstrong requirements for recycling. The Armstrong consultant will provide assistance to facilitate the recycle of the ceiling.

END OF SECTION 09 51 13

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SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product data and Samples.
- B. Extra Materials: Deliver to Owner at least one box of each type and color of resilient wall base installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

- A. Vinyl Base: ASTM F 1861, Type TV (vinyl, thermoplastic), Group 1 (solid, homogeneous).
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong World Industries, Inc.
 - b. Johnsonite; a Tarkett company.
 - c. Roppe Corporation, USA.
- B. Minimum Thickness: 0.125 inch.
- C. Height: 4 inches.
- D. Lengths: Coils in manufacturer's standard lengths.
- E. Outside Corners: preformed.
- F. Inside Corners: preformed.

2.2 RESILIENT MOLDING ACCESSORY

- A. Vinyl Molding Accessories.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong World Industries, Inc.
 - b. Johnsonite; a Tarkett company.

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- c. Roppe Corporation, USA.
- B. Description: Nosing for resilient flooring, Reducer strip for resilient flooring, and Transition strips.

2.3 INSTALLATION ACCESSORIES

- A. Adhesives: Water-resistant type recommended by manufacturer to suit floor covering and substrate conditions indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Prepare horizontal surfaces according to ASTM F 710. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
- B. Adhesively install resilient wall base and accessories.
- C. Install wall base in maximum lengths possible. Apply to walls, columns, pilasters, casework, and other permanent fixtures in rooms or areas where base is required.
- D. Install stair-tread-nose filler to nosing substrates that do not conform to tread contours.
- E. Install reducer strips at edges of floor coverings that would otherwise be exposed.

END OF SECTION 09 65 13

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SECTION 09 65 19 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product data and Samples.
- B. Extra Materials: Deliver to Owner 2 boxes of each type and color of resilient floor tile installed.

PART 2 - PRODUCTS

2.1 VINYL COMPOSITION FLOOR TILE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Johnsonite; a Tarkett company.
 - 3. Mannington Mills, Inc.
- B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.
- C. Wearing Surface: Smooth.
- D. Thickness: 0.125 inch.
- E. Size: 12 by 12 inches.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement- or blended-hydraulic-cement-based formulation provided or approved by flooring manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor covering and substrate conditions indicated.
- C. Floor Polish: Protective liquid floor polish products as recommended by manufacturer.

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Prepare concrete substrates according to ASTM F 710. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
- B. Lay out tiles so tile widths at opposite edges of room are equal and are at least one-half of a tile.
- C. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged. Lay tiles in basket-weave pattern with grain direction alternating in adjacent tiles.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor covering before applying liquid floor polish.
 - 1. Apply 5 coats.

END OF SECTION 09 65 19

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SECTION 09 67 23 - RESINOUS FLOORING AND WALLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes.
 - 1. SF 107 Penetrating Epoxy Primer
 - 2. SF 510 Epoxy Binder
 - 3. Decorative Vinyl Flakes
 - 4. SF 203 Water Clear Epoxy Grout coat
 - 5. SF 225 Water Clear Non Yellowing Epoxy Topcoat

1.2 SUBMITTALS

- A. Comply with Section 01 33 00 - Submittal Procedures.
- B. Product Data: Submit manufacturer's product data, including physical properties and colors available.
- C. Optional Submittal: Product Samples: Submit Architectural Standard samples representative of the final finish, as applied. The Standard shall be approved in writing by the Architect and shall be the final standard of acceptance of the finish.
- D. Maintenance Instructions: Submit manufacturer's maintenance instructions, including maintenance procedures and materials, procedures for stain removal and surface repair, and recommended schedule for cleaning.

1.3 QUALITY ASSURNACE

- A. Qualifications:
 - 1. Applicator: Use applicator experienced in application of specified materials for a minimum of five (5) years on projects of similar size and complexity. Provide list of completed projects including project name and location, name of architect, name of material manufacturer, and approximate quantity of materials applied. This is a hospital grade decorative floor and wall system that requires expert installation techniques. Contact Quality One Painting, Troy Hudson at 501-960-4440.

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2. Applicator's Personnel: Employ only persons trained for application of specified materials.

B. Pre-application Meeting: Convene a pre-application meeting two (2) weeks before start of application of floor coating. Require attendance of parties directly affecting work of this section, including Contractor, Architect, applicator, and manufacturer's representative. Review surface preparation, priming, application, curing, protection, and coordination with other work.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, batch or lot number, and date of manufacture. Do not store in direct sunlight or high heat conditions.

B. Storage:

1. Store materials in accordance with manufacturer's instructions.

2. Keep containers sealed until ready for use.

3. Do not subject material to excessive heat or freezing; do not apply material that has been subjected to excessive heat or freezing. Material subjected to excessive heat or freezing shall be separated from inventory and destroyed by mixing all three components. The solid reacted product shall be disposed of in environmentally sound and regulatory compliant manner.

4. Shelf life: 1 Year after date of manufacture, in unopened containers, under normal conditions.

C. Handling: Protect materials during handling and application to prevent damage or contamination.

D. Condition materials for use to 60-85 degrees for 24 hours prior to application.

1.5 SITE CONDITIONS

A. Do not apply materials if floor or air temperature is below 60 degrees or above 90 degrees.

B. Do not apply materials if relative humidity is above 85 percent or within 5° of dew point at time of application [Omit if not applicable]

C. Utilities, including electric, water, heat and finished lighting to be supplied by General Contractor

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- D. Maintain room temperature between 60-85 degrees for 48 hours before, during and 48 hours after installation, or until cured.
- E. At the time of application ensure the minimum substrate temperature is above 60°F (15°C) and the substrate temperature is 5°F (3°C) above the measured dew point at the time of application.[Omit if not applicable]
- F. Erect suitable barriers and post legible signs at points of entry to prevent traffic and trades from entering the work area during application and cure period of the floor.
- G. Protection of finished floor from damage by subsequent trades shall be the responsibility of the General Contractor.

1.6 WARRANTY

- A. Provide a warranty covering materials and workmanship for a period of one (1) year after date of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Manufacturer shall be certified under ISO 9001: All liquid materials, including primers, resins, curing agents, finish coats, and sealants are manufactured and tested under an ISO 9001 registered quality system.
- B. Manufacturers:
 - 1. Sika Corp., Industrial Flooring
 - 2. Approved equal

2.2 MATERIALS

- A. Sikafloor® DecoFlake Floor and Wall Coating System
 - 1. SF 107 Penetrating Epoxy Flex Primer at 200-250 s/f per gallon for 6 mils dft
 - 2. SF 510 Polyaspartic Binder at 200 s/f per gallon for 8 mils dft
 - 3. Decorative Vinyl Flakes broadcast at .2 lbs per s/f
 - 4. SF 510 Binder Coat at 200 s/f per gallon for 16 mils dft
 - 5. Decorative Vinyl Flakes broadcast at .2 lbs per s/f
 - 6. SF 203 Water Clear Epoxy grout coat at 80 s/f per gallon for 20 mils dft

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7. SF225 Water Clear Non Yellowing Topcoat at 12 mils dft

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive Sikafloor DecoFlake. Notify Architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected. Do not apply to substrate treatments for moisture, repair, or leveling not of the same Manufacturer.
- B. Do not apply Sikafloor DecoFlake to concrete less than 60 days old. Consult Technical Service prior to application when concrete has not cured for 60 days.
- C. Do not apply Sikafloor DecoFlake to sand-cement setting beds, regardless of condition. Sand-cement beds shall be removed to structural concrete substrate and re-leveled/sloped as necessary to achieve grade and/or adequate drainage.
- D. Do not apply to asphaltic or bitumen membranes, soft wood, aluminum, copper or fiberglass reinforced polyester/vinyl ester composites.
- E. Application to glazed or vitrified brick and tile, structural wood, steel shall be approved only with the Manufacturer's written recommendation

3.2 SURFACE PREPARATION

- A. Prepare concrete surfaces in accordance with manufacturer's instructions and ASTM D 4258.
- B. Remove dirt, oil, grease, wax, laitance, curing compounds, water-soluble concrete hardeners, and other surface contaminants.
- C. Remove sealers, finishes, and paints.
- D. Remove unsound concrete by scarifying, sand blasting, shot blasting, or high pressure water blasting.
- E. Chemical Surface Preparation:

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1. Chemical surface preparation (acid etching) is unacceptable and will void Manufacturer's warranty.

F. Mechanical Surface Preparation:

1. Mechanically abrade concrete surface in accordance with manufacturer's instructions.
2. Leave concrete surface with an aggressive texture.
3. Remove concrete dust.
4. Conform to ASTM D-4259.
5. Surface profile shall conform to IRCI Guideline 03732 CSP 3.

3.3 CONTROL JOINTS, CRACKS

- A. Provide repair and treatment of control joints and surface cracks utilizing manufacturer's standard materials and installation details.

3.4 APPLICATION

- A. Repair concrete substrate as required using SikaQuick® 1000 cementitious repair/resurfacer in accordance with Manufacturer's instructions. Shallow repairs may require Sikafloor EpoRok epoxy mortar or SF 203 with an appropriate filler. Sand the surface smooth after the repairs are cured to accept the final coating, taking care that the repairs are not very noticeable. Moving cracks may require special techniques to repair so that they do not telegraph thru the final coating.
- B. Do not add thinners to materials. No thinners shall be approved or allowed.
- C. For coverage rates, consult data sheet and this specification.
- D. Finish surface to be uniform texture, free of surface defects, and without porous areas.
- E. Follow Manufacturer's recommendations on terminations and connections to walls, drains, doorways, columns and floor-to-floor transitions.

3.5 CLEANUP

- A. Remove masking, draping, and other protection from adjacent surfaces.
- B. Remove remaining materials and debris from job site and dispose of them in according with local rules and regulations. Leave area in clean condition free of debris.

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3.6 PROTECTION

- A. Protect Sikafloor DecoFlake floor coating during curing from traffic and chemical spillage. Based on air temperature of 73°F/23°C
1. Foot Traffic: 10 to 12 hours.
 2. Medium Wheeled Loads: 12 to 24 hours.
 3. Full Cure: 7 days.

END OF SECTION 09 67 23

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SECTION 09 91 23 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals:
 - 1. Product Data: Include printout of MPI's "MPI Approved Products List" with product highlighted.
 - 2. Samples.
- B. Mockups: Full-coat finish Sample of each type of coating, color, and substrate, applied where directed.
- C. Extra Materials: Deliver to Owner 1 gal. of each color and type of finish-coat paint used on Project, in containers, properly labeled and sealed.

PART 2 - PRODUCTS

2.1 PAINT

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Benjamin Moore & Co.
 - 2. Farrell-Calhoun.
 - 3. PPG Architectural Finishes, Inc.
 - 4. Sherwin-Williams Company (The).
- B. MPI Standards: Provide materials that comply with MPI standards indicated and listed in its "MPI Approved Products List."
 - 1. Primer Sealer, Latex: MPI #50.
 - 2. Primer, Latex, for Interior Wood: MPI #39.
 - 3. Primer, Alkyd, Anticorrosive: MPI #79.
 - 4. Primer, Galvanized, Water Based: MPI #134.
 - 5. Primer, Quick Dry, for Aluminum: MPI #95.
 - 6. Latex, High-Performance Architectural, Semigloss (Gloss Level 5): MPI #141.
- C. Material Compatibility: Provide materials that are compatible with one another and with substrates.

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1. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- D. Colors: As selected.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Comply with recommendations in MPI's "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove hardware, lighting fixtures, and similar items that are not to be painted. Mask items that cannot be removed. Reinstall items in each area after painting is complete.
- C. Clean and prepare surfaces in an area before beginning painting in that area. Schedule painting so cleaning operations will not damage newly painted surfaces.

3.2 APPLICATION

- A. Comply with recommendations in MPI's "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Paint exposed surfaces unless otherwise indicated.
 1. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces.
 2. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Paint the back side of access panels.
 4. Color-code mechanical piping in accessible ceiling spaces.
 5. Do not paint prefinished items, items with an integral finish, operating parts, and labels unless otherwise indicated.
- C. Apply paints according to manufacturer's written instructions.
 1. Use brushes only where the use of other applicators is not practical.
 2. Use rollers for finish coat on interior walls and ceilings.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
 1. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

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3.3 INTERIOR PAINT APPLICATION SCHEDULE

- A. Exposed Concrete:
 - 1. Concrete Floor Sealer: Three coats: MPI INT 3.2F.
- B. Steel:
 - 1. Semigloss, Quick-Dry Enamel: Two coats over quick-drying alkyd metal primer: MPI INT 5.1A.
- C. Galvanized Metal:
 - 1. Semigloss High-Performance Architectural Latex: Two coats over waterborne galvanized-metal primer: MPI INT 5.3J.
- D. Aluminum:
 - 1. Semigloss High-Performance Architectural Latex: Two coats over quick-drying primer for aluminum: MPI INT 5.4H.
- E. Wood: Including wood trim, architectural woodwork, and wood-based panel products.
 - 1. Semigloss High-Performance Architectural Latex: Two coats over latex primer for wood: MPI INT 6.3A.
- F. Gypsum Board:
 - 1. Semigloss High-Performance Architectural Latex: Two coats over latex primer/sealer: MPI INT 9.2B.

END OF SECTION 09 91 23

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SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 TOILET AND BATH ACCESSORIES

- A. Toilet Tissue Dispenser:
1. Basis-of-Design Product: Vondrehle #3253.
 2. Type: Roll-in-reserve dispenser with hinged front secured with tumbler lockset.
 3. Mounting: Surface mounted with concealed anchorage.
 4. Material: ABS plastic.
- B. Paper Towel Dispenser:
1. Basis-of-Design Product: Enmotion #59462.
 2. Mounting: Surface.
 3. Minimum Capacity: 8-inch-wide, 800-foot-long roll.
 4. Material: ABS plastic.
- C. Soap Dispenser:
1. Basis-of-Design Product: Provon TFX #2745-12.
 2. Mounting: Surface.
 3. Stainless-Steel Soap Valve: Designed for dispensing soap in lather form.
 4. Lockset: Tumbler type.
 5. Refill Indicator: Window type.
- D. Grab Bar:
1. Basis-of-Design Product: Bobrick B-6806 series see plans for locations and sizes.
 2. Material: Stainless steel, 0.050 inch thick.
 3. Mounting: Concealed.
 4. Gripping Surfaces: Slip-resistant texture.
 5. Outside Diameter: 1-1/2 inches for heavy-duty applications.
- E. Mirror Unit:

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1. Basis-of-Design Product: Bobrick B-165 2436.
2. Frame: Stainless-steel angle, 0.050 inch thick.

F. Underlavatory Guard:

1. Description: Insulating pipe coverings for supply and drain piping assemblies, which prevent direct contact with and burns from piping and allow service access without removing coverings.
2. Material and Finish: Antimicrobial, molded plastic, white.

2.2 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, No. 4 finish (satin), 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, ASTM B 16/B 16M, or ASTM B 30.
- C. Sheet Steel: ASTM A 1008/A 1008M, 0.036-inch minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, G60.
- E. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- F. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic-enamel coating.
- G. Mirrors: ASTM C 1503, mirror glazing quality, clear-glass mirrors, nominal 6.0 mm thick.
- H. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- I. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.
- J. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

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1. Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.
- B. Adjust accessories for unencumbered, smooth operation, and verify that mechanisms function properly. Replace damaged or defective items. Remove temporary labels and protective coatings.

END OF SECTION 10 28 00

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SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHERS AND BRACKETS

- A. Portable Fire Extinguishers: NFPA 10, listed and labeled for the type, rating, and classification of extinguisher.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Guardian Fire Equipment, Inc.
 - b. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - c. Pem All Fire Extinguisher Corp.; Pem Systems, Inc.
 - d. Pyro-Chem; Tyco Fire Suppression & Building Products.
 - 2. Stored-Pressure Water Type: UL-rated 2-A, 2.5-gal. nominal capacity, in stainless-steel container; with pressure-indicating gage.
 - 3. Stored-Pressure Antifreeze Type: UL-rated 2-A, 2.5-gal. nominal capacity, in stainless-steel container; with pressure-indicating gage.
 - 4. Multipurpose Dry-Chemical Type: UL-rated 2-A:10-B:C, 5-lb nominal capacity, in enameled-steel container.
- B. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for fire extinguishers indicated, with plated or baked-enamel finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install mounting brackets in locations indicated at heights acceptable to authorities having jurisdiction.
- B. Install fire extinguishers in mounting brackets where indicated.

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END OF SECTION 10 44 00

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SECTION 13 34 19 - METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, Samples, Shop Drawings, and structural analysis data signed and sealed by a qualified professional engineer registered in the state where Project is located.
 - 1. Submit letter of design certification, signed and sealed by a qualified professional engineer. Indicate name and location of Project, name of manufacturer, order number, name of contractor, governing building code and standards including year of edition, design loads and load combinations, building use category, and load importance factors.
- B. Comply with AISC 360, "Specification for Structural Steel Buildings," and with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

PART 2 - PRODUCTS

2.1 METAL BUILDINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alliance Steel, Inc.
 - 2. American Buildings Company; a Nucor Company.
 - 3. Butler Manufacturing Company; a division of BlueScope Buildings North America, Inc.
 - 4. Pinnacle Structures, Inc.
 - 5. SBI Metal Buildings
 - 6. Star Building Systems; a division of NCI Building Systems, Inc.
 - 7. Varco-Pruden Buildings; a division of BlueScope Buildings North America, Inc.
- B. Metal Building System Description: Rigid clear span with nonexpandable endwalls, primary frame and endwall columns.
 - 1. Eave Height: As required to provide clear height indicated on Drawings.
 - 2. Dimensions and Bay Spacings: As indicated on Drawings.
 - 3. Roof Slope: 4 inches per 12 inches.

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- C. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses according to procedures in MBMA's "Metal Building Systems Manual":
1. Design Loads: As required by MBMA's "Metal Building Systems Manual." or the Arkansas Fire Prevention Code 2012 whichever is more stringent.
- D. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for Class 30.
- E. Structural-Framing Materials:
1. W-Shapes: ASTM A 992/A 992M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
 2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
 3. Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
 4. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
 5. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.
 6. Structural-Steel Sheet: Hot-rolled, ASTM A 1011/A 1011M, Structural Steel (SS), Grades 30 through 55, or High-Strength Low-Alloy Steel (HSLAS), Grades 45 through 70; or cold-rolled, ASTM A 1008/A 1008M, Structural Steel (SS), Grades 25 through 80, or High-Strength Low-Alloy Steel (HSLAS), Grades 45 through 70.
 7. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades 33 through 80, or High-Strength Low-Alloy Steel (HSLAS), Grades 50 through 80; with G60 coating designation; mill phosphatized.
 8. Steel Joists and Joist Girders: Comply with SJI's "Standard Specifications, Load Tables, and Weight Tables for Steel Joists and Joist Girders," with steel-angle top and bottom chord members.
- F. Roof and Wall Panels:
1. Metal Panels: Steel sheet, zinc coated by the hot-dip process, complying with ASTM A 653/A 653M, G90, Structural Steel (SS), and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 2. Standing-Seam Roof Panels: Metal panels factory formed to provide 24-inch coverage; with 3-inch-high (including seam), raised trapezoidal major ribs at panel edges, and intermediate stiffening ribs symmetrically spaced between major ribs. Single-folded, mechanically seamed panels. Design panels for mechanical attachment to structure using concealed clips engaging panel edges.
 3. Roof Panel Metal Thickness: 0.028 inch.
 4. Lap-Seam Wall Panels: Metal panels factory formed to provide 12-inch coverage, with flush profile. Design panels for mechanical attachment to structure using concealed fasteners, lapping major ribs at panel edges.
 5. Wall Panel Metal Thickness: 0.028 inch.

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6. Metal Panel Finish: Fluoropolymer two-coat system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight, with a total minimum dry film thickness of 1 mil.
 7. Panel Accessories: Provide clips, flashings, sealants, gaskets, and similar items.
- G. Insulation: Simple Saver System consisting of Roof Insulation, Wall Insulation, Vapor Barrier Liner Fabric, Thermal Breaks, Straps, and other devices and components in a proprietary insulation system as follows:
1. Roof Insulation: Formaldehyde-free fiberglass batt or fiberglass blanket complying with ASTM C 991 Type 1 and ASTM E 84 with a thermal resistance and thickness as follows:
 - a. R-30; 9-1/2 inches, 6 inches plus 3-1/2 inches (two layers).
 2. Wall Insulation: Formaldehyde-free fiberglass blanket or batt complying with ASTM C 991 Type 1, ASTM E 136 and ASTM E 84 with a thermal resistance and thickness as follows:
 - a. R-19; 6 inches
 3. Vapor Barrier Liner Fabric: Syseal type woven, reinforced, high-density polyethylene yarns coated on both sides with a continuous white or colored polyethylene coatings, as follows:
 - a. Product complies with ASTM C 1136, Types I through Type VI.
 - b. Perm rating: 0.02 for fabric and for seams in accordance with ASTM E 96.
 - c. Flame/Smoke Properties:
 - 1) 25/50 in accordance with ASTM E 84.
 - 2) Self-extinguishes with field test using matches or butane lighter.
 - d. Ultra violet radiation inhibitor to minimum UVMAX® rating of 8.
 - e. Size and seaming: Manufactured in large custom pieces by extrusion welding from roll goods, and fabricated to substantially fit defined building area with minimum practicable job site sealing.
 - f. Provide with factory double, extrusion welded seams. Stapled seams or heat-melted seams are not acceptable due to degradation of fabric.
 - g. Factory-folded to allow for rapid installation.
 - h. Color:
 - 1) Super white.
 4. Vapor Barrier Lap Sealant: Solvent-based, Simple Saver polyethylene fabric adhesive.
 5. Vapor Barrier Tape: Double-sided sealant tape 3/4 inch wide by 1/32 inch thick.
 6. Vapor Barrier Patch Tape: Single-sided, adhesive backed sealant tape 3 inches wide made from same material as Syseal® type liner fabric.
 7. Thermal Breaks:
 - a. 1/8 inch thick by 3 inch wide white, closed-cell polyethylene foam with pre-applied adhesive film and peel-off backing.
 - b. Polystyrene Snap-R snap-on thermal blocks.
 8. Straps:
 - a. 100 KSI minimum yield tempered, high-tensile-strength steel.
 - b. Size: Not less than 0.020 inch thick by 1 inch by continuous length.

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- c. Galvanized, primed, and painted to match specified finish color on the exposed side.
- 9. Fasteners:
 - a. For light gage steel: #12 by 3/4 (19 mm) inch plated Tek 2 type screws with sealing washer, painted to match specified color.
 - b. For heavy gage steel: #12 by 1-1/2 inch (38 mm) plated Tek 4 type screws with sealing washer, painted to match specified color.
- H. Miscellaneous Materials:
 - 1. Grout: ASTM C 1107, factory-packaged, nonmetallic grout, noncorrosive, and nonstaining.
 - 2. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing; of manufacturer's standard size.
 - 3. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.
 - 4. Snow Guards: Seam-Mounted, Rail-Type Snow Guards, brackets with one rail, clear anodized aluminum finish.

PART 3 - EXECUTION

3.1 ERECTION

- A. Setting Base and Bearing Plates: Clean concrete and masonry of bond-reducing materials and roughen surfaces before setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts.
 - 2. Tighten anchor rods after supported members have been positioned and plumbed.
 - 3. Pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure.
- B. Erect framing true to line, level, plumb, rigid, and secure. Comply with AISC specifications referenced in this Section.
 - 1. Make field connections for primary framing using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts," snug tightened or pretensioned.
 - 2. Fasten secondary framing to primary framing using clips and non-high-strength bolts. Hold rigidly to a straight line by sag rods.
 - 3. Install joists, girders, and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Standard Specifications, Load Tables, and Weight Tables for Steel Joists and Joist Girders."

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4. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
 5. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.
- C. Roof Panel Installation: Provide roof panels of full length from eave to ridge when possible.
1. Install screws with power tools having controlled torque to compress neoprene washer without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 2. Use aluminum or stainless-steel fasteners for exterior and galvanized fasteners for interior.
 3. Locate panel splices over, but not attached to, structural supports; stagger panel splices.
 4. Standing-Seam Roof Panels: Fasten to purlins with concealed clips at each standing-seam joint. Install clips over top of insulation. Crimp standing seams with manufacturer-approved motorized seamer tool. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction.
 5. Lap-Seam Roof Panels: Fasten to purlins with exposed fasteners at each lapped joint. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on lap seams. At splices, lap panels 6 inches, seal with butyl sealant and fasten together with interlocking clamping plates.
- D. Wall Panel Installation: Provide panels full height of building unless otherwise indicated.
1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints.
 2. When two rows of panels are required, lap panels 4 inches minimum. Locate panel splices over structural supports.
 3. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
 4. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as necessary for waterproofing.
 5. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on lap seams.
 6. Install screws with power tools having controlled torque to compress neoprene washer without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 7. Use aluminum or stainless-steel fasteners for exterior and galvanized fasteners for interior.
- E. Roof Insulation Installation

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1. Straps:
 - a. Cut straps to length and install in the pattern and spacings indicated on shop drawings.
 - b. Tension straps to required value.

 2. Vapor Barrier Fabric:
 - a. Install vapor barrier fabric in large one-piece custom fabricated pieces to substantially fit defined building areas with minimum practicable job site sealing.
 - b. Position pre-folded fabric on the strap platform along one eave purlin.
 - c. Clamp the two bottom corners at the eave and also centered on the bay.
 - d. Pull the other end of the pleat-folded fabric across the building width on the strap platform, pausing only at the ridge to fasten the straps and fabric in position where plane of roof changes and to release temporary fasteners on the opposite ridge purlins.
 - e. Once positioned, install fasteners from the bottom side at each strap/purlins intersection.
 - f. Trim edges and seal along the rafters.
 - g. All seams must be completely sealed and stapled seams not acceptable.

 3. Insulation:
 - a. Unpack, and shake to a thickness exceeding the specified thickness.
 - b. Ensure that cavities are filled completely with insulation.
 - c. Place on the vapor barrier liner fabric without voids or gaps.
 - d. Place top layer of insulation over and perpendicular to the purlins without voids or gaps, as roof sheathing is applied.
 - e. Place thermal block on top of purlins or bottom of purlins for retrofit work, if no other thermal break exists.
 - f. Place new insulation between purlins at the required thickness for the R-value specified.
 - g. Seal vapor barrier fabric to the wall fabric and elsewhere as required to provide a continuous vapor barrier.
- F. Wall Insulation:
1. Install thermal break to exterior surface of girts as wall sheathing is applied.
 2. Install self-sticking foam thermal break to interior surface of girts prior to installation of insulation.
 3. Position and secure Fast-R hangers to girt on the inside face of the wall sheathing.
 4. Cut insulation to required lengths to fit vertically between girts.
 5. Fluff the insulation to the full-specified thickness.
 6. Neatly position in place and secure to Fast-R hangers.
 7. Ensure that cavities are filled completely with insulation.
- G. Vapor Barrier Fabric:
1. Install vapor barrier fabric in large one-piece custom fabricated pieces to substantially fit defined building areas with minimum practicable job site sealing.

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2. Apply the vapor barrier fabric by clamping it in position over eave strap and installing fasteners through the eave strap into each roof strap, permanently clamping the wall fabric between them.
 3. Once in position, draw the vapor barrier fabric down over the column flanges to the base angle and install vertical straps along each column and 5 feet 0 inches on center, maximum, fastening to each girt to retain system permanently in place.
 4. All seams must be completely sealed and stapled seams not acceptable.
- H. Seal wall fabric to the roof fabric, to the base angle and up the columns to provide a continuous vapor barrier.
- I. Accessory Installation:
1. Seal perimeter of door window and louver frames with elastomeric sealant used for panels.
 2. Install personnel doors and frames straight, level, and plumb. Securely anchor frames to building structure. Set units with maximum 1/8-inch clearance between door and frame at jambs and head and maximum 3/4-inch clearance between door and floor.
 3. Sliding Service Door Installation: Bolt support angles to opening head members. Bolt door tracks to support angles at maximum 24 inches o.c. Set doors and operating equipment with necessary hardware, stops, and continuous hood flashing.
 4. Install windows level, plumb, and true to line, without warp or rack, anchored securely in place. Set sill members in a bed of sealant and seal perimeter of each unit.
 5. Pipe Flashing: Form flashing around pipe penetrations. Fasten and seal to panels.
 6. Adjust and check each operating item of hardware to ensure proper operation and function. Replace units that cannot be adjusted to operate freely and smoothly.
- J. Gutters, Downspouts, Flashing, and Trim Installation: Comply with SMACNA's "Architectural Sheet Metal Manual." Provide for thermal expansion; conceal fasteners where possible, and set units true to line and level. Install work with laps and seams that will be permanently watertight.

END OF SECTION 13 34 19

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SECTION 22 05 23 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals:
 - 1. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded end valves.
 - 2. ASME B16.1 for flanges on iron valves.
 - 3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 4. ASME B16.18 for solder-joint connections.
- B. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.

2.2 GENERAL-DUTY VALVES

- A. Valve Sizes: Same as upstream piping unless otherwise indicated.
- B. Valves in Insulated Piping: With 2-inch stem extensions.
- C. One-Piece, Brass Ball Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. KITZ Corporation.
 - c. NIBCO INC.
 - 2. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 400 psig.
 - c. Body Design: One piece.

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- d. Body Material: Forged brass or bronze.
- e. Ends: Threaded and soldered.
- f. Seats: PTFE.
- g. Stem: Brass or stainless steel.
- h. Ball: Chrome-plated brass or stainless steel.
- i. Port: Reduced.

D. Class 125, Bronze Swing Check Valves with Bronze Disc:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. American Valve, Inc.
 - b. KITZ Corporation.
 - c. NIBCO INC.
- 2. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded or soldered. See valve schedule articles.
 - f. Disc: Bronze.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Use ball valves for shutoff duty; globe and ball for throttling duty.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves for each fixture and item of equipment.
- D. Install three-valve bypass around each pressure-reducing valve using throttling-type valves.
- E. Install valves in horizontal piping with stem at or above center of pipe.
- F. Install valves in a position to allow full stem movement.
- G. Install check valves for proper direction of flow in horizontal position with hinge pin level.

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SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product.
2. Hangers and Supports:
 - a. Shop Drawings: Signed and sealed by a qualified professional engineer.
 - b. Welding certificates.
 - c. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - d. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
1. Design supports for multiple pipes capable of supporting combined weight of supported systems, and system contents.
 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

2.2 HANGERS AND SUPPORTS FOR PLUMBING PIPING EQUIPMENT

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.

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4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Copper Pipe Hangers:
1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.
- C. Miscellaneous Materials:
1. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
 2. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - a. Properties: Nonstaining, noncorrosive, and nongaseous.
 - b. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 GENERAL PIPING INSTALLATIONS

- A. Install piping free of sags and bends.
- B. Install fittings for changes in direction and branch connections.

3.2 HANGERS AND SUPPORTS

- A. Comply with MSS SP-69 and MSS SP-89. Install building attachments within concrete or to structural steel.
- B. Install hangers and supports to allow controlled thermal and seismic movement of piping systems.
- C. Install powder-actuated fasteners and mechanical-expansion anchors in concrete after concrete is cured. Do not use in lightweight concrete or in slabs less than 4 inches thick.

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- D. Load Distribution: Install hangers and supports so piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

- E. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 - 1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
 - 2. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 - 3. Adjustable Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
 - 4. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
 - 5. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.

- F. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

END OF SECTION 22 05 29

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SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product.
 - a. Samples: For color, letter style, and graphic representation required for each identification material and device.

PART 2 - PRODUCTS

2.1 WARNING SIGNS AND LABELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Brady Corporation.
 2. Carlton Industries, LP.
 3. Champion America.
 4. Craftmark Pipe Markers.
 5. National Marker Company.
- B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- C. Letter Color: White.
- D. Background Color: Black.
- E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- H. Fasteners: Stainless-steel rivets.

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- I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- J. Label Content: Include caution and warning information plus emergency notification instructions.

2.2 VALVE TAGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Brady Corporation.
 - 2. Carlton Industries, LP.
 - 3. Champion America.
 - 4. Craftmark Pipe Markers.
- B. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
 - 1. Tag Material: Aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Fasteners: Brass wire-link chain or beaded chain.
- C. Valve-tag schedule shall be included in operation and maintenance data.

2.3 WARNING TAGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Brady Corporation.
 - 2. Champion America.
 - 3. Craftmark Pipe Markers.
 - 4. Marking Services Inc.
- B. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.
 - 1. Size: 3 by 5-1/4 inches minimum.
 - 2. Fasteners: Brass grommet and wire.
 - 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
 - 4. Color: Safety yellow background with black lettering.

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PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
 - 1. Valve-Tag Size and Shape:
 - a. Cold Water: 1-1/2 inches, round.
 - b. Hot Water: 1-1/2 inches, round.
 - 2. Valve-Tag Colors:
 - a. Cold Water: Natural.
 - b. Hot Water: Natural.
 - 3. Letter Colors:
 - a. Cold Water: White.
 - b. Hot Water: White.

3.3 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 22 05 53

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SECTION 22 07 00 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals:
1. Product Data: For each type of product.
 2. For adhesives and sealants, documentation including printed statement of VOC content and chemical components.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less according to ASTM E 84.
- B. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less according to ASTM E 84.

2.2 INSULATION MATERIALS

- A. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Owens Corning.

2.3 ADHESIVES

- A. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products.

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- b. Eagle Bridges – Marathon Industries.
 - c. Mon-Eco Industries, Inc.
2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less.
- B. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. Childers Brand; H. B. Fuller Construction Products.
 - b. Eagle Bridges – Marathon Industries.
 - c. Mon-Eco Industries, Inc.
2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less.

2.4 MASTICS

- A. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. Foster Brand; H. B. Fuller Construction Products.
 - b. Vimasco Corporation.
2. For indoor applications, use mastics that have a VOC content of 50 g/L or less.
3. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
4. Service Temperature Range: Minus 20 to plus 180 deg F.
5. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
6. Color: White.
- B. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. Childers Brand; H. B. Fuller Construction Products.
 - b. Eagle Bridges – Marathon Industries.
 - c. Mon-Eco Industries, Inc.
2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.

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5. Color: White.

2.5 SEALANTS

A. Joint Sealants for Cellular-Glass Products:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Eagle Bridges – Marathon Industries.
 - c. Mon-Eco Industries, Inc.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less.

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing:

1. Manufacturers: Subject to compliance with requirements, provide products by following:
 - a. Childers Brand; H. B. Fuller Construction Products.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

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2.7 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Avery Dennison Corporation.
 - b. Compac Corporation.
 - c. Ideal Tape Co., Inc, an American Biltrite Company.
 - 2. Width: 3 inches.
 - 3. Thickness: 11.5 mils.
 - 4. Adhesion: 90 ounces force/inch in width.
 - 5. Elongation: 2 percent.
 - 6. Tensile Strength: 40 lbf/inch in width.
 - 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

PART 3 - EXECUTION

3.1 PIPE INSULATION INSTALLATION

- A. Comply with requirements of the Midwest Insulation Contractors Association's "National Commercial & Industrial Insulation Standards" for insulation installation on pipes and equipment.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Mineral-Fiber Insulation Installation:
 - 1. Insulation Installation on Straight Pipes and Tubes: Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 - 2. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
 - 3. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- D. Interior Piping System Applications: Insulate the following piping systems:
 - 1. Domestic hot and cold water.
 - 2.

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3. Exposed water supplies and sanitary drains of fixtures for people with disabilities.
- E. Do not apply insulation to the following systems, materials, and equipment:
1. Flexible connectors.
 2. Sanitary drainage and vent piping.
 3. Drainage piping located in crawlspaces unless otherwise indicated.
 4. Chrome-plated pipes and fittings, except for plumbing fixtures for people with disabilities.
 5. Piping specialties, including air chambers, unions, strainers, check valves, plug valves, and flow regulators.

END OF SECTION 22 07 00

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SECTION 22 11 16 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals:
 - 1. Product Data: For transition fittings and dielectric fittings.
 - 2. Product for solvent cements and adhesive primers, documentation including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 PREFORMANCE REQUIREMENTS

- A. Potable-water piping and components shall comply with NSF 14 and NSF 61.

2.2 PIPE AND FITTINGS

- A. Hard Copper Tubing: ASTM B 88, Types K and L, water tube, drawn temper with wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 - 1. Copper Unions: Cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
 - 2. Joining Materials: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder.
- B. Flexible Connectors: Bronze, corrugated-metal tubing with wire-braid covering. Working-pressure rating a minimum of 200 psig.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install piping free of sags and bends.
- B. Install fittings for changes in direction and branch connections.
- C. Install unions at final connection to each piece of equipment.

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- D. Install dielectric unions and flanges to connect piping materials of dissimilar metals in gas piping.
- E. Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals in water piping.
- F. Soldered Joints: Comply with procedures in ASTM B 828 unless otherwise indicated.
- G. Install shutoff valve inside the building at each domestic water service entrance.
- H. Install domestic water piping without pitch for horizontal piping and plumb for vertical piping.
- I. Comply with requirements in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support devices.
 - 1. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
 - a. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.
 - b. NPS 1-1/2: 108 inches with 3/8-inch rod.
 - c. NPS 2: 10 feet with 3/8-inch rod.
 - d. NPS 2-1/2: 11 feet with 1/2-inch rod.
 - e. Support vertical piping at each floor.

3.2 INSPECTING AND CLEANING

- A. Inspect and test piping systems as follows:
 - 1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 - 2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
- B. Clean and disinfect potable domestic water piping by filling system with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

3.3 PIPING SCHEDULE

- A. Underground, Service Entrance Piping: Schedule 80 PVC piping.
- B. Aboveground Distribution Piping: Type K or L, hard copper tubing.

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3.4 VALVE SCHEDULE

- A. Where specific valve types are not indicated, the following requirements apply:
1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 and smaller. Use cast-iron butterfly or gate valves with flanged ends for piping NPS 2-1/2 and larger.
 2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 and smaller. Use cast-iron butterfly valves with flanged ends for piping NPS 2-1/2 and larger.
 3. Hot-Water-Piping, Balancing Duty: Calibrated balancing valves.
 4. Drain Duty: Hose-end drain valves.
- B. Install gate valves close to main on each branch and riser serving two or more plumbing fixtures or equipment connections and where indicated.
- C. Install gate or ball valves on inlet to each plumbing equipment item, on each supply to each plumbing fixture not having stops on supplies, and elsewhere as indicated.
- D. Install drain valve at base of each riser, at low points of horizontal runs, and where required to drain water distribution piping system.

END OF SECTION 22 11 16

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SECTION 22 13 16 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals:
 - 1. Product Data: For each type of product.
 - 2. For solvent cements and adhesive primers, documentation including printed statement of VOC content.
 - 3. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.
 - 2. Waste, Force-Main Piping: 50 psig.
- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- C. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- D. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components.

2.2 PIPES AND FITTINGS

- A. PVC Plastic, DWV Pipe and Fittings: ASTM D 2665, Schedule 40, plain ends with PVC socket-type, DWV pipe fittings.
 - 1. Adhesive Primer: ASTM F 656.
 - a. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Solvent Cement: ASTM D 2564.

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- a. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Comply with requirements in Section 22 11 13 "Facility Water Distribution Piping" for basic piping installation requirements.
- B. Install wall penetration system at each pipe penetration through foundation wall. Make installation watertight. Comply with requirements in Section 22 11 13 "Facility Water Distribution Piping" for wall penetration systems.
- C. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- D. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- E. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- F. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.
- G. Install underground PVC soil and waste drainage piping according to ASTM D 2321.
- H. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- I. Comply with requirements in Section 22 11 13 "Facility Water Distribution Piping" for basic piping joint construction.

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- J. Comply with requirements in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support devices.

3.2 PIPE SCHEDULE

- A. Aboveground Applications: PVC plastic, DWV pipe and fittings with solvent-cemented joints.
- B. Belowground Applications: PVC plastic, DWV pipe and drainage-pattern fittings with cemented joints.

END OF SECTION 22 13 16

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SECTION 23 05 17 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- B. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- C. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Advance Products & Systems, Inc.
 - 2. Metraflex Company (The).
 - 3. Pipeline Seal and Insulator, Inc.
- B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 1. Sealing Elements: ethylene-propylene-diene-monomer-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Carbon steel.
 - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

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PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand, and make a watertight seal.

END OF SECTION 23 05 17

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SECTION 23 05 23 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of valve indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. ASME Compliance:
1. ASME B1.20.1 for threads for threaded end valves.
 2. ASME B16.1 for flanges on iron valves.
 3. ASME B16.5 for flanges on steel valves.
 4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 5. ASME B16.18 for solder-joint connections.
 6. ASME B31.1 for power piping valves.
 7. ASME B31.9 for building services piping valves.

2.2 GENERAL-DUTY VALVES

A. One-Piece, Brass Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. KITZ Corporation.
 - c. NIBCO INC.
2. Description: Standard: MSS SP-110.

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3. CWP Rating: 400 psig.
 4. Seats: PTFE.
- B. Class 125, Bronze Swing Check Valves with Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. KITZ Corporation.
 - c. NIBCO INC.
 2. Standard: MSS SP-80, Type 3.
 3. CWP Rating: 200 psig.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Valve Sizes: Same as upstream piping unless otherwise indicated.
- B. Valves in Insulated Piping: With 2-inch stem extensions.
- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves for each fixture and item of equipment.
- E. Install three-valve bypass around each pressure-reducing valve using throttling-type valves.
- F. Install valves in horizontal piping with stem at or above center of pipe.
- G. Install valves in a position to allow full stem movement.
- H. Install check valves for proper direction of flow in horizontal position with hinge pin level.

END OF SECTION 23 05 23

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SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product indicated.
2. Hangers and Supports:
 - a. Shop Drawings: Signed and sealed by a qualified professional engineer.
 - b. Welding certificates.
 - c. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - d. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hangers and Supports for Plumbing Piping Equipment:

1. Structural Performance: Hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - a. Design supports for multiple pipes capable of supporting combined weight of supported systems and system contents.
 - b. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 - c. Design seismic-restraint hangers and supports for piping and equipment, and obtain approval from authorities having jurisdiction.

2.2 HANGERS AND SUPPORTS FOR HVAC

A. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

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B. Fastener Systems:

1. Verify suitability of fasteners in this article for use in lightweight concrete or concrete slabs less than 4 inches thick.
2. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pullout, tension, and shear capacities appropriate for supported loads and building materials where used.
3. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pullout, tension, and shear capacities appropriate for supported loads and building materials where used.

C. Miscellaneous Materials:

1. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
2. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - a. Properties: Nonstaining, noncorrosive, and nongaseous.
 - b. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 GENERAL PIPING INSTALLATIONS

- A. Install piping free of sags and bends.
- B. Install fittings for changes in direction and branch connections.

3.2 HANGERS AND SUPPORTS

- A. Comply with MSS SP-69 and MSS SP-89. Install building attachments within concrete or to structural steel.
- B. Install hangers and supports to allow controlled thermal and seismic movement of piping systems.
- C. Load Distribution: Install hangers and supports so piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- D. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.

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2. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4 to allow off-center closure for hanger installation before pipe erection.
 3. Adjustable Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
 4. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
 5. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
- E. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

END OF SECTION 23 05 29

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SECTION 23 23 00 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop based on manufacturer's test data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line-Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

B. Comply with ASME B31.5, "Refrigerant Piping," and with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

2.2 TUBES AND FITTINGS

A. Copper Tube: ASTM B 88, Types K and L and ASTM B 280, Type ACR.

B. Wrought-Copper Fittings and Unions: ASME B16.22.

C. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

D. Brazing Filler Metals: AWS A5.8.

2.3 VALVES AND SPECIALTIES

A. Thermostatic Expansion Valve: Comply with ARI 750.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.

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- b. Emerson Climate Technologies.
 - c. Heldon Products; Henry Technologies.
 - 2. Forged brass or steel body, stainless-steel internal parts, copper tubing filled with refrigerant charge for 40 deg F suction temperature; 700-psig working pressure, and 240 deg F operating temperature.
- B. Solenoid Valves: Comply with AHRI 760 and UL 429; listed and labeled by a Nationally Recognized Testing Laboratory.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.
 - b. Emerson Climate Technologies.
 - c. Heldon Products; Henry Technologies.
 - 2. Plated steel body and bonnet, 240 deg F temperature rating, 400-psig working pressure, 240 deg F operating temperature; and 24-V, normally closed holding coil.
- C. Straight-Type Strainers:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.
 - b. Heldon Products; Henry Technologies.
 - 2. Welded steel with corrosion-resistant coating and 100-mesh, stainless-steel screen with socket ends; 500-psig working pressure and 275 deg F working temperature.
- D. Moisture/Liquid Indicators:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.
 - b. Emerson Climate Technologies.
 - c. Heldon Products; Henry Technologies.
 - 2. Forged brass body, 500-psig operating pressure, 240 deg F operating temperature; with replaceable, polished, optical viewing window and color-coded moisture indicator.
- E. Replaceable-Core Filter Dryers: Comply with AHRI 730.

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1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.
 - b. Emerson Climate Technologies.
 - c. Heldon Products; Henry Technologies.
 2. Steel shell with ductile-iron cover; 500-psig operating pressure; 240 deg F operating temperature.
- F. Permanent Filter Dryers: Comply with AHRI 730.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.
 - b. Emerson Climate Technologies.
 - c. Heldon Products; Henry Technologies.
 2. Steel shell with ductile-iron cover; 500-psig operating pressure; 240 deg F operating temperature.
- G. Mufflers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.
 - b. Emerson Climate Technologies.
- H. Welded steel with corrosion-resistant coating and socket ends; 500-psig operating pressure; 240 deg F operating temperature.

2.4 REFRIGERANTS

- A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Arkema Inc.
 - b. DuPont Fluorochemicals Div.
 - c. Genetron Refrigerants; Honeywell International Inc.

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with requirements in Section 23 05 00 "Common Work Results for HVAC" for basic piping installation requirements.
- B. Install wall penetration system at each pipe penetration through foundation wall. Make installation watertight. Comply with requirements in Section 23 05 00 "Common Work Results for HVAC" for wall penetration systems.
- C. Install refrigerant piping and charge with refrigerant according to ASHRAE 15.
- D. Belowground, install copper tubing in PVC conduit. Vent conduit outdoors.
- E. Insulate suction lines to comply with Section 23 07 00 "HVAC Insulation."
- F. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Install traps and double risers to entrain oil in vertical runs.
 - 4. Liquid lines may be installed level.
- G. Install solenoid valves upstream from each thermostatic expansion valve. Install solenoid valves in horizontal lines with coil at top.
- H. Install thermostatic expansion valves as close as possible to distributors on evaporator coils.
- I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.
- J. Install strainers upstream from and adjacent to solenoid valves, thermostatic expansion valves, and compressors unless they are furnished as an integral assembly for device being protected.
- K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

3.2 PIPING APPLICATIONS FOR REFRIGERANT R-410A

- A. Suction Lines: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with soldered joints.

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- B. Hot-Gas and Liquid Lines: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with soldered joints.

END OF SECTION 23 23 00

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SECTION 23 31 00 - HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product indicated.
2. Documentation indicating that duct systems and accessories comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."
3. Documentation indicating that duct systems comply with ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air Conditioning" and Section 6.4.4 - "HVAC System Construction and Insulation."
4. Documentation of work performed for compliance with ASHRAE 62.1, Section 7.2.4 - "Ventilation System Start-up."
5. For adhesives and sealants, documentation including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- E. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."
- F. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems" and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- G. Comply with NFPA 96 for ducts connected to commercial kitchen hoods.

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- H. Comply with UL 181 for ducts and closures.

2.2 DUCTS

- A. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip galvanized coating.
 - 1. Galvanized Coating Designation: G60.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- B. Joint and Seam Tape, and Sealant: Comply with UL 181A.
- C. Rectangular Metal Duct Fabrication: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Fibrous-Glass Liner: Comply with NFPA 90A or NFPA 90B and with NAIMA AH124.
 - 1. Thickness: 1/2 inch.
 - 2. Airstream surface coated with an antimicrobial erosion-resistant coating.
 - 3. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
 - 4. Mechanical Fasteners: Galvanized steel suitable for adhesive attachment, mechanical attachment, or welding attachment.

2.3 ACCESSORIES

- A. Volume Dampers and Control Dampers: Single-blade and multiple opposed-blade dampers, standard leakage rating, and suitable for horizontal or vertical applications; factory fabricated and complete with required hardware and accessories.
- B. Flexible Connectors: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
- C. Flexible Ducts: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-inch-thick, glass-fiber insulation around a continuous inner liner complying with UL 181, Class 1.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Outdoor, Supply-Air Ducts: Seal Class A.

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2. Outdoor, Exhaust Ducts: Seal Class C.
 3. Outdoor, Return-Air Ducts: Seal Class C.
 4. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
 5. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
 6. Unconditioned Space, Exhaust Ducts: Seal Class C.
 7. Unconditioned Space, Return-Air Ducts: Seal Class B.
 8. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
 9. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher than 2-Inch wg: Seal Class B.
 10. Conditioned Space, Exhaust Ducts: Seal Class B.
 11. Conditioned Space, Return-Air Ducts: Seal Class C.
- C. Conceal ducts from view in finished and occupied spaces.
- D. Avoid passing through electrical equipment spaces and enclosures.
- E. Support ducts to comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Hangers and Supports."
- F. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- G. Install volume and control dampers in lined duct with methods to avoid damage to liner and erosion of duct liner.
- H. Clean new duct system before testing, adjusting, and balancing.

3.2 TESTING, ADJUSTING, AND BALANCING

- A. Balance airflow within distribution systems, including submains, branches, and terminals, to indicated quantities.

END OF SECTION 23 31 00

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SECTION 23 37 13 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product indicated, including color charts for factory finishes.

PART 2 - PRODUCTS

2.1 DIFFUSERS

A. Square Ceiling Supply Diffusers:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Titus.
 - 1) Model: TSM.
2. Material: Steel.
3. Size: 24 inches by 24 inches.
4. Finish: Baked enamel, white.
5. Mounting: Lay-in.

B. Square Perforated Return Diffuser:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Titus.
 - 1) Model: Par
2. Material: Steel.
3. Size: 24 inches by 24 inches.
4. Finish: Baked enamel, white.
5. Mounting: Lay-in.

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2.2 GRILLES

A. Filter Grill:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Titus.
 - 1) Model: 350RSF1
2. Material: Steel.
3. Size: 24 inches by 24 inches.
4. Finish: Baked enamel, white.
5. Mounting: Lay in.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel unless otherwise indicated. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13

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SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with NFPA 70.

2.2 CONDUCTORS AND CABLES

- A. Conductors and Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THW, Type THHN/THWN, or Type XHHW.
- B. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC and Type SO with ground wire.
- C. Cable Type SEU: Comply with UL 854, with Type THHN/THWN conductors complying with UL 83.

2.3 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 WIRING METHODS

- A. Feeders and Branch Circuits: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Service Entrance: Type THHN/THWN, single conductors in raceway.
- C. Exposed Feeders, Branch Circuits, and Class 1 Control Circuits, Including in Crawlspace: Type THHN/THWN, single conductors in raceway.

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- D. Feeders and Branch Circuits Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN, single conductors in raceway.
- E. Feeders and Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN, single conductors in raceway.
- F. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, and strain-relief device at terminations to suit application.
- G. Class 2 Control Circuits: Type THHN/THWN, in raceway.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

- A. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- B. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."
- C. Complete cable tray systems installation according to Section 26 05 36 "Cable Trays for Electrical Systems" prior to installing conductors and cables.
- D. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
- E. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 07 84 13 "Penetration Firestopping."
- F. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- G. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway. Use manufacturer-approved pulling compound or lubricant where necessary.
- H. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- I. Make splices, terminations, and taps that are compatible with conductor material. Install conductor at each outlet, with at least 6 inches of slack.
- J. Identify conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."

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3.3 FIELD QUALITY CONTROL

- A. Contractor will engage a qualified testing agency to perform tests and inspections with the assistance of a factory-authorized service representative.
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and conductors feeding all critical equipment and services for compliance with requirements.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters. Cables will be considered defective if they do not pass tests and inspections.

- B. Test and Inspection Reports: Prepare a written report showing procedures used, results complying with requirements, and corrective action taken to achieve compliance.

END OF SECTION 26 05 19

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SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data for each type of product indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 GROUNDING MATERIALS

- A. Conductors: Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger unless otherwise indicated.
 - 1. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable code or authorities having jurisdiction.
 - 2. Bare, Solid-Copper Conductors: Comply with ASTM B 3.
 - 3. Bare, Stranded-Copper Conductors: Comply with ASTM B 8.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade.

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- B. Pipe and Equipment Grounding-Conductor Terminations: Bolted.
- C. Underground Connections: Welded.
- D. Connections to Structural Steel: Bolted.
- E. Install grounding conductors routed along shortest and straightest paths possible unless otherwise indicated or required by code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- F. Install ground rods driven into ground until tops are 2 inches below final grade or 4 inches above finished floor slab unless otherwise indicated.
- G. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape.
- H. Make connections without exposing steel or damaging coating if any.
- I. Install bonding straps and jumpers in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
- J. Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
- K. Bond to equipment mounted on vibration isolation hangers and supports so vibration is not transmitted to rigidly mounted equipment.
- L. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding-conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- M. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells.
 - 1. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

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2. Perform tests by fall-of-potential method according to IEEE 81.
3. Report measured ground resistances that exceed 10 ohms.
4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 26 05 26

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SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data for steel and nonmetallic slotted support systems.
2. Shop Drawings signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents. The rated strength of supports are to be adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

B. Comply with NFPA 70.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch-diameter holes at a maximum of 8 inches o.c., in at least one surface.

C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings.

E. Mounting, Anchoring, and Attachment Components:

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1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
2. Mechanical-Expansion Anchors: Insert-wedge type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Separate dissimilar metals and metal products from contact with wood or cementitious materials by painting each metal surface in area of contact with a bituminous coating or by other permanent separation.
- C. Raceway Support Methods: In addition to methods described in NECA 1, EMT IMC and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- D. Multiple Raceways or Cables: Install on trapeze-type supports fabricated with steel slotted channel.
- E. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- F. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 1. To Wood: Fasten with lag screws or through bolts.
 2. To New Concrete: Bolt to concrete inserts.
 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 4. To Existing Concrete: Expansion anchor fasteners.

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5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 6. To Light Steel: Sheet metal screws.
 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount on slotted-channel racks attached to substrate.
- G. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.2 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit, so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Anchor equipment to concrete base.
1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

END OF SECTION 26 05 29

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SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and Shop Drawings for custom enclosures and cabinets.
- B. Seismic qualification certificates for enclosures, cabinets, conduit racks, and mounting provisions.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Galvanized Rigid Conduit: Comply with ANSI C80.1 and UL 6.
- C. Intermediate Metal Conduit (IMC): Comply with ANSI C80.6 and UL 1242.
- D. Electrical Metallic Tubing (EMT): Comply with ANSI C80.3 and UL 797.
- E. Flexible Metal Conduit (FMC): Comply with UL 1; zinc-coated steel or aluminum.
- F. Liquidtight Flexible Metal Conduit (LFMC): Flexible steel conduit with PVC jacket, complying with UL 360.
- G. Raceway Fittings: Specifically designed for raceway type used in Project.

2.2 BOXES, ENCLOSURES, AND CABINETS

- A. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- B. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- C. Metal Floor Boxes:
 - 1. Material: Cast metal.
 - 2. Type: Fully adjustable.
 - 3. Shape: Rectangular.

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4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
 1. Standard: Comply with SCTE 77.
 2. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
 3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural-load rating consistent with enclosure and handhole location.
 4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 5. Cover Legend: Molded lettering, "ELECTRIC."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Outdoor Raceways Applications:
 1. Exposed or Concealed: IMC.
 2. Underground, Single Run: RNC.
 3. Connection to Vibrating Equipment: LFMC.
 4. Boxes and Enclosures: Metallic, NEMA 250, Type 3R or Type 4.
- B. Indoor Raceways Applications:
 1. Exposed or Concealed: EMT.
 2. Connection to Vibrating Equipment: FMC; in wet or damp locations, use LFMC.
 3. Damp or Wet Locations: IMC.
 4. Boxes and Enclosures: Metallic, NEMA 250, Type 1, unless otherwise indicated.
- C. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.
- D. Install raceways and cables at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.
- E. Install raceways embedded in slabs in middle third of slab thickness where practical, and leave at least 1-inch-thick concrete cover.

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1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.
3. Install conduit larger than 1-inch trade size, parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.
4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.

F. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.

G. Install pull wires in empty raceways.

H. Connect motors and equipment subject to vibration, noise transmission, or movement with a 72-inch maximum length of flexible conduit.

I. Install raceways and cables concealed within finished walls, ceilings, and floors unless otherwise indicated.

J. Install raceways and cables at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.

K. Installation of Hangers and Supports:

1. Comply with NECA 1 and NECA 101 for installation requirements, except as specified in this article.
2. Separate dissimilar metals and metal products from contact with wood or cementitious materials by painting each metal surface in area of contact with a bituminous coating or by other permanent separation.
3. Raceway Support Methods: In addition to methods described in NECA 1, EMT IMC and RMC may be supported by openings through structure members, as permitted in NFPA 70.
4. Multiple Raceways or Cables: Install on trapeze-type supports fabricated with steel slotted channel.
5. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
6. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural

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elements by the following methods, unless otherwise indicated or required by Code:

- a. To Wood: Fasten with lag screws or through bolts.
 - b. To New Concrete: Bolt to concrete inserts.
 - c. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - d. To Existing Concrete: Expansion anchor fasteners.
 - e. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - f. To Light Steel: Sheet metal screws.
 - g. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount on slotted-channel racks attached to substrate.
7. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.2 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

END OF SECTION 26 05 33

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SECTION 26 05 44 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Wall Sleeves:
1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
 2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Sleeves for Rectangular Openings: Galvanized sheet steel.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
1. Sealing Elements: Ethylene-propylene-diene monomer rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 2. Pressure Plates: Stainless steel.
 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout; noncorrosive, nonstaining.

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PART 3 - EXECUTION

3.1 SLEEVE AND SLEEVE-SEALS INSTALLATION

- A. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- B. Cut sleeves to length for mounting flush with both wall surfaces.
- C. Extend sleeves installed in floors 2 inches above finished floor level.
- D. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
- E. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- F. Interior Penetrations of Non-fire-rated Walls and Floors: Seal annular space between sleeve and cable using joint sealant appropriate for size, depth, and location of joint according to Section 07 92 00 "Joint Sealants."
- G. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.
- H. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- I. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between cable and sleeve for installing mechanical sleeve seals.

END OF SECTION 26 05 44

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SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Seismic-Restraint Loading: Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 26 05 48.16 "Seismic Controls for Electrical Systems."
- B. Enclosures: **[Flush] [Surface] [Flush- and surface]-mounted cabinets; NEMA 250, [Type 1] <Insert type>.**
- C. Service Equipment Label: Nationally Recognized Testing Laboratory (NRTL) labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.
- D. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- E. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices; listed and labeled for series-connected short-circuit rating by an NRTL.
- F. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

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2.3 DISTRIBUTION PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Square D.
- B. Panelboards: NEMA PB 1, power and feeder distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
- D. Mains: Lugs only.
- E. Branch Overcurrent Protective Devices: Plug-in, or Bolt-on circuit breakers.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Square D.
- B. Molded-Case Circuit Breaker: Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
 - 2. Ground-Fault Circuit-Interrupter Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Receive, inspect, handle, store, and install panelboards and accessories according to NECA 407.
- B. Comply with mounting and anchoring requirements specified in Section 26 05 48.16 "Seismic Controls for Electrical Systems."
- C. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- D. Stub four empty 3/4-inch conduits from panelboard into accessible or designated ceiling space.

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- E. Arrange conductors into groups; bundle and wrap with wire ties.
- F. Create a directory to indicate installed circuit loads and incorporating Owner's final room designations. Obtain approval before installing.

END OF SECTION 26 24 16

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SECTION 26 27 13 - ELECTRICITY METERING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and Shop Drawings.
- B. Coordinate with utility companies for services and components they furnish.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 EQUIPMENT FOR ELECTRICITY METERING BY UTILITY COMPANY

- A. Meters will be furnished by utility company.
- B. Current-Transformer Cabinets: Comply with requirements of electrical power utility company.
- C. Meter Sockets: Comply with requirements of electrical power utility company.
- D. Meter Sockets: Steady-state and short-circuit current ratings shall meet indicated circuit ratings.
- E. Modular Meter Center: Factory-coordinated assembly of a main service terminal box with lugs only, wireways, tenant meter socket modules, and tenant feeder circuit breakers arranged in adjacent vertical sections. Assembly shall be complete with interconnecting buses and other features as specified below:
 - 1. Comply with requirements of utility company for meter center.
 - 2. Housing: NEMA 250, Type 3R enclosure.
 - 3. Main Disconnect Device: Circuit breaker, series-combination rated for use with downstream feeder and branch circuit breakers or Fusible switch, series-combination rated by breaker manufacturer to protect downstream feeder and branch circuit breakers.
 - 4. Surge Protective Device: Integrally mounted, complying with UL 1449 Type 1.

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5. Tenant Feeder Circuit Breakers: Series-combination-rated molded-case units, rated to protect circuit breakers in downstream tenant and to house loadcenters and panelboards that have 10,000-A interrupting capacity.
 - a. Identification: Provide legend identifying tenant's address.
 - b. Physical Protection: Tamper resistant, with hasp for padlock.
6. Meter Socket: Rating coordinated with indicated tenant feeder circuit rating.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with equipment installation requirements in NECA 1.
- B. Install equipment for utility company metering. Install raceways and equipment according to utility company's written requirements. Provide empty conduits for metering leads, and extend grounding connections as required by utility company.
- C. Install modular meter center according to NECA 400 switchboard installation requirements.

END OF SECTION 26 27 13

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SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

2.2 COMMERCIAL-GRADE DEVICES

- A. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with the requirements in this Section.
- B. Device Color:
 - 1. Wiring Devices: Ivory unless otherwise indicated or required by NFPA 70 or device listing.
- C. Convenience Receptacles: NEMA WD 1, NEMA WD 6, Configuration 5-20R, and UL 498.
- D. Duplex Ground-Fault Circuit-Interrupter (GFCI) Convenience Receptacles: 125-V, 20-A, straight blade, feed-through type. NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

2.3 WALL PLATES

- A. Wall Plates: Smooth, high-impact thermoplastic, fastened with metal screws having heads matching plate color.

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- B. Wall Plates, Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet locations.

2.4 FLOOR SERVICE FITTINGS

- A. Modular, flush-type, dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Round, die-cast aluminum with satin finish.
- D. Power Receptacle: NEMA WD 6, Configuration 5-20R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 Category 5 jacks for UTP cable.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- C. Install unshared neutral conductors on line and load side of dimmers.
- D. Mount devices flush, with long dimension vertical, and grounding terminal of receptacles on top unless otherwise indicated. Group adjacent devices under single, multigang wall plates.

END OF SECTION 26 27 26

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SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

- A. Fusible Switches, 600 A and Smaller: UL 98 and NEMA KS 1, Type HD, that accommodate specified fuses, and with lockable handle interlocked with cover in closed position.

- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Square D.

- B. Nonfusible Switches, 600 A and Smaller: UL 98 and NEMA KS 1, Type HD, with lockable handle interlocked with cover in closed position.

- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Square D.

2.3 MOLDED-CASE CIRCUIT BREAKERS

- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Square D.

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- B. Description: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers: Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with field-adjustable instantaneous trip settings.
 3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
 4. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.
 5. GFEP Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.

2.4 ENCLOSURES

- A. NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
1. Outdoor Locations: NEMA 250, Type 3R.

2.5 SUPPORT AND ANCHORAGE COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly, and provide finish suitable for the environment in which installed.
1. Channel Dimensions: Selected for structural loading and applicable seismic forces.
- B. Raceway and Cable Supports: As described in NECA 1.
- C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and fittings.
- D. Mounting, Anchoring, and Attachment Components:
1. Powder-Actuated Fasteners: Threaded-steel stud.
 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete.
 3. Concrete Inserts: Steel or malleable-iron, slotted-support-system units similar to MSS Type 18; complying with MFMA-3 or MSS SP-58.
 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 5. Through Bolts: Structural type, hex head, high strength; complying with ASTM A 325.
 6. Toggle Bolts: All-steel springhead type.
 7. Hanger Rods: Threaded steel.

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8. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings and matched to type and size of anchor bolts and studs used.
9. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings and matched to type and size of attachment devices used.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Install electrical equipment to allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
- C. Install electrical equipment to provide for ease of disconnecting the equipment with minimum interference to other installations.
- D. Install electrical equipment to allow right of way for piping and conduit installed at required slope.
- E. Install electrical equipment to ensure that connecting raceways, cables, wireways, cable trays, and busways are clear of obstructions and of the working and access space of other equipment.
- F. Install required supporting devices in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- G. Install fuses in fusible devices.
- H. Comply with NECA 1.

3.2 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections, and prepare test reports:
 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

END OF SECTION 26 28 16

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SECTION 26 43 13 - TRANSIENT-VOLTAGE SUPPRESSION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.
- B. Comply with IEEE C62.41.2, and test devices according to IEEE C62.45.
- C. Comply with UL 1449.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SERVICE ENTRANCE SUPPRESSORS

- A. Surge Protective Devices (SPD): Integrally mounted, complying with UL 1449 Type 1.
 - 1. Comply with IEEE C62.41, Category C, 200-kA short-circuit current rating.
 - 2. Non-modular type with the following features and accessories:
 - a. Integral disconnect switch.
 - b. LED indicator lights for power and protection status.
- B. Protection modes and UL 1449 Vpk for 240/120 V, single-phase, three-wire circuits shall be as follows:
 - 1. Line to Neutral: 600 V.
 - 2. Line to Ground: 1000 V.
 - 3. Line to Line: 1000 V.

2.3 PANELBOARD SUPPRESSORS

- A. SPDs: Integrally mounted, complying with UL 1449 Type 1.

TRANSIENT-VOLTAGE
SUPPRESSION FOR
LOW-VOLTAGE ELECTRICAL
POWER CIRCUITS

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1. Comply with IEEE C62.41, Category C, 200-kA short-circuit current rating.
 2. Non-modular type with the following features and accessories:
 - a. Integral disconnect switch.
 - b. LED indicator lights for power and protection status.
- B. Protection modes and UL 1449 Vpk for 240/120-V, single-phase, three-wire circuits shall be as follows:
1. Line to Neutral: 600 V.
 2. Line to Ground: 1000 V.
 3. Neutral to Ground: 600 V.
 4. Line to Line: 1000 V.

2.4 ENCLOSURES

- A. Indoor Enclosures: NEMA 250, Type 1.
- B. Outdoor Enclosures: NEMA 250, Type 3R.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Do not energize or connect service entrance equipment to their sources until transient-voltage surge-suppression devices are installed and connected.

END OF SECTION 26 43 13

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SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
- B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- C. Utility Locator Service: Notify "One Call" for area where Project is located before site clearing.
- D. Do not commence site-clearing operations until temporary erosion- and sedimentation-control measures are in place.
- E. Soil Stripping, Handling, and Stockpiling: Perform only when topsoil is dry or slightly moist.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance.
- B. Locate and clearly flag trees and vegetation to remain or to be relocated.
- C. Protect remaining trees and shrubs from damage and maintain vegetation. Employ a licensed arborist to repair tree and shrub damage. Restore damaged vegetation. Replace damaged trees that cannot be restored to full growth, as determined by arborist.
- D. Do not store materials or equipment or permit excavation within drip line of remaining trees.
- E. Protect site improvements to remain from damage. Restore damaged improvements to condition existing before start of site clearing.
- F. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and

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walkways, according to a sediment and erosion control plan, specific to the site, that complies with EPA document No. EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

3.2 SITE CLEARING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
- C. Strip topsoil. Remove sod and grass before stripping topsoil. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade stockpiles to drain water.
 - 1. Stockpile surplus topsoil to allow for respreading deeper topsoil.

END OF SECTION 31 10 00

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SECTION 31 20 00 - EARTH MOVING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Unauthorized excavation consists of excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- B. Utility Locator Service: Notify "One Call" for area where Project is located before beginning earthmoving operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soil: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, or other deleterious matter.
- B. Unsatisfactory Soil: ASTM D 2487 Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT.
- C. Backfill and Fill: Satisfactory soil materials.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Drainage Course: Narrowly graded mixture of washed crushed stone or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.
- G. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

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PART 3 - EXECUTION

3.1 EARTHWORK

- A. Protect and maintain erosion and sedimentation controls during earthmoving operations.
- B. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
- C. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- D. Explosives: Do not use explosives.
- E. Excavate to the depths indicated on the Plans for the structures and other below grade appurtenances as shown or required to perform the work. Extreme care shall be exercised in the final 6" of excavations for footings and grade beams and these excavations shall be uniform. Do all shoring and bracing necessary to maintain banks of excavation. The Contractor shall be responsible for the adequacy and safety of all shoring and bracing.
- F. Utility Trenches: Excavate trenches to indicated slopes, lines, depths, and invert elevations. Shape subgrade to provide continuous support.
 - 1. Place, compact, and shape bedding course to provide continuous support for pipes and conduits over rock and other unyielding bearing surfaces and to fill unauthorized excavations.
 - 2. Place and compact initial backfill of satisfactory soil material or subbase material, free of particles larger than 1 inch, to a height of 12 inches over the utility pipe or conduit. Place and compact final backfill of satisfactory soil material to final subgrade.
- G. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- H. Plow strip or break up sloped surfaces steeper than 1 vertical to 4 horizontal to receive fill.
- I. Place backfill and fill in layers not more than 8 inches in loose depth at optimum moisture content. Compact each layer under structures, building slabs, pavements, and walkways to 95 percent of maximum dry unit weight according to ASTM D 698. Where compaction tests are considered necessary by the Owner, the tests will be made by or paid for by the Owner.

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- J. Do not backfill until foundations have been inspected by the Department. Do not fill against walls until they have attained full strength. Fill and backfill material shall be free from trash, lumber and other debris and shall have a proper moisture content for the required degree of compaction.
- K. Grade areas to a smooth surface to cross sections, lines, and elevations indicated. Grade lawns, walkways, and unpaved subgrades to tolerances of plus or minus 1 inch and pavements and areas within building lines to plus or minus 1/2 inch.
- L. Under pavements and walkways, place subbase course material on prepared subgrades and compact at optimum moisture content to required grades, lines, cross sections, and thicknesses.
- M. Under slabs-on-grade, place drainage course on prepared subgrade and compact to required cross section and thickness.
- N. Allow testing agency to inspect and test each subgrade and each fill or backfill layer and to verify compliance with requirements.
- O. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 20 00

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SECTION 31 31 16 - TERMITE CONTROL

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product data and product certificates. Include EPA-registered label.
- B. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite-control treatment and products in jurisdiction where Project is located, and who employs workers trained and approved by manufacturer to install manufacturer's products, and who is accredited by manufacturer.

1.2 WARRANTY

- A. As a part of the termite control work, issue for delivery to the Department, a Termite Damage Warranty with performance jointly Warranted by the manufacturer of the chemicals and the applicator and with performance further insured by an insurance company authorized to do business in the State of Arkansas.
- B. The Damage Warranty shall provide service and reservice for any subterranean termite infestation without cost to the Department. In addition, the Damage Guaranty Contract shall cover any and all subterranean termite damage to any of the structures and/or contents. Such damage to be repaired, replaced or corrected without cost to the Department.
- C. The Damage Warranty shall be effective for a period of five (5) years after completion of the initial treatment without payment of any additional fees or premiums by the Department. Upon expiration of the five (5) year period, the Department shall have the option of extending the Damage Warranty Contract at an annual fee mutually agreed upon by the Department and the applicator. The Department shall reserve the right to cancel as of any anniversary date. The service, reservice and Damage Guaranty provisions of the Contract shall be non-cancelable by the applicator, the manufacturers of the chemicals and the insurance company. The annual fee shall be subject to revision as of the fifth of any later extension date by giving advance written notice to the Department.
- D. Upon completion of the work, the Damage Warranty shall be issued in duplicate, one (1) copy for the General Contractor and one (1) for the Department.

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PART 2 - PRODUCTS

2.1 TERMITE-CONTROL PRODUCTS

- A. Soil Treatment Termiticide: EPA-registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution.
 - 1. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1 INSTALLATION

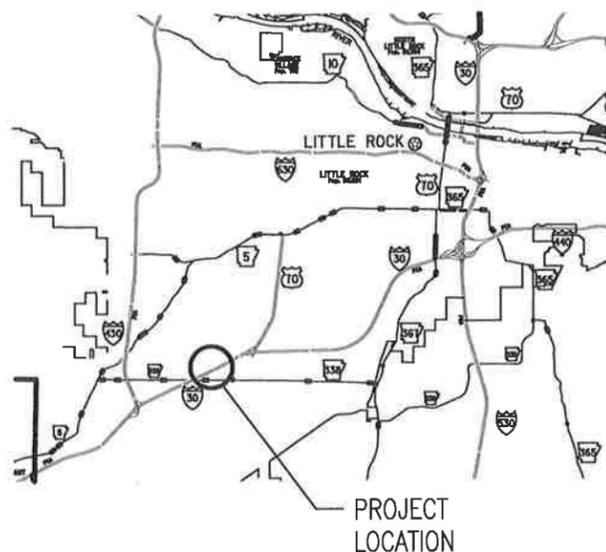
- A. General: Comply with requirements of authorities having jurisdiction and with manufacturer's EPA-registered label for products.
- B. Soil Treatment Application: Provide a continuous horizontal and vertical termiticidal barrier or treated zone around and under building construction:
 - 1. At foundations.
 - 2. Under concrete floor slabs-on-grade.
 - 3. Under basement floor slabs.
 - 4. At hollow masonry.
 - 5. At expansion and control joints and slab penetrations.
 - 6. At crawlspaces; treat soil under and adjacent to foundations. Treat adjacent areas, including around entrance platform, porches, and equipment bases.
- C. Post warning signs in areas of soil treatment application.
- D. Reapply soil termiticide treatment solution to areas disturbed by subsequent excavation or other construction activities following application.

3.2 MAINTENANCE SERVICE

- A. Continuing Service: Provide 12 month continuing service, including monitoring, inspection, and re-treatment for occurrences of termite activity.

END OF SECTION 31 31 16

**ARKANSAS DEPARTMENT OF TRANSPORTATION
CONSTRUCTION PLANS:
GROUNDS CREW BUILDING
LITTLE ROCK, ARKANSAS
PULASKI COUNTY
JOB 42-56**



VICINITY MAP

SCALE: NO SCALE



ARK. HWY. DIST. NO. 6



PROJECT LOCATION
9003 MABLEVALE PIKE



LOCATION MAP

SCALE: NO SCALE



GROUNDS CREW BUILDING

Little Rock, Arkansas
Pulaski County



DATE: NOV. 15, 2018
JOB NO: 42-56
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REVISIONS:

G1.1

ABBREVIATIONS

AD	AREA DRAIN	GALV	GALVANIZED
ADA	AMERICANS WITH DISABILITIES	INSUL	INSULATION
AFF	ABOVE FINISHED FLOOR	INT	INTERIOR
AFG	ABOVE FINISHED GRADE	MAX	MAXIMUM
ALUM	ALUMINUM	MBM	METAL BUILDING MANUFACTURER
ANOD	ANODIZED	MECH	MECHANICAL
BOT	BOTTOM	MIN	MINIMUM
CJ	CONTROL JOINT	MTL	METAL
CLG	CEILING	NIC	NOT IN CONTRACT
CLR	CLEAR	NO	NUMBER
CMU	CONCRETE MASONRY UNIT	NOM	NOMINAL
COL	COLUMN	OC	ON CENTER
CONC	CONCRETE	OPG	OPENING
CONT	CONTINUOUS	PLUMB	PLUMBING
DEMO	DEMOLITION	PLAS. LAM.	PLASTIC LAMINATE
DTL	DETAIL	PLYWD	PLYWOOD
DIA	DIAMETER	PVC	POLYVINYL CHLORIDE
DIM	DIMENSION	RBR	RUBBER
EA	EACH	RD	ROOF DRAIN
EJ	EXPANSION JOINT	REQ	REQUIRED
ELEC	ELECTRICAL	SIM	SIMILAR
ELEV	ELEVATION	SPEC	SPECIFICATION
EQ	EQUAL	SPK	SPRINKLER
EWC	ELECTRIC WATER COOLER	STRUCT	STRUCTURAL
EXIST	EXISTING	T&G	TONGUE AND GROOVE
FD	FLOOR DRAIN	TELE	TELEPHONE
FEC	FIRE EXTINGUISHER CABINET	TLT	TOILET
FFE	FINISHED FLOOR ELEVATION	TYP	TYPICAL
FIXT	FIXTURE	UNO	UNLESS NOTED OTHERWISE
FLR	FLOOR	VCT	VINYL COMPOSITION TILE
GA	GAUGE		

SYMBOL LEGEND

	DOOR AND FRAME
	HARDWARE SET
	WINDOW TAG
	ROOM NAME
	FINISH
	CEILING HEIGHT
	ROOM NUMBER
	MILLWORK ELEVATION TAG
	DRAWING NUMBER
	SHEET NUMBER
	KEYED PLAN NOTE
	KEYED DEMOLITION PLAN NOTE

MATERIAL LEGEND

	FACE BRICK
	CONCRETE BLOCK RE: PLANS FOR SIZE
	STUDS
	CONCRETE (SECTION)
	BATT. INSULATION
	FOAM OR RIGID INSULATION
	ROUGH FRAMING
	FINISHED WOOD

INDEX OF SHEETS

SHEET	NO.	SHEET TITLE
G1.1	1	TITLE SHEET
G1.2	2	INDEX OF SHEETS
C1.1	3	SITE PLAN
A1.1	4	DOOR, WINDOW AND FINISH SCHEDULES AND DETAILS
A2.1	5	FLOOR PLAN
A3.1	6	EXTERIOR ELEVATIONS
A3.2	7	EXTERIOR ELEVATIONS
A4.1	8	BUILDING SECTIONS
A4.2	9	BUILDING SECTIONS
A4.3	10	WALL SECTIONS
A4.4	11	WALL SECTIONS
A5.1	12	REFLECTED CEILING PLAN
A6.1	13	ROOF PLAN
S1.1	14	FOUNDATION PLAN
S1.2	15	FOUNDATION DETAILS
M1.1	16	MECHANICAL FLOOR PLAN
P1.1	17	SEWER FLOOR PLAN
P1.2	18	PIPING FLOOR PLAN
P2.1	19	RISER DIAGRAMS, LEGEND AND SCHEDULES
E1.1	20	POWER FLOOR PLAN
E1.2	21	LIGHTING FLOOR PLAN
E2.1	22	LEGENDS AND SCHEDULES



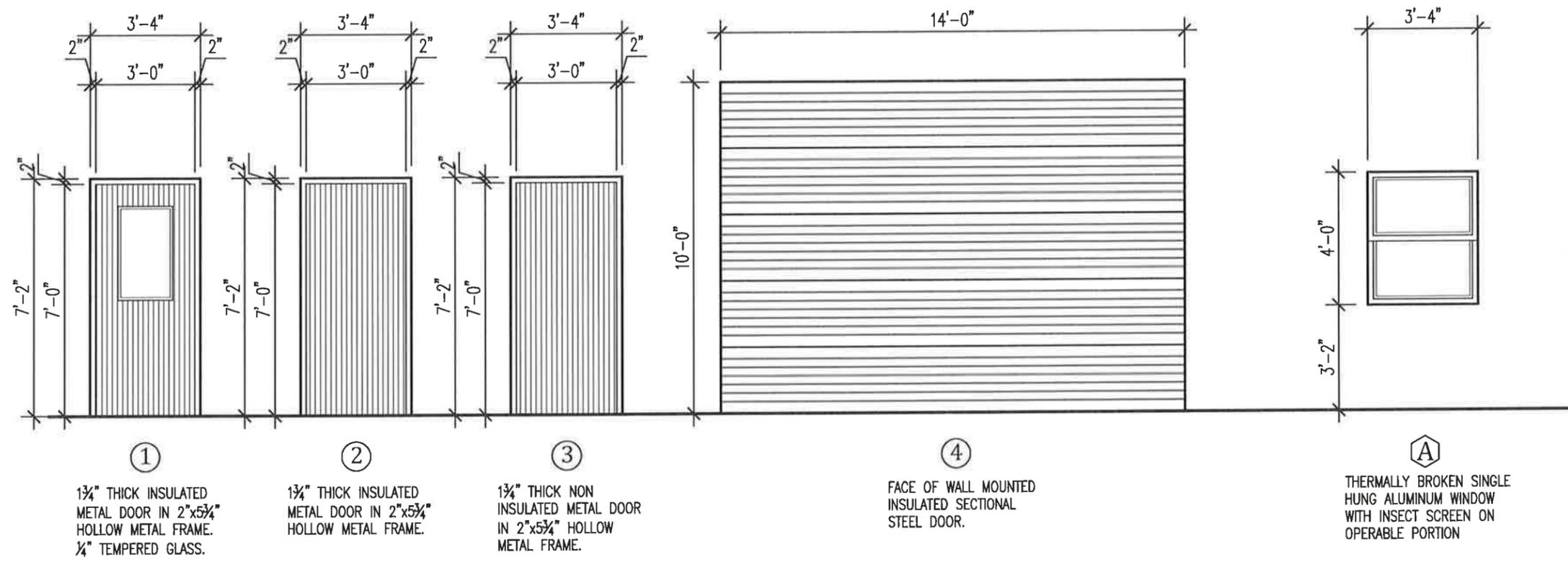
GROUND'S CREW BUILDING
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 Pulaski County



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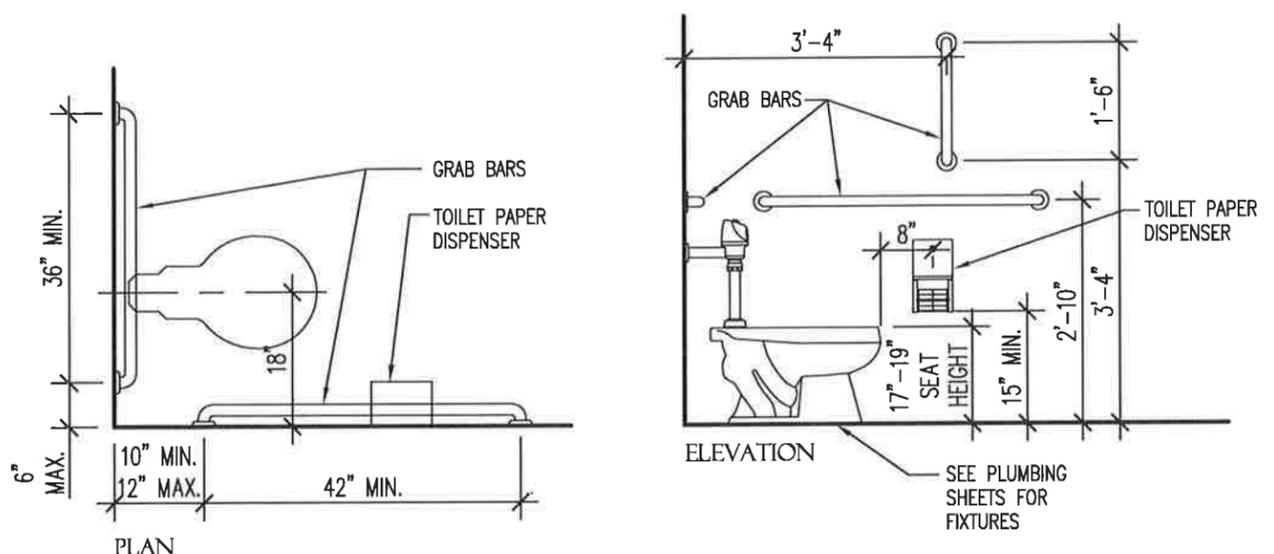
G1.2

2 OF 22



1 DOOR AND WINDOW SCHEDULE
SCALE: 1/4" = 1'-0"

MATERIAL		ROOM FINISH MARK						COMMENTS
		A	B	C	D	E	F	
FLOOR	SEALED CONCRETE	●	●					
	EPOXY COATING			●				
BASE	4" VINYL BASE		●					
	4" EPOXY BASE			●				
	NONE	●						
WALLS	5/8" GYP. BOARD, PAINT		●					
	1/2" PLYWOOD, PAINT	●						
	EPOXY COATING			●				
	EXPOSED STRUCTURE, PAINT	●						
CEILING	2'x2' ACOUSTICAL TILE		●	●				
	EXPOSED STRUCTURE, PAINT	●						



2 TOILET DETAIL
SCALE: NO SCALE



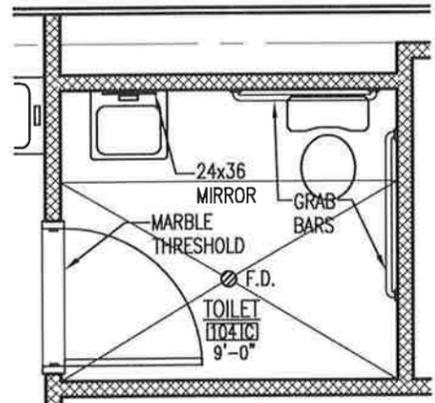
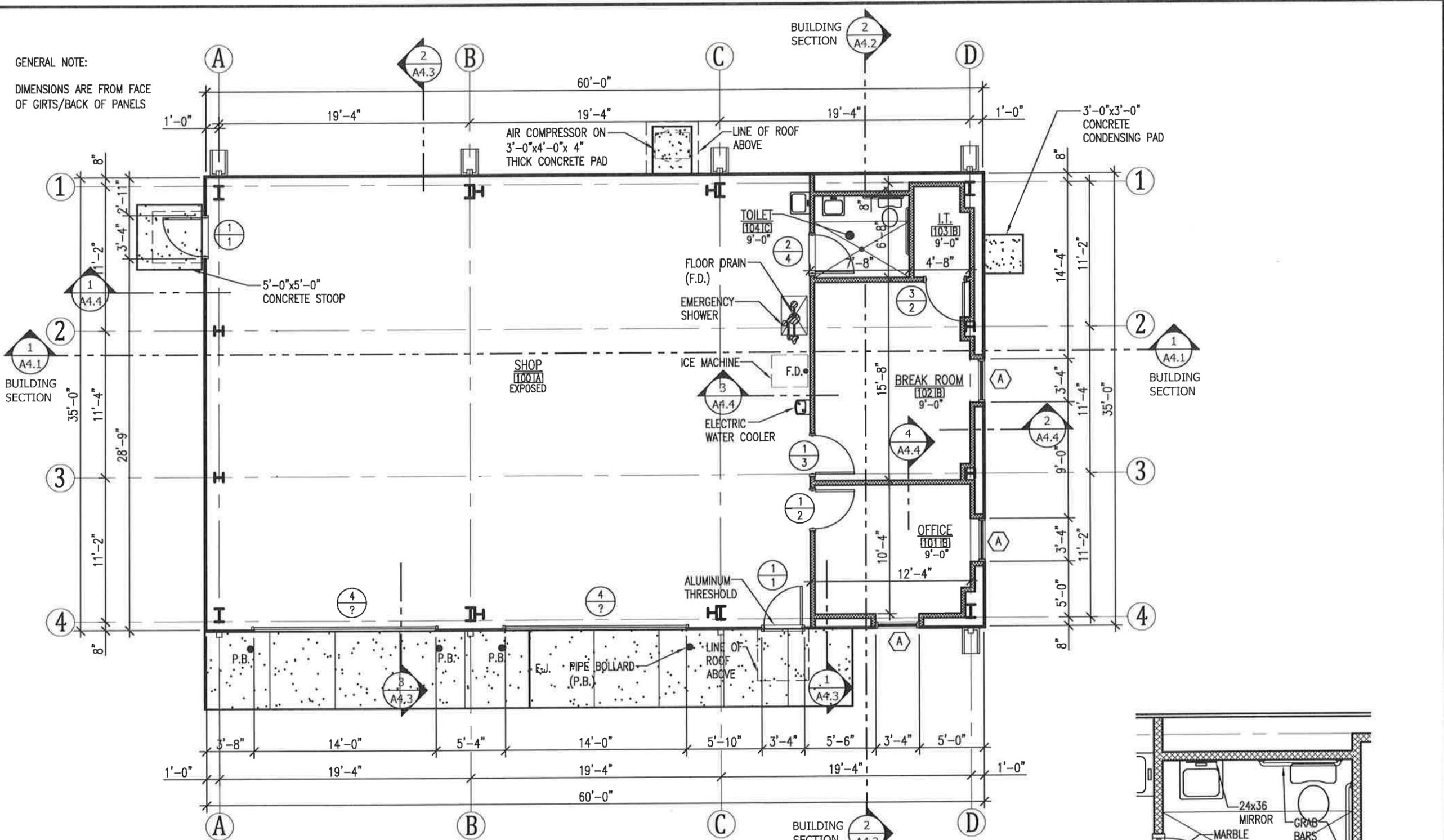
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A2.1



ENLARGED TOILET PLAN

2
A2.1

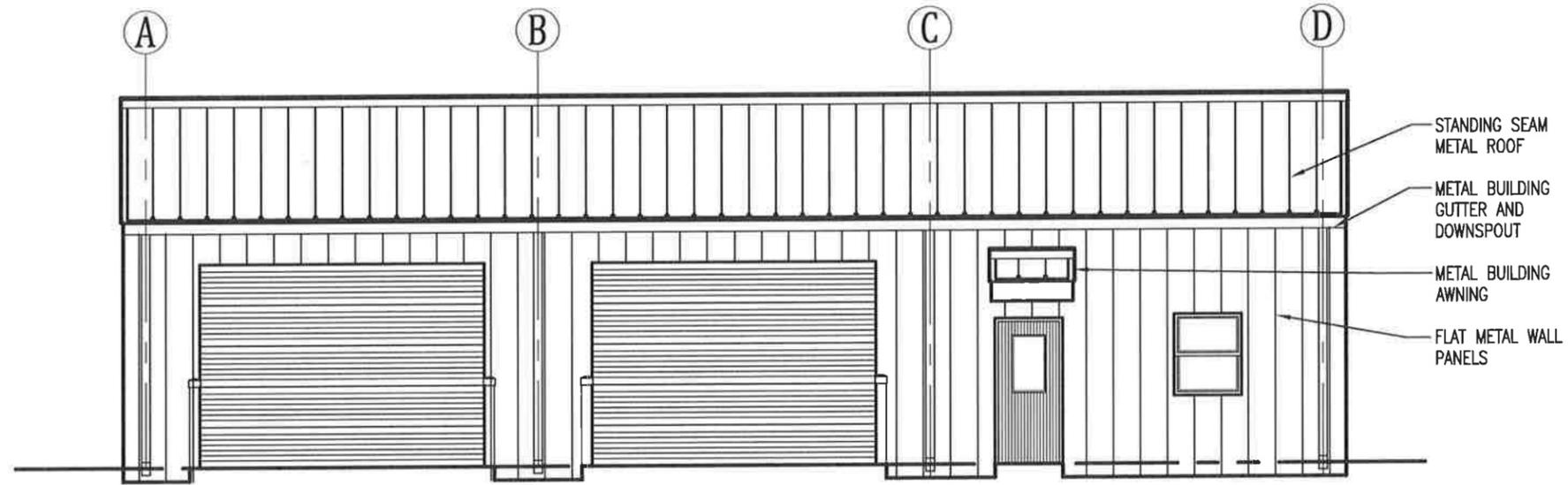
SCALE: 1/8" = 1'-0"

FLOOR PLAN

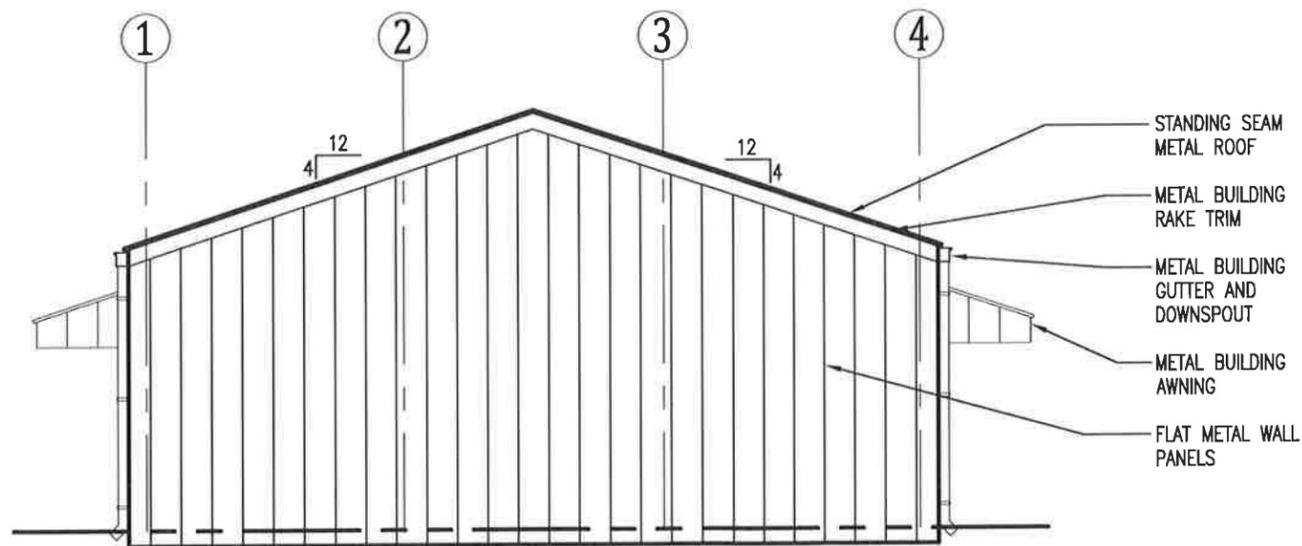
SCALE: 1/8" = 1'-0"



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 Little Rock, Arkansas
 Pulaski County



1 WEST ELEVATION
 A3.1 SCALE : 1/8" = 1'-0"

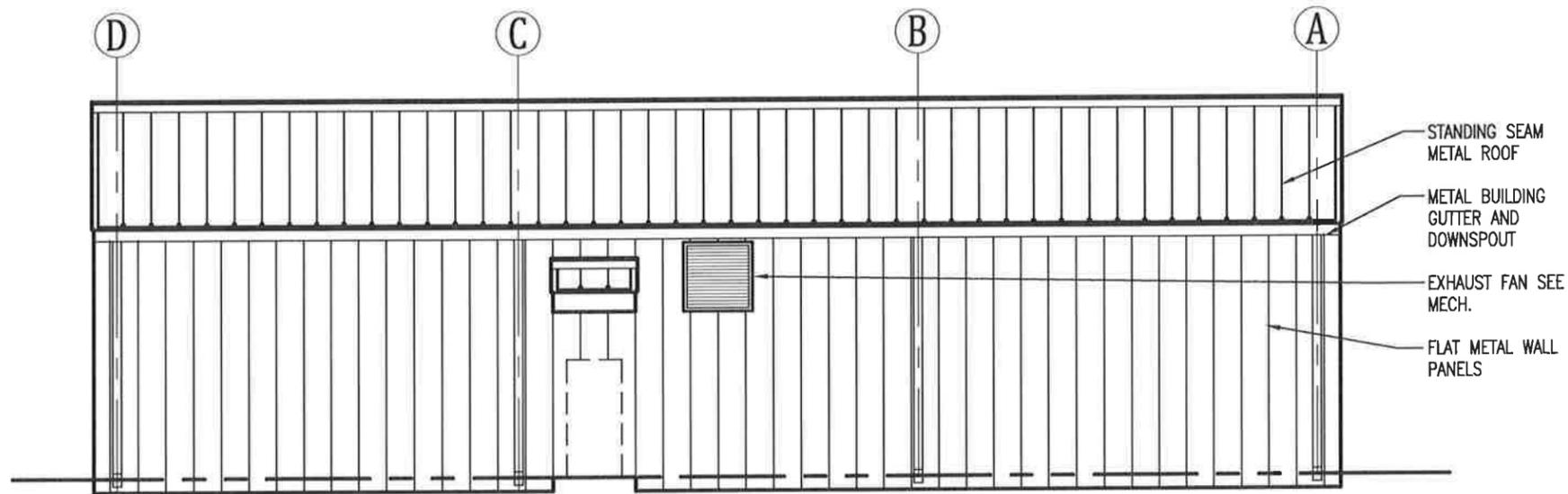


1 NORTH ELEVATION
 A3.1 SCALE : 1/8" = 1'-0"

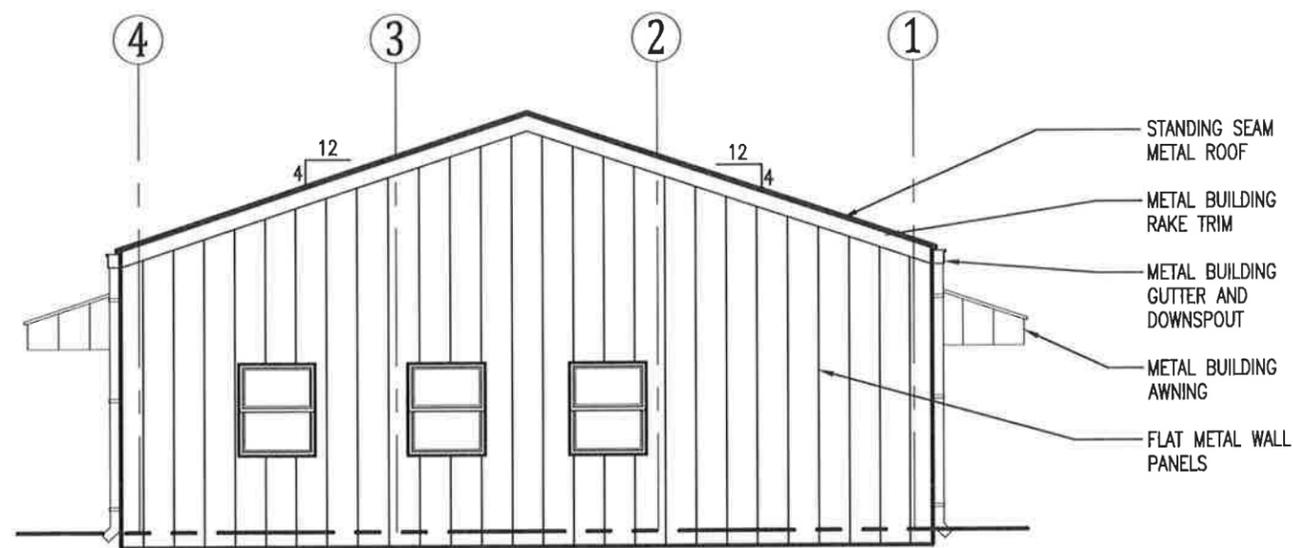


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GROUPS CREW BUILDING
 Little Rock, Arkansas
 Pulaski County



1 EAST ELEVATION
 A3.2 SCALE: 1/8" = 1'-0"



1 SOUTH ELEVATION
 A3.2 SCALE: 1/8" = 1'-0"

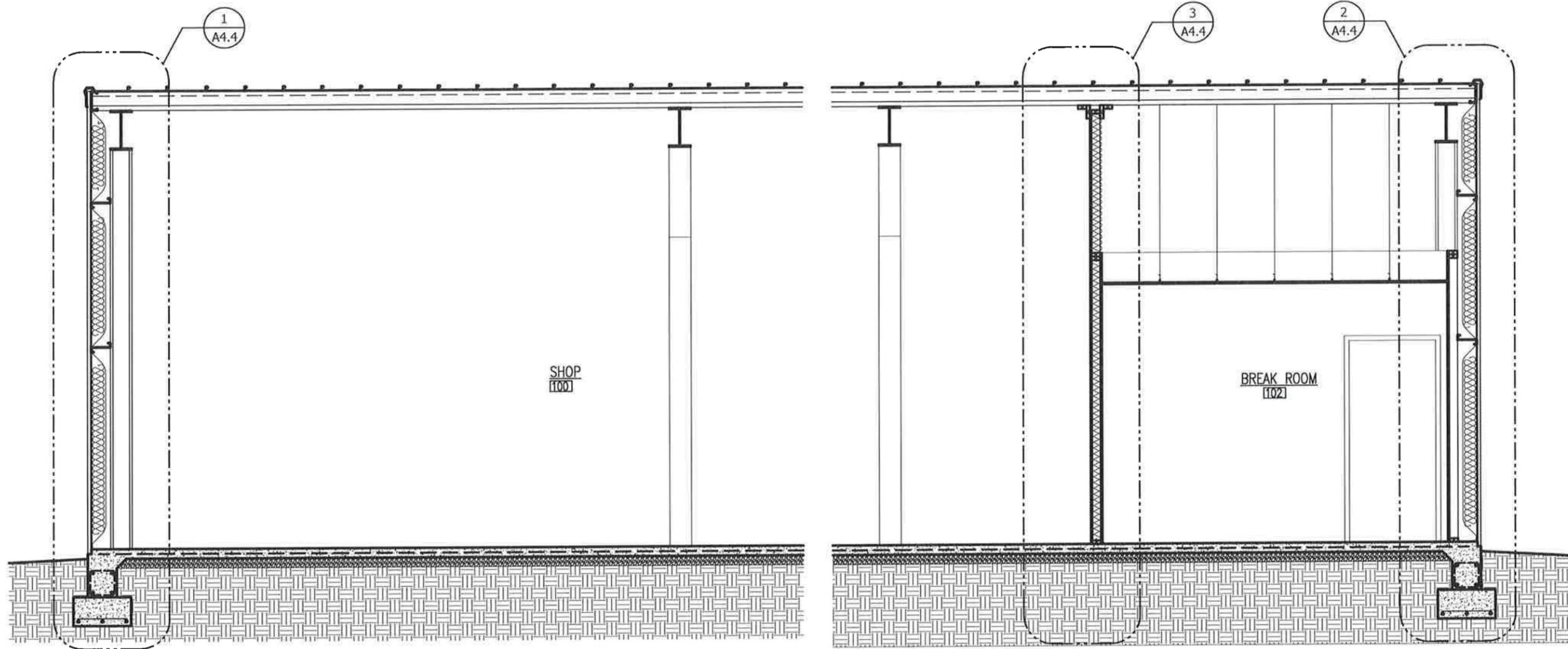


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A3.2

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Little Rock, Arkansas
 Pulaski County

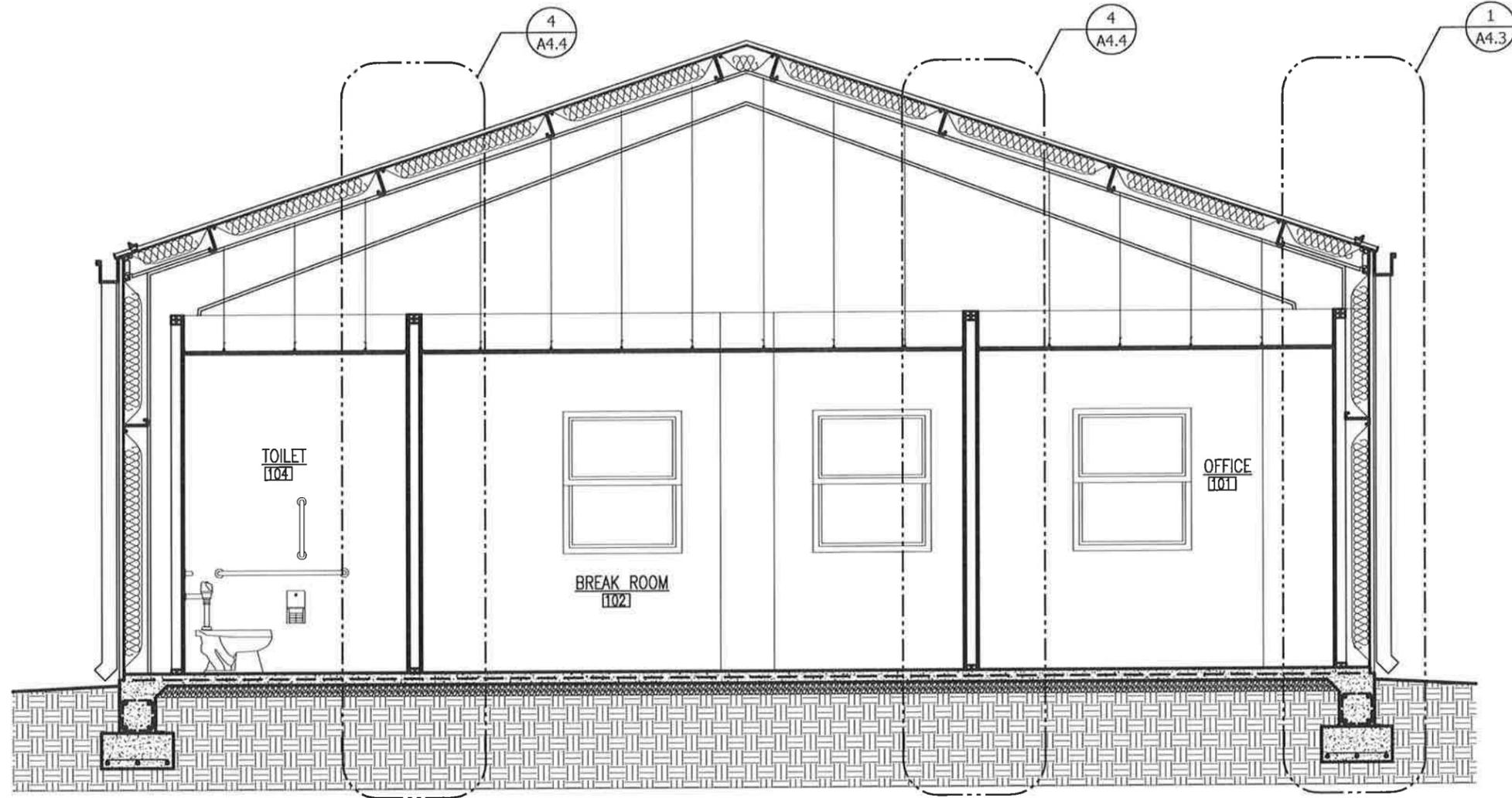


1 BUILDING SECTION
 A4.1 SCALE: 1/4" = 1'-0"



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A4.1



1 BUILDING SECTION
 A4.2 SCALE: 1/4" = 1'-0"

GROUND CREW BUILDING
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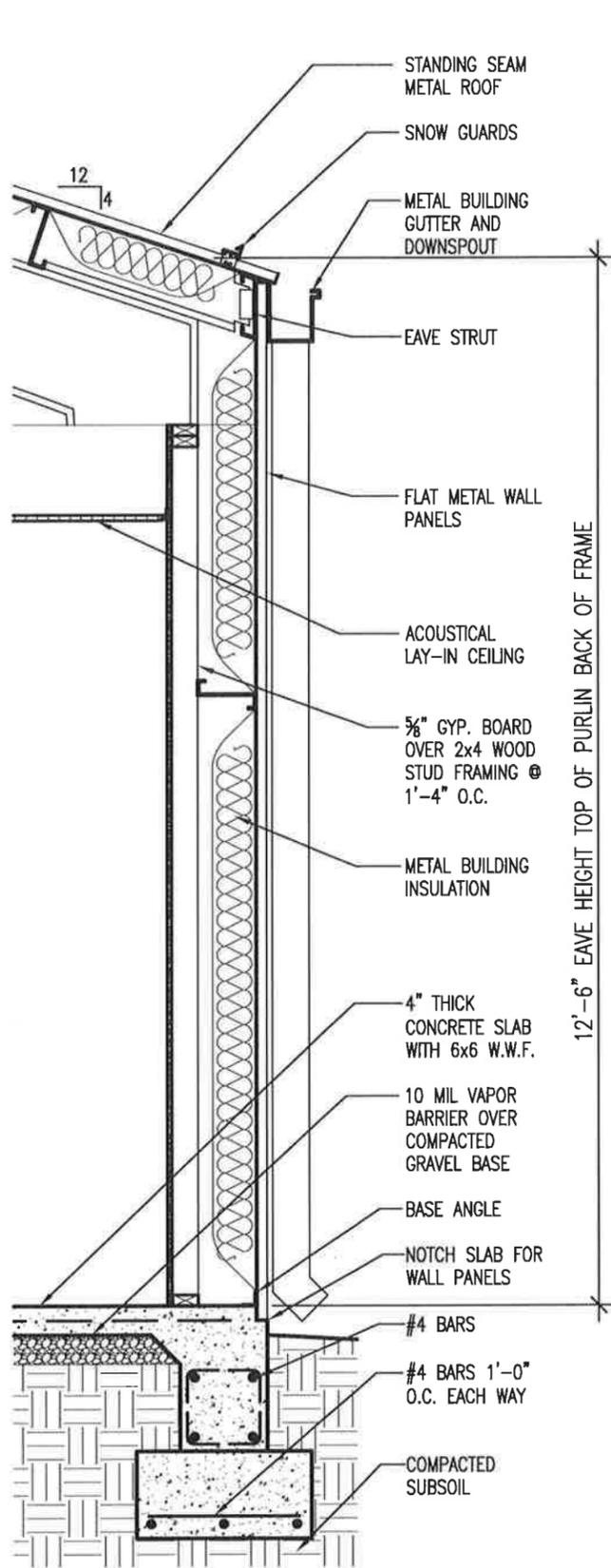
A4.2

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 Little Rock, Arkansas
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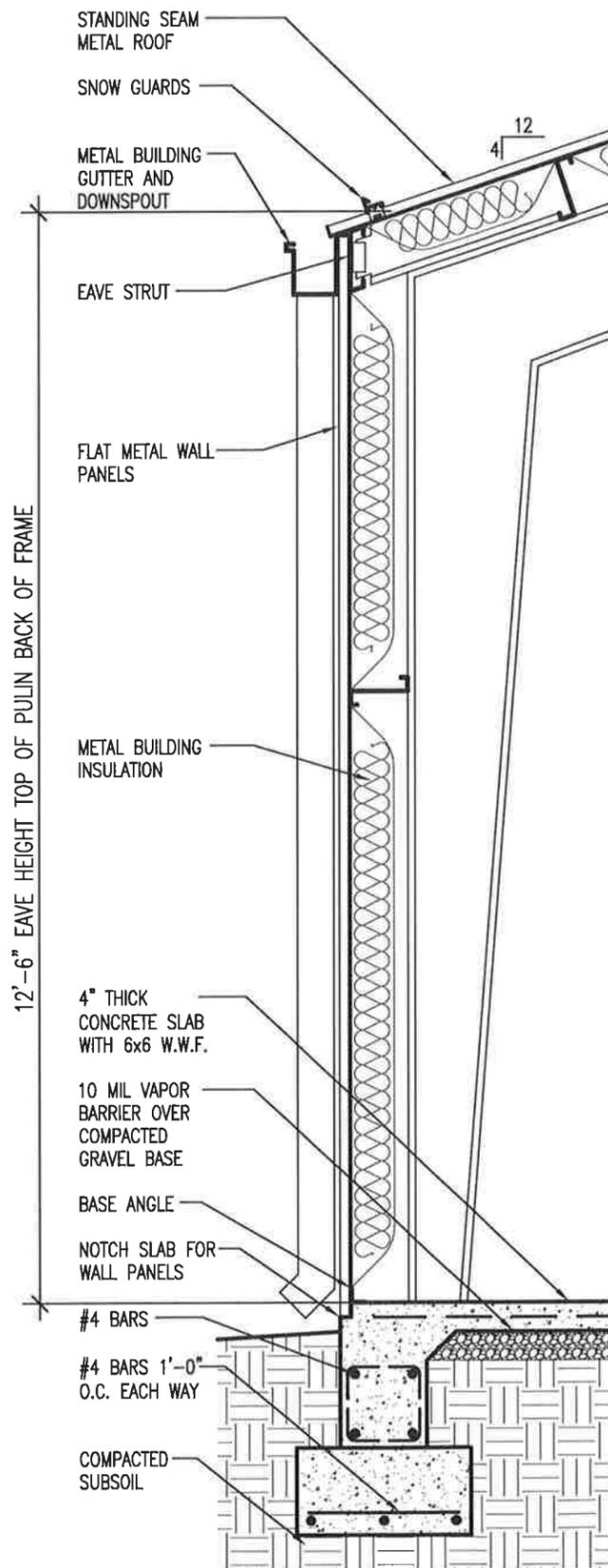


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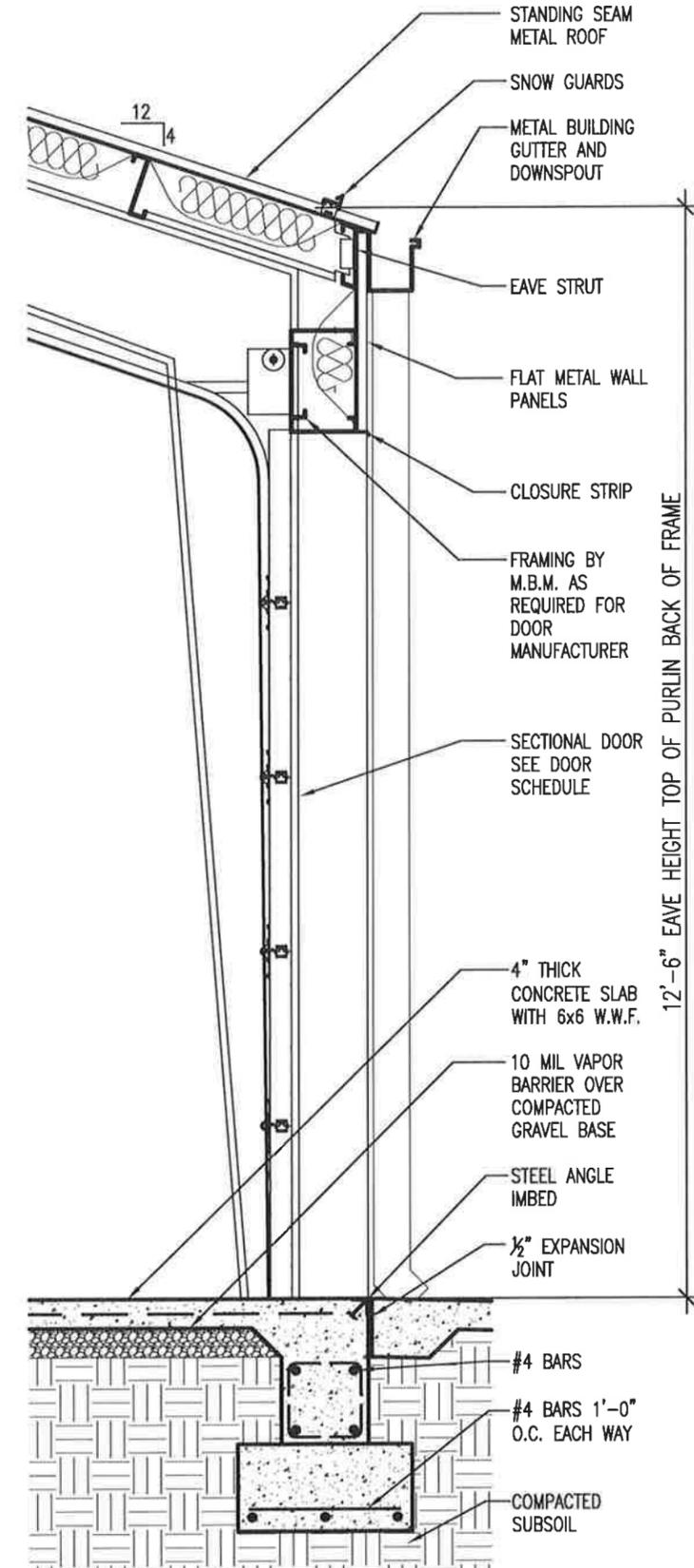
A4.3



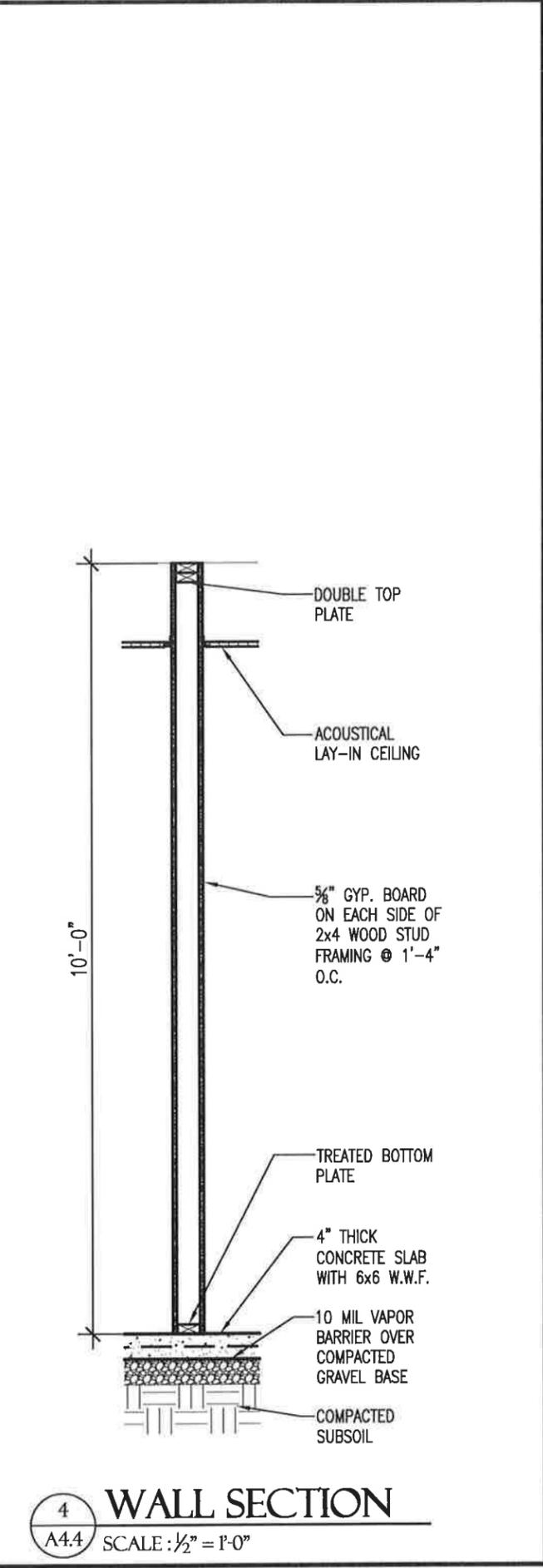
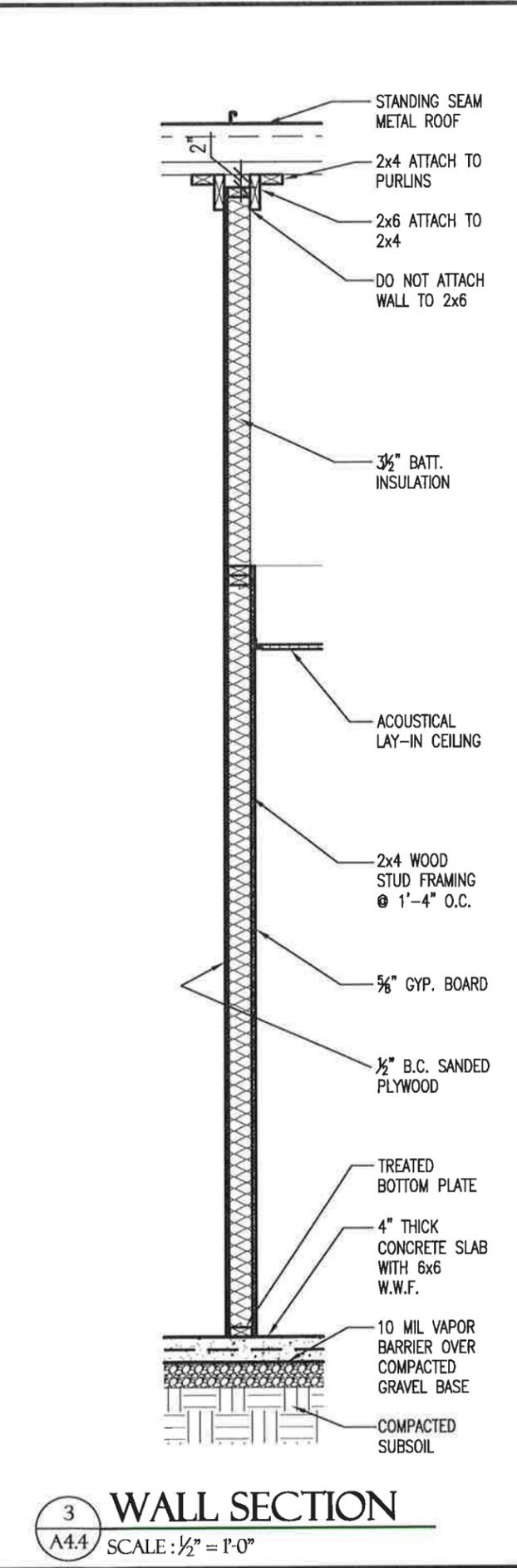
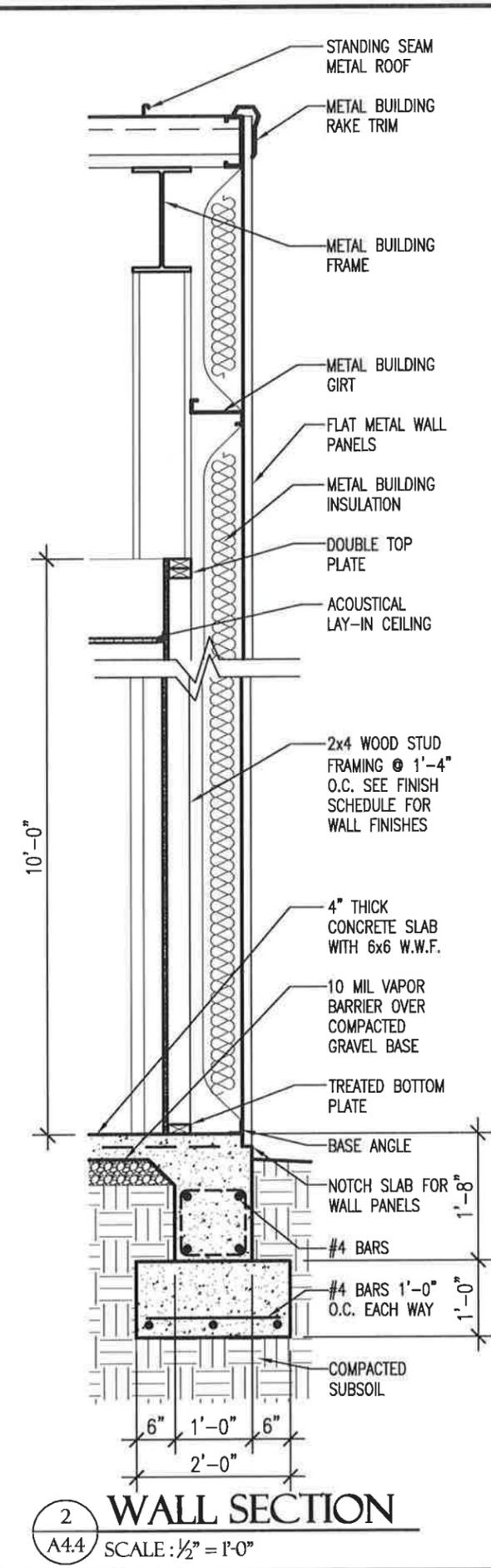
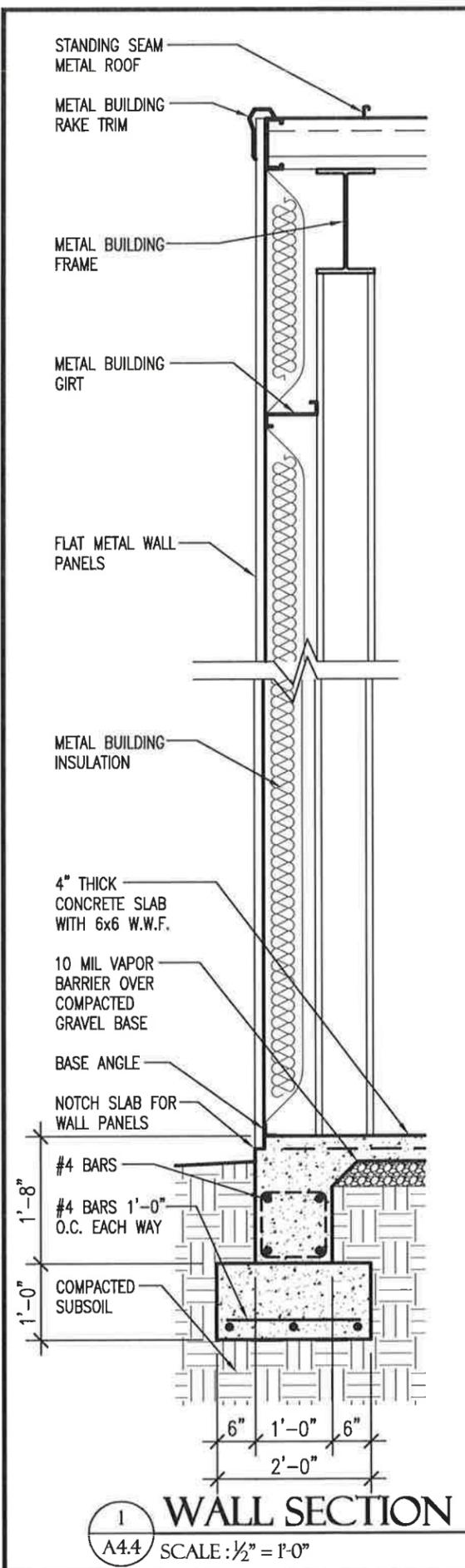
1 WALL SECTION
 A4.3 SCALE: 1/4" = 1'-0"



2 WALL SECTION
 A4.3 SCALE: 1/4" = 1'-0"



3 WALL SECTION
 A4.3 SCALE: 1/4" = 1'-0"



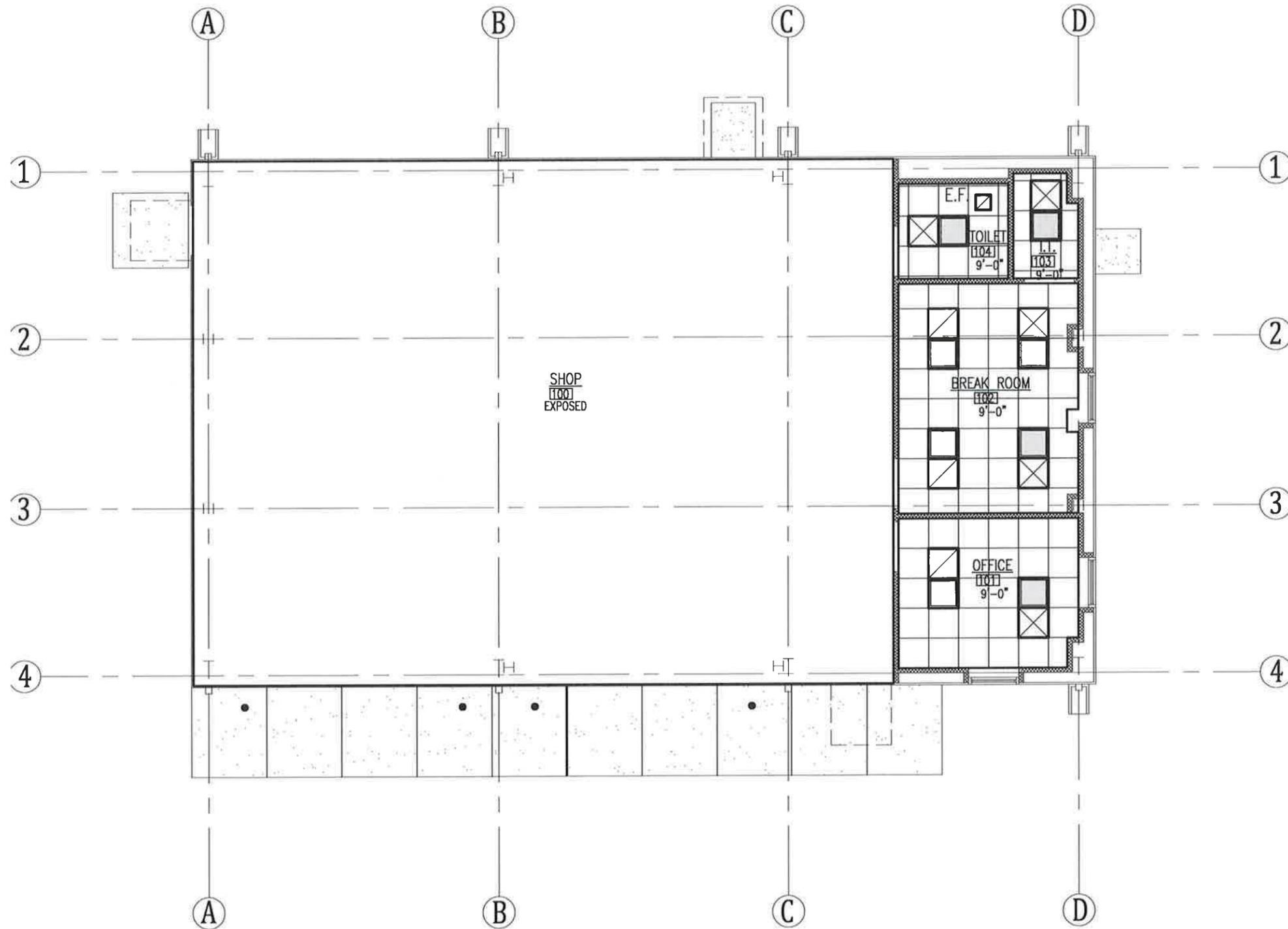
GROUNDS CREW BUILDING
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GROUNDS CREW BUILDING
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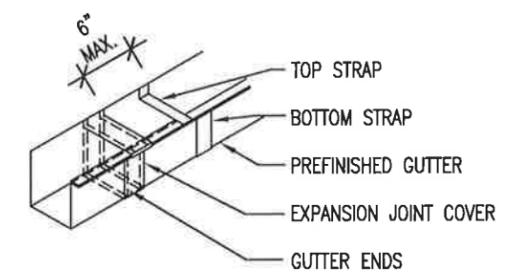
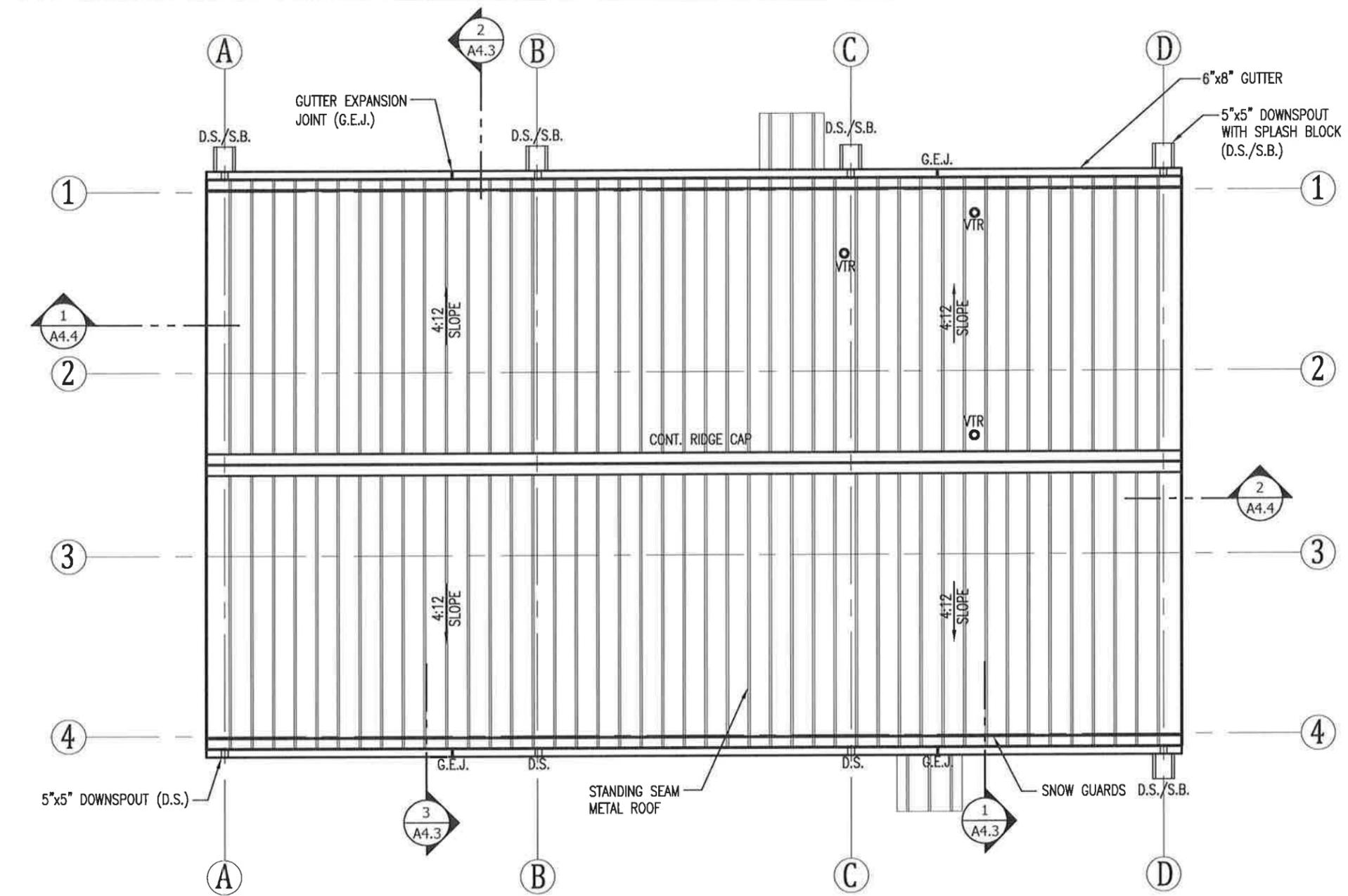
REFLECTED CEILING PLAN
 NORTH 1 A5.1 SCALE: 1/8" = 1'-0"



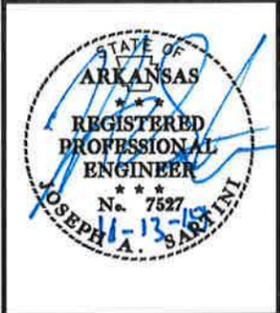
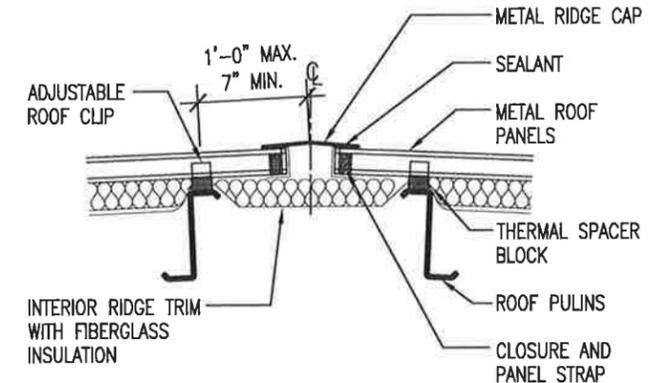
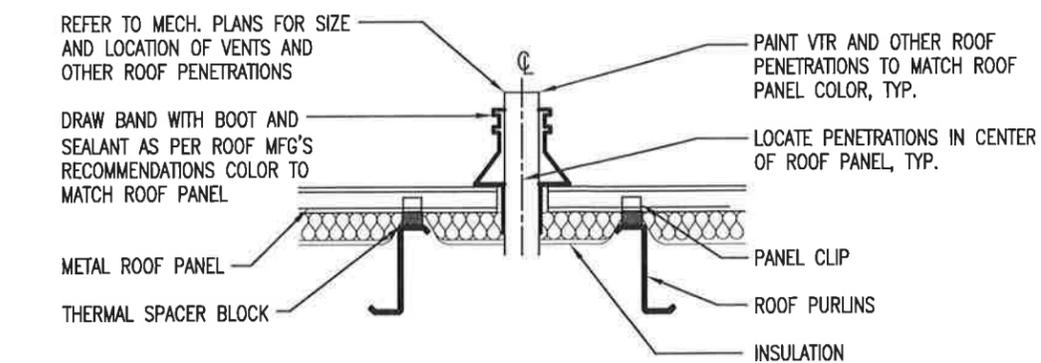
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GROUND'S CREW BUILDING
Little Rock, Arkansas
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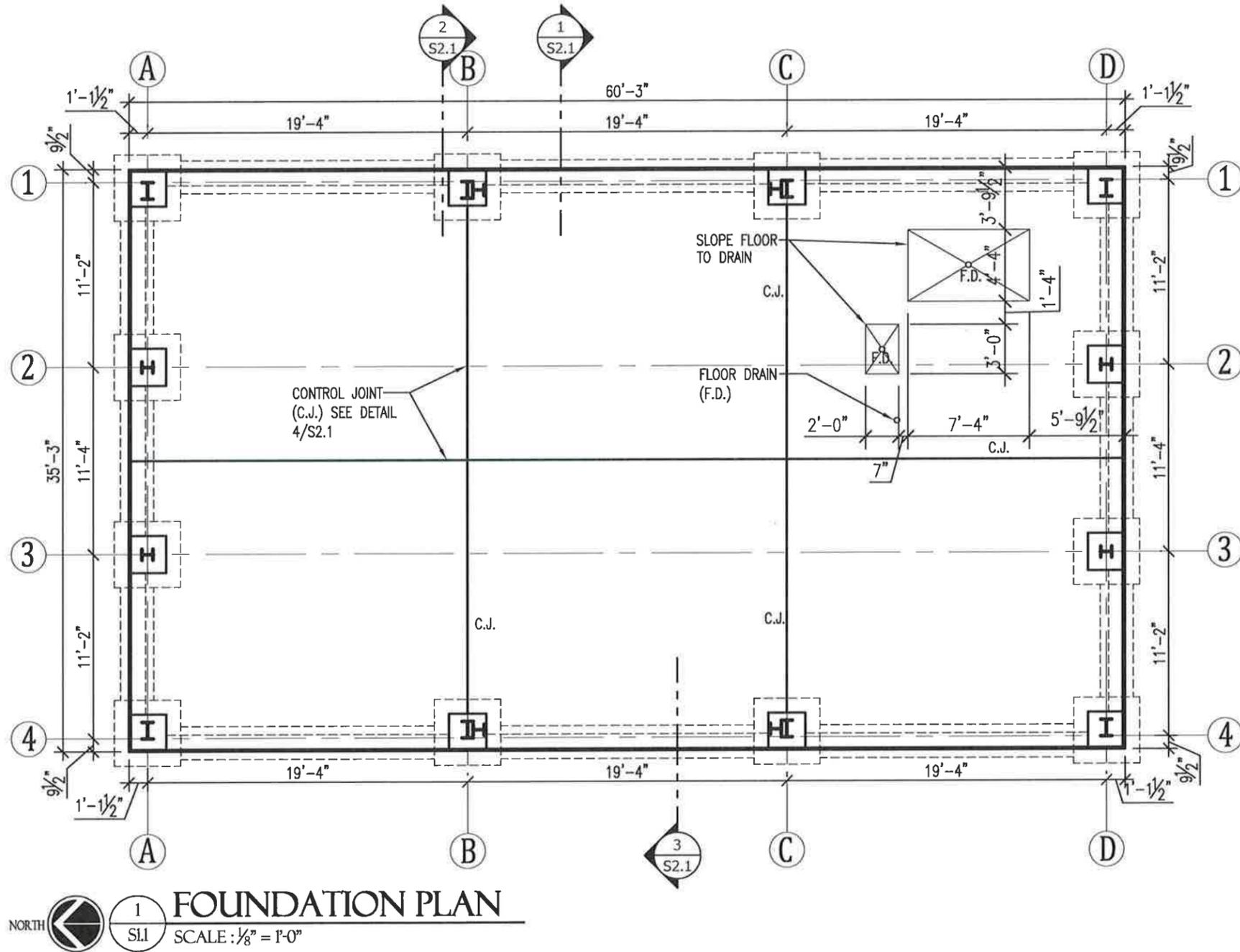


1 ROOF PLAN
SCALE: 1/8" = 1'-0"



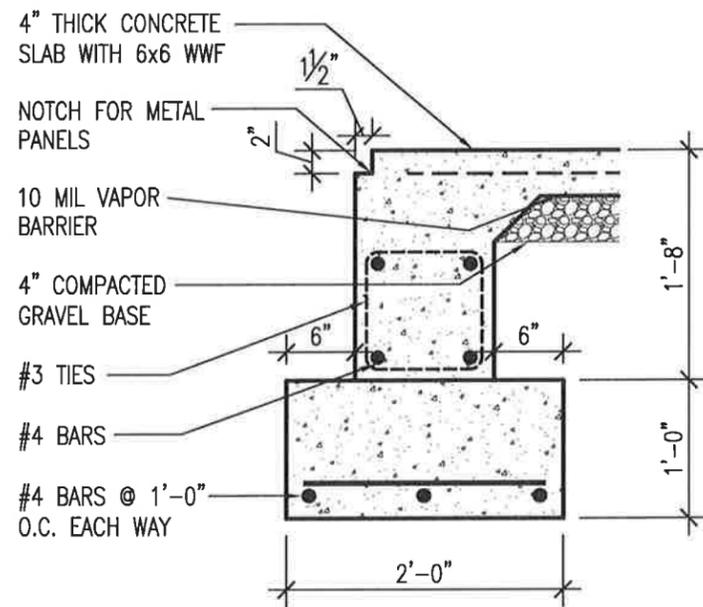
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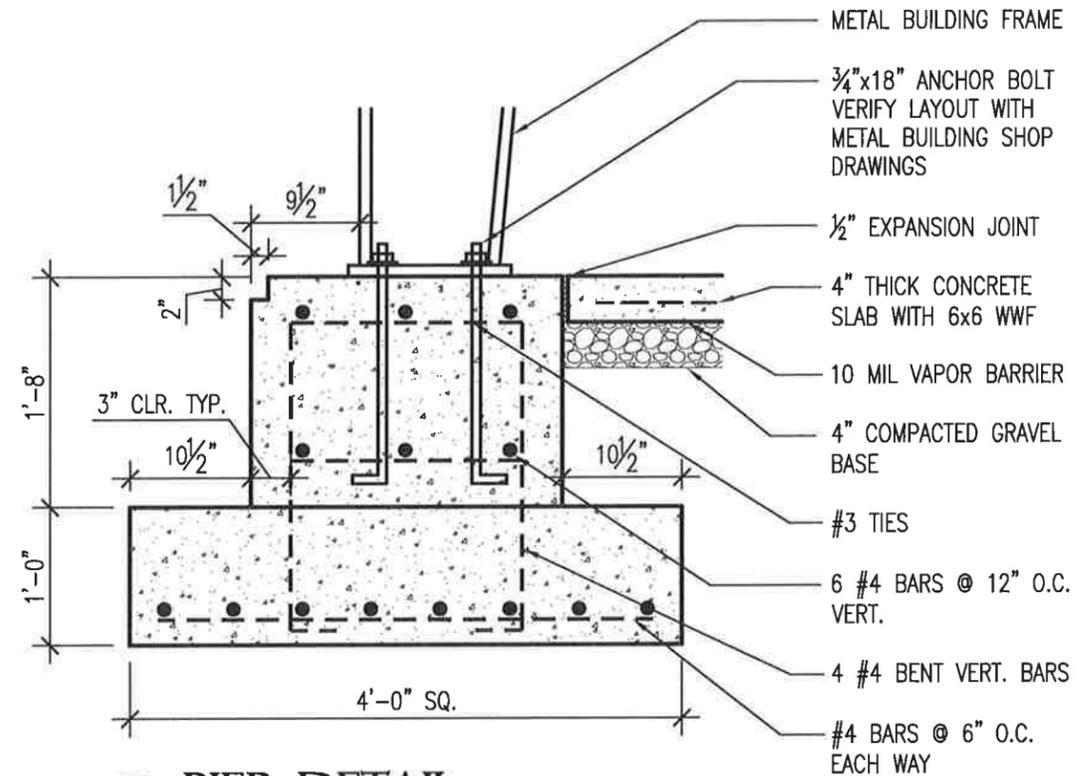


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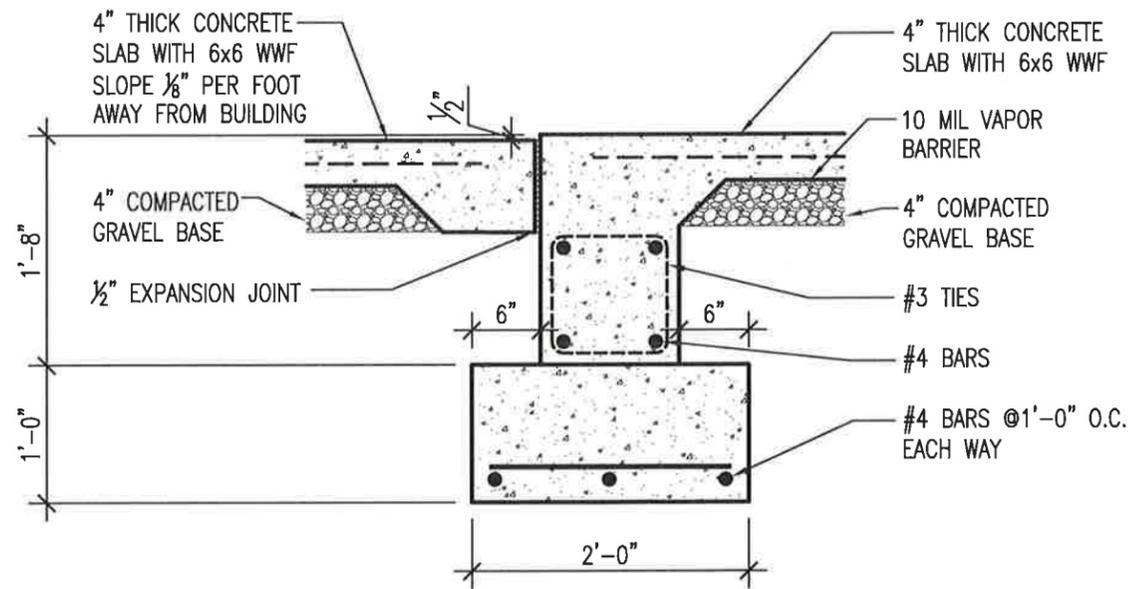
S1.1



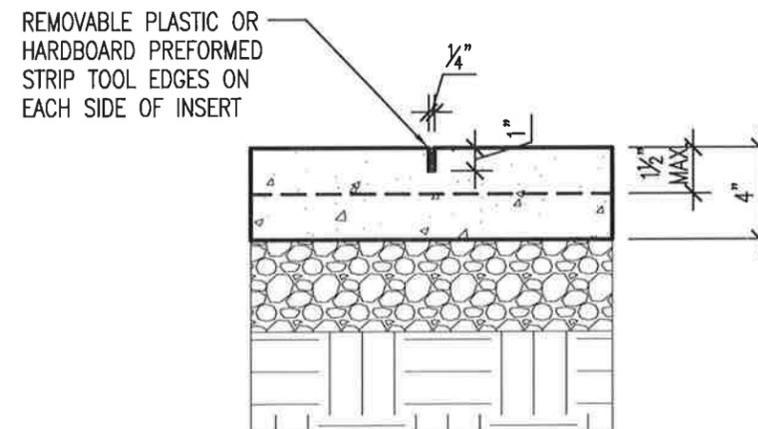
1 FOUNDATION DETAIL
S2.1 SCALE: $\frac{3}{4}'' = 1'-0''$



2 PIER DETAIL
S2.1 SCALE: $\frac{3}{4}'' = 1'-0''$

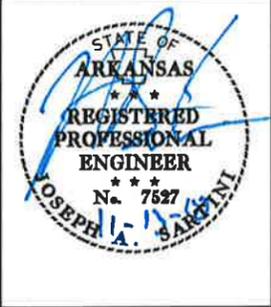


3 FOUNDATION DETAIL
S2.1 SCALE: $\frac{3}{4}'' = 1'-0''$



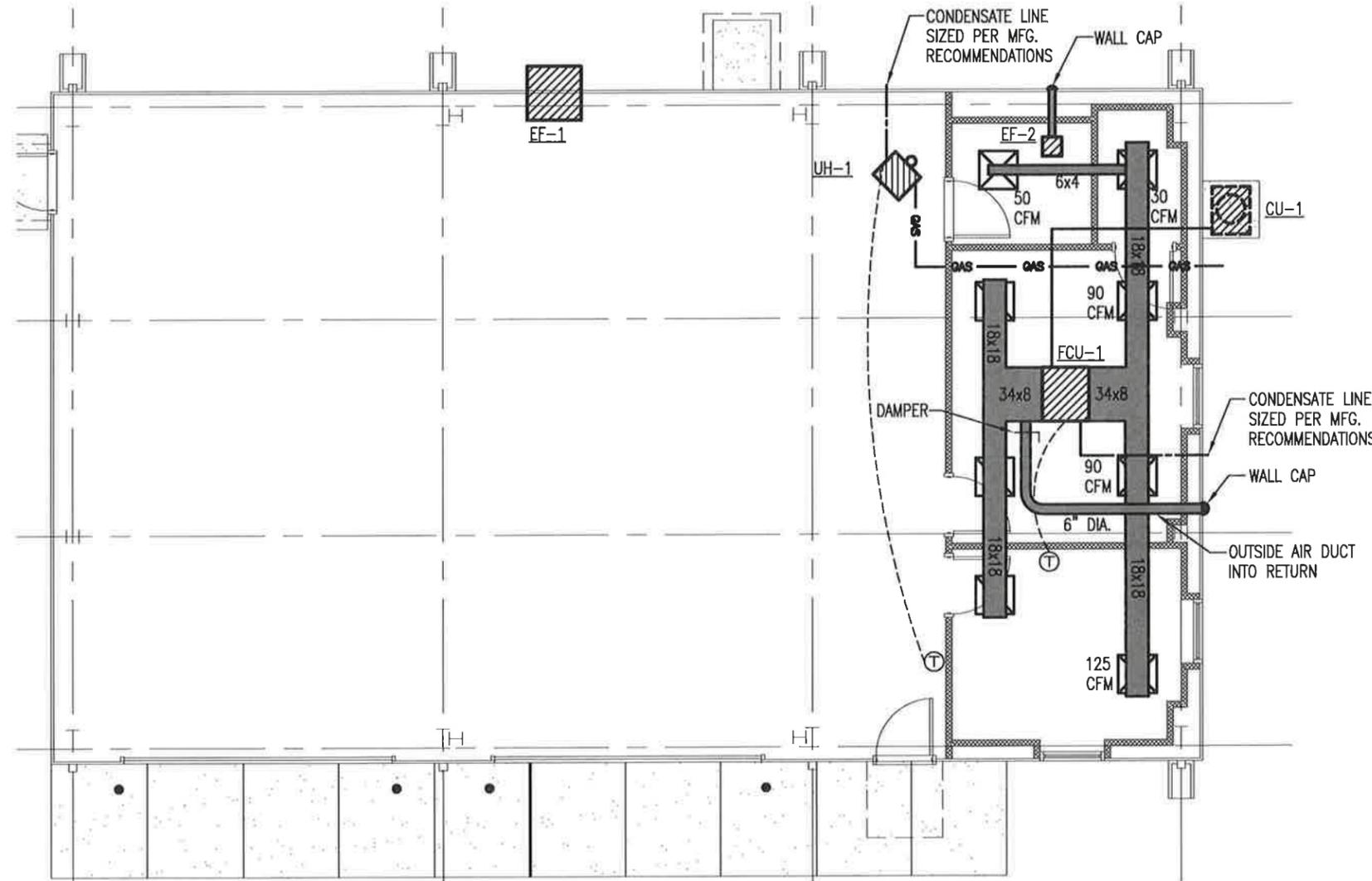
- NOTES:
1. FILL JOINT WITH SEALANT AFTER SLAB HAS CURED
 2. PROVIDE SUPPORT CHAIRS TO HOLD SLAB REINF. IN POSITION DURING CONCRETE PLACEMENT.
 3. SAWCUT JOINTS ARE PERMITTED WITH THE APPROVAL OF THE OWNER'S PROJECT MANAGER ONLY. IF APPROVED SAWCUT JOINTS USING A "SOFF-CUT" MACHINE OR EQUAL IMMEDIATELY AFTER FINISHING SLAB.

4 CONTROL JOINT DETAIL
S2.1 SCALE: $\frac{1}{2}'' = 1'-0''$



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S2.1



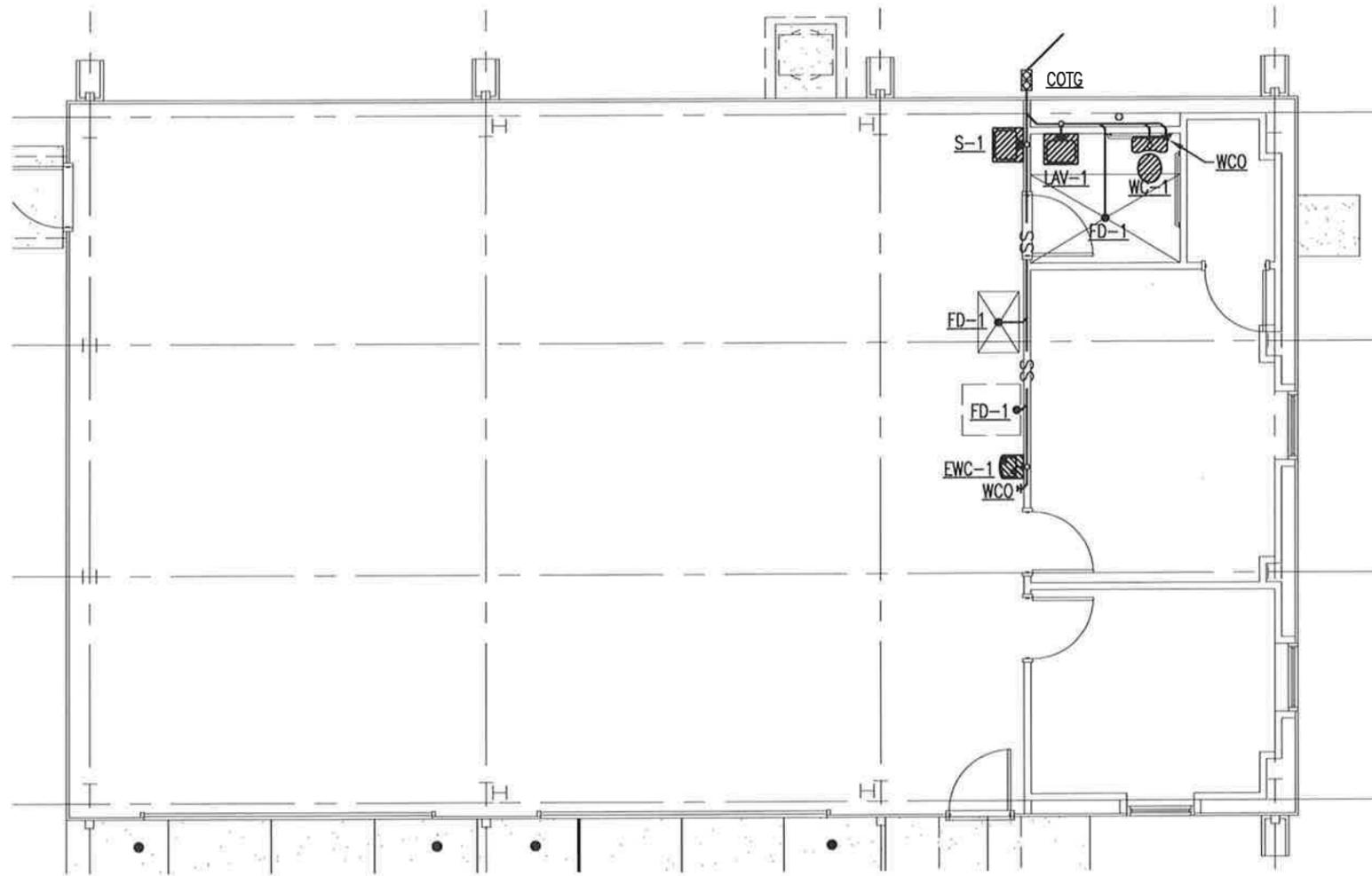
HVAC PLAN
 M1.1 SCALE: 1/8" = 1'-0"
 NORTH

PIPING LEGEND	
SYMBOL	DESCRIPTION
—	REFRIGERANT PIPING
- - -	CONDENSATE PIPING

MECHANICAL EQUIPMENT SCHEDULE			
MARK	MANUFACTURER	MODEL	REMARKS
CU-1	MITSUBISHI ELECTRIC	SUZ-KA15NAR1	PROVIDE LOW AMBIENT
FCU-1	MITSUBISHI ELECTRIC	PEAD-A15AA7	PROVIDE WIRED WALL CONTROLLER AND FILTER RACK
UH-1	MODINE	PTC085SS0111SBAN	
EF-1	GREENHECK	SBE-3L24-7	PROVIDE MOTORIZED DAMPER



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1 SEWER PLAN

SCALE: 1/8" = 1'-0"

NORTH

SEE PLUMBING DWGS FOR CONTINUATION OF GAS LINE

SHUT OFF VALVE

UNIT HEATER

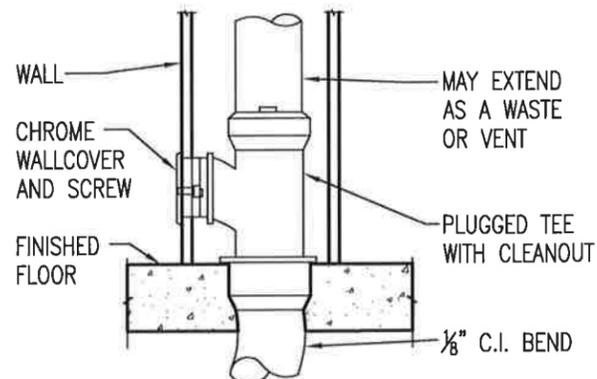
APPROVED GAS VALVE AND FLEX TUBING

COUPLER

3" LONG CAPPED DIR LEG

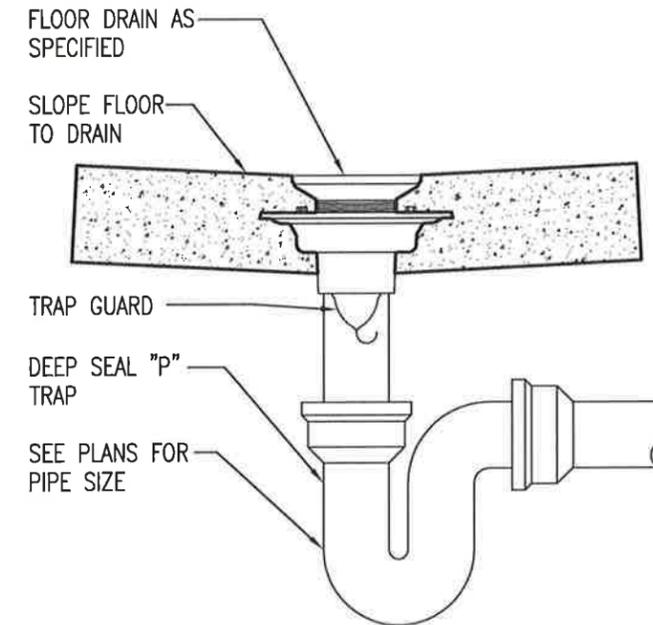
4 GAS HOOK UP DETAIL

SCALE: NO SCALE



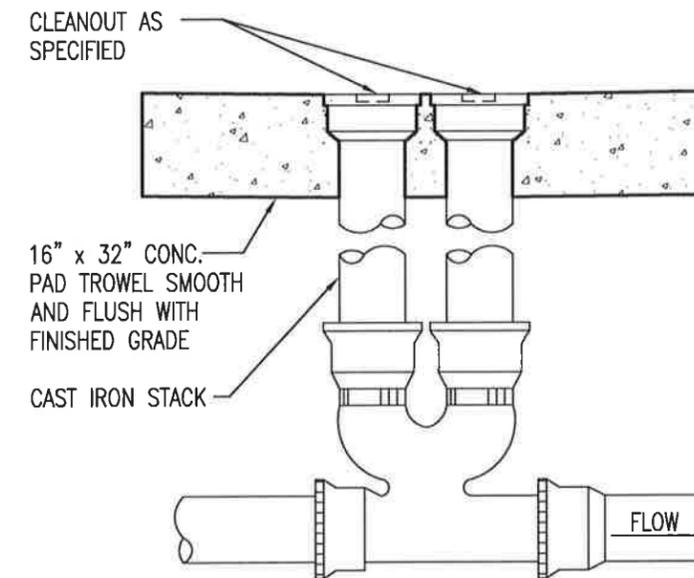
5 WALL CLEANOUT (WCO)

SCALE: NO SCALE



2 FLOOR DRAIN

SCALE: NO SCALE



3 DOUBLE CLEANOUT

SCALE: NO SCALE



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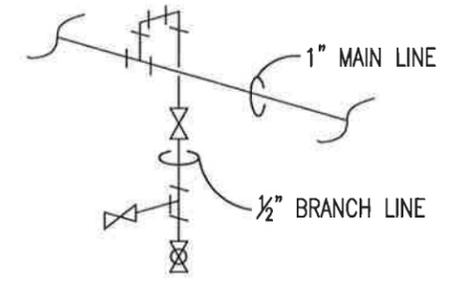
P1.1

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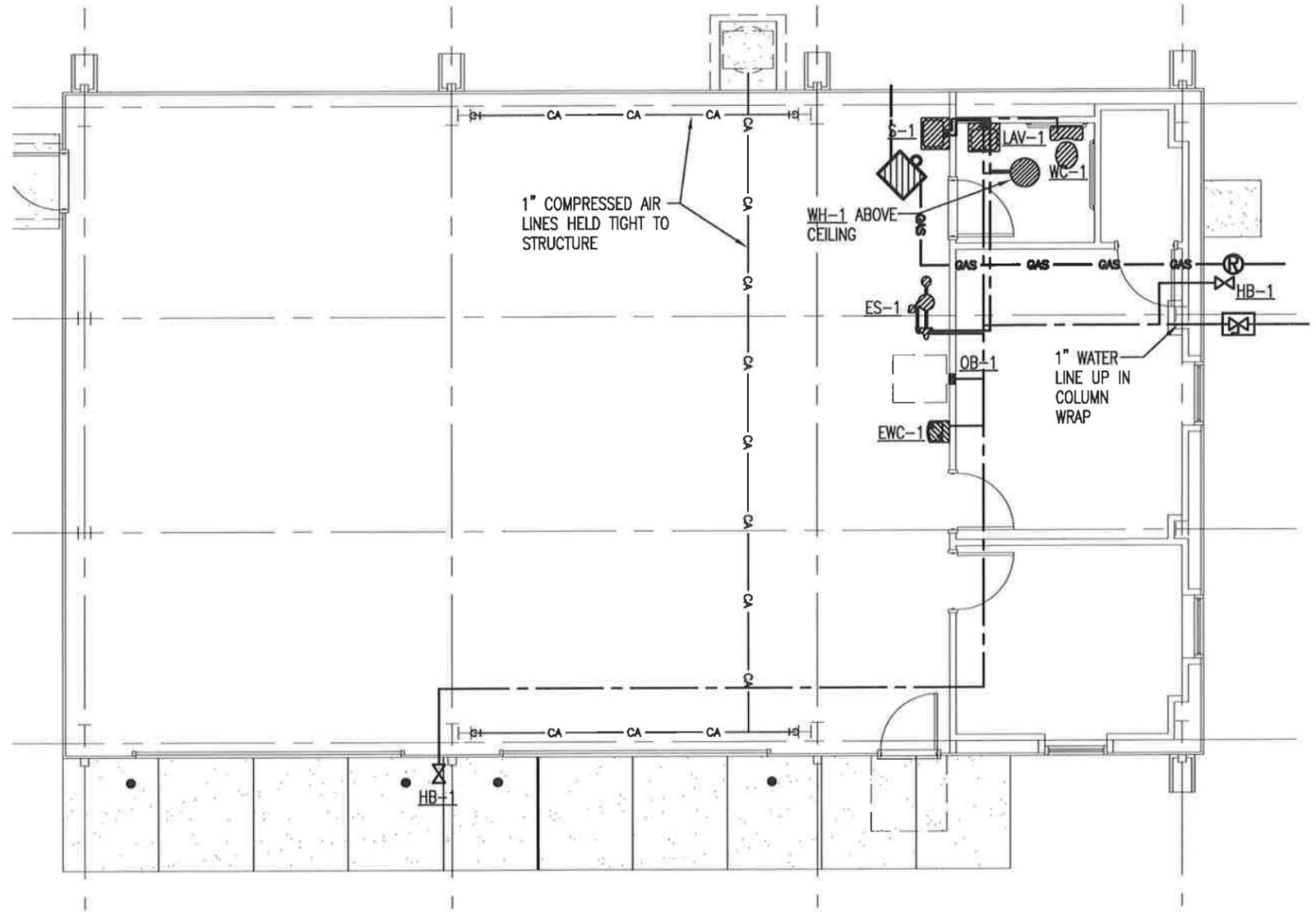
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**COMPRESSED AIR
 BRANCH DETAIL**

2
 P1.2 SCALE: NO SCALE



1 PIPING PLAN

NORTH
 P1.2 SCALE: 1/8" = 1'-0"

PLUMBING FIXTURE SCHEDULE

MARK	MANUFACTURER	MODEL	REMARKS
WC-1	KOHLER OR EQUAL	K-3589-T CIMARRON COMFORT HEIGHT 1.6 GPF TOILET WITH K-4636 CACHET QUIET-CLOSE ELONGATED TOILET SEAT	RIM SHALL BE MOUNTED AT 17" A.F.F.
LAV-1	KOHLER OR EQUAL	K-2005 KINGSTON WALL-MOUNT BATHROOM SINK WITH K-97282-4 JULY SINGLE-HOLE COMMERCIAL FAUCET, K-8998 P-TRAP	RIM SHALL BE MOUNTED AT 34" A.F.F. PROVIDE CONCEALED CARRIER AND ADA COMPLIANT INSULATION WRAP ON EXPOSED PIPING AND DRAIN
S-1	KOHLER OR EQUAL	K-6716 BANNON WALL MOUNTED SERVICE SINK WITH K-6673 ADJUSTABLE TRAP, K-8905 FAUCET AND K-8801 STRAINER	
EWC-1	ELKAY	EZS8L 120 VOLT WALL MOUNTED BARRIER FREE DRINKING FOUNTAIN	SPOUT SHALL BE MOUNTED AT 36" A.F.F.
FD-1	WADE	1100STD CAST IRON FLOOR DRAIN WITH FLANGE, 1/2" PRIMER TAP, 5"DIA. NICKEL BRONZE STRAINER AND "P" TRAP WITH MODEL SS2009V TRAP SEALER BY RECTORSEAL	
WH-1	EXISTING	REUSE EXISTING WATER HEATER	
ES-1	HAWS	8320-8325 COMBINATION SHOWER AND EYE/FACE WASH WITH AXION MSR PROVIDE WATTS LFMMV MIXING VALVE	
OB-1	IPS CORPORATION	MDWB1AB ICE MACHINE OUTLET BOX W/ 3/8" OUTLET QTR. TURN VALVE 1/2" SWEAT / WITH ARRESTER	
HB-1	McMASTER-CARR	2947K5 HIGH FLOW FAUCET ONE T-HANDLE, HOT OR COLD WATER, 3/4" NPT MALE INLET	
COTG	WADE	6000Z CAST IRON CLEANOUT WITH THREADED ADJUSTABLE HOUSING, FLANGED FERRULE WITH ROUND SCORIATED CAST IRON TRACTOR TYPE COVER.	



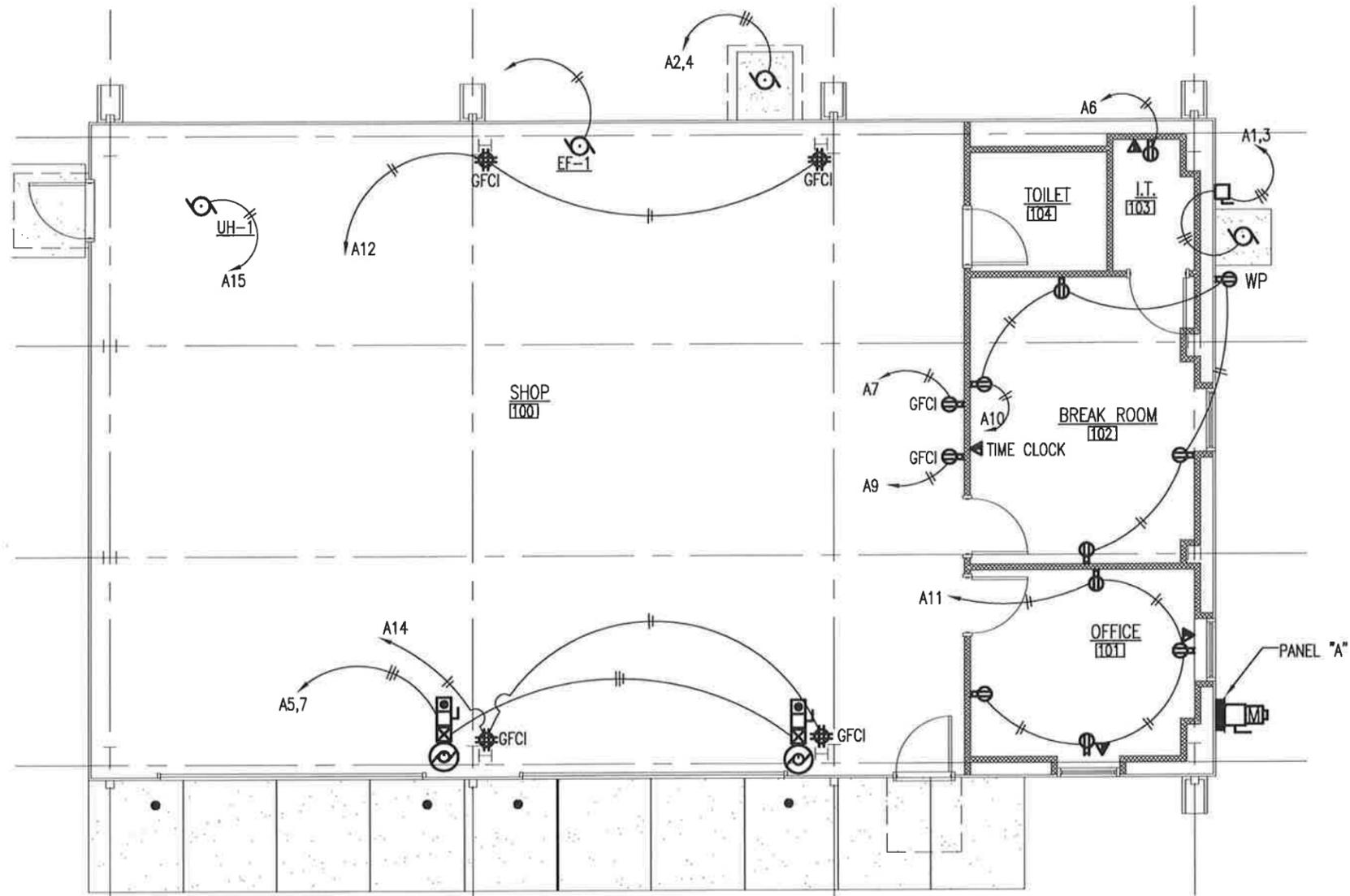
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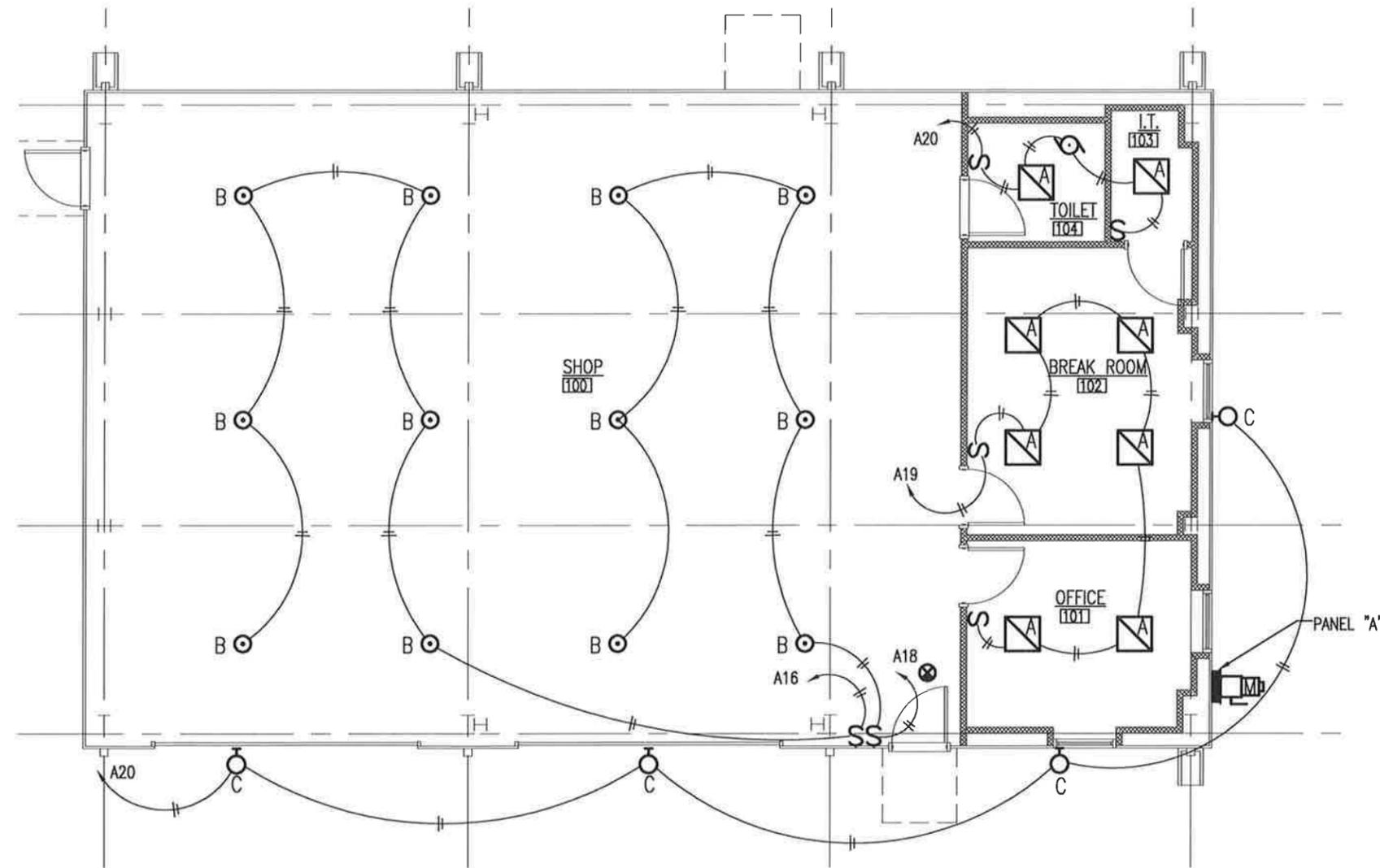
1 POWER PLAN
 NORTH E1.1 SCALE: 1/8" = 1'-0"



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1 LIGHTING PLAN
 NORTH EL2 SCALE: 1/8" = 1'-0"



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E1.2

PANELBOARD: A	VOLTAGE: 120/240V, 1 ϕ , 3W	BUS RATING: 200A	MAIN: LUGS ONLY
LOCATION: SHOP 100	MFG. AND TYPE: SQ-D TYPE NQOD	EQUIP. GRD. BUS: YES	ISOL. GRD. BUS: NO
MOUNTING: SURFACE	ENCLOSURE: NEMA 1	MINIMUM A.I.C. RATING: 22K	FED FROM:
SERVES		SERVES	
CU-1	2 20	1 3	AIR COMPRESSOR
SECTIONAL DOORS	1 30	5 7	RECPT. I.T. 103
ICE MACHINE	1 20	9	RECPT. BREAK ROOM 102
RECPT. OFFICE 101	1 20	11	RECPT. SHOP 100
UH-1	1 20	13	RECPT. SHOP 100
RECPT. OFFICE 101	1 20	15	LIGHTS SHOP 100
RECPT. OFFICE 101	1 20	17	LIGHTS SHOP 100
LIGHTS OFFICE 101 AND BREAK ROOM 102	1 20	19	LIGHTS I.T. 103 AND TOILET 104
SPARE		21	SPARE
		23	
		25	
		27	
		29	

ELECTRICAL SYMBOL LEGEND			
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
S	SWITCH		METER
S ₃	THREE WAY SWITCH		COMBINATION TELEPHONE AND DATA OUTLET
	110V DUPLEX OUTLET		PUSH BUTTON CONTROL
	110V QUADPLEX OUTLET		MOTOR CONTROL BOX
	110V DUPLEX OUTLET IN FLUSH MTD. FLOOR BOX		DISCONNECT
	110V QUADPLEX OUTLET IN FLUSH MTD. FLOOR BOX		AUTOMATIC TRANSFER SWITCH
	110V GROUND FAULT CIRCUIT INTERRUPTER		MOTOR
	110V WEATHER PROOF OUTLET		SQUARE JUNCTION BOX
	220V OUTLET		ROUND JUNCTION BOX
	4x4 BOX RADIO OUTLET		42" FIVE BLADE HARBOR BREEZE CEILING FAN W/O LIGHT KIT
	THERMOSTAT		

LIGHT FIXTURE SCHEDULE			
MARK	MANUFACTURER	MODEL	REMARKS
A	LITHONIA OR EQUAL	2VTL 40L EZ1 LP840 N80	2x2 LED ARCHITECTURAL TROFFER
B	LITHONIA OR EQUAL	IBG 18000LM SEF PCL WD MVOLT OZ10 40K 70CRI WGX XAD DWH	BOTTOM AT 12'-0" A.F.F.
C	LITHONIA OR EQUAL	TWR2 LED 1 50K MVOLT DDB	BOTTOM AT 11'-0" A.F.F. WITH PHOTOCELL
D	LITHONIA OR EQUAL	ECBR LED M6	WALL MOUNTED

LIGHTING SYMBOL LEGEND	
SYMBOL	DESCRIPTION
	2x2 LED FIXTURE
	2x4 LED FIXTURE
	4' STRIP LED FIXTURE
	HIGH BAY LED FIXTURE
	LED EXTERIOR WALL PACK
	EMERGENCY LIGHTING



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E2.1