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**BID NUMBER:** I.F.B. 17-524-RAD  
**PROJECT:** INFRASTRUCTURE & NEW CONSTRUCTION  
**LOCATION:** Uplands Townhomes, Pueblo, Colorado

## **INVITATION FOR BIDDERS**

The El Centro Pueblo Development Corp. and the Housing Authority of the City of Pueblo will receive bids for the **Infrastructure & New Construction of 72 Units for Uplands Townhomes in Pueblo, Colorado.**

**Bids will be received until Wednesday, May 24, 2017 at 11:00 a.m.** Mountain Time at the Owner's chosen location at **201 S. Victoria Avenue, Pueblo, Colorado.** All bids received by the date and time of receipt specified will be publicly opened and read.

A pre-bid conference and Contractor walk-thru will be conducted @ **10:00 a.m. Mountain Time on Thursday, April 27, 2017** starting at the Owner's chosen location at **201 S. Victoria, Pueblo, Colorado.** All bidders are encouraged to attend.

The El Centro Pueblo Development Corp. and the Housing Authority of the City of Pueblo reserve the right to reject any or all bids and to waive informalities in the bid specifications.

### **THE PROPOSED BID PACKAGE SHALL CONTAIN THE FOLLOWING:**

1. **BID SECURITY**, is required according to Article 9 of the Instructions to Bidders.
2. **NON-COLLUSIVE AFFIDAVIT** is to be signed and notarized.
3. **BID PROPOSAL FORM**, (2) copies signed, attested, and sealed if applicable. Copies provided in the specifications.

**NOTE: Bid Proposal form shall also contain:**

- 1) Amount of bid
- 2) Calendar days to complete the work
- 3) Acknowledgment of the receipt of the Addenda
- 4) Form and amount of bid security
- 5) Unit pricing and alternates as required.

**NOTE:** 1) **THE BID PACKAGE SHALL BE ENCLOSED IN A SEALED ENVELOPE AND CLEARLY MARKED WITH THE BID NO. (I.F.B. 17-524-RAD), ALONG WITH THE CONTRACTOR'S NAME AND ADDRESS.**



**BID NUMBER: I.F.B. 17-524-RAD**  
**PROJECT: Infrastructure & New Construction of 72 Units**  
**LOCATION: Uplands Townhomes, Pueblo, Colorado**

## **INFORMATION FOR BIDDERS**

### **A. PLANS AND SPECIFICATIONS**

1. A complete bid proposal package for all portions of the work will be on deposit at the following location and may be examined by Contractors, Sub-Contractors, and Material Suppliers:

Office of the Owner: El Centro Pueblo Development Corp.  
201 S. Victoria Avenue  
Pueblo, CO 81003  
Attn: Cindy A. Bowles, P&D Admin. Asst.

2. The Owner will require a non-refundable deposit of **\$5 for a formatted disk of all specifications and drawings.** It is intended that any printing of the specifications and drawings shall be the responsibility of the contractor.

### **B. GENERAL INFORMATION**

1. Successful Bidder will provide the following documents to the Owner prior to the execution of the Contract:

- \* Assurance of Completion - According to Article 11 of the General Conditions
- \* City of Pueblo Contractor's License Copy
- \* Insurance Certificates - According to Article 11 of the General Conditions

**\* NOTE: Owner's responsibility regarding insurance under subparagraph 11.3.1.1 of the General Conditions**

2. The Bidder will, within **seven (7) days** after the Notice of Award, submit proprietary names of suppliers and sub-contractors according to Article 6 of the Instructions to Bidders.
3. City of Pueblo taxes, County of Pueblo taxes, and State of Colorado taxes are to be paid by the Contractor. (See Article 3.6 of the General Conditions.). The City of Pueblo requires a pre-payment of a portion of the city sales and use tax, (see Article 3.6.7 of the General Conditions).

4. Contractor to pay for all permits (See Article 3.7 of the General Conditions.). **The owner has pre-paid a plan review fee of \$13,010. And this sum shall be deducted from the Pueblo Regional Building construction permit fee.**
5. Contractor shall exercise due care for the safety of employees and residents.
6. Owner shall pay for all tap fees, plant water, investment fees, and water meter set fees (See Article 3.7.1 of the General Conditions.), gas meter and set fees (See Article 3.7..2 of the General Conditions.),and electrical meter, installation and set fees (See Article 3.7.3 of the General Conditions.).
7. All laborers and mechanics employed under this contract in the development or construction of the project shall be subject to the prevailing wage (see Article 13.9 of the General Conditions Labor Standards – Davis Bacon).
8. The work to be performed under this Contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (see Article 13.8 CFR Part 135.38 Section 3 Clause). Contractors should not that a minimum requirement for employment of low and very low-income recipients shall be (10) fulltime positions. A pool of certified applicants shall be provided to the contractor for employment in the project.

**WARNING: The above information is provided for general reference only. Prospective bidders are directed to review in detail the Contract Documents in order to determine the specific requirements of the Contract. To the extent, if any, that inconsistencies exist between this information and the Contract Documents, the Contract Documents shall control. All bids should be based upon the information contained and reasonably inferable from the Contract Documents. (The Information for Bidders shall not be part of the Contract between the parties).**



## **Instructions to Bidders**

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## CONSTRUCTION PROCEDURES

### INSTRUCTIONS TO BIDDERS

#### **ARTICLE** **DEFINITIONS**

**1.1** Bidding documents include the Invitation to Bid, Instructions to Bidders, the bid form, and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.

**1.2** All definitions set forth in the General Conditions of the Contract for Construction, or in other Contract Documents are applicable to the Bidding Documents.

**1.3** Addenda written or graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the bidding Documents by additions, deletions, clarifications or corrections.

**1.4** A Bid is a complete and properly signed proposal to do the Work or designated portion thereof for the sums stipulated therein, submitted in accordance with the Bidding Documents.

**1.5** The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which work may be added or from which work may be deleted for sums stated in Alternate Bids.

**1.6** An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

**1.7** A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials or services as described in the Bidding Documents or in the proposed Contract Documents.

**1.8** A Bidder is a person or entity who submits a Bid.

**1.9** A Sub-bidder is a person or entity who submits a bid to a Bidder for materials or labor for a portion of the Work.

#### **ARTICLE 2** **BIDDER'S REPRESENTATIONS**

**2.1** Each Bidder by making his Bid represents that:

**2.1.1** He has read and understands the Bidding Documents and his Bid is made in accordance therewith.

**2.1.2** The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, for other portions of the Project, if any, being bid concurrently or presently under construction.

**2.1.3** He has visited the site, has familiarized himself with the local conditions under which the Work is to be performed and has correlated his observations with the requirements of the proposed Contract Documents.

**2.1.4** His Bid is based upon the materials, systems and equipment required by the Bidding Documents without exception.

**ARTICLE 3**  
**BIDDING DOCUMENTS**

**3.1 COPIES**

**3.1.1** Bidders may obtain complete sets of the Bidding Documents from the issuing office designated in the Information for Bidders in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Bidders who submit a bonafide Bid and return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of any missing or damaged documents will be deducted from the deposit. Any Bidding Documents not returned within 60 days will cause the deposit to be forfeited. A Bidder receiving a Contract award may retain the Bidding Documents and his deposit will be refunded.

**3.1.2** Bidding Documents will not be issued directly to sub-bidders or others unless specifically offered in the Advertisement or Invitation to Bid.

**3.1.3** Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor the Architect assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

**3.1.4** In making copies of the bidding Documents available on the above terms, the Owner and the Architect do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant permission for any other use of the Bidding Documents.

**3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS**

**3.2.1** The bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.

**3.2.2** Bidders and sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect at least five days prior to the date for receipt of Bids.

**3.2.3** Any interpretation, correction or change of the Bidding Documents will be made by the Addendum. Interpretations, corrections or changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon such interpretations, corrections and changes.

**3.3 SUBSTITUTIONS**

**3.3.1** The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

**3.3.2** No substitution will be allowed unless Article 3.3 is followed. The Owner reserves the right to maintain a proprietary specification on certain products. It is the responsibility of the Bidder to verify if any substitution is allowed. No substitution will be considered after the Contract award unless specifically provided in the Contract Documents.

**3.3.3** If the Architect approves any proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.

**3.3.4** No substitutions will be considered after the Contract award unless specifically provided in the Contract Documents.

**3.3.5** The Owner reserves the right to maintain a proprietary specification on certain products. It is the responsibility of the bidder to verify if any substitution is allowed.

#### **3.4 ADDENDA**

**3.4.1** Addenda will be mailed or delivered to all who are known by the Architect to have received a complete set of Bidding Documents.

**3.4.2** Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

**3.4.3** No Addenda will be issued later than four days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

**3.4.4** Each Bidder shall ascertain prior to submitting his bid that he has received all Addenda issued, and he shall acknowledge their receipt in his Bid.

### **ARTICLE 4**

## **BIDDING PROCEDURE**

### **4.1 FORM AND STYLE OF BIDS**

**4.1.1** Bids shall be submitted on forms identical to the form included with the Bidding Documents. (2) copies signed and attested (sealed if applicable).

**4.1.2** All blanks on the Bid Proposal Form shall be filled in by typewriter or manually in ink.

**4.1.3** Where so indicated by the makeup of the Bid Proposal Form, sums shall be expressed in both words and figures, and in case of discrepancy between the two, the amount written in words shall govern.

**4.1.4** Any interlineation, alteration or erasure must be initialed by the signer of the Bid.

**4.1.5** All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change."

**4.1.6** Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of his bid security, state his refusal to accept award of less than the combination of Bids he so stipulates. The Bidder shall make no additional stipulations on the Bid Proposal Form nor qualify his Bid in any other manner.

**4.1.7** Each copy of the Bid shall include the legal name of the Bidder and a statement that the Bidder is a sole proprietor, a partnership, a corporation, or some other legal entity. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall

further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

## **4.2 BID SECURITY**

**4.2.1** Bid security shall be forfeited to the Owner as liquidated damages, not as a penalty.

**4.2.2** A surety bond is required it shall be written on AIA Document A310, Bid Bond, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of his Power of Attorney. Power of Attorney shall be similar to the form provided in the Bidding Documents.

**4.2.3** The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn, or (c) all Bids have been rejected.

## **4.3 SUBMISSION OF BIDS**

**4.3.1** all copies of the Bid, the bid security, if any, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the Owner receiving the Bids and shall be identified with the Bid number, Project name, the Bidder's name and address and the designated portion of the work for which the Bid is submitted. If the Bid is sent by mail the sealed envelope shall be enclosed in a separate mailing envelope

with the notation "SEALED BID ENCLOSED"

on the face thereof.

**4.3.2** Bids shall be deposited at the designated location prior to the time and date for receipt of Bids indicated in the Advertisement or Invitation to Bid, or any extension thereof made by Addendum. Bids received after the time and date for receipt of Bids will be returned unopened.

**4.3.3** Oral, telephonic or telegraphic Bids are invalid and will not receive consideration.

**4.3.4** The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of bids.

## **4.4 MODIFICATION OR WITHDRAWAL OF BID**

**4.4.1** A Bid may not be modified, withdrawn or cancelled by the Bidder during the stipulated time period following the time and date designated for the receipt of bids, and each Bidder so agrees in submitting his Bid.

**4.4.2** Prior to the time and date designated for receipt of Bids, any Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder or by telegram; if by telegram, written confirmation over the signature of the Bidder shall be mailed and postmarked on or before the date and time set for receipt of Bids, and it shall be so worded as not to reveal the amount of the original Bid.

**4.4.3** Withdrawn Bids may be resubmitted up to the time designated for the receipt of Bids provided that they are fully in conformance with these Instructions to

Bidders.

**4.4.4** Bid security shall be in an amount sufficient for the Bid as modified or resubmitted.

## **ARTICLE 5** **CONSIDERATION OF BIDS**

### **5.1 OPENING OF BIDS**

**5.1.1** Unless stated otherwise in the Advertisement or Invitation to Bid, the properly identified Bids received on time will be opened publicly and will be read aloud. An abstract of the Base Bids and Alternate Bids, if any, will be made available to Bidders. When it has been stated that Bids will be opened privately, an abstract of the same information may, at the discretion of the Owner, be made available to the Bidders within a reasonable time.

### **5.2 REJECTION OF BIDS**

**5.2.1** The Owner shall have the right to reject any or all Bids and to reject a Bid not accompanied by any required bid security or by other data required by the Bidding Documents, or to reject a Bid which is in any way incomplete or irregular.

### **5.3 ACCEPTANCE OF BID (AWARD)**

**5.3.1** It is the intent of the Owner to award a Contract to the lowest responsible Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive any informality or irregularity in any Bid or Bids received and to accept the Bid or Bids which, in his judgement, is in his own best interest.

**5.3.2** The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in Article 9, and to determine the low Bidder on the basis of the sum of the Base Bid and the Alternates accepted.

## **ARTICLE 6** **POST BID INFORMATION**

### **6.1 SUBMITTALS**

**6.1.1** The Bidder shall, within seven days after notification of selection for the award of a Contract for the Work, submit the following information to the Architect:

- .1** a designation of the Work to be performed by the Bidder with his own forces;
- .2** the proprietary names and the suppliers of principal items or systems of materials and equipment proposed for the Work;
- .3** a list of names of the sub-contractors or other persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the work.

**6.1.2** The Bidder will be required to establish to the satisfaction of the Architect and the Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

**6.1.3** Prior to the award of the Contract, the Architect will notify the Bidder in writing if either the Owner or the Architect, after due investigation, has reasonable objection to any such proposed person or entity. If the Owner or Architect has reasonable objection to any such proposed person or entity, the

Bidder may, at his option, (1) withdraw his Bid, or (2) submit an acceptable substitute person or entity with an adjustment in his bid price to cover the difference in cost occasioned by such substitution. The Owner may, at his discretion, accept the adjusted bid price or he may disqualify the Bidder. In the event of either withdrawal or disqualification under this subparagraph, bid security will not be forfeited, notwithstanding the provisions of Paragraph 4.4.1.

**6.1.4** Persons and entities proposed by the Bidder and to whom the Owner and the Architect have made no reasonable objection under the provisions of subparagraph 6.3.3 must be used on the work for which they were proposed and shall not be changed except with the written consent of the Owner and the Architect.

## **ARTICLE 7** **ASSURANCE OF COMPLETION**

### **7.1 BOND**

**7.1.1** Prior to execution of the Contract, the Bidder shall furnish an Assurance of Completion prior to the execution of any Contract under this solicitation. This Assurance may be one of the following:

- a. A performance and payment bond 100 percent of the contract price, or, as may be required or permitted by State law;
- b. A 50% performance bond and a 50% payment bond the total shall be 100% of the contract price.

### **7.2 TIME OF DELIVERY AND FORM OF ASSURANCE OF COMPLETION**

**7.2.1** The Bidder shall deliver the required Assurance of Completion to the Owner no later than the date of execution of the

contract, or if the Work is to be commenced prior thereto in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such Assurance of Completion will be furnished.

**7.2.2** The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of his power of attorney.

## **ARTICLE 8**

### **FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR**

#### **8.1 FORM TO BE USED**

**8.1.1** The Agreement for the Work will be written on the Form Agreement Between Owner and Contractor, where the basis of payment is a Stipulated Sum. Sample as provided in the project manual.





**FORM OF NON-COLLUSIVE AFFIDAVIT**

**(PRIME BIDDER)**

State of Colorado)ss.

County of Pueblo)

\_\_\_\_\_, being first duly sworn deposes and say:

That he is \_\_\_\_\_

The party making the foregoing proposal or bid, that such proposal or bid is genuine and not collusive or sham; that said bidder has not colluded, conspired, connived or agreed, directly or indirectly, with any bidder or person, to put in a sham bid or to refrain from bidding, and has not in any manner, directly or indirectly sought by agreement or collusion or communication or conference, with any person, to fix the bid price of affiant or of any other bidder, or to fix any overhead, profit or cost element of said bid price or of that of any other bidder, or to secure any advantage against the Pueblo Housing Authority or any person interested in the proposed Contract; and that all statements in said proposal or bid are true.

Signature of:

Bidder, if the bidder is an individual: \_\_\_\_\_

Partner, if the bidder is a partnership: \_\_\_\_\_

Officer, if the bidder is a corporation: \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_

day of \_\_\_\_\_, 20\_\_\_\_\_

My commission expires \_\_\_\_\_, 20\_\_\_\_\_

\_\_\_\_\_  
NOTARY



General Decision Number: CO170014 04/07/2017 CO14

Superseded General Decision Number: CO20160014

State: Colorado

Construction Type: Residential

Counties: Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, El Paso, Jefferson, Larimer, Mesa, Pueblo and Weld Counties in Colorado.

RESIDENTIAL CONSTRUCTION PROJECTS (consisting of single family homes and apartments up to and including 4 stories)

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.20 for calendar year 2017 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.20 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2017. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Modification Number	Publication Date
0	01/06/2017
1	01/13/2017
2	01/20/2017
3	04/07/2017

BRC00007-007 01/01/2017

ADAMS, ARAPAHOE, BOULDER, BROOMFIELD, DENVER, DOUGLAS AND JEFFERSON COUNTIES

	Rates	Fringes
BRICKLAYER.....	\$ 25.44	7.71

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ELEC0012-007 09/01/2016

PUEBLO COUNTY

	Rates	Fringes
ELECTRICIAN (Including Low Voltage Wiring and Installation of Fire Alarms, Security Systems and Communications Systems) Electrical contract over \$1,000,000.....	\$ 28.00	11.00+3%

Electrical contract under  
 \$1,000,000.....\$ 24.85                    11.00+3%

ELEC0068-014 01/01/2017

ADAMS, ARAPAHOE, BOULDER, BROOMFIELD, DENVER, DOUGLAS,  
 JEFFERSON, LARIMER, AND WELD COUNTIES

Rates                    Fringes

ELECTRICIAN  
 (Including Low Voltage  
 Wiring and Installation of  
 Fire Alarms, Security  
 Systems and Communication  
 Systems).....\$ 26.14                    8.86

ELEC0113-007 06/01/2016

EL PASO COUNTY

Rates                    Fringes

ELECTRICIAN  
 (Including Low Voltage  
 Wiring and Installation of  
 Fire Alarms, Security  
 Systems and Communication  
 Systems).....\$ 22.88                    13.02

ELEC0969-007 06/01/2015

MESA COUNTY

Rates                    Fringes

ELECTRICIAN  
 (Including Low Voltage  
 Wiring and Installation of  
 Fire Alarms, Security  
 Systems and Communication  
 Systems).....\$ 24.00                    7.92

ENGI0009-007 10/23/2013

Rates                    Fringes

Power equipment operators:  
 Bulldozer.....\$ 24.73                    9.15  
 Motor Grader: Blade-finish..\$ 25.04                    9.15  
 Motor Grader: Blade-rough...\$ 24.73                    9.15  
 Roller: Self-propelled all  
 types over 5 tons.....\$ 24.73                    9.15  
 Roller: Self-propelled  
 rubber tires under 5 tons...\$ 24.37                    9.15  
 Scraper: Single bowl  
 including pups 40 cubic  
 yards and tandem bowls and  
 over

Single bowl including pups 40 cubic yards and tandem bowls and over.....	\$ 25.04	9.15
Scraper: Single bowl under 40 cubic yards.....	\$ 24.88	9.15
Water Wagon.....	\$ 24.73	9.15

-----  
\* IRON0024-001 01/01/2017

	Rates	Fringes
IRONWORKER, STRUCTURAL.....	\$ 26.05	12.00

-----  
PAIN0930-001 07/01/2016

	Rates	Fringes
GLAZIER.....	\$ 31.02	8.62

-----  
PLUM0003-002 01/01/2017

ADAMS, ARAPAHOE, BOULDER, BROOMFIELD, DENVER, DOUGLAS,  
JEFFERSON, LARIMER AND WELD COUNTIES

	Rates	Fringes
PLUMBER (Including HVAC Pipe).....	\$ 23.24	5.10

-----  
PLUM0058-011 07/01/2016

EL PASO AND PUEBLO COUNTIES

	Rates	Fringes
PLUMBER/PIPEFITTER (Plumbers include HVAC pipe)  (Pipefitters exclude HVAC pipe).....	\$ 31.10	13.65

Zone 1 - 40 miles and over: \$19.85 per hour + \$32.00 per day per diem will be paid on projects over 40 miles (Zone 1) measured in practical driving miles by the shortest route, beginning at 5th and Main Streets in Pueblo, Colorado, when the employee stays overnight or drives their own vehicle.

Hazardous Pay: Add \$2.20 per hour to \$19.85 base rate. Hazardous pay applies to projects at chemical plants, steel mills, cement plants, power generator plants, process piping at manufacturing plants, food processing plants, and all projects which may present a health hazard or serious personal injury.

-----  
PLUM0145-005 08/01/2016

MESA COUNTY

	Rates	Fringes
PLUMBER (Plumbers include HVAC pipe) & PIPEFITTERS (exclude HVAC pipe).....	\$ 26.18	11.52

-----  
 PLUM0208-002 06/01/2016

ADAMS, ARAPAHOE, BOULDER, BROOMFIELD, DENVER, DOUGLAS,  
 JEFFERSON, LARIMER AND WELD COUNTIES

	Rates	Fringes
PIPEFITTER (Excluding HVAC pipe).....	\$ 36.03	13.39

-----  
 SHEE0009-003 07/01/2016

	Rates	Fringes
Sheet metal worker HVAC Duct and Installation of HVAC Systems.....	\$ 32.56	15.96

-----  
 SUCO2001-002 12/20/2001

	Rates	Fringes
CARPENTER (Excluding drywall hanging/framing, metal stud work and form building/setting).....	\$ 16.36	1.38
Cement Mason/Concrete Finisher...	\$ 16.80	
Drywall Finisher/Taper.....	\$ 13.00	
Drywall Hanger/Framer (Including metal stud work).....	\$ 17.13	2.63
Formbuilder/Formsetter.....	\$ 12.78	1.98
Laborers:		
Brick Finishers/Tenders.....	\$ 11.25	
Common.....	\$ 8.86	
Concrete/Mason Tenders.....	\$ 10.00	

PAINTER (Excludes drywall finishing and taping): Brush, Roller and Spray.....	\$ 13.62	3.39
Power equipment operators:		
Backhoe.....	\$ 12.98	3.31
Front End Loader.....	\$ 16.50	

ROOFER.....	\$ 14.73	
Sheet Metal Worker		
All Other Work.....	\$ 17.30	4.05
SPRINKLER FITTER.....	\$ 18.47	3.74

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

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The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number,

005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

#### Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

#### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

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#### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling



On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

=====  
END OF GENERAL DECISION



**BID FOR LUMP SUM CONTRACT**  
**EL CENTRO PUEBLO DEVELOPMENT CORP.**  
**201 S. VICTORIA AVENUE, PUEBLO, CO 81003 (719) 542-6741**

**BID NUMBER: I.F.B. 17-524-RAD**  
**PROJECT: Infrastructure and New Construction of 72 Units (AMP 500)**  
**LOCATION: Uplands Townhomes, Pueblo, Colorado**

Gentlemen:

The undersigned, being familiar with the local conditions affecting the cost of the Work, and having examined the Plans and Specifications with related documents and the site of the proposed Work, and being familiar with all of the conditions surrounding the Work of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the Work required under the Contract Documents, of which this proposal is a part. The undersigned hereby proposes to complete the **Infrastructure and New Construction of 72 Units** located at the **Uplands Townhomes, Pueblo, Colorado**, for the sum of

\$ \_\_\_\_\_/100 dollars (\$ \_\_\_\_\_).

In submitting this bid, it is understood that the right is reserved by the Owner to reject any and all bids and to waive informalities. If written notice of the acceptance of this bid is mailed, telegraphed, or delivered to the undersigned within **30** days after the opening thereof, or at any time thereafter before this bid is withdrawn, the undersigned agrees to execute and deliver a contract in the prescribed form and furnish the required bond(s) and Certificates of Insurance within **10** days after the contract is presented for signature.

Time for Completion \_\_\_\_\_ Calendar Days. **(Not to exceed a substantial completion date of July 31, 2018).**

**Bidder acknowledges receipt of the addenda(s)** \_\_\_\_\_

The bid security which is **5% of the bid amount** is submitted herewith in accordance with the specifications.

**Dated this** \_\_\_\_ **day of** \_\_\_\_\_, **2017.**

THE BIDDER:

\_\_\_\_\_

Address

By: \_\_\_\_\_

ATTEST:

\_\_\_\_\_  
Secretary

(SEAL - if bid is by Corporation)

Signatures: If the Proposal is being submitted by a Corporation, the Proposal should be signed by an Officer, i.e., President or Vice President. The signature of the Officer signing shall be attested to by the Secretary and properly sealed. If the Proposal is being submitted by an individual or a partnership, the Proposal shall so indicate and be properly signed.



**BID FOR LUMP SUM CONTRACT**  
**EL CENTRO PUEBLO DEVELOPMENT CORP.**  
**201 S. VICTORIA AVENUE, PUEBLO, CO 81003 (719) 542-6741**

**BID NUMBER:** I.F.B. 17-524-RAD  
**PROJECT:** Infrastructure and New Construction of 72 Units (AMP 500)  
**LOCATION:** Uplands Townhomes, Pueblo, Colorado

Gentlemen:

The undersigned, being familiar with the local conditions affecting the cost of the Work, and having examined the Plans and Specifications with related documents and the site of the proposed Work, and being familiar with all of the conditions surrounding the Work of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the Work required under the Contract Documents, of which this proposal is a part. The undersigned hereby proposes to complete the **Infrastructure and New Construction of 72 Units** located at the **Uplands Townhomes, Pueblo, Colorado**, for the sum of

\$ \_\_\_\_\_ and /100 dollars (\$ \_\_\_\_\_).

In submitting this bid, it is understood that the right is reserved by the Owner to reject any and all bids and to waive informalities. If written notice of the acceptance of this bid is mailed, telegraphed, or delivered to the undersigned within **30** days after the opening thereof, or at any time thereafter before this bid is withdrawn, the undersigned agrees to execute and deliver a contract in the prescribed form and furnish the required bond(s) and Certificates of Insurance within **10** days after the contract is presented for signature.

Time for Completion \_\_\_\_\_ Calendar Days. **(Not to exceed a substantial completion date of July 31, 2018).**

**Bidder acknowledges receipt of the addenda(s) :** \_\_\_\_\_

The bid security which is **5% of the bid amount** is submitted herewith in accordance with the specifications.

**Dated this** \_\_\_\_ **day of** \_\_\_\_\_, **2017.**

THE BIDDER:

\_\_\_\_\_

Address

By: \_\_\_\_\_

ATTEST:

\_\_\_\_\_

Secretary

(SEAL - if bid is by Corporation)

Signatures: If the Proposal is being submitted by a Corporation, the Proposal should be signed by an Officer, i.e., President or Vice President. The signature of the Officer signing shall be attested to by the Secretary and properly sealed. If the Proposal is being submitted by an individual or a partnership, the Proposal shall so indicate and be properly signed.



# SAMPLE

**UPLANDS TOWNHOMES**  
**Developed by the Housing Authority of the City of Pueblo**  
**and El Centro Pueblo Development Corporation, Inc.**  
**201 S. Victoria Avenue, Pueblo, CO 81003**

## NOTICE OF AWARD

**CONTRACTOR NAME:** \_\_\_\_\_

**BID NUMBER:** I.F.B. 17-524-RAD

**PROJECT DESCRIPTION:** Infrastructure & New Construction of 72 Units

**LOCATION:** Uplands Townhomes, Pueblo, Colorado

**DATE OF NOTICE:** \_\_\_\_\_

The Owner, **UPLANDS TOWNHOMES, LLLP**, represented by the undersigned, has considered the bid proposals submitted for the above described project. Your bid proposal has been determined to be in the best interest of the Owner, in the amount of \_\_\_\_\_ **and /100 Dollars** (\$\_\_\_\_\_).

You are hereby requested to furnish the required Contractor's Completion Assurance, and your Certificates of Insurance, all as prescribed in the contract bidding documents, and to execute the Owner-Contractor Agreement attached hereto within **ten (10) days** from the date of this notice.

Failure to execute said agreement and furnish said performance and payment assurance, insurance policies and certificates, within **ten (10) days** from the date of this notice, the Owner shall be entitled to retain the amount of the Proposal Guaranty submitted with your bid proposal as liquidated damages. In this event, the right is reserved to consider all of your rights arising out of the acceptance of your bid proposal as abandoned and to award the work covered by your bid proposal to another, to re-advertise the work, or otherwise dispose thereof.

**Uplands Townhomes, L.L.L.P.,**  
**and El Centro Pueblo Development Corp., Inc.**

BY: \_\_\_\_\_  
Owner's Representative

ACCEPTED: \_\_\_\_\_  
Contractor's Business Name

DATE: \_\_\_\_\_

BY: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATE: \_\_\_\_\_





SAMPLE

**I.F.B. 17-524-RAD  
OWNER AND CONTRACTOR AGREEMENT**

---

This **AGREEMENT** is made **this** \_\_\_\_ **day of** \_\_\_\_\_ **in the year of** **Two Thousand and Seventeen.** **BETWEEN** the Owner: **Uplands Townhomes, L.L.L.P.,** and El Centro Pueblo Development Corporation as General Partner located at 201 S. Victoria Ave., Pueblo, CO 81003 and the Contractor: \_\_\_\_\_.

**The Project is for the: Infrastructure & New Construction of 72 Units for the Uplands Townhomes, Pueblo, Colorado, dated March 27, 2017.**

**The Architect is:**                   Housing Authority of the City of Pueblo  
  its Agents and Employees  
  201 S. Victoria Avenue  
  Pueblo, CO 81003

The Owner and Contractor agree as set forth below:

**ARTICLE 1**  
**THE CONTRACT DOCUMENTS**

- 1.1     The Contract Documents consist of this Agreement, General Conditions of the Contract, Drawings, Specifications, addenda issued prior to execution of this Agreement, Notice of Award, Notice to Proceed, and other documents listed in this Agreement and Modifications issued after execution of this Agreement; these form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated Agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. An enumeration of the Contract Documents other than Modifications appears in Article 9.

**ARTICLE 2**  
**THE WORK OF THIS CONTRACT**

- 2.1     The Contractor shall execute the entire Work described in the Contract Documents or reasonably inferable by the Contractor as necessary to produce the results intended by the Contract Documents, except to the extent specifically indicated in the Contract Documents to be the responsibility of others.

**ARTICLE 3**  
**DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION**

- 3.1     The date of commencement is the date from which the Contract Time of Paragraph 3.2 is measured, and shall be the date the Contractor is issued a Notice to Proceed by the Owner.

- 3.2 The Contractor shall diligently prosecute the Work and achieve Substantial Completion no later than **July 31, 2018**. In the event that the entire Work is not substantially complete on the date indicated above.

#### **ARTICLE 4** **CONTRACT SUM**

- 4.1 The Owner shall pay the Contractor in current funds for the Contractor's proper performance of the Contract and the completion of the Work. The Contract Sum of \$ \_\_\_\_\_ **and /100 Dollars (\$ \_\_\_\_\_)** subject to authorized additions and deductions as provided in the Contract Documents.
- 4.2 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner.
- 4.3 Unit prices, as listed are as follows: None.
- 4.3.1 Unit prices are considered complete and include (1) all materials equipment, labor, delivery, installation, overhead and profit and (2) any other costs or expenses in connection with, or incidental to, the performance of that portion of the Work to which such unit prices apply.

#### **ARTICLE 5** **PROGRESS PAYMENTS**

- 5.1 Based upon Applications for Payment including all supporting documentation submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.
- 5.2 The period covered by each application for Payment shall be one calendar month ending on the last day of the month. **Retainage of ten (10%) percent** of the amount of progress payments shall be withheld until completion and acceptance of all work under the Contract.
- 5.3 Provided an Application for Payment including all supporting documentation is received by the Architect no later than the 5th day of a month, the Owner shall make payment to the Contractor no later than **30** days after receipt of the Application of Payment. If an application for Payment is received by the Architect after the application date fixed above, payment shall be made by the Owner no later than forty five (**45**) days after the Architect receives the Application for Payment.
- 5.4 Each Application for Payment including all supporting documentation shall be based upon the Schedule of Values submitted by the Contractor in accordance with the Contract Documents. The Schedule of Values shall allocate the entire Contract Sum among the various portions of the Work and be prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

- 5.5 Applications for Payment shall indicate the percentage of completion of each portion of the work as of the end of the period covered by the Application for Payment. In addition to the other required items, each Application for Payment shall be accompanied by the following, all in a form and substance satisfactory to the Owner:
- 5.5.1 A current Sworn Statement from the Contractor setting forth all sub-contractors and materialmen with whom the Contractor has subcontracted, the amount of such subcontract, the amount requested for any sub-contractor or materialman in the Application for Payment and the amount to be paid to the Contractor from such Progress Payment, together with a current, duly executed waiver of mechanics' and materialmen's liens from the Contractor establishing receipt of payment or satisfaction of the payment requested by the Contractor in the current Application for Payment;
- 5.5.2 Commencing with the second (2nd) Application for Payment submitted by the Contractor, duly executed waivers of mechanic's and materialmen's liens from all sub-contractors, materialmen and, when appropriate, from lower tier sub-contractors, establishing receipt of payment or satisfaction of payment of all amounts requested on behalf of such entities and disbursed prior to submittal by the Contractor of the current Application for Payment, plus sworn statements from all sub-contractors, materialmen and, where appropriate, from lower tier sub-contractors, covering all amounts described in this Paragraph 5.5.2.
- 5.5.3 Such other information, documentation and materials as the Owner may require.
- 5.6 Subject to the Provisions of the Contract Documents, the amount of each Progress Payment shall be computed as follows:
- 5.6.1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the total Contract Sum allocated to that portion of the Work in the Schedule of Values, less retainage of ten percent (10%). Pending final determination of cost to the Owner of changes in the Work, amounts not in the dispute may be included as provided in subparagraph 7.3.7 of the General Conditions even though the Contract Sum has not yet been adjusted by Change Order.
- 5.6.2 Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), less retaining of ten percent (10%).
- 5.6.3 Subtract the aggregate of previous payments made by the Owner, and
- 5.6.4 Subtract amounts, if any, for which the Architect has withheld or nullified a Certificate for Payment as provided in Paragraph 9.5 of the General Conditions.
- 5.7 The progress payment amount determined in accordance with Paragraph 5.6 shall be further modified under the following circumstances.

- 5.7.1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payment to one hundred percent 100% of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work and unsettled claims; and
- 5.7.2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with subparagraph 9.10.3 of the General Conditions.

## **ARTICLE 6** **FINAL PAYMENT**

- 6.1 Final payment, constituting the entire unpaid balance of the Contract Sum including the retainage, shall be made by the Owner to the Contractor when (1) the Contract has been fully performed by the Contractor in accordance with the Contract Documents, except for the Contractor's responsibility to correct nonconforming Work as provided in subparagraph 12.2.2 of the General Conditions and to satisfy other requirements, if any, which necessarily survive final payment, and (2) a final Certificate for Payment has been issued by the Architect; such final payment shall be made by the Owner not more than 30 days after the issuance of the Architect's final Certificate for Payment.

## **ARTICLE 7** **MISCELLANEOUS PROVISIONS**

- 7.1 Where reference is made in this Agreement to a provision of the General Conditions or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.
- 7.2 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate as provided by subparagraph 13.6.1 of the General Conditions.
- 7.3 The Contractor represents and warrants the following to the Owner (in addition to any other representations and warranties contained in the Contract Documents) as an inducement to the Owner to execute the Agreement and the final completion of the Work;
- a) that it and its sub-contractors are financially solvent, able to pay all debts as they mature and possessed of sufficient working capital to complete the Work and perform all obligations, hereunder;
  - b) that it is able to furnish the plant, tools, materials, supplies, equipment and labor required to complete the Work and perform its obligations hereunder;
  - c) that it is authorized to do business in the State of Colorado and properly licensed by all necessary governmental and public and quasi-public authorities having jurisdiction over it and over the Work and the Project;
  - d) that its execution of this Agreement and its performance thereof is within its duly authorized powers;

e) that its duly authorized representative has visited the site of the Project, is familiar with the local and special conditions under which the Work is to be performed and has correlated on-site observations with the requirements of the Contract Documents; and

f) that it possesses a high level of experience and expertise in the business administration, construction, construction management and superintendence of projects of the size, complexity and nature of this particular Project, and that it will perform the Work with the care, skill and diligence of such a contractor.

g) The foregoing warranties are in addition to, and not in lieu of, any and all other liability imposed upon the Contractor by law with respect to the Contractor's duties, obligations and performance hereunder. The Contractor's liability and hereunder shall survive the Owner's final acceptance of and payment for the Work. All representations and warranties set forth in this Agreement, including without limitation, this Paragraph 7.3.1, shall survive the final completion of the Work or the earlier termination of this Agreement.

h) The Contractor acknowledges that the Owner is relying upon the Contractor's skill and experience in connection with the Work called for hereunder.

- 7.4 **Hold Harmless.** Contractor agrees to indemnify, defend and hold harmless the Housing Authority of the City of Pueblo, Colorado and its agents, commissioners, and its employees from and against any and all liability, claims, demands, and expenses, including court costs and reasonable attorney fees, on account of any injury, loss or damage which arise out of or are in any manner connected with the work to be performed under this agreement if such injury, loss or damage is caused by the negligent act, error or omission of the Contractor, any Sub-contractor of the Contractor, any material supplier of the Contractor, or any officer, employee or agent of the Contractor. These obligations shall not apply to damages which the Owner shall become liable by final judgment to pay to a third party as the result of the negligence of the Owner.

## **ARTICLE 8** **TERMINATION OR SUSPENSION**

- 8.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of the General Conditions.
- 8.2 The Work may be suspended by the Owner as provided in Article 14 of the General Conditions.

## **ARTICLE 9** **ENUMERATION OF CONTRACT DOCUMENTS**

- 9.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated as follows:
- 9.1.1 The Agreement is this executed Agreement Between Owner and Contractor.
- 9.1.2 The Bidding and Contract Documents of the Contract are those contained in the Project Manual

dated **March 27<sup>th</sup>, 2017** and are as follows:

<u>Section</u>	<u>Title</u>	<u>Pages</u>
BIDDING REQUIREMENTS		

<u>Section</u>	<u>Title</u>	<u>Pages</u>
CONTRACT DOCUMENTS		

9.1.3 The Drawings dated **March 27th, 2017** as contained in the Contract are as follows:

<u>Drawing No.</u>	<u>Title</u>
--------------------	--------------

This Agreement entered into as of the day and year first written above.

**OWNER: Uplands Townhomes, L.L.L.P.,  
and El Centro Pueblo Development Corporation**

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

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Signature)

By: Theodore R. Ortiviz, Owner Representative

By: \_\_\_\_\_

Date: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

# SAMPLE

## **NOTICE TO PROCEED**

**TO:** \_\_\_\_\_

**BID NUMBER:** I.F.B. 17-524-RAD

**PROJECT:** Infrastructure & New Construction of 72 Units

**LOCATION:** Uplands Townhomes, Pueblo, Colorado

Dear Sir:

Pursuant to the terms of your Contract dated \_\_\_\_\_, **2017** for the **Infrastructure and New Construction of 72 Units for the Uplands Townhomes** in Pueblo, Colorado, Bid No. **I.F.B. 17-524-RAD**, you are hereby notified to commence work thereunder at the start of business on \_\_\_\_\_, **2017**. The time for completion as set forth in the Contract is \_\_\_\_\_, **2018** (\_\_\_\_\_) calendar days from the date of this notice, establishing \_\_\_\_\_ as the contract completion date.

Under separate cover we are forwarding to you an executed set of Contract Documents, consisting of the Contract, Specifications, and Addendums and Drawing Sheets. Please acknowledge receipt of this Notice by signing and dating.

Very truly yours,

By: \_\_\_\_\_

Date: \_\_\_\_\_

**Owner: Uplands Townhomes, LLLP, a Colorado Limited Liability Limited Partnership and El Centro Pueblo Development Corporation, Inc.,**  
a Colorado nonprofit corporation, its General Partner  
Theodore R. Ortiviz, Secretary

ACCEPTED:

By: \_\_\_\_\_

Date: \_\_\_\_\_

Contractor: \_\_\_\_\_





**I.F.B. 17-524-RAD**  
**Infrastructure & New Construction of 72 Units**  
**Uplands Townhomes, Pueblo, Colorado**

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**ARTICLE I – GENERAL PROVISIONS**

**1.1 BASIC DEFINITIONS**

**1.1.1 THE CONTRACT DOCUMENTS**

The Contract Documents consist of the Agreement between Owner and Contractor (hereinafter the Agreement), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include other documents such as bidding requirements (advertisement or Invitation to Bid, Instructions to Bidders, sample forms, the Contractor's bid or portions of addenda relating to bidding requirements).

**1.1.2 THE CONTRACT**

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Architect and Contractor, (2) between the Owner and a sub-contractor or sub-subcontractor or (3) between any persons or entities other than the Owner and Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

**1.1.3 THE WORK**

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

**1.1.4 THE PROJECT**

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner or by separate contractors.

**1.1.5 THE DRAWINGS**

The Drawings are the graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

**1.1.6 THE SPECIFICATIONS**

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards and workmanship for the Work, and performance of related services.

**1.1.7 THE PROJECT MANUAL**

The Project Manual is the volume usually assembled by the Architect for the Work which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications.

## **1.2 EXECUTION, CORRELATION AND INTENT**

**1.2.1** The Contract Documents shall be signed by the Owner and Contractor as provided in the Agreement. If either the Owner or both do not sign all the Contract Documents, the Architect shall identify such unsigned Documents upon request.

**1.2.2** Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become familiar with local and any special conditions under which the Work is to be performed and any special correlated personal observations with requirements of the Contract Documents. The Contractor and each sub-contractor shall evaluate and satisfy themselves as to the conditions and limitations under which the Work is to be performed, including, without limitation (1) the location, condition, layout and nature of the Project site and surrounding areas, (2) generally prevailing climatic conditions, (3) anticipated labor supply and costs, (4) availability and cost of materials, tools and equipment and (5) other similar issues. The Owner assumes no responsibility or liability for the physical condition or safety of the Project site or any improvements located on the Project site. Except as set forth in Paragraph 10.1.2, the Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment in either the Contract Sum or Contract Time in connection with any failure by the Contractor or any sub-contractor to comply with the requirements of this Paragraph 1.2.2.

**1.2.3** The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results.

**1.2.4** Organization of the Specifications into divisions, sections, and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among sub-contractors or in establishing the extent of Work to be performed by any trade.

**1.2.5** Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

## **1.3 OWNERSHIP AND USE OF ARCHITECT'S DRAWINGS, SPECIFICATIONS, AND OTHER DOCUMENTS**

**1.3.1** The Drawings, Specifications, and other documents prepared by the Architect are instruments of the Architect's service through which the Work to be executed by the Contractor is described. The Contractor may retain one contract record set. Neither the Contractor nor any sub-contractor, sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect, and unless otherwise indicated by the Architect, shall be deemed the author of them and will retain all common law, statutory and other reserved rights, in addition to the copyright. All copies of them, except the Contractor's record set, shall be returned or suitably accounted for to the Architect on request, upon completion of the Work. The Drawings, Specifications and other documents prepared by the Architect, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any sub-contractor, sub-subcontractor, or material or equipment supplier or other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner and Architect. The Contractor, sub-contractor, sub-subcontractors and material or equipment supplies are granted a limited license to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect appropriate to and for use in the execution of their Work under the Contract Documents. All copies made under this license shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's copyright or other reserved rights.

## **1.4 CAPITALIZATION**

**1.4.1** Terms capitalized in these General Conditions include those which are (1) specifically defined, (2) the titles of numbered articles and identified references to Paragraphs, sub-paragraphs and Clauses in the document.

## **1.5 INTERPRETATION**

**1.5.1** In the interest of brevity, the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

## **ARTICLE 2 - OWNER**

### **2.1 DEFINITION**

**2.1.1** The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Owner" means the Owner or the Owner's authorized representative.

### **2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER**

**2.2.1** The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site.

**2.2.2** Except for permits and fees which are the responsibility of the Contractor under the Contract Documents, the Owner shall secure and pay for necessary approvals, easements, assessments, and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

**2.2.3** Information or services under the Owner's control shall be furnished by the Owner with reasonable promptness to avoid delay in orderly progress of the Work.

**2.2.4** Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, such copies of Drawings and Project Manuals as are reasonably necessary for execution of the Work.

**2.2.5** The foregoing are in addition to other duties and responsibilities of the Owner enumerated herein and especially those in respect to Article 6 (Construction by Owner or by Separate Contractors), Article 9 (Payments and Completion) and Article 11 (Insurance and Bonds).

### **2.3 OWNER'S RIGHT TO STOP THE WORK**

**2.3.1** If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Paragraph 12.2 or in the Owner's reasonable judgement fails to carry out Work in accordance with the Contract Documents, the Owner, by written order signed personally or by an agent specifically so empowered by the Owner in writing, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by subparagraph 6.1.3.

### **2.4 OWNER'S RIGHT TO CARRY OUT THE WORK**

**2.4.1** If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may after such seven-day period

without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Architect's additional services and expenses made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

## **2.5 EXTENT OF OWNER RIGHTS**

**2.5.1** The rights stated in this Article 2 and elsewhere in the Contract Documents are cumulative and not in limitation of any rights of the Owner (1) granted in the Contract Documents, (2) at law or (3) in equity.

**2.5.2** In no event shall the Owner have control over, charge of, or any responsibility for construction means, methods, techniques, sequences or procedures or for safety precautions and programs in connection with the Work, notwithstanding any of the rights and authority granted the Owner in the Contract Documents.

## **ARTICLE 3 - CONTRACTOR**

### **3.1 DEFINITION**

**3.1.1** The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Contractor" means the Contractor or the Contractor's authorized representative.

### **3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR**

**3.2.1** The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by the Owner pursuant to subparagraph 2.2.1 and shall at once report to the Architect errors, inconsistencies or omissions discovered. The Contractor shall not be liable to the Owner or Architect for damage resulting from errors, inconsistencies or omissions in the Contract Documents unless the Contractor recognized such error, inconsistency or omission and failed to report it to the Architect. If the Contractor performs any construction activity knowing it involves a recognized error, inconsistency or omission in the Contract Documents without such notice to the Architect, the Contractor shall assume appropriate responsibility for such performance and shall bear the attributable costs for correction.

**3.2.2** The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies or omissions discovered shall be reported to the Architect at once.

**3.2.3** The Contractor shall perform the Work in accordance with the Contract Documents and submittals approved pursuant to Paragraph 3.12.

**3.2.4** The Contractor shall satisfy itself as to the accuracy of all grades, elevations, dimensions and locations of the Work. Any errors due to the Contractor's failure to verify all grades, elevations, locations and/or dimensions shall be promptly rectified by the Contractor without any additional cost to the Owner.

**3.2.5** Except as to any reported errors, inconsistencies or omissions, and to concealed or unknown conditions defined in Paragraph 4.3.6, the Contractor represents that the Contract Documents are sufficiently complete and detailed for the Contractor to perform the work required to produce the results intended in the Contract Documents and comply with all the requirements of the Contract Documents.

### **3.3 SUPERVISION AND CONSTRUCTION PROCEDURES**

**3.3.1** The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract unless Contract Documents give other specific instructions concerning these matters.

**3.3.2** The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, sub-contractors and their agents and employees, and any entity or other persons performing portions of the Work.

**3.3.3** The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor.

**3.3.4** The Contractor shall be responsible for inspection of portions of Work already performed under this Contract to determine that such portions are in proper condition to receive subsequent Work.

### **3.4 LABOR AND MATERIALS**

**3.4.1** Unless otherwise specifically provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

**3.4.2** The Contractor shall enforce strict discipline, safety, and good order among the Contractor's employees and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

### **3.5 WARRANTY**

**3.5.1** The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized may be considered defective. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials, and equipment.

### **3.6 TAXES**

**3.6.1 City of Pueblo Taxes.** The Contractor shall pay all City of Pueblo sales, consumer, use and other similar taxes required by law.

**3.6.2** The Contract between the Owner and The Contractor and the Contract between the Contractor and each sub-contractor shall require that the City of Pueblo sales and use tax be paid by the Contractor or sub-contractor on all pursuance of the Contract. The City law requires that the tax be paid on all material built into the building regardless of where purchased.

**3.6.3** An amount sufficient to cover the payment of the above taxes must be included in each bid submitted. Contractor shall make certain that all sub-contractors have included these amounts of their bids, and it shall be the duty of the prime Contractor to make certain that all required sales and use taxes are paid by both himself and by his sub-contractors, wherever they may be located.

**3.6.4** If materials are purchased outside the limits of the City of Pueblo, Use Tax returns must be filed with the City of Pueblo Finance Department. No Sales Tax License is necessary to make these payments.

**3.6.5** The Contractor shall comply with and shall require all his sub-contractors to comply with all of the provisions and amendments of the Act of Congress approved August 14, 1934, known and cited as the "Social Security Act."

**3.6.6** The Contractor shall indemnify and save harmless the Owner of and from any and all claims and demands made against him by virtue of failure of the Contractor or any sub-contractors to comply with the provisions of all said laws acts, and/or amendments.

**3.6.7 Prepayment of City Sales and Use Tax** *(This section applies only to public improvement construction projects over \$1,000,000).* The Contractor shall make application for, and prepayment of, City sales and use tax on the estimated percentage basis being forty percent (40%) of the total Project bid as awarded including Base Bid plus those Alternates selected. Application and prepayment shall be made within fourteen (14) days of the date authorized to proceed with construction of the Project as set forth in the Notice to Proceed. All applications and prepayments shall be coordinated directly with City's Division of Sales and Use Tax, Attention: Tax Audit Manager, 1 City Hall Place, Pueblo, Colorado 81003.

### **3.7 PERMITS, FEES, AND NOTICES**

**3.7.1** Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for any permits required by the Pueblo Regional Building Department and any other permits and governmental fees, licenses and inspections necessary for proper execution and completion of the Work.

**3.7.1.1** The Contractor shall not include in his bid the cost of the water meter, the tap fee, the setting fee, and any other charges required by the Water Board, to provide the services required. The Owner shall pay for these fees.

**3.7.1.2** The Contractor shall not include in his bid the cost of the gas meter, the tap fee, setting fee, and any other charges required by this utility company to provide the service. The Owner shall pay for these fees.

**3.7.1.3** The Contractor shall not include in his bid the charges required by the power company for installation of overhead or underground services shown on the drawings, charges for setting transformers, meters, and/or other charges relating to this project. The Owner shall pay these fees and charges.

**3.7.1.4** Should any laws, codes, ordinances, or regulations be changed during performance of this Contract, the Architect will request in writing a proposal from the Contractor for making the required changes. Such required changes shall be made only upon written order as required for other changes in Work.

**3.7.2** The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of public authorities bearing on performance of the Work.

**3.7.3** It is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations unless such laws, statutes, ordinances, Building Codes and rules and regulations bear upon performance of the Work. However, if the Contractor observes that portions of the Contract Documents are at variance therewith, the Contractor shall promptly notify the Architect and Owner in writing, and necessary changes shall be accomplished by appropriate Modification.

**3.7.4** If the Contractor performs Work knowing it to be contrary to laws, statutes, ordinances, building codes, and rules and regulations without such notice to the Architect and Owner, the Contractor shall assume full responsibility for such Work and shall bear the attributable costs.

### **3.8 ALLOWANCES**

**3.8.1** The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities against which the Contract makes reasonable objection.

**3.8.2** Unless otherwise provided in the Contract Documents:

- .1** materials and equipment under an allowance shall be selected promptly by the Owner to avoid delay in the Work;
- .2** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .3** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum and not in the allowances;
- .4** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Clause 3.8.2.2 and (2) changes in Contractor's costs under Clause 3.8.2.3.

### **3.9 SUPERINTENDENT**

**3.9.1** The Contractor shall employ a competent superintendent and necessary assistants who shall continuously be at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

### **3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES**

**3.10.1** The Contractor, within (5) calendar days of the Notice to Proceed, shall prepare and submit for the Owner's and Architect's information a Contractor's Construction Schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

**3.10.2** The Contractor shall prepare and keep current, for the Architect's, approval, a schedule of submittals which is coordinated with the Contractor's Construction Schedule and allows the Architect reasonable time to review submittals.

**3.10.3** The Contractor shall conform to the most recent schedules.

### **3.11 DOCUMENTS AND SAMPLES AT THE SITE**

**3.11.1** The Contractor shall maintain at the site for the Owner one record copy of the Drawings, Specifications, addenda, Change Orders and other Modifications, in good order and marked currently to record changes and selections made during construction and in addition approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work.

### **3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES**

**3.12.1** Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a sub-contractor, sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.



**3.12.2** Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

**3.12.3** Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

**3.12.4** Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required the way the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review by the Architect is subject to the limitations of subparagraph 4.2.7.

**3.12.5** The Contractor shall review, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals made by the Contractor which are not required by the Contract Documents may be returned without action.

**3.12.6** The Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect. Such Work shall be in accordance with approved submittals.

**3.12.7** By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

**3.12.8** The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and the Architect has given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

**3.12.9** The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, samples or similar submittals, to revisions other than those requested by the Architect on previous submittals.

**3.12.10** Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents.

**3.12.11** When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the Architect shall be entitled to rely upon the accuracy and completeness of such calculations and certifications.

### **3.13 USE OF SITE**

**3.13.1** The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

**3.13.2** Only materials and equipment which are to be used directly in the Work shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project site. Protection of construction materials and equipment stored at the Project site from weather, theft, damage and all other adversity is solely the responsibility of the Contractor.

**3.13.3** Contractor shall ensure that the Work, at all times, is performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building materials and equipment likely to cause hazardous conditions. Without limitations of any other provision of the Contract Documents, Contractor shall use its best efforts to minimize any interference with the occupancy or beneficial use of (1) any areas and buildings adjacent to the site of the Work or (2) the Building in the event of partial occupancy, as more specifically describe in Paragraph 9.9.

**3.13.4** Without prior approval of the Owner, the Contractor shall not permit any workers to use any existing facilities at the Project site, including, without limitation, lavatories, toilets, entrances, and parking areas other than those designated by the Owner.

### **3.14 CUTTING AND PATCHING**

**3.14.1** The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

**3.14.2** The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written the Project site from weather, theft, damage and all other adversity is solely the responsibility of the Contractor.

### **3.15 CLEANING UP**

**3.15.1** The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove from and about the Project waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials.

**3.15.2** If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor.

### **3.16 ACCESS TO WORK**

**3.16.1** The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

### **3.17 ROYALTIES AND PATENTS**

**3.17.1** The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer(s) is required by the Contract Documents. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

### **3.18 INDEMNIFICATION**

**3.18.1** To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to reasonable attorneys' fees and costs, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including loss of use resulting therefrom, but only to the extent caused by negligent acts, errors, or omissions of the Contractor, a sub-contractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Paragraph 3.18.

**3.18.2** In claims against any person or entity indemnified under this Paragraph 3.18 by an employee of the Contractor, a sub-contractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this Paragraph 3.18 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a sub-contractor under Workers' Compensation acts, disability benefits acts or other employee benefit acts.

**3.18.3** The obligations of the Contractor under this Paragraph 3.18 shall not extend to the liability of the Architect, the Architect's consultants, and agents and employees of any of them arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications, or (2) the giving of or the failure to give directions or instructions by the Architect, the Architect's consultants, and agents and employees of any of them provided such giving or failure to give is the primary cause of the injury or damage.

## **ARTICLE 4 - ADMINISTRATION OF THE CONTRACT**

### **4.1 ARCHITECT**

**4.1.1** The Architect is the person lawfully licensed to practice architecture or an entity lawfully practicing architecture identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Architect" means the Architect or the Architect's authorized representative.

**4.1.2** Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

**4.1.3** In case of termination of employment of the Architect, the Owner shall appoint an Architect against whom the Contractor makes no reasonable objection and whose status under the Contract Documents shall be that of the former Architect.

### **4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT**

**4.2.1** The Architect will provide administration of the Contract as described in the Contract Documents, and will be the Owner's representative (1) during construction, (2) until final payment is due and (3) with the Owner's concurrence, from time to time during the correction period described in Paragraph 12.2. The Architect will advise and consult with the Owner. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents unless otherwise modified by written instrument in accordance with other provisions of the Contract.

**4.2.2** The Architect will visit the site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the completed Work and to determine in general if the Work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check quality or quantity of the Work. On the basis of on-site observations as an Architect, the Architect will keep the Owner informed of progress of the Work, and will endeavor to guard the Owner against defects and deficiencies in the Work.

**4.2.3** The Architect will not have control over or charge of and will not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility as provided in Paragraph 3.3. The Architect will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, sub-contractors, or their agents or employees, or of any other persons performing portions of the Work.

**4.2.4 Communications Facilitating Contract Administration.** Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate through the Architect. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with sub-contractors and materials suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

**4.2.5** Based on the Architect's observations and evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

**4.2.6** The Architect will have authority to reject Work which does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable for implementation of the intent of the Contract Documents, the Architect will have authority to require additional inspection or testing of the Work in accordance with subparagraph 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, sub-contractors, material and equipment suppliers, their agents or employees, or other persons performing portions of the Work.

**4.2.7** The Architect will review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken with such promptness as to not unreasonably delay the Work or the activities of the Owner, Contractor or separate contractors, while allowing sufficient time in the Architect's professional judgement to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Paragraph 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

**4.2.8** The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Paragraph 7.4.

**4.2.9** The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion, will receive and forward to the Owner for the Owner's review and records written warranties and related Documents required by the Contract and assembled by the Contractor and will issue a final Certificate for Payment upon compliance with the requirements of the Contract Documents.

**4.2.10** If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

**4.2.11** The Architect will interpret and decide matters concerning performance under and requirements of the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made with reasonable promptness and within any time limits agreed upon. If no agreement is made concerning the time within which interpretations required of the Architect shall be furnished in compliance with this Paragraph 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretations until 15 days after written request is made for them.

**4.2.12** Interpretations and decisions of the Architect will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will not be liable for results of interpretations or decisions so rendered in good faith.

**4.2.13** The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

### **4.3 CLAIMS AND DISPUTES**

**4.3.1 Definitions.** A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in questions between the Owner and Contractor arising out of or relating to the Contract. Claims must be made by written notice. The responsibility to substantiate Claims shall rest with the party making the Claim.

**4.3.2 Decision of Architect.** Claims, including those alleging an error or omission by the Architect, shall be referred initially to the Architect for action as provided in Paragraph 4.4. A decision by the Architect, as provided in subparagraph 4.4.4, shall be required as a condition precedent to litigation of a Claim between the Contractor and Owner as to all such matters arising prior to the date final payment is due, regardless of (1) whether such matters relate to execution and progress of the Work or (2) the extent to which the Work has been completed. The decision by the Architect in response to a Claim shall not be a condition precedent to litigation in the event (1) the position of Architect is vacant, (2) the Architect has not received evidence or has failed to render a decision within agreed time limits, (3) the Architect has failed to take action required under subparagraph 4.4.4 within 30 days after the Claim is made or, (4) 45 days have passed after the Claim has been referred to the Architect.

**4.3.3 Time Limits on Contractor Claims.** Claims by Contractor must be made within 10 days after Contractor first recognizes the conditions giving rise to the Claim, whichever is later; provided, however, that Contractor shall use its best efforts to furnish the Architect and Owner, as expeditiously as possible, with notice of any Claim once such Claim is recognized, and shall cooperate with the Architect and the Owner in an effort to mitigate the alleged or potential damages, delay or other adverse consequences arising out of the condition which is the cause of such a Claim. Claims must be made by written notice. An additional Claim made after the initial Claim has been implemented by Change Order will not be considered unless submitted in a timely manner.

**4.3.4 Continuing Contract Performance.** Pending final resolution of a Claim, unless otherwise agreed in writing, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

**4.3.5 Waiver of Claims: Final Payment.** The making of final payment shall constitute a waiver of Claims by the Owner except those arising from:

- .1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents; or
- .3 terms of special warranties required by the Contract Documents.

**4.3.6 Claims for Concealed or Unknown Conditions.** If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then written notice by the observing party shall be given to the other party promptly before conditions are disturbed and in no event later than 10 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall so notify the Owner and Contractor in writing, stating the reasons. Claims by either party in opposition to such determination must be made within 10 days after the Architect has given notice of the decision. If the Owner and Contractor cannot agree on an adjustment in the Contract Sum or Contract Time, the adjustment shall be referred to the Architect for initial determination, subject to further proceeding pursuant to Paragraph 4.4. No adjustment in the Contract Time or Contract Sum shall be permitted, however, in connection with the concealed or unknown condition which does not differ materially from those conditions disclosed or which reasonably should have been disclosed by the Contractor's (1) prior inspections, tests, reviews and/or preconstruction services for the Project, or (2) inspections, tests, reviews, and preconstruction services which the Contractor had the opportunity to make or should have performed in connection with the Project.

**4.3.7 Claims for Additional Cost.** If the Contractor wishes to make claims for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Paragraph 10.3. If the Contractor believes additional cost is involved for reasons including but not limited to (1) a written interpretation from the Architect, (2) an order by the Owner to stop the Work where the Contractor was not at fault, (3) a written order for a minor change in the Work issued by the Architect, (4) failure of payment by the Owner, (5) termination of the Contract by the Owner, (6) suspension or (7) other reasonable grounds, Claims shall be filed in accordance with the procedure established herein.

#### **4.3.8 Claims for Additional Time**

**4.3.8.1** If the Contractor wishes to make Claim for an increase in the Contract Time, written notice pursuant to Paragraph 4.3.3 shall be provided. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on the Completion Date of the Work. In the case of continuing delay, only one Claim is necessary.

**4.3.8.2** If unusually severe weather conditions are the basis for Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were unusually severe for the period of time and could not have been reasonably anticipated, and that weather conditions had an adverse effect on the scheduled construction to the extent critical path activities were delayed. In the event Contractor establishes that its Completion Date was impacted by unusually severe weather, Contractor shall be entitled to additional time but not compensation.

**4.3.9 Injury or Damage to Persons or Property.** If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, of any of the party's employees or agents, or of others for whose acts such party is legally liable, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding fourteen (14) days after first observance. The notice shall provide sufficient detail to enable the other party to investigate the matter. If a Claim for additional cost or time related to this Claim is to be asserted, it shall be filed as provided in subparagraphs 4.3.7, or 4.3.8.

#### **4.4 RESOLUTION OF CLAIMS AND DISPUTES**

**4.4.1** The Architect will review Claims and take one or more of the following preliminary actions within fourteen (14) days of receipt of a Claim; (1) request additional supporting data from the claimant, (2) submit a schedule to the parties indicating when the Architect expects to take action, (3) reject the Claim in whole or in part stating the reasons for rejection, (4) recommend approval of the Claim by the other party or (5) suggest a compromise. The Architect may also, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim.

**4.4.2** If a claim has been resolved, the Architect will prepare or obtain appropriate documentation.

**4.4.3** If a Claim has not been resolved, the Party making the Claim shall, within ten days after the Architect's preliminary response, take one or more of the following actions; (1) submit additional supporting data requested by the Architect, (2) modify the initial Claim or (3) notify the Architect that the initial Claim stands.

**4.4.4** If a Claim has not been resolved after consideration of the foregoing and of further evidence presented by the parties or requested by the Architect, the Architect will notify the parties in writing that the Architect's decision will be made within seven days, which decision shall be final and binding on the parties but subject to later resolution as provided herein. Upon expiration of such time period, the Architect will render to the parties the Architect's written decision relative to the Claim, including any change in the Contract Sum or Contract Time or both. If there is a surety and there appears to be a possibility of a Contractor's default, the Architect may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

**4.4.5** If Contractor is dissatisfied with any decision made by Architect pursuant to Paragraph 4.4.4, any cause of action based upon that decision, whether in Contract or tort, law or equity, shall be commenced not later than one (1) year after the date of Substantial Completion of the Work. Notwithstanding the foregoing, as to any and all acts or failures to act by the Owner, Contractor shall commence any cause of action, based upon any and all theories, whether in Contract or tort, law or equity, not later than one (1) year after the date of Substantial Completion of the Work.

### **ARTICLE 5 - SUB-CONTRACTORS**

#### **5.1 DEFINITIONS**

**5.1.1** A sub-contractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "sub-contractor" is referred to throughout the contract Documents as if singular in number and means a sub-contractor or an authorized representative of the sub-contractor. The term "sub-contractor" does not include a separate contractor or sub-contractors of a separate contractor, and a person or entity who has a direct contract with the Contractor to supply any material incorporated into the Work.

**5.1.2** A sub-subcontractor is a person or entity who has a direct or indirect contract with a sub-contractor to perform a portion of the Work at the site. The term "sub-contractor" is referred to throughout the Contract Documents as if singular in number and means a sub-subcontractor or an authorized representative of the sub-subcontractor.

## **5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK**

**5.2.1** Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or the entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect will promptly reply to the Contractor in writing stating whether or not the Owner or the Architect has reasonable objection to any such proposed person or entity. Failure of the Owner or Architect to reply promptly shall constitute notice of no reasonable objection.

**5.2.2** The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

**5.2.3** If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. The Contract Sum shall be increased or decreased by the difference in cost occasioned by such change and an appropriate Change Order shall be issued. However, no increase in the Contract Sum shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

**5.2.4** The Contractor shall not change a sub-contractor or person or entity previously selected if the Owner or Architect makes reasonable objection to such change.

## **5.3 SUBCONTRACTUAL RELATIONSHIPS**

**5.3.1** By appropriate agreement, written where legally required for validity, the Contractor shall require each sub-contractor, to the extent of the Work to be performed by the sub-contractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the sub-contractor so that subcontracting thereof will not prejudice such rights, and shall allow to the sub-contractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each sub-contractor to enter into similar agreements with sub-subcontractors. The Contractor shall make available to each proposed sub-contractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the sub-contractor will be bound, and, upon written request of the sub-contractor, identify to the sub-contractor terms and conditions of the proposed subcontract agreement which may be at variance with the Contract Documents. Sub-contractors shall similarly make copies of applicable portions of such documents available to their respective proposed sub-subcontractors.

## **5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS**

**5.4.1** Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner provided that:

- .1** assignment is effective only after termination of the Contract by the Owner for cause pursuant to Paragraph 14.2 and only for those subcontract agreements which the Owner accepts by notifying the sub-contractor in writing; and
- .2** assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

**5.4.2** If the Work has been suspended for more than 30 days, the sub-contractor's compensation shall be equitably adjusted.



## **ARTICLE 6 - CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS**

### **6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS**

**6.1.1** The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided elsewhere in the Contract Documents.

**6.1.2** When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

**6.1.3** The Owner shall provide for coordination of the activities of the Owner's own forces and each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule and Contract Sum deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

**6.1.4** Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights which apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, and 12.

### **6.2 MUTUAL RESPONSIBILITY**

**6.2.1** The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

**6.2.2** If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor to report shall constitute an acknowledgment that the Owner's or separate contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

**6.2.3** Costs caused by delays or improperly timed activities or defective construction shall be borne by the party responsible therefor.

**6.2.4** The Contractor shall promptly remedy damage caused by the Contractor to completed or partially completed construction or to property of the Owner or separate contractors as provided in subparagraph 10.2.5.

**6.2.5** Claims and other disputes and matters in question between the Contractor and a separate contractor shall be subject to the provisions of Paragraph 4.3 provided the separate contractor has reciprocal obligations.

**6.2.6** The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Paragraph 3.14.

## **6.3 OWNER'S RIGHT TO CLEAN UP**

**6.3.1** If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish as described in Paragraph 3.15, the Owner may clean up and allocate the cost among those responsible as the Architect determines to be just.

## **ARTICLE 7 - CHANGES IN THE WORK**

### **7.1 CHANGES**

**7.1.1** Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

**7.1.2** A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

**7.1.3** Changes in the Work shall be performed under applicable provisions of the Contract Documents and the Contractor shall proceed promptly unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work. Except as permitted in Paragraph 7.3 and Paragraph 9.7.2, a change in the Contract Sum or the Contract Time shall be accomplished only by Change Order. Accordingly, no course of conduct or dealings between the parties, nor express or implied acceptance of alterations or additions to the Work, and no claim that the Owner has been unjustly enriched by any alteration or addition to the Work, whether or not there is, in fact, any unjust enrichment to the Work, shall be the basis of any claim to an increase in any amounts due under the Contract Documents or a change in any time period provided for in the Contract Documents.

**7.1.4** If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are so changed in a proposed Change Order or Construction Change Directive that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

### **7.2 CHANGE ORDERS**

**7.2.1** A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

- .1** a change in the Work;
- .2** the amount of the adjustment in the Contract Sum, if any; and
- .3** the extent of the adjustment in the Contract Time, if any.

**7.2.2** Methods used in determining adjustments to the Contract Sum may include those listed in subparagraph 7.3.3.

**7.2.3** Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work, which is the subject of the Change Order, including, but not limited to, all direct and indirect costs associated with such change and any and all adjustments to the Contract Sum, Contract Time, and the construction schedule. In the event a Change Order increases the Contract Sum, Contractor shall include the Work covered by such Change Orders in Applications for Payment as if such Work were originally part of the Contract Documents.

## **7.3 CONSTRUCTION CHANGE DIRECTIVES**

**7.3.1** A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

**7.3.2** A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

**7.3.3** If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1** mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2** unit prices stated in the Contract Documents or subsequently agreed upon;
- .3** cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4** as provided in subparagraph 7.3.6

**7.3.4** Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

**7.3.5** A Construction Change Directive signed by the Contractor indicates the agreement of the Contractor therewith including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

**7.3.6** If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the method and the adjustment shall be determined by the Architect on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, a reasonable allowance for overhead and profit. In such case, and also under Clause 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this subparagraph 7.3.6 shall be limited to the following:

- .1** costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
- .2** costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
- .3** rental costs of machinery and equipment, exclusive of small tools, whether rented from the Contractor or others. The rental value of the Contractor's own equipment shall not be more than 50% of the fair rental value of such equipment in Pueblo County and in no event shall the aggregate amount charged to the Owner for such equipment exceed 50% of the fair market value of the equipment itself. Fair market value shall be based on the depreciated value of any Contractor owned equipment as shown on Contractor's books. Small tools and consumables shall be included in overhead;
- .4** costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; however, cost of premiums for all bonds and insurance shall not be added to the construction charges until such changes would total 5% of the original Contract amount.
- .5** additional costs of supervision and field office personnel directly attributable to the change.

**7.3.7** Pending final determination of cost to the Owner, amounts not in dispute may be included in Applications for Payment. The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work of substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

**7.3.8** If the Owner and Contractor do not agree with the adjustment in Contract Time or the method for determining it, the adjustment or the method shall be referred to the Architect for determination.

**7.3.9** When the Owner and Contractor agree with the determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and shall be recorded by preparation and execution of an appropriate Change Order.

## **7.4 MINOR CHANGES IN THE WORK**

**7.4.1** The Architect will have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly.

## **7.5 AGREED OVERHEAD AND PROFIT RATES**

**7.5.1** For any adjustments to the Contract Sum which are based on other than the unit prices method, the Contractor agrees to charge, and accept, as payment for overhead and profit, the following percentages of costs attributable to the change in the Work;

- .1** for the sub-contractor, 12% of the net extra cost of the Work it performs;
- .2** for the Contractor, 6% of the net extra cost of the Work performed by sub-contractors;
- .3** for the Contractor, 12% of the net extra cost of the Work it performs with its own forces.

## **ARTICLE 8 - TIME**

### **8.1 DEFINITIONS**

**8.1.1** Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

**8.1.2** The date of commencement of the Work shall be the date issued in the Notice to Proceed. The date shall not be postponed by the failure to act of the Contractor or of persons or entities for whom the Contractor is responsible.

**8.1.3** The date of Substantial Completion is the date certified by the Architect in accordance with Paragraph 9.8.

**8.1.4** The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

### **8.2 PROGRESS AND COMPLETION**

**8.2.1** Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

**8.2.2** The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by

Article 11 to be furnished by the Contractor. The date of commencement of the work shall not be changed by the effective date of such insurance.

**8.2.3** The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

### **8.3 DELAYS AND EXTENSIONS OF TIME**

**8.3.1** If the Contractor is delayed at any time in progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control, or by delay authorized by the Owner, or by other causes which the Architect determines may justify delay, then the Contract Time shall be extended by Change Order, but only to the extent such delay is a critical path delay which will prevent the Contractor from achieving Substantial Completion within the Contract Time and if the performance of the Work is not, was not or would not have been delayed by any other cause for which the Contractor is not entitled to an extension in the Contract Time under the Contract Documents. The Contractor further acknowledges and agrees that adjustments in the Contract Time will be permitted for a delay only to the extent such delay (1) is not caused, or could not have been anticipated, by the Contractor, (2) could not be limited or avoided by the Contractor's timely notice to the Owner of delay and (3) is of a duration not less than one (1) day.

**8.3.2** Claims relating to time shall be made in accordance with applicable provisions of Paragraph 4.3.

**8.3.3** This Paragraph 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

**8.3.4** No extension of time will be allowed for extra work authorized by the Owner, unless the time of completion is adjusted and agreed to prior to the issuance of Change Order for the extra Work. If any time adjustment is agreed to, it will be so stated in writing on Change Order and accepted by the Owner.

**8.3.5** No extension of time will be allowed unless the Contractor shall show that the entire Work of his Contract was or will be delayed for the extension requested.

## **ARTICLE 9 - PAYMENTS AND COMPLETION**

### **9.1 CONTRACT SUM**

**9.1.1** The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

### **9.2 SCHEDULE OF VALUES**

**9.2.1** Upon execution of the Agreement, the Contractor shall submit to the Architect a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

### **9.3 APPLICATIONS FOR PAYMENT**

**9.3.1** At least ten (10) days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment for operations completed in accordance with the schedule of values. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from sub-contractors and material suppliers, and reflecting retainage if provided for elsewhere in the Contract Documents.

**9.3.1.1** Such applications may include requests for payment on account of changes in the Work which have been properly authorized by Construction Change Directives but not yet included in Change Orders.

**9.3.1.2** Such applications may not include requests for payment of amounts the Contractor does not intend to pay to a sub-contractor or material supplier because of a dispute or other reason.

**9.3.2** Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

**9.3.3** The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment, all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests, or encumbrances in favor of the Contractor, sub-contractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

## **9.4 CERTIFICATES FOR PAYMENT**

**9.4.1** The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in subparagraph 9.5.1.

**9.4.2** The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's observations at the site and the data comprising the Application for Payment, that the Work has progressed to the point indicated. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to minor deviations from the Contract Documents correctable prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods techniques, sequences or procedures, (3) review copies of requisitions received from sub-contractors and material suppliers and other requested by the Owner to substantiate the Contractor's right to payment or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

## **9.5 DECISIONS TO WITHHOLD CERTIFICATION**

**9.5.1** The Architect may decide not to certify payment and may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by subparagraph 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the application, the Architect will notify the Contractor and Owner as provided in subparagraph 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also decide not to certify payment or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss because of:

- .1 defective Work not remedied
- .2 claims filed or reasonable evidence indicating probable filing of such claims
- .3 failure of the Contractor to make payments properly to sub-contractors or for labor, materials, or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or another contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 failure in the Owner's reasonable judgement to carry out the Work in accordance with the Contract Documents.

**9.5.2** When any of the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

## **9.6 PROGRESS PAYMENTS**

**9.6.1** After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

**9.6.2** The Contractor shall promptly pay each sub-contractor upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such sub-contractor's portion of the Work, the amount to which said sub-contractor is entitled, reflecting percentage actually retained from payments to the Contractor on account of such sub-contractor's portion of the Work. The Contractor shall, by appropriate agreement with each sub-contractor, require each sub-contractor to make payments to sub-subcontractors in similar manner.

**9.6.3** The Architect will, on request, furnish to a sub-contractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such sub-contractor.

**9.6.4** Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a sub-contractor except as may otherwise be required by law.

**9.6.5** Payment to material suppliers shall be treated in a manner similar to that provided in subparagraphs 9.6.2, 9.6.3, and 9.6.4.

**9.6.6** A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

## **9.7 FAILURE OF PAYMENT**

**9.7.1** If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect, then the Contractor may, upon thirty additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut down delay and start-up which shall be accomplished as provided in Article 7.

**9.7.2** If the Owner is entitled to reimbursement or payment from the Contractor under, or pursuant to, the Contract Documents, such payment shall be made promptly upon demand by the Owner. Notwithstanding anything contained in the Contract Documents to the contrary, if the Contractor fails to promptly make any

payment due the Owner, or the Owner incurs any costs and expenses to cure any default of the Contractor or to correct defective Work, the Owner shall have an absolute right to offset such amount against the Contract Sum and may, in the Owner's sole discretion, elect either to: (1) deduct an amount equal to that which the Owner is entitled from any payment then or thereafter due the Contractor from the Owner, or (2) issue a written notice to the Contractor reducing the Contract Sum by an amount equal to that which the Owner is entitled.

## **9.8 SUBSTANTIAL COMPLETION**

**9.8.1** Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use; provided, however, that as a condition precedent to Substantial Completion, the Owner has received all certificates of occupancy and any other permits, approvals, licenses, and other documents from any governmental authority having jurisdiction thereof necessary for the beneficial occupancy of the Project.

**9.8.2** When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected. The Contractor shall proceed promptly to complete and correct items on the list. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Upon receipt of the Contractor's list, the Architect will make a site visit to determine whether the Work or designated portion thereof is substantially complete. If the Architect's observation discloses any item, whether or not included on the Contractor's list, which is not in accordance with the requirements of the Contract Documents, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. The Contractor shall then submit a request for another observation by the Architect to determine Substantial Completion. When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damages to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate.

**9.8.3** Upon Substantial Completion of the Work or designated portion thereof and upon application by the Contractor and certification by the Architect, the Owner shall make payment, reflecting adjustment in retainage, if any, for such Work or portion thereof as provided in the Contract Documents.

## **9.9 PARTIAL OCCUPANCY OR USE**

**9.9.1** The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under subparagraph 11.3.10 and authorized by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under subparagraph 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.



**9.9.2** Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

**9.9.3** Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

## **9.10 FINAL COMPLETION AND FINAL PAYMENT**

**9.10.1** Upon receipt of written notice that the Work is ready for final acceptance and upon receipt of a final Application for Payment, the Architect will promptly make a site visit and, when the Architect finds the Work appears to be acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate of Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's observations, the Work appears to have been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in said final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in subparagraph 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

**9.10.2** Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials, and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be cancelled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a sub-contractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

**9.10.3** If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims. The making of final payment shall constitute a waiver of claims by the Owner as provided in subparagraph 4.3.5.

**9.10.4** Acceptance of final payment by the Contractor, a sub-contractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment. Such waivers shall be in addition to the waiver described in subparagraph 4.3.5.

## **ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY**

### **10.1 SAFETY PRECAUTIONS AND PROGRAMS**

**10.1.1** The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

**10.1.2** In the event the Contractor encounters on the site material reasonably believed to be asbestos or polychlorinated biphenyl (PCB) which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and Architect in writing. The Work in the affected area shall not thereafter be resumed except by written agreement of the Owner and Contractor if in fact the material is asbestos or polychlorinated biphenyl (PCB) and has not been rendered harmless. The Work in the affected area shall be resumed in the absence of asbestos or polychlorinated biphenyl (PCB), or when it has been rendered harmless, by written agreement of the Owner and Contractor, or in accordance with final determination by the Architect. The term "rendered harmless" shall be interpreted to mean that levels of asbestos and polychlorinated biphenyls are less than any applicable exposure standards set forth in current OSHA regulations. In no event, however, shall the Owner have any responsibility for any substance or material that is brought to the Project site by the Contractor, any sub-contractor, any materialman or supplier or any entity for whom any of them is responsible. The Contractor agrees not to use any fill or other materials to be incorporated into the Work which are hazardous, toxic or comprised of any items that are hazardous or toxic.

**10.1.3** The Contractor shall not be required pursuant to Article 7 to perform without consent any Work relating to asbestos or polychlorinated biphenyl (PCB).

### **10.2 SAFETY OF PERSONS AND PROPERTY**

**10.2.1** The Contractor shall take reasonable precautions for safety of and shall provide reasonable protection to prevent damage, injury or loss to:

- .1** employees on the Work and other persons who may be affected thereby;
- .2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor or the Contractor's sub-contractors or sub-subcontractors; and
- .3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

**10.2.2** The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

**10.2.3** The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities. The Contractor shall also be responsible at its own expense, for all measures necessary to protect any adjacent property, and any damage to such property shall be promptly repaired by Contractor.

**10.2.4** When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

**10.2.5** The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Clauses 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a sub-contractor, a sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Clauses 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Paragraph 3.18.

**10.2.6** The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

**10.2.7** The Contractor shall not load or permit any part of the construction or site to be loaded so as to endanger its safety.

### **10.3 EMERGENCIES**

**10.3.1** In an emergency affecting safety or persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Paragraph 4.3 and Article 7.

## **ARTICLE 11 - INSURANCE AND ASSURANCE OF COMPLETION (BONDS)**

### **11.1 CONTRACTOR'S LIABILITY INSURANCE**

**11.1.1** The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a sub-contractor or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- .1** claims under worker's compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;
- .2** claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees.
- .3** claims for damages because of bodily injury, sickness or disease or death of any person other than the Contractor's employees;
- .4** claims for damages insured by usual personal injury liability coverage which are sustained (1) by a person as a result of an offense directly or indirectly related to employment of such person by the Contractor, or (2) by another person;
- .5** claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- .6** claims for damages because of bodily injury, death of a person or property damage arising out of ownership maintenance or use of a motor vehicle; and
- .7** claims involving contractual liability insurance applicable to the Contractor's obligations under Paragraph 3.18.

**11.1.2** The insurance required by subparagraph 11.1.1 and purchased by Contractor shall be written for not less than the limits set forth below, or required by law, whichever is greater. Providing limits of coverage less than as specified and extending the limits through the use of "Umbrella" coverage shall be permitted only with review and approval by the Owner.

- .1 Worker's Compensation as required by all applicable State, or other laws including Employer's Liability with a limit of at least \$100,000 per individual;
- .2 Commercial General Liability including Contractor's Liability, Contingent Liability, Contractual Liability, completed operations, endorsements, and Products Liability all on an occurrence basis with bodily Injury Coverage and Broad Form Property Damage Endorsement. Remove the XC-U exclusion relating to Explosion, Collapse, and Underground Property Damage. Completed Operations Liability shall be kept in force for at least two (2) years after the date of final completion. Limits shall be at least:
  - Bodily Injury
  - Each Person .....\$1,000,000
  - Each Occurrence.....\$1,000,000
  - Property Damage
  - Each Accident.....\$500,000
  - Aggregate.....\$500,000 or combined single limit of \$1,000,000;
- .3 Comprehensive Automobile Liability including non-owned and hired car coverage as well as owned vehicles with limits at least:
  - Bodily Injury
  - Each Person.....\$1,000,000
  - Each Occurrence.....\$1,000,000
  - Property Damage
  - Each Occurrence.....\$1,000,000 or combined single limit of \$1,000,000;

**11.1.3** Certificates of Insurance acceptable to the Owner shall be filed with the Owner within ten (10) days of the Notice to Proceed. These Certificates and the insurance policies required by this Paragraph 11.1 shall contain a provision that coverages afforded under the policies will not be cancelled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. If any of the foregoing insurance coverages are required to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the final Application for Payment as required by subparagraph 9.10.2. Information concerning reduction of coverage shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor's information and belief.

**11.2 OWNER'S LIABILITY INSURANCE**

**11.2.1** The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance. Optionally, the Owner may purchase and maintain other insurance for self-protection against claims which may arise from operations under the Contract. The Contractor shall not be responsible for purchasing and maintaining this optional Owner's liability insurance unless specifically required by the Contract Documents.

**11.3 PROPERTY INSURANCE**

**11.3.1** Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance in the amount of the initial Contract Sum as well as subsequent modifications thereto for the entire Work at the site on a replacement cost basis without voluntary deductibles. Such property insurance shall be maintained unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Paragraph 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Paragraph 11.3 to be covered, whichever is earlier. This insurance shall include interests of the Owner, Contractor, sub-contractors, and sub-subcontractors in the Work.

**11.3.1.1** Property insurance shall be on an all-risk policy form and shall insure against the perils of fire and extended coverage and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, falsework, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's services and expenses required as a result of such insured loss. Coverage for other perils shall not be required unless otherwise provided in the Contract Documents. The Owner shall purchase and maintain an Installation Floater Policy providing coverage for the Work. The policy will be written on a replacement cost basis with a 100% co-insurance clause on an "All Risk" basis to include the demolition, renovation, and remodeling. There will be a \$1,000 deductible per occurrence on the insurance policy and the Contractor and sub-contractors shall be responsible for payment of this deductible. The policy provides coverage to the Contractor and sub-contractors as their interests appear. However, the Contractor and all sub-contractors are encouraged to purchase their own installation floater which will give them coverage for labor and materials on the portion of their Contract. It is also encouraged that Contractor and all sub-contractors have adequate coverage for their tools and equipment since the Owners have no insurable interest in these items and cannot purchase coverage for them. Any loss on these items is the responsibility of the Contractor.

**11.3.1.2** If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance which will protect the interests of the Contractor, sub-contractors and sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor, then the Owner shall bear all reasonable costs properly attributable thereto.

**11.3.1.3** If the property insurance requires minimum deductibles and such deductibles are identified in the Contract Documents, the Contractor shall pay costs not covered because of such deductibles. If the Owner or insurer increases the required minimum deductibles above the amounts so identified or if the Owner elects to purchase this insurance with voluntary deductible amounts, the Owner shall be responsible for payment of the additional costs not covered because of such increased or voluntary deductibles. If deductibles are not identified in the Contract Documents, the Owner shall pay costs not covered because of deductibles.

**11.3.2 Loss of Use Insurance.** The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused.

**11.3.3** If the Contractor requests in writing that insurance for risks other than those described herein or for other special hazards be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused to the extent (1) of actual recovery of any insurance proceeds under policies obtained pursuant to this Paragraph and (2) permitted by the applicable policies of insurance.

**11.3.4** If during the Project construction period the Owner insures properties, real or personal or both, adjoining or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of subparagraph 11.3.6 for damages caused by fire or other perils covered by this separate property, insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

**11.3.5** Before an exposure to loss may occur, the Owner shall file with the Contractor a certificate of insurance evidencing such insurance coverages required by this Paragraph 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be cancelled or allowed to expire until at least 30 days' prior written notice has been given to the Contractor.

**11.3.6 Waivers of Subrogation.** If permitted by the Owner's and the Contractor's insurance companies, the Owner and Contractor waive all rights against (1) each other and any of their sub-contractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors describe in Article 6, if any, and any of their sub-contractors, sub-subcontractors, agents employees, for damages caused by fire or other perils to the extent of actual recovery of any insurance proceeds under any property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the sub-contractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly, or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

**11.3.7** A loss insured under Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner for the insured, as their interest may appear, subject to requirements of any applicable mortgagee clause and of subparagraph 11.3.9. The Contractor shall pay sub-contractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require sub-contractors to make payments to their sub-subcontractors in similar manner.

**11.3.8** If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or in accordance with an arbitration award in which case the procedure shall be as provided in paragraph 4.5. If after such loss no other special agreement is made, replacement of damaged property shall be covered by appropriate Change Order.

**11.3.9** The Owner shall have power to adjust and settle a loss with insurers.

**11.3.10** Partial occupancy or use in accordance with Paragraph 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

## **11.4 ASSURANCE OF COMPLETION**

**11.4.1** The successful bidder shall furnish an assurance of completion prior to the execution of any Contract under this solicitation. This assurance may be:

- a) a performance and payment bond in a penal sum of 100 percent of the contract price;
- b) a separate performance and payment bonds each for 50% or more of the contract price.

**11.4.2** The Contractor shall provide a performance and payment bond in a penal sum of 100 percent (100%) of the Contract price. Bonds must be obtained from guarantee or surety companies acceptable to the U.S. government and authorized to do business in the State of Colorado. Individual sureties will not be considered. Each bond shall clearly state the rate of premium and the total amount of premium charged. The current signs for the surety company must be attached to the bond. The effective date of the power of attorney shall not precede the date of the bond shall be on or after the execution date of the Contract.

## **ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK**

### **12.1 UNCOVERING OF WORK**

**12.1.1** If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Architect, be uncovered for the Architect's observation and be replaced at the Contractor's expense without change in the Contract Time.

**12.1.2** If a portion of the Work has been covered which the Architect has not specifically requested to observe prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work is not in accordance with the Contract Documents, the Contractor shall pay such costs unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

### **12.2 CORRECTION OF WORK**

**12.2.1** The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear costs of correcting such rejected Work, including additional testing and inspections and compensation for the Architect's services and expenses made necessary thereby.

**12.2.2** If, within one year after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under subparagraph 9.9.1 or by terms of an applicable special warranty required by the Contract Documents, any of the Work is not found to be in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such conditions. This period of one year shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the work. This obligation under this subparagraph 12.2.2 shall survive acceptance of the Work under the Contract and termination of the Contract. The owner shall give such notice promptly after discovery of the condition.

**12.2.3** The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

**12.2.4** If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Paragraph 2.4. If the Contractor does not proceed with correction of such nonconforming Work within a reasonable time fixed by written notice from the Architect, the Owner may remove it and store the salvable materials or equipment at the Contractor's expense. If the Contractor does not pay costs of such removal and storage within ten days after written notice, the Owner may upon ten additional days' written notice sell such materials and equipment at auction or at private sale and shall account for the proceeds thereof, after deducting costs and damages that should have been borne by the Contractor, including compensation for the Architect's services and expenses made necessary thereby. If such proceeds of sale do not cover costs which the Contractor should have borne, the Contract Sum shall be reduced by the deficiency. If payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

**12.2.5** The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed of the Owner or separate contractors caused by the Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

**12.2.6** Nothing contained in this Paragraph 12.2. shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the time period of one year as described in subparagraph 12.2.2. relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

### **12.3 ACCEPTANCE OF NONCONFORMING WORK**

**12.3.1** If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

## **ARTICLE 13 - MISCELLANEOUS PROVISIONS**

### **13.1 GOVERNING LAW**

**13.1.1** The Contract shall be governed by the Law of the State of Colorado.

**13.1.2** Venue of any suit or cause of action under or related to this Contract shall be in Pueblo County, Colorado. Should any section of this Contract be found to be invalid, it is agreed that all other sections shall remain in full force and effect.

**13.1.3** The General Contractor selected and under contract will be required to comply with the Employment Eligibility Verification Program (EEVP). The State of Colorado requires that the General Contractor provide the information prescribed in the EEVP. The General Contractor in turn provides HACP with a filled out form verifying that all sub-contractors under contract for this project as well as the General Contractor do not have illegal aliens working for them.

### **13.2 SUCCESSORS AND ASSIGNS**

**13.2.1** The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect to covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

### **13.3 WRITTEN NOTICE**

**13.3.1** Written notice shall be deemed to have been duly served if delivered in person to the individual or a member of the firm or entity or to an officer of the corporation for which it was intended, or if delivered at or sent by registered or certified mail to the last business address known to the party giving notice.

### **13.4 RIGHTS AND REMEDIES**

**13.4.1** Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.



**13.4.2** No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

### **13.5 TESTS AND INSPECTIONS**

**13.5.1** Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made. Architect may observe such procedures. The Owner shall bear costs of tests, inspections or approvals which do not become requirements until after bids are received or negotiations concluded.

**13.5.2** If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under subparagraph 13.5.1 the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give time of notice to the Architect of when and where tests and inspections are to be made so the Architect may observe such procedures. The Owner shall bear such costs except as provided in subparagraph 13.5.3.

**13.5.3** If such procedures for testing, inspection or approval under subparagraph 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, the Contractor shall bear all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses.

**13.5.4** Required certificates of testing, inspections or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

**13.5.5** If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

**13.5.6** Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

### **13.6 INTEREST**

**13.6.1** Payments due and unpaid under the Contract Documents shall bear annual interest from the date payment is due at the rate of three (3%) percent above prime as printed in The Wall Street Journal on the date payment is due.

### **13.7 EQUAL EMPLOYMENT OPPORTUNITY**

**13.7.1** During performance of this Contract, the Contractor agrees that it shall not discriminate against any employee, applicant for employment of sub-contractor or supplier because of race, color, religion, sex, national origin, or handicap. The Contractor further agrees that it shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, national origin, or handicap. Such action shall include, but not be limited to, (1) employment, (2) upgrading, (3) demotion, (4) transfer, (5) recruitment or recruitment advertising, (6) layoff or termination, (7) rates of pay or other forms of compensation, and (8) selection for training, including apprenticeship.

## **13.8 24 CFR PART 135.38 SECTION 3 CLAUSE**

**13.8.1** All Section 3 covered Contracts shall include the following clauses:

**13.8.1.2**The work to be performed under this contract is subject to the requirements of section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (section 3). The purpose of section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

**13.8.1.3**The parties to this contract agree to comply with HUD's regulations in 24 CFR part 135, which implement section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the part 135 regulations.

**13.8.1.4** The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.

**13.8.1.5**The contractor agrees to include this section 3 clause in every subcontract subject to compliance with regulations in 24 CFR part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR part 135. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR part 135.

**13.8.1.6** The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR part 135 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR part 135.

**13.8.1.7**Noncompliance with HUD's regulations in 24 CFR part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

**13.8.1.8** With respect to work performed in connection with section 3 covered Indian housing assistance, section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e) also applies to the work to be performed under this contract. Section 7(b) requires that to the greatest extent feasible (i) preference and opportunities for training and employment shall be given to Indians, and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprises. Parties to this contract that are subject to the provisions of section 3 and section 7(b) agree to comply with section 3 to the maximum extent feasible, but not in derogation of compliance with section 7(b).

**13.8.2** The minimum requirement for the ensurement of employment of low and very low-income recipients shall be (10) fulltime positions but not less than 30% of the contractor's aggregate number of new hires whichever is greater. A pool of certified applicants shall be provided to the contractor for employment in the project. Each certified applicant shall have completed a job training and safety program.

**13.8.2.1** Contracts. Numerical goals set forth in paragraph (c) of this section apply to contracts awarded in connection with all section 3 covered projects and section 3 covered activities. Each recipient and contractor and subcontractor (unless the contract or subcontract awards do not meet the threshold specified in §135.3(a)(3)) may demonstrate compliance with the requirements of this part by committing to award to section 3 business concerns:

**13.8.2.2** At least 10 percent of the total dollar amount of all section 3 covered contracts for building trades work for maintenance, repair, modernization or development of public or Indian housing, or for building trades work arising in connection with housing rehabilitation, housing construction and other public construction; and

**13.8.2.3** At least three (3) percent of the total dollar amount of all other section 3 covered contracts.

**13.8.3** The parties to this Contract agree to comply with HUD's regulations in 24 CFR part 135, which implement Section 3. As evidenced by their execution of this Contract, the parties to this Contract certify that they are under no contractual or other impediment that would prevent them from complying with the part 135 regulations.

**13.8.4** The Contractor agrees to send to each labor organization or representative of workers with which the Contractor has a collective bargaining agreement or other understanding, a notice advising the labor organization or workers representative of the Contractor's commitments under this Section 3 clause, and will post copies to the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3.

**13.8.5** The Contractor agrees to include this Section 3 clause in every subcontract subject to compliance with regulations in 24 CFR part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this Section 3 clause, upon finding that the sub-contractor is in violation of the regulations in 24 CFR part 135.

The Contractor will not sub-contract with any sub-contractor where the Contractor has notice or knowledge that the sub-contractor has been found in violation of the regulations in 24 CFR part 135.

**13.8.6** The Contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the Contractor is selected but before the Contract is executed and (2) with persons other than those to whom the regulations of 24 CFR part 135 require employment opportunities to be directed, were not filled to circumvent the Contractor's obligations under 24 CFR part 135.

**13.8.7** Noncompliance with HUD's regulations in 24 CFR part 135 may result in sanctions, termination of this Contract for default, and debarment or suspension from future HUD assisted Contracts.

### **13.9 LABOR STANDARDS – DAVIS BACON AND RELATED ACTS – MINIMUM WAGES**

**13.9.1** All laborers and mechanics employed under this contract in the development or construction of the project(s) involved will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the regular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits in the wage determination for

the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

- i. Any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when all the following criteria have been met: (A) The work to be performed by the classification requested is not performed by a classification in the wage determination; and (B) The classification is utilized in the area by the construction industry; and (C) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
- ii. If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employee Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.
- iii. In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.
- iv. The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (ii) or (iii) of this clause shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in classification.

**13.9.2** Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof. If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

**13.9.3** Withholding of funds. HUD or its designee shall, upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working in the construction or development of the project, all or part of the wages

required by the contract, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the Contractor, disburse such amounts withheld for and on account of the Contractor or subcontractor to the respective employees to whom they are due.

**13.9.4 Payrolls and Basic Records.** Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working in the construction or development of the project. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found, under 29 CFR 5.5(a)(1)(iv), that the wages of any laborer or mechanic include the amount of costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

**13.9.5.5** The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Owner for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under subparagraph (c)(1) of this clause. This information may be submitted in any form desired. Optional Form WH-347 (Federal Stock Number 029-005-00014-1) is available for this purpose and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. The Contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB Control Number 1214-0149.)

- i. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
  - a. That the payroll for the payroll period contains the information required to be maintained under paragraph (c) (1) of this clause and that such information is correct and complete;
  - b. That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3; and
  - c. That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
- ii. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirements for submission of the "Statement of Compliance" required by subparagraph (c)(2)(ii) of this clause.
- iii. The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.

**13.9.5.6** The Contractor or subcontractor shall make the records required under subparagraph (c)(1) available for inspection, copying, or transcription by authorized representatives of HUD or its designee, the Owner, or the Department of Labor and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

**13.9.5.7** Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship and Training, Employer and Labor Services (OATELS), or with a State Apprenticeship Agency recognized by OATELS, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by OATELS or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in this paragraph, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator of the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event OATELS, or a State Apprenticeship Agency recognized by OATELS, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

**13.9.5.8** Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess

of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

- i. Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this clause shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

**13.9.5.9** Compliance with Copeland Act requirements. The Contractor shall comply with the requirements of 29 CFR Part 3, which are hereby incorporated by reference in this contract.

**13.9.5.10** Contract termination; debarment. A breach of this contract clause may be grounds for termination of the contract and for debarment as a Contractor and a subcontractor as provided in 29 CFR 5.12.

**13.9.5.11** Compliance with Davis-Bacon and related Act requirements. All rulings and interpretations of the Davis-Bacon and related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

**13.9.5.12** Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this clause shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the PHA, HUD, the U.S. Department of Labor, or the employees or their representatives.

**13.9.5.13** Certification of eligibility. By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

- i. No part of this contract shall be subcontracted to any person or firm ineligible for award of a United States Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
- ii. The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.

**13.9.5.14** Contract Work Hours and Safety Standards Act. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

- i. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics, including watchmen and guards, shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.
- ii. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the provisions set forth in subparagraph (j)(1) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic (including watchmen and guards) employed in violation of the provisions set forth in subparagraph (j)(1) of this clause, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the

overtime wages required by provisions set forth in subparagraph (j)(1) of this clause.

- iii. Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the provisions set forth in subparagraph (j)(2) of this clause.

**13.9.5.15 Subcontracts.** The Contractor or subcontractor shall insert in any subcontracts all the provisions contained in this clause, and such other clauses as HUD or its designee may by appropriate instructions require, and also a clause requiring the subcontractors to include these provisions in any lower tier subcontracts. The prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all these provisions.

## **ARTICLE 14 - TERMINATION OR SUSPENSION OF THE CONTRACT**

### **14.1 TERMINATION BY THE CONTRACTOR**

**14.1.1** The Contractor may terminate the Contract if the Work is stopped for a period of 60 days through no act or fault of the Contractor or a sub-contractor, sub-subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor, for any of the following reasons:

- .1 issuance of an order of a court or other public authority having jurisdiction;
- .2 an act of government, such as declaration of national emergency, making material unavailable;

**14.1.2** If one of the above reasons exists, the Contractor may, upon seven additional days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery including reasonable overhead, profit and damages.

**14.1.3** If the Work is stopped for a period of 60 days through no act or fault of the Contractor or a sub-contractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has persistently failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in subparagraph 14.1.2.

### **14.2 TERMINATION BY THE OWNER FOR CAUSE**

**14.2.1** The Owner may terminate the Contract if the Contractor:

- .1 in the Owner's reasonable judgement repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to sub-contractors for materials or labor in accordance with the respective agreements between the Contractor and the sub-contractors;
- .3 disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction;
- .4 is guilty of material breach of a provision of the Contract Documents;
- .5 breaches any warranty made by the Contractor under or pursuant to the Contract Documents;
- .6 fails to furnish the Owner with assurances satisfactory to the Owner evidencing the Contractor's ability to complete the Work in compliance with all the requirements of the Contract Documents, or



- .7 fails after commencement of the Work to proceed continuously with the construction and completion of Work for more than ten (10) days, except as permitted under the Contract Documents.

**14.2.2** When any of the above reasons exist, the Owner, upon certification by the Architect that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 accept assignment of subcontracts pursuant to Paragraph 5.4; and
- .3 finish the Work by whatever reasonable method the Owner may deem expedient.

**14.2.3** When the Owner terminates the Contract for one of the reasons stated in subparagraph 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

**14.2.4** If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's service and expenses made necessary thereby, such excess shall be paid to the contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner as the case may be, shall be certified by the Architect, upon application, and this obligation for payment shall survive termination of the Contract.

### **14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE**

**14.3.1** The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

### **14.4 OWNER'S TERMINATION FOR CONVENIENCE**

**14.4.1** The Owner may, at any time, terminate the Contract, in whole or in part, for the Owner's convenience and without cause. Termination by the Owner under this Paragraph shall be by a notice of Termination delivered to the Contractor specifying the extent of termination and the effective date.

**14.4.2** Upon such termination, the Contractor shall recover as its sole remedy payment for Work properly performed in connection with the terminated portion of the Work prior to the effective date of termination and for items properly and timely fabricated off the project site, delivered and stored in accordance with the Owner's instructions. The Contractor hereby waives and forfeits all other claims for payment and damages, including, without limitations, anticipated profits.

**14.4.3** The Owner shall be credited for (1) payments previously made to the Contractor for the terminated portion of the Work, (2) claims which the Owner has against the Contractor under the Contract and (3) the value of the materials, supplies, equipment or other items that are to be disposed of by the Contractor that are part of the Contract Sum.



**I.F.B. 17-524-RAD  
DIVISION 1  
GENERAL REQUIREMENTS  
SECTION 01010  
SUMMARY OF WORK**

**I. DESCRIPTION**

**A. SITE LOCATION AND CONDITIONS**

1. The project is located in the Uplands Subdivision on the south side of Pueblo, CO (see sets location map). Building sites are contiguous to each other within the subdivision.
2. The contractor shall exercise caution to prevent damage to any adjacent property or properties that remain and shall be solely responsible for correction of damage.

**B. SCOPE OF PROJECT**

1. Construction of 72 townhomes.
2. The construction called for in the drawings and specifications is new construction of townhome units. Typical construction is to be wood framed stucco one-story and two-story units.
3. All townhomes to qualify for Energy Star Label. To ensure that the homes meet Energy Star guidelines, third-party verification by a certified home energy rater (or equivalent) is required. (Rater provided by Owner).
3. Exterior work consists of site utilities, backfill, grading, sidewalks, driveways and recreation areas.

**C. USE OF SITE**

1. The operations under this contract shall be limited to the area of the total subdivision indicated on the drawings. All materials must be stored within the area. Lots not under construction may be used for storage of materials and mobilization, but approved by Owner.

**II. COORDINATION**

**A. Sub-contractors**

1. Craftsmanship
  - a. Sub-contractors shall use their experience, knowledge, skills, and expert craftsmanship to produce quality work that is functional and trouble free for the Owner.

2. Functional Intent
  - a. Sub-contractors shall understand the functional intent of their product in the total building concept and shall provide that function.
  - b. Sub-contractors shall analyze the conditions under which their work is affected by, or affects the work of other trades and shall make appropriate accommodations and adjustments.
3. Building Codes
  - a. Sub-contractors shall review the current Uniform Building Mechanical, Electrical, and Plumbing Codes for changes and any discrepancy or error brought to the Architect's attention prior to bid.
  - b. Study the classifications, particularly those that affect his part of the work.
  - c. Comply with the code requirements.
4. Maintenance Accessibility and Convenience
  - a. Sub-contractors shall understand the Owner's future routine maintenance requirements and make convenience and accessibility for maintenance purposes a high priority.
  - b. Sub-contractor shall make minor adjustments and modifications to provide convenience and accessibility for maintenance purposes.
5. Cooperation
  - a. Sub-contractors shall cooperate with the General Contractor's Superintendent in coordinating their work with other trades. Sub-contractors shall make adjustments and modifications to their work to accommodate the work of others and to best fit with the total building concept, function, and use. Items to be discussed with Architect before change.

B. CONSTRUCTION SUPERINTENDENT

1. The General Contractor shall employ a FULL TIME superintendent throughout the project work.
2. In addition to his other duties, the Construction Superintendent shall:
  - a. Understand the total building concept and the function of the various parts, products, and systems in the project. He shall assist sub-contractors in interpreting the plans and specifications correctly. He shall review the plans and specifications with his sub-contractors for compliance with applicable codes, and be responsible to see that the same are followed.
  - b. Coordinate the sequence of construction so that the proper sequence precludes the possibility of one sub-contractors work causing damage to the materials and equipment of another sub-contractor or limiting intended function.

2. Prepare for the work of the various trades and sub-contractors.
  - a. Review the contract requirements with the sub-contractors and resolve any misunderstandings.
  - b. Review substrate conditions with the sub-contractor over which his work is to be applied or attached.
  - c. correct any unacceptable conditions that preclude proper installation or function before proceeding.
  
3. Applicable Building Codes for this project are:
  - 2015 Edition of the International Building Code
  - 2015 Edition of the Uniform Plumbing Code
  - 2015 Edition of the Uniform Mechanical Code
  - 2014 Edition of the Uniform Electrical Code
  - 2015 National Fire Protection Assoc. NFPA 13R
  - U.S. Department of Housing and Urban Development, Minimum Property Standard, Handbook 4910.1, Appendices, C, D, E, and Uniform Federal Accessibility Standards, and U.S. Department of Agriculture, Thermal Performance Construction Standards
  
4. Supervise the execution of the sub-contractors' work.



**I.F.B. 17-524-RAD**  
**DIVISION 1**  
**SECTION 01300**  
**SUBMITTALS**

I. GENERAL

A. RELATED DOCUMENTS

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

B. SUMMARY

1. This Section specifies administrative and procedural requirements for submittals required for performance of the work, including:
  - a. Submittal schedule
  - b. Shop drawings
  - d. Product data
  - e. Samples
2. Administrative Submittals
  - a. Refer to other Division-1 sections and other contract documents for requirements for administrative submittals. Such submittals include, but are not limited to:
    - b. Schedule of Values
    - c. Permits
    - d. Applications for payment
    - e. Performance and payment bonds
    - f. Insurance certificates
    - g. List of sub-contractors
3. The Schedule of Values submittal is required prior to the first payments.

C. SUBMITTAL PROCEDURES

1. Coordination
  - a. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
  - b. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
  - c. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

2. Processing

- a. Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for re-submittals.
- b. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Architect will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
- c. If an intermediate submittal is necessary, process the same as the initial submittal.
- d. Allow two weeks for reprocessing each submittal.
- e. No extension of contract time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the work to permit processing.

3. Submittal Preparation

- a. Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
- b. Provide a space approximately 4" x 5" on the label or beside the title block on shop drawings to record the Contractor's review and approval markings and the action taken.
- c. Include the following information on the label for processing and recording action taken.
- d. Project name
- e. Date
- f. Name and address of Architect
- g. Name and address of sub-contractor
- h. Name and address of Contractor
- i. Name and address of Supplier
- j. Name of manufacturer
- k. Number and title of appropriate specification section
- l. Drawing number and detail references, as appropriate.

4. Submittal Transmittal

- a. Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.
- b. The transmittal record relevant information and requests for data. On the form, or separate sheet, record deviations from contract document requirements, including minor variations and limitations. Include Contractor's certification that information complies with contract document requirements.



D. SUBMITTAL SCHEDULE

1. After development and acceptance of the Contractor's construction schedule, prepare a complete schedule of submittals. Submit the schedule within 10 days of the date required for establishment of the Contractor's construction schedule.
2. Distribution
  - a. Following response to initial submittal, print and distribute copies to the Architect, Owner, sub-contractors, and other parties required to comply with submittal dates indicated. Post copies in the project meeting room and field office.
  - b. When revisions are made, distribute to the same parties and post in the same locations. delete parties from distribution when they have completed their assigned portion of the work and are no longer involved in construction activities.

E. SHOP DRAWINGS

1. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the contract documents. Do not reproduce contract documents or copy standard information as the basis of shop drawings. Standard information prepared without specific reference to the project is not considered shop drawings.
2. Shop drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:
  - a. Dimensions
  - b. Identification of products and materials included
  - c. Compliance with specified standards
  - d. Notation of coordination requirements
  - e. Notation of dimensions established by field measurement
3. Sheet Size
  - a. Except for templates, patterns and similar full-size drawings, submit shop drawings on sheets at least 8½" x 11" but no larger than 36" x 48".
4. Initial Submittals
  - a. Submit one correctable translucent reproducible print and one blue- or black-line print for the Architect's review; the reproducible print will be returned.

5. Final Submittals
  - a. Submit 3 blue- or black-line prints; submit 5 prints where required for maintenance manuals. 2 prints will be retained; the remainder will be returned.
  
6. Coordination Drawings are a special type of shop drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.
  - a. Preparation of coordination drawings is specified in section "Project Coordination" and may include components previously shown in detail on shop drawings or product data.
  - b. Submit coordination drawings for integration of different construction elements. Show sequences and relationships of separate components to avoid conflicts in use of space.

F. PRODUCT DATA

1. Collect product data into a single submittal for each element of construction or system. Product data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, rough-in diagrams and templates, standard wiring diagrams and performance curves. Where product data must be specially prepared because standard printed data is not suitable for use, submit as "shop drawings."
  - a. Mark each copy to show applicable choices and options. Where printed product data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
    - b. Manufacturer's printed recommendations
    - c. Compliance with recognized trade association standards
    - d. Compliance with recognized testing agency standards
    - e. Application of testing agency labels and seals
  - f. Notation of dimensions verified by field measurement
  - g. Notation of coordination requirements.
  
2. Do not submit product data until compliance with requirements of the contract documents has been confirmed.
  
3. Preliminary Submittal
  - a. Submit a preliminary single-copy of product data where selection of options is required.

4. Submittals
  - a. Submit 2 copies of each required submittal; submit 4 copies where required for maintenance manuals. The Architect will retain one, and will return the other marked with action taken and corrections or modifications required.
  - b. Unless noncompliance with contract document provisions is observed, the submittal may serve as the final submittal.
  
5. Distribution
  - a. Furnish copies of final submittal to installers, sub-contractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
  - b. Do not proceed with installation until an applicable copy of product data applicable is in the installer's possession.
  - c. Do not permit use of unmarked copies of product data in connection with construction.

## I. SAMPLES

1. Submit full-size, fully fabricated samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.
  - a. Mount, display, or package samples in the manner specified to facilitate review of qualities indicated. Prepare samples to match the Architect's sample. Include the following:
    - b. Generic description of the sample
    - c. Sample sources
    - d. Product name or name of manufacturer
    - e. Compliance with recognized standards
    - f. Availability and delivery time
  
2. Submit samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
  - a. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.



**I.F.B. 17-524-RAD  
DIVISION 1  
GENERAL REQUIREMENTS  
SECTION 01310  
PROJECT MANAGEMENT AND COORDINATION**

GENERAL

1.1 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
1. Coordination Drawings.
  2. Project meetings.
  3. Progress Chart
  4. Schedules of Amounts (Values)

1.2 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different sections, that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
  3. Make adequate provisions to accommodate items scheduled for later installation.
  4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work.

Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

### 1.3 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
  2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within FIVE days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than fifteen days after execution of the Agreement. Hold the conference at the office of the Owner. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing and long-lead items.
    - d. Designation of key personnel and their duties.
    - e. Procedures for processing field decisions and Change Orders.

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

- p. Acceptability of substrates.
  - q. Temporary facilities and controls.
  - r. Space and access limitations.
  - s. Regulations of authorities having jurisdiction.
  - t. Testing and inspecting requirements.
  - u. Installation procedures.
  - v. Coordination with other work.
  - w. Required performance results.
  - x. Protection of adjacent work.
  - y. Protection of construction and personnel.
- 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  - 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
  - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at bi-weekly intervals. Coordinate dates of meetings with preparation of payment requests.
- 1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.



- 4) Access.
  - 5) Site utilization.
  - 6) Progress cleaning.
  - 7) Quality and work standards.
  - 8) Status of correction of deficient items.
  - 9) Field observations.
  - 10) Requests for interpretations (RFIs).
  - 11) Status of proposal requests.
  - 12) Pending changes.
  - 13) Status of Change Orders.
  - 14) Pending claims and disputes.
  - 15) Documentation of information for payment requests.
3. Minutes: Architect will record and distribute meeting minutes.
  4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
    - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

#### 1.4 PROGRESS CHART

- A. Submit: to the Architect immediately after execution of the Contract an overall timetable of construction schedule for the project. This timetable shall start with the date of the Notice to Proceed and the completion time shall be as specified in the Agreement.
- B. The Timetable: shall portray fully a schedule representing the various elements in the Schedule of Amounts. The time shown between the starting and completion dates of the various elements within the Schedule of Amounts shall represent one hundred percent (100%) completion of each element.
- C. In addition: the General Contractor shall submit monthly progress charts. These charts shall reflect the Schedule of Amounts and the General Contractor's "work in place" progress.

#### 1.5 SCHEDULE OF AMOUNTS (VALUES)

- A. The Schedule of Amounts: shall form the basis upon which periodic payment requests are reviewed.
- B. Submit: to the Architect immediately after execution of the contracts a Schedule of Amounts showing the amount of the contract for each of the divisions of the specifications and sections under those divisions, where possible.

- C. Upon Review: the Architect may require additional information or more details in the Schedule of Amounts. This information shall be completed prior to the submittal of requests for payment.

**I.F.B. 17-524-RAD  
DIVISION 1  
GENERAL REQUIREMENTS  
SECTION 01320  
SUBSTITUTIONS AND ADDENDA**

**I. GENERAL**

**A. RELATED DOCUMENTS**

1. Drawings and general provisions of Contract, including General and Division 1 Specification sections apply to the work of this section.

**B. SUBSTITUTIONS**

1. The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.
2. No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect at least **seven** days prior to the date for receipt of Bids. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work, including changes in the work of other contracts that incorporation of the proposed substitution would require, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.
3. If the Architect approves a proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.
4. No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

**C. ADDENDA**

1. Addenda will be transmitted to all who are known by the issuing office to have received a complete set of Bidding Documents.
2. Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.
3. Addenda will be issued no later than four days prior to the date of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.
4. Each Bidder shall ascertain prior to submitting a Bid that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.



**I.F.B. 17-524-RAD  
DIVISION 1  
GENERAL REQUIREMENTS  
SECTION 01506  
TEMP. FACILITIES, SEPARATE PRIMES**

**I. GENERAL**

**A. RELATED DOCUMENTS**

1. Drawings and general provisions of Contract, including General and Division 1 Specification sections, apply to the work of this section.

**B. DESCRIPTION REQUIREMENTS**

1. Definitions
  - a. Specific administrative and procedural minimum actions are specified in this section, as extensions of provisions in General Conditions and other contract documents. These requirements have been included for special purposes as indicated. Nothing in this section is intended to limit types and amounts of temporary work required, and no omission from this section will be recognized as an indication by Architect/Engineer that such temporary activity is not required for successful completion of the work and compliance with requirements of contract documents. Provisions of this section are applicable to, but not by way of limitation, utility services, construction facilities, security/protection provisions, and support facilities.

**C. PROTECTION OF EXISTING FACILITIES**

1. Contractor shall exercise extreme caution when working around installed equipment and structures. When welding or accomplishing other possible damaging work, all existing facilities shall be properly protected to prevent damage to installed equipment and/or structures. In the event installed equipment is accidentally damaged; Contractor shall report the damage immediately to the Architect and be prepared to repair the damage at his expense once an acceptable repair plan has been approved.

**D. BARRICADES**

1. Contractor shall provide barricades and other safety precautions as required to insure the protection of the public as well as employees and others concerned with their duties and presence on the premises of the project site. Provide all bracing, shoring, and sheeting as required for safety and for proper execution of work, and remove same when work is complete. Provide and maintain guard lights at all barricades, obstructions in streets and sidewalks, and all trenches and pits. At all times provide protection against rain, wind, storm, frost, or heat so as to maintain all work, materials, apparatus, and fixtures free from injury or damage. At the end of each day's work, cover all work likely to be damaged.

E. AREA OF OPERATIONS

1. Contractor shall be required to erect and maintain suitable barricading around open excavations. The Contractor shall remove the barricading at the completion of the work. The definition of suitable barricading shall be means necessary to warn the public of the dangers of the construction site and control access.
2. Contractor shall exercise extreme caution in preventing any employees, equipment, or materials from interfering with other projects in progress or with the operations of the existing building. The Contractor shall confine his work and storage area to within the area of the property line.
3. Contractor shall provide temporary chain link fencing to existing chain link fencing left in place by the owner for the purposes of security the property boundary. As required by the installation of permanent facilities the temporary fencing shall be removed.

F. LAYOUT

1. Contractor shall layout his work from established bench marks indicated on the drawings or designated by the Architect and shall be responsible for all measurements in connection therewith, and in order to assist the contractor in the layout of his work **shall provide and pay for the engineering and surveying.**  
**This will include:**
  - a. **CONTROL:** verify and/or set control necessary for stakeout purposes.
  - b. **OVERLOT ROUGH GRADES:** Provide stakes at an approximate 50'x50' grid, four (4) corners of building pads for over-excavation purposes, slope stakes at detention ponds, and establish a temporary working benchmark with reference to finish floor.
  - c. **SANITARY SEWER:** Provide stakes at 25' stations with offset and grade at wyes, cleanouts, and manholes.
  - d. **WATER:** Provide stakes at approximately 50' stations with offset and grade at all tees, elbows, valves, lowerings, fire hydrants, and meters.
  - e. **STORM SEWERS:** Provide stakes at approximately 25' stations with offset and grade at tees, roof drains, and manholes.
  - f. **STORM STRUCTURES:** Provide stakes at an offset and grade at all inlet boxes, headwalls, rip rap pads, and trickle pans.
  - h. **BUILDING LAYOUT:** Provide stakes at an offset to be determined by Contractor at corners of building (2 points each per corner, approximately 14-16 points per unit).
  - i. **RETAINING WALLS:** Provide stakes at approximately 25' stations with offset and grade and at all changes of direction.
  - j. **SIDEWALKS:** Provide stakes at approximately 25' stations with offset and grade at all meandering sidewalks that are not controlled by curb and gutter.
  - k. **CURB & GUTTER:** Provide stakes at approximately 25' stations at all changes of direction, grade breaks, handicap ramps, and radius points.
  - l. **RED TOPS:** Provide stakes at approximately 25" stations in parking lot only with reference to top subgrade.

- m. **BLUE TOPS:** Provide stakes at approximately 25' stations in parking lot only with reference to top base course.
- n. **OFFICE:** Provide office support, calculations and supervision for field crews.

**NOTE: NOT INCLUDED:**

- i. Any utility not mentioned above
- ii. Construction or demolition limits
- iii. Certification surveys of any kind
- iv. Re-establishment of any lost or destroyed property corners or control
- v. Paint striping

**NOTE:** This is for one-time staking only. Any re-staking will be the responsibility of the Contractor.

G. TEMPORARY FACILITIES

- 1. Temporary Water
  - a. Existing fire hydrants on site may be used by the General Contractor for temporary water. The Board of Water Works shall be contacted for procedures and payment of temporary water by the Contractor.
- 2. Temporary Power
  - a. The Contractor shall arrange for, furnish, maintain, and pay for all electrical power necessary for required illumination, power tools, lighting, and outlets for temporary structures, and temporary heat for construction operations including all necessary generators, transformers, cables, panel boards, switches, wiring, poles, meters, and accessories. Temporary electrical work shall meet the requirements of the National Electrical Code NFPA 70.
- 3. Temporary Heat
  - a. The Contractor shall provide and pay for all heat, fuel, and services necessary to protect the work and materials against injury from dampness and cold during construction of the building. Provide temporary heating devices, electrical power, adequate and proper fuel, enclosures, and related items as required for the work of all trades. Provide and maintain required levels of heat as specified hereafter in the respective sections relating to finish grades. Use only Underwriters Laboratories (UL) approved equipment. Open salamanders will not be allowed. L.P.G. and other lighter than air fuel gases will not be allowed. Permanent heating system may be used for temporary heat prior to occupancy of the building or as otherwise approved by the Architect; however, use of permanent equipment for purposes of temporary heat shall not affect the guarantee period stated elsewhere in these Specifications. Contractor shall be responsible for operation and maintenance of the heating system and equipment used for temporary heat until completion of the building and shall repair or replace all items damaged during temporary use, replace all filters with new filters, and be responsible for restoration and cleaning of all permanent heating equipment if same is used for temporary heat before final acceptance.

4. Temporary Toilet
  - a. The Contractor shall provide and maintain temporary toilet facilities at the site for the duration of operations in properly proportioned number of fixtures for number of workmen employed. Use chemical toilets. Provide urinals with each toilet. Provide facilities with solid walls and floors, and furnished with tissue or holders. Place facilities at approved locations near the work and keep in a clean, sanitary condition at all times.

#### H. FIELD OFFICE

1. The Contractor shall provide and maintain for duration of the work one approved location for a field office of construction. Provide own office furniture, supplies, equipment, temporary light, heat, and telephone. Office may be trailer on wheels or other portable type as approved. Properly file all drawings and specifications on the project and make them accessible at all times for the Architect. Maintain in a clean, sanitary condition at all times.

#### I. SCAFFOLDING, STAIRS, AND LADDERS

1. The Contractor shall provide and maintain for the duration of requirement all equipment such as temporary scaffolding, stairs, ladders, ramps, hoists, derricks, etc.

#### J. CLEANING AND TRASH DISPOSAL

1. Each prime contractor and each other entity shall be responsible for daily cleaning up of spillage and debris resulting from its operations and from those of its subcontractors; and shall be responsible for complete removal and disposition of hazardous and toxic waste materials. Contractor for General Work shall provide containers at grade, sufficient for the depositing of nonhazardous/nontoxic waste materials, and shall remove such waste materials from project site at least weekly.

#### K. TEMPORARY SIGN

1. No sign or advertisement will be allowed without approval of the Architect.
2. The Contractor shall erect one painted sign as approved by the Architect giving names and addresses of the Owner, Architect, Engineers, and General Contractor.
3. Sign shall be 4'-0" x 8'-0" x 3/4" thick exterior grade plywood securely fastened to two (2) 4" x 4" x 10' posts set 3'-0" into the ground. All exposed surfaces shall be painted. Letters shall be painted by a professional sign painter in lettering styles, sizes and colors as indicated on review submittal. Sign shall be removed at the completion of the project.



**I.F.B. 17-524-RAD**  
**DIVISION 1**  
**GENERAL REQUIREMENTS**  
**SECTION 01710**  
**CLEANING**

I. GENERAL

A. SCOPE

1. The work under this section includes the furnishing of all material and labor necessary for the completion of all cleaning as herein specified or a necessary part of same.

B. RUBBISH REMOVAL

1. During construction, each subcontractor shall be responsible for the removal from the premises of all boxes, cartons, packing materials, and trash brought onto the site by his part of the work.

C. CLEANING

1. Exterior- in addition to items specified below, all surfaces on exterior shall be carefully and thoroughly cleaned, using cleaners and methods that will not damage or discolor the materials being cleaned.
2. Glass - both sides of all glass shall be carefully and thoroughly cleaned and left absolutely clean and free from paint, grease, dirt, etc.
3. Hardware - all hardware shall be carefully and thoroughly cleaned and polished and left absolutely clean and free from paint, grease, dirt, etc.
4. Plumbing - all plumbing fixtures, fittings, and exposed plating piping shall be carefully and thoroughly cleaned and polished and left absolutely clean and free from paint, grease, dirt, etc. and all labels shall be removed.
5. Electric - all items of equipment, mechanical electrical, cabinets, etc. shall be carefully cleaned and thoroughly free from paint, grease, dirt, etc.
6. Equipment - all items of equipment, mechanical electrical, cabinets, etc. shall be carefully cleaned and thoroughly free from paint, grease, dirt, etc.
7. Floors - all floors shall be thoroughly cleaned. Resilient floor covering shall be mopped with warm water and mild detergent, then thoroughly machine buffed.
8. Finally - the entire work inside and out, and the entire premises shall be in first-class clean condition upon completion before being accepted.



**I.F.B. 17-524-RAD  
DIVISION 1 – GENERAL REQUIREMENTS  
PROJECT CLOSEOUT  
SECTION 01720**

I. GENERAL

A. DESCRIPTION

1. Scope: Prior to final acceptance of the project, the following will be required of the Contractor:
  - a. Deliver all maintenance manuals to the Owner
  - b. Deliver all bonds, warranties/guarantees required by these Specifications to the Owner
  - c. Deliver all lien waivers from materials and labor sub-contractors and suppliers to the Owner.
  - d. Deliver to Owner at 201 S. Victoria Avenue, Pueblo, Colorado all extra parts specified in Divisions 2 through 16 packaged and clearly marked with the contents and the project name. These items will be covered with a letter of transmittal signed by the Owner's Representative as to the contents received, and a copy of that transmittal will accompany the final pay request.
  
2. Architect's Inspection
  - a. The Architect shall schedule with the Contractor a date to inspect the project and prepare a punch list of the incomplete work.
  - b. Content of punch list - a separate punch list shall be prepared for each building which identifies the:
    - 1) Date of inspection
    - 2) Name and title of the Contractor representative
    - 3) Each incomplete or unsatisfactory work item
    - 4) Specific location of each item of incomplete work
  - c. Contractor notification - the Architect will send a letter to the Contractor which:
    - 1) Transmits a copy of the punch list
    - 2) Advises the Contractor to promptly correct each item of incomplete or unsatisfactory work
    - 3) Requests that the Contractor promptly notify the Owner of the date by which the corrective work will be complete so that the Owner can schedule a final inspection prior to contract settlement.
  - d. Deductions for incomplete work - the Owner shall consult with the Architect to determine if it would be advantageous to accept a project prior to final inspection. In such instances, the Architect shall prepare a deductive change order prior to the final inspection. The amount of deduction from the contract price shall be based on current replacement cost for correcting any incomplete or unsatisfactory work.
  
3. Final Inspection
  - a. A final project inspection shall be made when all work is completed. Until the final inspection has been made and approved by the Owner shall not advance any of the retainage or make the final payment to the Contractor.

- b. Inspection date - upon receipt of the Contractor's notification of the date when the corrective work will be completed, the Owner shall schedule a final inspection. Each member of the inspection team shall be given a fifteen (15) day notification of the scheduled inspection date.
- c. Inspection participants - the final inspection shall be conducted by:
  - 1) The Architect
  - 2) A Contractor Representative
- d. Inspection report - the Architect shall prepare a final inspection report and certificate of completion based on the agreements reached at the inspection conference. The Certificate of Completion will show the amount of payment to be withheld for any incomplete work provided that such work is not of a major nature requiring correction before settlement.
- e. Prepare as-built drawings of the work other than as shown on the drawings and submit to the Architect.
- f. Deliver all keys to Owner that may have been issued.
- g. Deliver all new keys to the owner identifying door, unit number, and function.

4. Warranty Inspections

- a. The Owner is responsible for performing required warranty inspections during the warranty period and promptly notifying the Contractor in writing to remedy any defects.
- b. Warranty period - the warranty period for all construction work shall be at least 365 calendar days from the date specified on the Certificate of Completion that is applicable to the work in question or such longer period otherwise specified in the construction contract. The General Contractor shall immediately correct any deficiencies identified as contractor responsibility.

**I.F.B. 17-524-RAD**  
**DIVISION 1 - GENERAL REQUIREMENTS**  
**PHYSICAL DATA**  
**SECTION 01800**

I. GENERAL

A. SOILS CONDITIONS

1. Test Boring
  - a. A complete soils report will be provided to the General Contractors @ 201 S. Victoria, 2<sup>nd</sup> floor.
2. The complete report prepared by the Soils Engineer, whose name appears on same, covering the conditions found to exist is on file at the Architect's office, where it may be examined in detail. **Full copies may be provided upon request.** The complete soils report shall be made part of the contract documents as such it is recommended that the contractors familiarize themselves with the Soils Report during bidding.
3. The log and the report prepared by the soils Engineer, whose name appears on same, are believed to be accurate. However, neither the Owner nor the Architect guarantees the information containing therein, nor do they guarantee that the conditions indicated to exist on the location of the test holes will prevail at other locations on the site.
4. Additional test borings may be done at the bidder's or Contractor's expense at his option to verify the conditions reported in the logs included in these specifications.
5. A summary of drilling locations and corresponding soils logs are contained within this Section 01800.



**I.F.B. 17-524-RAD**  
**DIVISION 1 - GENERAL REQUIREMENTS**  
**SUSTAINABLE DESIGN REQUIREMENTS IECC**  
**SECTION 01814**

I. GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. SUMMARY

1. Section includes general requirements and procedures for compliance with certain 2015 IECC.
  - a. Other IECC Requirements and credits needed to obtain Requirements certification depend on material selections and may not be specifically identified as IECC requirements. Compliance with requirements needed to obtain IECC prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
  - b. A copy of the Comcheck Project checklist is attached at the end of this Section for information only.
2. Related Sections:
  - a. Divisions 01 through 33 Sections for IECC requirements specific to the work of each of these Sections. Requirements may or may not include reference to IECC.

C. DEFINITIONS

1. Air Barrier: Materials assembled and joined together to provide a barrier to air leakage through the building envelope. An air barrier may be a single material or a combination of materials.
2. Alteration: Any construction, retrofit or renovation to an existing structure other than repair or addition that requires a permit. Also, a change in a building, electrical, gas, mechanical or plumbing system that involves an extension, addition or change to the arrangement, type or purpose of the original installation that requires a permit.
3. Boiler, Modulating: A boiler that is capable of more than a single firing rate in response to a varying temperature or heating load.

4. Building Commissioning: A process that verifies and documents that the selected building systems have been designed, installed, and function according to the owner's project requirements and construction documents, and to minimum code requirements.
5. Building Thermal Envelope: The basement walls, exterior walls, floor, roof and any other building elements that conditioned space and exempt or unconditioned space.
6. C-Factor (Thermal Conductance): The coefficient of heat transmission (surface to surface) through a building component or assembly, equal to the time rate of heat flow per unit area and the unit temperature difference between the warm side and cold side surfaces (Btu/h • ft<sup>2</sup> • °F) [W/(m<sup>2</sup> • K)].
7. Coefficient of Performance (COP) – Cooling: The ratio of the rate of heat input, in consistent units, for a complete refrigerating system or some specific portion of that system under designated operating conditions.
8. Coefficient of Performance (COP) – Heating: The ratio of the rate of the heat delivered to the rate of energy input, in consistent units, for a complete heat pump system, including the compressor and, if applicable, auxiliary heat, under designated operating conditions.
9. Continuous Insulation (ci): Insulating material that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior or is integral to any opaque surface of the building envelope.
10. Economizer, AIR: A duct and damper arrangement and automatic control system that allows a cooling system to supply outside air to reduce or eliminate the need for mechanical cooling during mild or cold weather.
11. Energy Analysis: A method for estimating the annual energy use of the proposed design and standard reference design based on estimates of energy use.
12. [M] Energy Recover Ventilation System: Systems that employ air-to-air heat exchangers to recover energy from exhaust air for the purpose of preheating, precooling, humidifying or dehumidifying outdoor ventilation air prior to supplying the air to a space, either directly or as part of an HVAC system.
13. Energy Simulation Tool: An approved software program or calculation-based methodology that projects the annual energy use of a building.



14. Fan Efficiency Grade (FEG): A numerical rating identifying the fan's aerodynamic ability to convert shaft power, or impeller power in the case of a direct-driven fan, to air power.
15. F-Factor: The perimeter heat loss factor for slab-on-grade floor (Btu/h • ft • °F) [W/m • K].
16. Linear System (Ls): A system that includes the following:
  - a. A continuous vapor barrier linear membrane that is installed below the purlins and that is uninterrupted by framing members.
  - b. An uncompressed, unfaced insulation resting on top of the liner membrane and located between the purlins.

For multilayer installations, the last rated R-value of insulation is for unfaced insulation draped over purlins and then compressed when the metal roof panels are attached.

17. Occupant Sensor Control: An automatic control device or system that detects the presence or absence of people within an area and causes lighting, equipment or appliances to be regulated accordingly.
18. On-site Renewable Energy: Energy derived from solar radiation, wind, waves, tides, landfill gas, biomass or the internal heat of the earth. The energy system providing on-site renewable energy shall be located on the project site.
19. Powered Roof/Wall Ventilators: A fan consisting of a centrifugal or axial impeller with an integral driver in a weather-resistant housing and with a base designed to fit, usually by means of a curb, over a wall or roof opening.
20. Radiant Heating System: A heating system that transfers heat to objects and surfaces within a conditioned space, primarily by infrared radiation.
21. Registered Design Professional: An individual who is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws of the state or jurisdiction in which the project is to be constructed.
22. R-Value (Thermal Resistance): The inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area (h • ft<sup>2</sup> • °F/Btu) [m<sup>2</sup> • K/W].

23. Solar Heat Gain Coefficient (SHGC): The ratio of the solar heat gain entering the space through the fenestration assembly to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation which is then reradiated, conducted or convected into the space.

24. U-Factor (Thermal Transmittance): The coefficient of heat transmission (air to air) through a building component or assembly, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/h • ft<sup>2</sup> • °F) [W/(m<sup>2</sup> • K)].

#### D. SUBMITTALS

1. General: Submit additional IECC submittals required by other Specification Sections.
2. IECC submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated IECC requirements.
3. IECC Commissioning Action Plans: Provide preliminary submittals within 14 days of date established for commencement of the Work indicating how the following requirements will be met:
4. IECC Documentation Submittals:
  - a. Credit EA 5: Product data and wiring diagrams for sensors and data collection system used to provide continuous metering of building energy-consumption performance over a period of time of not less than one year of post construction occupancy.
5. Documentation Submittals:
  - a. Insulation values to meet Zone 5 IECC table C402.1.3 as per construction documents.
  - b. Slab on grade perimeter insulation as in accordance with Section C402.2.5.
  - c. Roof solar reflections IECC C402.3.
  - d. Fenestration as in compliance with table IECC C402.4.
  - e. Daylight response control C407.1.1 where designated on design document (Note: Pueblo Regional Building does not require this it is Owner Optional). Not required in this Project.

- f. Mandatory air leakage – thermal envelope. Constructor shall provide thermal envelope testing of completed building envelope in accordance with ASTM E 779 with no greater rate of air leakage 0.40 crm/ft<sup>2</sup> (blower door test).
1. A continuous air barrier shall be provided as per 6402.5.1 and as specified in building construction documents.
  2. Materials and assemblies for air barrier are per Section C402.1.2.1, C402.5.1.2.2.
  3. Exceptions for fenestration and room containing fuel burning appliance are in C402.5.2 C402.5.3.
- g. HVAC equipment performance requirements at a minimum provide manufacture equipment certification for all installed equipment. HVAC to provide start-up equipment checklist for each piece of HVAC equipment installed. HVAC contractor shall test equipment in the presence of design engineer for certified acceptance. As per section IECC 403.2.3 all paperwork, checklists shall be included with Owners' manual.
- h. Duct and plenum insulation sealing. IECC C403.2.9 through C403.2.9.1.3. All high pressure duct systems shall be leak tested by the contractor in accordance with SMACNA HVAC Air Duct Leakage Test Manual to have a rate of air leakage of less than 4.0 as determined by  $CL = F/p^{0.65}$
- F = measured leakage rate of cfm per 100 sf of duct surface.  
P = static pressure.
- A minimum of 25% of duct area needs to be tested with a passing certification. If testing does not pass all ductwork shall be tested.
- i. Mechanical System Commissioning. IECC C408.2 Refer to commissioning spec for requirements. All HVAC equipment, plumbing equipment fixtures shall be commissioned by design engineer. Contractor shall coordinate required testing work for design engineers approval and certification of all equipment.
- j. Electrical system commissioning IECC Section C405. All electrical fixtures and equipment shall be commissioned by Design Engineer. Contractor shall coordinate required testing work for Design Engineers approval and certification.
- k. Review actual energy performance based design Section 407.3 – Contractor shall review at 11 month walk-thru with Design Architects and Engineers actual utility building usage and have a meeting to discuss any control procedure variations to improve building overall efficiency. This will take place at the buildings 11 Month Walk-thru schedule by the General Contractor.

- l. General Contractor shall provide compliance report using energy rating programs such as target finder by Energy Star to generate compliance report C407.4.1 and C407.4.2. Mechanical and Electrical Engineer will coordinate information with Owner and General Contractor.
- m. Report will include:
  1. Schedule of commission at final closeout period of construction.
  2. A list of all equipment in the building installed by contractor start-up parameters.
  3. Functional testing report (test and balance).
  4. Weather conditions at time of functional testing.
  5. Measurable criteria of performance.
- n. Compliance Report and commissioning documents shall be added to O&M after 11 Month building walk-thru.

**I.F.B. 17-524-RAD  
DIVISION 2 - SITEWORK  
SECTION 02205  
EARTHWORK FOR SITE**

I. GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.
2. “Soils and Foundation Investigation” – Project SC-03229-125 as prepared by CTL Thompson as on file at the office of the owner and in Section 01800 controls all material installation and compaction requirements.

B. DESCRIPTION OF WORK

1. Extent of earthwork and site grading is indicated on drawings.
  - a. Excavation and backfill for building structure and foundations is included as part of this work.
2. Preparation of subgrade for walks and pavement is included as work of this section.
3. Excavation for Mechanical/Electrical Work - Refer to Drawings for locations of underground mechanical and electrical utilities, and buried mechanical and electrical appurtenances. All requirements of Division 2 shall apply for mechanical and electrical excavation/backfill.

C. REGULATIONS, STANDARDS, AND REFERENCES

1. Comply with applicable regulations of the following references and standards of current editions in effect on date of Invitation for Bids.
  - a. American Association of State Highway and Transportation Officials (AASHTO)
  - b. American society for Testing and Materials (ASTM)
  - c. Division of Highways, State of Colorado Standard Specification for road and Bridge Construction (CDH)
  - d. State of Colorado, Division of Mines, Regulations for Blasting, Bulletin 20.
  - e. City of Pueblo, Department of Public Works Standard Specifications.
2. Testing and Inspection Service
  - a. Owner will engage and pay for testing and inspection service, to perform testing of soil materials proposed for use in work to provide field facilities for quality control testing during earthwork and site grading operations.

- b. Cooperate with soil testing and inspection service as it obtains samples of soil materials and furnish testing service with necessary samples of haul-in fill.
  - c. Any failure of soil compaction testing to be at Contractor's expense. Any soils compaction tests which fail, shall be retested after removal and compaction of soils in failed area. Subsequent retesting of failed areas shall be at the expense of the Contractor.
3. Test for Proposed Soil Materials
- a. Test soil materials proposed for use in the work and promptly submit test result reports.
  - b. Provide one optimum moisture-maximum density curve for each type of soil to be used for subgrade and fills. Determine maximum densities in accordance with ASTM D 1557 (AASHTO T180).
  - c. Analyze material within 3 feet of finished grades of paved areas to determine frost susceptibility.
  - d. Testing service will determine suitability of materials to be used to fill.

D. SUBMITTALS

1. Test Reports
- a. Submit copies of following reports directly to Architect/Engineer. All test reports must be signed by a licensed engineer.
  - b. Test reports required on proposed fill material. Those tests shall be paid for by the Contractor.

E. JOB CONDITIONS

1. Site Information - Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil profiles. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn there from by Contractor. Data is made available for convenience of Contractor.
- a. Additional test borings and other exploratory operations may be made by Contractor at no cost to Owner.
2. Existing Utilities
- a. Locate existing underground utilities in areas of work before starting earthwork operations. Where utilities are to remain in place, provide adequate means of protection during earthwork operations. Utilities as shown on the plans, (as provided by the Owner) are intended to be representative of the locations as accurately as possible. It is still the responsibility of the Contractor to locate these utilities.

- b. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner, and public and private utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
  - c. Demolish and completely remove from site underground utilities indicated to be removed. Coordinate with local utility companies for shut-off of services if lines are active.
3. Use of Explosives
- a. Use of explosives is not permitted.
4. Temporary Protection
- a. Barricade open excavations made as part of earthwork operations and post with warning lights. Operate warning lights as recommended by authorities having jurisdiction.
  - b. Protect structures, utilities, sidewalks, pavements, and other facilities from damages caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
  - c. Perform excavation within drip-line of large trees to remain by hand, and protect the root system from damage or dryout to the greatest extent possible. Maintain moist condition for root system and over exposed roots with burlap. Paint root cuts of 1" diameter and larger with emulsified asphalt tree paint.

## II. PRODUCTS

### A. SOIL MATERIALS

- 1. Sub-Base Material
  - a. Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, natural or crushed sand.
- 2. Drainage Fill
  - a. Washed, uniformly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100% passing a 1-11/4" sieve and not more than 5% passing a No. 4 sieve.
- 3. Backfill and Fill Materials
  - a. Use satisfactory soil materials as determined by the testing agency, for backfill and fill, free of rock or gravel larger than 2" in any dimension, debris, waste, frozen materials, vegetable, and other deleterious matter and comply with the above definitions. **All imported backfill material radon gas levels shall not exceed current Colorado State and Federal Standards of 400 pico-**

**scories per liter. Tests of this shall be provided prior to imprinting the materials.**

4. Pavement Sub-base Material
  - a. Properly graded mixture of natural or crushed gravel, crushed stone, crushed slag, natural or processed sand that will readily compact to required density in accordance with the City of Pueblo Standard Specifications.

**B. DEFINITIONS**

1. Satisfactory Soil Materials
  - a. Are defined as those complying with ASTM D 2487 soil classification groups GW, GP, GM, SM, SW ANS SP.
  - b. Are defined as those complying with the American Association of State Highway and Transportation Officials (AASHTO) Designation M145, soil classification Groups A-1, A-2-4, A-2-5, and A-3.
  - c. All soil materials must be approved by the testing agency **prior to use**.
2. Unsatisfactory Soil Materials
  - a. Are defined as those complying with ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.
3. Cohesionless Soil Materials
  - a. Include gravels, sand-gravel mixtures, sands, gravelly-sands.

**III. EXECUTION**

**A. EXCAVATION**

1. **GENERAL** - Excavation consists of removal and disposal of materials encountered when establishing required grade elevations.
2. Excavation is Unclassified and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.
3. Earth Excavation - includes excavation of pavements and other obstructions visible on ground surface; underground structures, utilities and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.
4. Unauthorized Excavation - consists of removal of materials beyond indicated elevations or side dimensions without the specific direction of Architect/Engineer. Replace unauthorized excavation by backfilling and



compacting as specified for authorized excavations of same classification, unless otherwise directed by Architect/Engineer. Cost of unauthorized excavation and remedial backfill shall be borne by Contractor.

5. Additional Excavation

- a. When excavation has reached required subgrade elevations, notify Architect/Engineer to allow for inspection of conditions.
- b. If unsuitable materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by Architect/Engineer.
- c. Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work.

6. Dewatering

- a. Prevent surface water and subsurface or ground water from flowing into excavations, and flooding project site and surrounding area.
- b. Do not allow water to accumulate in excavations. Remove water from excavations to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from site.
- c. Establish and maintain temporary drainage ditches or diversions to convey water removed from excavations and rain water to collecting or run-off areas. Do not use trench excavations for site utilities as temporary drainage ditches.

7. Stability of Excavations

- a. Slope sides of excavations to comply with applicable codes and ordinances. Shore and brace where sloping is not possible either because of space restrictions or stability of material excavated.
- b. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

8. Shoring and Bracing

- a. Provide shoring and bracing to comply with local codes and authorities having jurisdiction.
- b. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross-braces, in good serviceable condition.
- c. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.
- d. Provide permanent steel sheet piling or pressure creosoted timber sheet piling wherever subsequent removal of sheet piling.

9. Material Storage
  - a. Stockpile excavated materials classified as satisfactory soil material where directed, until required for fill. Place stockpiled fill materials away from edges of excavation; grade, and shape stockpiles for proper drainage.
  - b. Do not store fill materials within drip line of trees indicated to remain.
  - c. Dispose of excess unsatisfactory soil material, trash and debris, as specified.
  
10. Excavation for Pavements
  - a. Cut surface under pavements to comply with cross-sections, elevations and grades as shown.
  
11. Excavation for Trenches
  - a. Dig trenches to uniform width required for particular item to be installed, sufficiently wide to provide working room.
  - b. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations.
  - c. Where rock is encountered, carry excavation 6" below required elevation and backfill with a 6" layer of crushed stone or gravel prior to installing pipe.
  - d. Where rock is encountered, carry excavation 6" below required elevation and backfill with a 6" layer of crushed stone or gravel prior to installing pipe.
  - e. For pipes or conduit 5" or less in nominal size, do not excavate beyond indicated depths. Hand excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.
  - f. For pipes or conduit 6" or larger in nominal size, tanks and other mechanical/electrical work indicated to receive subbase, excavate to subbase depth indicated, or, if not otherwise indicated, to 6" below bottom of work to be supported.
  - g. Except as otherwise indicated, excavate for exterior waterbearing piping (water, drainage) so top of piping is not less than 3"-6" below finished grade.
  - h. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.
  - i. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by Architect/Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.

B. BACKFILL AND FILL

1. General

- a. In excavations, use satisfactory excavated or borrow material that has been sampled, tested and approved by soil testing agency. Place in layers to required subgrade elevations indicated.
  - i. Under grassed areas - use excavated or borrow material.
  - ii. Under walks and pavements - use subbase material, or excavated or borrow material, or combination of both.
  - iii. Under steps - use subbase material.
  - iv. Under piping and conduit - provide subbase material where indicated under piping or conduit; shape to fit bottom 90° of cylinder.

2. Ground Surface Preparation

- a. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills, Flow, strip, or break-up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
- b. When existing ground surface has density less than that specified under "Compaction" for particular area classification, break-up the ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and specified percentage of relative density.

3. Prior to Backfill Placement

- a. Backfill excavations as work permits, but not until completion of the following:
  - i. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
  - ii. Inspection, testing, approval, and recording locations of underground utilities.
  - iii. Removal of concrete formwork.
  - iv. Removal of trash and debris.

4. Placement and Compaction

- a. Place backfill and fill materials in layer not more than 8" in loose depth for material compacted by heavy compaction equipment, and not more than 4" loose depth for material compacted by hand-operated equipment.

- b. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content of soil material. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification as indicated in the “Soils and Foundation Investigation – Uplands Townhomes”.

Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

- c. Backfill excavations as promptly as work permits, but not until completion of inspection, testing, approval, and recording location of underground utilities, as required.

## C. GRADING

### 1. General

- a. Uniformly grade areas within limits of site grading under this section, including adjacent transition areas. Smooth finished surfaces within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
- b. Degree of finish required will be that ordinarily obtainable from either blade-grader or scraper operations.

### 2. Ditches

- a. Finish ditches to ensure proper flow and drainage. Conduct final rolling operations to produce hard, uniform and smooth cross-section.

### 3. Lawn or Unpaved Areas

- a. Finish areas to receive topsoil to within not more than 1" above or below required subgrade elevations, compacted as specified, and free from irregular surface changes.

### 4. Walks

- a. Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than ¼" above or 1" below the required subgrade elevation, compacted as specified, and graded to prevent ponding of water after rains.

### 5. Pavements

- a. Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than ½" above or below required subgrade elevation, compacted as specified in the City of Pueblo Standard Specifications, and graded to prevent ponding of water after rains. Include such operations as plowing, discing, and any moisture or aerating required to provide optimum moisture content for compaction. Fill low areas resulting from removal of

unsatisfactory soil materials, obstructions, and other deleterious materials, using satisfactory soil material. Shape in line, grade, and cross-section as indicated.

D. PAVEMENT SUBBASE COURSE

1. General

- a. Subbase course consists of placing subbase course material, in layers of specified thickness, over subgrade surface to support a pavement base course.
- b. See other Division-2 sections for paving specifications.

2. Grade Control

- a. During construction, maintain lines and grades including crown and cross-slope of subbase course.

3. Placing

- a. Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations as required by the City of Pueblo Standard Specifications.
- b. When compacted subbase course is shown to be 6" thick or less, place material in single layer. When shown to be more than 6" thick, place subbase material in equal layers, except no single layer more than 6" or less than 3" in thickness when compacted.

E. FIELD QUALITY CONTROL

1. Quality Control Testing During Construction

- a. Testing service must inspect and approve subgrades and fill layers before further construction work is performed thereon.
- b. Perform field density tests in accordance with ANSI/ASTM D 1556 (sand cone method) or ANSI/ASTM D 2167 (rubber balloon method).
- c. Make at least one field density test of subgrade for every 2000 sq. ft. of paved or surfaced area, but in no case less than 3 tests.
- d. In each compacted fill layer, make one field density test for every 2000 sq. ft. of overlaying paved or surfaced area, but in no case less than 2 tests.
- e. If, based on reports of testing service and inspection, subgrade or fills which have been placed are below specified density, additional compaction and testing will be required until satisfactory results are obtained.

- f. Results of density tests of soil-in-place will be considered satisfactory if average of any 4 consecutive density tests which may be selected are in each instance equal to or greater than specified density, and if not more than 1 density test out of 5 has a value more than 2% below required density.

F. MAINTENANCE

- 1. Protection of Graded Areas
  - a. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
  - b. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- 2. Reconditioning Compacted Areas
  - a. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

**I.F.B. 17-524-RAD**  
**DIVISION 3 - CONCRETE**  
**SECTION 03214**  
**PERMEABLE ARTICULATING CONCRETE BLOCK/MAT**

**I. GENERAL**

**A. Scope of Work**

The contractor shall furnish all labor, materials, equipment, and incidentals required and perform all operations in connection with the installation of the Permeable Articulating Concrete Block/Mats (P-ACB/M) in accordance with the fines, grades, design and dimensions shown on the Contract Drawings and as specified herein.

**B. Submittal**

The contractor shall submit to the engineer all manufacturer's performance research results and calculations in support of the permeable articulating concrete block/mat (P-ACBM) system and geotextile proposed for use.

The contractor shall furnish manufacturer's certificates of compliance for the permeable articulating concrete blocks/mats, revetment cable, and any revetment cable fittings and connectors to the engineer prior to the start of mat fabrication.

The contractor shall furnish to the engineer all manufacturer's specifications, literature, and layout drawings for the fabrication of the mats (if applicable) prior to assembly of the P-ACB/M.

**C. Preconstruction Meeting**

Approximately two weeks prior to the start of the installation, a preconstruction meeting shall occur with the representative(s) from the design team, the general contractor, the excavation contractor, the installation contractor and the manufacturer's representative.

**II. PRODUCTS**

**A. General**

Permeable articulating concrete block/mats shall be premanufactured of individual concrete blocks with specific stormwater runoff capacities. Blocks may be hand-placed, mechanically installed, or fabricated into mats by the use of revetment cables. The mats shall arrive at the jobsite assembled according to lengths and widths as specified on the shop drawings.

Individual blocks in the P-ACB/M shall be staggered, beveled, and interlocked for enhanced stability. The blocks/mats shall be constructed of closed cell blocks with an arched storage chamber for additional stormwater runoff as shown on the contract drawings. Parallel strands of cable shall extend through two (2) ducts in each block in a manner which provides for longitudinal binding of the blocks within the mats. Each row of blocks shall be laterally offset by one-half block width from the adjacent row so that any given block is interlocked and cabled to four other blocks (two in the row above and two in the row below). Six adjacent blocks shall also surround each block.

Each block shall incorporate interlocking surfaces that prevent lateral displacement of the blocks within the mats when they are lifted by the longitudinal revetment cables. The interlocking surfaces must not protrude beyond the perimeter of the blocks to such an extent that they reduce the flexibility or articulating capability of the articulating concrete mats or become damaged or broken when the mats are lifted during shipment or placement. Once the mats are in place, the interlocking surfaces shall prevent the lateral displacement of the blocks even if the cables should become damaged or removed. The mats must be able to flex a minimum of 10 degrees between any given row and column of blocks in the uplift direction.

The cables shall be inserted into the mats in such a manner to form lifting loops at one end of the mat with the corresponding cable ends spliced together to form a lifting loop at the other end of the mat with sleeves approved by the engineer.

Infiltration Performance: The P-ACB/M will only be accepted when accompanied by documented third party infiltration performance characteristics based on ASTM C1701/C1701M-09. The infiltration rate shall be no less than 2,000 inches per hour on an outdoor working surface, with typical base material utilized for the test.

Structural Performance: The design of the P-ACB/M shall be capable of supporting AASHTO H-25 and HS-25 truck loading. The blocks should be analyzed as unreinforced concrete arches supporting a uniform truck tire load with impact per AASHTO standards. *As with all vehicular traffic paving systems, the subgrade soil, geosynthetic and base preparation for the P-ACB/M must be properly designed and prepared. This is critical to the performance of the system.*

## B. Cellular Concrete Blocks

### 1. Materials

1.1 Cementitious Materials – Materials shall conform to the following applicable ASTM specifications:

1.1.1 Portland Cements – Specification C 150, for Portland Cement.

1.1.2 Blended Cements – Specification C 595, for Blended Hydraulic Cements.

1.1.3 Hydrated Lime Types – Specification C 207, for Hydrated Lime Types.



1.1.4 Pozzolans – Specification C 618, for Fly Ash and Raw or Calcinated Natural Pozzolans for use in Portland Cement Concrete.

1.2 Aggregates shall conform to the following ASTM specifications, except that grading requirements shall not necessarily apply:

1.2.1 Normal Weight – Specification C 33, for Concrete Aggregates.

2. Physical Requirements

At the time of delivery to the work site, the units shall conform to the physical requirements prescribed below:

**TABLE 1: PHYSICAL CHARACTERISTICS**

Item	Description	Values
Dimensions	Length x Width x Height	12" x 12" x 5.65" (+/- 1/8")
Compressive Strength	ASTM D-6684 / C-140	4,000 psi minimum
Block Weight		Arched Block: 45-50 lbs/sf Solid Block: 55-60 lbs/sf
Loading Capabilities	Traffic Rating	AASHTO HS-25
Joint Filler Between Blocks	Material Used	NONE Required
Percent Open Space		Surface: 7% Storage: 20%
Water Absorption (%) Density (lbs/cf)	ASTM D-6684 / C-140	9.1% Avg. of Three, 11.7% Individual 130 Avg of Three, 125 Individual
Storage Capacity	Above Aggregate Within Arch	0.0833 cf/block
Post-Installation, Verified Surface Infiltration Rate	ASTM C1701/C1701M-09	Minimum 2,000 inches/hour/sf

3. Visual Inspection

All units shall be sound and free of defects that would interfere with the proper placing of the unit or impair the strength or permanence of the construction. Surface cracks incidental to the usual methods of manufacture, or surface chipping resulting from customary methods of handling in shipment and delivery, shall not be deemed grounds for rejection. Cracks exceeding 0.25 inches in width and/or 1.0 inch in depth shall be deemed grounds for rejection.

4. Sampling and Testing

The purchaser or his authorized representative shall be accorded proper access to the manufacturer to inspect and sample the permeable articulating concrete blocks at the place of manufacture from lots ready for delivery.

5. Expense of Tests

Additional testing, other than that provided by the manufacturer, shall be borne by the purchaser.

6. Manufacturer

The permeable articulating concrete block/mat shall be PaveDrain<sup>®</sup> or pre-approved equal, as noted in Division 1.

C. Revetment Cable and Fittings (When Applicable)

General. Cable & Fittings are used only with Matted Installations. If blocks are not cabled into mats and placed by hand/machine, this section does not apply.

Polyester Revetment Cable and fittings. Revetment cable shall be constructed of high tenacity, low elongating, continuous filament polyester fibers. Cable shall consist of a core construction comprised of parallel fibers contained within an outer jacket or cover. The weight of the parallel core shall be between 65% to 70% of the total weight of the cable. The revetment cable shall have the following physical characteristics listed below.

Nominal Cable Diam. - Circum.		Approx. Ave. Strength Lbs.	Weight/100 ft. Min. lbs. Max Lbs.	
1/4"	20 mm	3,700	2.47	2.74
5/16"	27 mm	7,000	3.99	4.42

***NOTE: Polyester cable shall be determined by the supplier, based on the size of the mats to be placed.***

Elongation requirements specified below are based upon stabilized new, dry, cable. Stabilization refers to a process in which the cable is cycled fifty (50) times between a load corresponding to 200D<sup>2</sup> and a load equal to 10%, 20%, or 30% of the cables approximate average breaking strength. Relevant elongation values are as shown in the table below. The tolerance on the values is ± 5%.

	% Breaking Strength		
	10%	20%	30%
Permanent Elongation (while working)	0.7	1.8	2.6
Elastic Elongation	0.6	1.4	2.2
Total Stretch	1.3	3.2	4.8

The revetment cable shall exhibit good to excellent resistance to most concentrated acids, alkalis, and solvents. Cable shall be impervious to rot, mildew and degradation.

The materials used in the construction of the cable shall not be affected by continuous immersion in stormwater runoff.

Selection of cable and fittings shall be made in a manner that insures a safe design factor for mats being lifted from both ends, thereby forming a catenary. Consideration shall be taken for the bending of the cables around hooks or pins during lifting. Revetment cable splicing fittings shall be selected so that the resultant splice shall provide a minimum of 60% of the minimum rated cable strength. Fittings such as sleeves and stops shall be aluminum unless otherwise shown on the Contract Drawings.

D. Size of Permeable Articulating Concrete Block/Mats

Unless otherwise specified in the layout drawings, the P-ACB/M shall be a standard size of 7.14' x 17.4' (124 sf).

III. FOUNDATION PREPARATION AND MAT INSTALLATION

A. Foundation and Preparation

General. Areas on which permeable articulating concrete block/mats are to be placed shall be constructed to the lines and grades shown on the Contract Drawings and to the tolerances specified in the Contract Documents, and approved by the Engineer.

Subgrade. Unless required on engineering drawings, compaction of subgrade should be avoided or minimized in order to encourage infiltration of stormwater.

Geotextile Separator or Geogrid Stabilization. Install monofilament or multifilament geotextile (such as Mirafi RS380i, equivalent, or other material as shown on engineered drawings). The geotextile should be used on the bottom and sides of the installation to prevent contamination of clean base stone. A geogrid is also appropriate for base stabilization, but is not recommended on the sides of the aggregate base.

Stone Base. If more than 6" of base stone is required, only the top 4-6" shall be AASHTO #57 stone (3/4" – 1" clean, angular, with no fines, LA Abrasion <45), which is used as a leveling course directly beneath the blocks. Additional stone depth should consist of either AASHTO #2 or #3 stone, or as shown in drawings. The first leveling course of AASHTO #57 stone shall be placed in a 2" lift and then rolled into the underlying AASHTO #2 or #3 stone. The final 2-4" lift shall be compacted with a plate compactor in both the perpendicular and parallel directions in the area of coverage.

Grading & Compaction. The aggregate bedding layer shall be graded to a smooth plane surface to ensure intimate contact is achieved between the legs of the permeable articulating concrete block/mats and the aggregate bedding layer.

All base stone (AASHTO #2 or #3) shall be compacted in 6-8" lifts with roller.

Recommended Geogrid Separator. Install BX-1100 (or equal) geogrid separator directly on top of prepared leveling course.

Inspection. Immediately prior to placing the P-ACB/M mats the prepared area shall be inspected by the Engineer, the owner's representative, and or by the manufacturer's representative. No blocks/mats shall be placed thereon until that area has been approved by one of these parties.

B. Placement of Permeable Articulating Concrete Blocks/Mats

General. Permeable articulating concrete block/mats, shall be constructed within the specified lines and grades shown on the contract drawings.

Placement. The P-ACB/M shall be placed on the geogrid separator or on the aggregate bedding layer so as to produce a smooth plane surface. No individual block within the plane of placed articulating concrete mats shall protrude more than one-quarter of an inch or as otherwise specified by the Engineer.

If installed in mats the P-ACB/M shall be attached to a spreader bar or other conventional device to aid in the lifting and placing of the mats in their proper position by the use of a large, tracked excavator or other appropriate equipment. The equipment used should be adequate capacity to place the mats without bumping, dragging, or otherwise damaging the aggregate bedding layer. The mats shall be “zippered” together forming a seamless mat to mat connection.

Consultation. The manufacturer’s representative shall provide design and construction advice during the design and installation phases of the project.

Finishing. The joints between the P-ACB/M do not require backfilling with smaller aggregates or sand in order to function properly. The joints are meant to be left open. This includes following maintenance of the P-ACB/M

Post Installation Certification. Upon completion of the P-ACB/M installation, the surface infiltration rate of the pavement shall be verified by ASTM C1701M-09 to confirm the required infiltration rate of the pavement (per section 2.1, table 1). If the system fails to perform as required in section Table 1 of this spec, it shall be removed and replaced at the supplier’s cost.

**I.F.B. 17-524-RAD  
DIVISION 3  
SECTION 03300  
CAST-IN-PLACE CONCRETE**

**I. GENERAL**

**A. RELATED DOCUMENTS**

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

**B. SUMMARY**

1. This Section specifies cast-in place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.
2. Concrete paving and walks as specified in this section.

**C. SUBMITTALS**

1. General: Submit the following in accordance with Conditions of Contract and Division 1 Specifications Sections.
2. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by Architect.
3. Shop drawings for reinforcement, prepared by registered Professional Engineer for fabrication, bending, and placement of concrete reinforcement. Comply with ACI SP-66 (88), "ACI Detailing Manual," showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

**D. QUALITY ASSURANCE**

1. Code and Standards
  - a. Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:
    - i. ACI 318, 'Building Code Requirements for Reinforced Concrete.'
    - ii. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice."

## II. PRODUCTS

### A. FORM MATERIALS

1. Forms for Exposed Finish Concrete
  - a. Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
  - b. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form," Class I.
2. Forms for Unexposed Finish Concrete
  - a. Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
3. Forms for Cylindrical Columns and Supports
  - a. Metal, fiberglass-reinforced plastic, or paper or fiber tubes. provide paper or fiber tubes of laminated plies with water-resistant adhesive and wax-impregnated exterior for weather and moisture protection. Provide units with sufficient wall thickness to resist wet concrete loads without deformation.
4. Form Coatings
  - a. Provide commercial formulation form-coating compounds with a maximum VOC of 350 mg/l that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
5. Form Ties
  - a. Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units that will leave no metal closer than 1½ inches to exposed surface.
  - b. Provide ties that, when removed, will leave holes not larger than one inch diameter in concrete surface.

**NOTE:** Contractor option to provide galvanized wire from ties.

### B. REINFORCING MATERIALS

1. Reinforcing Bars
  - a. ASTM A 615, Grade 60, deformed bars, 60,000 psi yield strength.
  - b. No. 3 bars and smaller shall be Grade 40.
  - c. Bars to be welded in the field shall be Grade 40.

2. Welded Wire Fabric
  - a. ASTM A 185, welded steel wire fabric.
3. Supports for Reinforcement
  - a. Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place.  
Use wire-bar-type supports complying with CRSI specifications.

C. CONCRETE MATERIALS

1. Portland Cement
  - a. ASTM C 150, Type II.
2. Fly Ash
  - a. ASTM C 618 Class F
3. Normal Weight Aggregates
  - a. ASTM C 33 and as herein specified. Provide aggregates from a single source for exposed concrete.
  - b. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.
  - c. Local aggregates not complying with ASTM C 33 but that special tests or actual service have shown to produce concrete of adequate strength and durability may be used when acceptable to Architect.
4. Lightweight Aggregates
  - a. ASTM C 330.
5. Water
  - a. Drinkable
6. Admixtures, General
  - a. Provide admixtures for concrete that contain not more than 0.1 percent chloride ions.
  - b. Available Products - Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:
7. Fibrous Reinforcement
  - a. Engineered polypropylene fibers designed for secondary reinforcement of concrete slabs.
  - b. Available Products - Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:
  - c. Products - Subject to compliance with requirements, provide one of the following:

- d. "Fiberstrand 100," Euclid Chemical Co.  
"Fibermesh," Fibermesh, Inc.  
"Forta CR," Forta Corp.  
"Grace Fibers," W.R. Grace & Co.  
"300" by Propex

D. RELATED MATERIALS

1. Granular Base
  - a. Evenly graded mixture of fine and coarse aggregates to provide, when compacted, a smooth and even surface below slabs on grade.
  
2. Sand Cushion
  - a. Clean, manufactured or natural sand.
  
3. Vapor Retarder
  - a. Provide vapor retarder cover over prepared base material where indicated below slabs on grade. Use only materials that are resistant to deterioration when tested in accordance with ASTM E 154, as follows:
  - b. Polyethylene sheet not less than 6 mils thick.
  - c. Water-resistant barrier not consisting of heave Kraft papers laminated together with glass-fiber reinforcement and overcoated with black polyethylene on each side.
  - d. Product - "Moistop," Fortifiber Corp.
  
4. Liquid Membrane-Forming Curing Compound
  - a. Liquid-type membrane-forming curing compound complying with ASTM C 309, Type I, Class A. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.
  - b. Available Products - Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:
  - c. "A-H 3 Way Sealer," Anti-Hydro Co., Inc.  
"Spartan-Cote," The Burke Co.  
"Conspec #1," Conspec Marketing & Mfg. Co.  
"Hardtop," Cormix  
"Day-Chem Cure and Seal," Dayton Superior Corp.  
"Eucocure," Euclid Chemical Co.  
"Horn Clear Seal," A.C. Horn, Inc.  
"L&M Cure," L & M Construction Chemicals,  
"Masterkure," Master Builders, Inc.  
"CS-309," W.R. Meadows, Inc.  
"LR-151," Prokrete Industries  
"Kure-N-Seal," Sonneborn-Rexnord  
"Stontop CS2," Stonhard, Inc.



## E. PROPORTIONING AND DESIGN OF MIXES

1. Prepare Design Mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.
  - a. Submit written reports to Architect for each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until proposed mix designs have been reviewed by Architect.
  - b. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:
    - i. City Sidewalks 4000-psi, 28-day compressive strength; Type II cement with 20 percent fly ash (reduced to 15 percent for cold weather placement); maximum water/cementitious material ratio of 0.040i and air entrainment of 5.0 to .0 percent.
    - ii. Concrete Curbs adjacent to parking (colored concrete) 4000-psi, 28-day compressive strength; W/C ration, 0.51 maximum (non -air-entrained), 0.40 maximum (air-entrained).
    - iii. Patios, sidewalks and miscellaneous concrete, 3000-psi, 28-day compressive strength; W/C ration, 0.58 maximum (non -air-entrained), 0.46 maximum (air-entrained).
    - iv. Concrete paving (parking) 4000-psi, 28-day compressive strength; engineered polypropylene fibers (fibermesh). Holcim Type I/II cement with 20 percent fly ash (reduced to 15 percent for cold weather placement); maximum water/cementitious material ratio of 0.040i and air entrainment of 5.0 to .0 percent
    - v. Concrete foundations 4000-psi, 28-day compressive strength; engineered polypropylene fibers (fibermesh). Type II cement with 20 percent fly ash (reduced to 15 percent for cold weather placement); maximum water/cementitious material ratio of 0.040i and air entrainment of 5.0 to .0 percent
2. Adjustment to Concrete Mixes
  - a. Mix designs adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.

## F. ADMIXTURES

### 1. Water-Cement Ratio

- a. Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:
  - i. Subjected to freezing and thawing; W/C 0.45.
  - ii. Subjected to deicers/watertight; W/C 0.40.
  - iii. Subjected to brackish water, salt spray, or deicers; W/C 0.40.

### 2. Slump Limits

- a. Proportion and design mixes to result in concrete slump at point of placement as follows:
  - i. Ramps, slabs, and sloping surfaces: Not more than 3 inches.
  - ii. Reinforced foundation systems: Not less than 1 inch and not more than 3 inches.
  - iii. Concrete containing HRWR admixture (Superplasticizer): Not more than 8 inches after addition of HRWR to site-verified 2-inch to 3-inch slump concrete.
  - iv. Other concrete: Not more than 4 inches.

## III. EXECUTION

### A. GENERAL

#### 1. Coordinate

The installation of all joint materials and vapor retarders with placement of forms and reinforcing steel shall conform to layout.

### B. FORMS

#### 1. General

Design, erect, support, brace, and maintain formwork to support vertical and lateral, static and dynamic loads that might be applied until concrete structure can support such loads. Construct the formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347.

2. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

3. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
4. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
5. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
6. Provisions for Other Trades
  - a. Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
7. Cleaning and Tightening
  - a. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retighten forms and bracing before concrete placement as required to prevent mortar leaks and maintain proper alignment.

C. PLACING REINFORCEMENT

1. General
  - a. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as herein specified.
  - b. Avoiding cutting or puncturing vapor retarder during reinforcement placement and concreting operations.
2. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
3. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Architect.

4. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
5. Install welded wire fabric in as long length as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

#### D. JOINTS

1. Construction Joints
  - a. Locate and install construction joints as indicated on the drawings, locate so as not to impair strength and appearance of the structure, as acceptable to Architect.
2. Provide keyways at least 1½ inches deep in construction joints in walls and slabs and between walls and footings. Accepted bulkheads designed for this purpose may be used for slabs.
3. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as otherwise indicated. Do not continue reinforcement through sides of strip placements.
4. Isolation Joints in Slabs-on-Ground
  - a. Construct isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.
  - b. Joint filler and sealant materials are specified in Division 7 Sections of these specifications.
5. Contraction (Control) Joints in Slabs-on Ground
  - a. Construct contraction joints in slabs-on-ground to form panels of patterns as shown. Use saw cuts 1/8 inch wide by ¼ slab depths or inserts ¼ inch wide by ¼ of slab depth, unless otherwise indicated.
  - b. Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.
  - c. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finished as may be safely done without dislodging aggregate.
  - d. If joint pattern not shown, provide joints not exceeding 15 feet in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).

- e. Joint sealant material is specified in Division 7 Sections of these specifications.

## E. PREPARATION OF FORM SURFACES

### 1. General

- a. Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before reinforcement is placed.
- b. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.
- c. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

## F. CONCRETE PLACEMENT

### 1. Inspection

- a. Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work.

### 2. General

- a. Comply with ACI 304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," and as herein specified.
- b. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

### 3. Placing Concrete in Forms

- a. Deposit concrete in forms in horizontal layers not deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
- b. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.
- c. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that

have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

4. Placing Concrete Slabs

- a. Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
- b. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
- c. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
- d. Maintain reinforcing in proper position during concrete placement.

5. Cold-Weather Placing

- a. Comply with provisions of ACI 306 and as follows: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
- b. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
  - i. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  - ii. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

6. Hot-Weather Placing

- a. When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
- b. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
- c. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

- d. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.
- e. Use water-reducing retarding admixture- when required by high temperatures, low humidity, or other adverse placing conditions, when acceptable to Architect.

G. MONOLITHIC SLAB FINISHES

1. Scratch Finishes

- a. Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.
- b. After placing slabs, plane surface to tolerances for floor flatness (Ff) of 15 and floor levelness (F1) of 13. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.

2. Float Finish

- a. Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and as otherwise indicated.
- b. After screening, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Check and level surface to tolerances of FF 18 - F1 15. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

3. Trowel Finish

- a. Apply trowel finish to monolithic slab surfaces to be exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.
- b. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances of Ff 20 - F1 17. Grind smooth surface defects that would telegraph through applied floor covering system.

4. Trowel and Fine Broom Finish
  - a. Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.
5. Nonslip Broom Finish
  - a. Apply nonslip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
  - b. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

## H. CONCRETE CURING AND PROTECTION

1. General
  - a. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply in accordance with manufacturer's instructions after screening and bull floating, but before power floating and troweling.
  - b. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
2. Curing Methods
  - a. Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.
  - b. Provide moisture curing by following methods.
    - i. Keep concrete surface continuously wet by covering with water.
    - ii. Use continuous water-fog spray.
    - iii. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-inch lap over adjacent absorptive covers.
    - iv. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.



## I. REMOVAL OF FORMS

### 1. General

- a. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.
- b. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days and until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.
- c. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

## J. REUSE OF FORMS

1. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.
2. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do use "patched" forms for exposed concrete surfaces except as acceptable to Architect.

## K. CONCRETE SURFACE REPAIRS

### 1. Patching Defective Areas

- a. Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.
- b. Cut out honeycomb, rock pockets, voids, over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specific bonding agent. Place patching mortar before bonding compound has dried.

- c. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

2. Repair of Formed Surfaces

- a. Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry-pack mortar, or precast cement cone plugs secured in place with bonding agent.
  - i. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

3. Repair of Unformed Surfaces

- a. Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having required slope.
  - i. Repair finished unformed surfaces that contain defects that affect durability of concrete. Surface defects, as such, include crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets, and other objectionable conditions.
- b. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
- c. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with patching compound. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Architect.
- d. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4 - inch clearance all around. Dampen concrete surfaces in contact with patching concrete and applying bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

- e. Repair isolated random cracks and single holes not over 1 inch in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part portland cement to 2½ parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack before bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.
- f. Perform structural repairs with prior approval of Architect for method and procedure, using specified epoxy adhesive and mortar.
- g. Repair methods not specified above may be used, subject to acceptance of Architect.

## L. QUALITY CONTROL TESTING DURING CONSTRUCTION

- 1. General
  - a. The Owner will employ a testing laboratory to perform tests and to submit test reports.
  - b. Sampling and testing for quality control during placement of concrete may include the following, as directed by Architect.
- 2. Sampling Fresh Concrete
  - a. ASTM C 172, except modified for slump to comply with ASTM C94.
  - b. Slump - ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
  - c. Air Content - ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
- 3. Concrete Temperature
  - a. Test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above and each time a set of compression test specimens is made.
- 4. Compression Test Specimen
  - a. ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cure test specimens are required.

5. Compressive Strength Tests
  - a. ASTM C 39; one set for each day's pour exceeding 5 cu. yds. plus additional sets for each 50 cu. yds. more than the first 25 cu. yds. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days and one specimen retained in reserve for later testing if required.
  - b. When frequency of testing will provide fewer than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
  
6. Test Results will be reported in writing to Architect, Structural Engineer, Ready-Mix Producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.
  
7. Nondestructive Testing
  - a. Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
  
8. Additional Tests
  - a. The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

**I.F.B. 17-524-RAD**  
**DIVISION 4 - GENERAL REQUIREMENTS**  
**SECTION 04200**  
**UNIT MASONRY**

I. GENERAL

A. RELATED DOCUMENTS

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

B. SUMMARY

1. This section includes the following:
  - a. Clay unit masonry in the form of brick
2. Related Sections: The following sections contain requirements that relate to this section:
  - a. Division 7 Section "Flashing and Sheet Metal" for exposed sheet metal flashing installed in masonry.
3. Products installed but not furnished under this section include the following:
  - a. Reglets in masonry joints for metal flashing are specified in Division 7 Section "Flashing and Sheet Metal".

C. SYSTEM PERFORMANCE REQUIREMENTS

1. Provide unit masonry that develops the following installed compressive strengths (f'm):
  - a. For clay unit masonry f'm=3000psi

D. SUBMITTALS

1. Samples for verification purposes of the following:
  - a. Full-size units for each different exposed masonry unit required showing full range of exposed color, texture, and dimensions to be expected in completed construction.
2. Material certificates for the following signed by manufacturer and Contractor certifying that each material complies with requirements.
  - a. Each different cement product required for mortar and grout including name of manufacturer, brand, type, and weight slips at time of delivery.
  - b. Each material and grade indicated for reinforcing bars.

- c. Each type and size of joint reinforcement.
  - d. Each type and size of anchors, ties, and metal accessories.
3. Cold-weather construction procedures evidencing compliance with requirements specified in referenced unit masonry standard.

E. QUALITY ASSURANCE

- 1. Unit Masonry Standard
  - a. Comply with ACI 530.1/ASCE 6 “Specifications for Masonry Structures”, except as otherwise indicated.
- 2. Single-Source Responsibility for Masonry Units
  - a. Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.

F. DELIVERY, STORAGE, AND HANDLING

- 1. Deliver masonry materials to project in undamaged condition.
- 2. Store and handle masonry units off the ground, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not place until units are in an air-dried condition.
- 3. Store cementitious materials off the ground, under cover, and in dry location.
- 4. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- 5. Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil.

G. PROJECT CONDITIONS

- 1. Protection of Masonry
  - a. During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day’s work. Cover partially completed masonry when construction is not in progress.
  - b. Extended cover a minimum of 24 inches down both sides and hold cover securely in place.

2. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
3. Stain Prevention
  - a. Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that comes in contact with such masonry.
  - b. Protect base of walls from rain-splashed mud and mortar splatter by means of covering spread on ground and over wall surface.
  - c. Protect sills, ledges, and projections from mortar droppings.
  - d. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes from mortar droppings.
4. Cold-Weather Construction
  - a. Comply with referenced unit masonry standard for cold-weather construction and the following:
  - b. Do not lay masonry units that are wet or frozen.
  - c. Remove masonry damaged by freezing conditions.

## II. PRODUCTS

### A. MATERIALS, GENERAL

1. Comply with referenced unit masonry standard and other requirements specified in this Section applicable to each material indicated.

### B. CLAY MASONRY UNITS

1. General
  - a. Comply with the following requirements applicable to each form of brick required.
  - b. For applications requiring brick of form, color, texture, and size on exposed surfaces that cannot be produced by sawing standard brick sizes.
  - c. For applications where stretcher units cannot accommodate special conditions including those at corners, movement joints, bond beams, sashes, and lintels.
  - d. Provide units without cores or frogs and with all exposed surfaces finished for ends of sills, caps, and similar applications that expose brick surfaces that otherwise would be concealed from view.
2. Face Brick Uniwall
  - a. ASTM C 216 and as follows:
  - b. 3000 psi
  - c. "Super Queen" Uniwall, 2 3/4" x 4 1/16" x 8 9/16"
  - d. Manufacturer: Summit Brick & Tile

C. MORTAR AND GROUT MATERIALS

1. Masonry Cement
  - a. ASTM C 91
  - b. For colored pigmented mortars use premixed colored masonry cements of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations. The Architect shall select from a standard range of mortar colors for pigmentation of mortar in exposed face brick and calcium silicate masonry units.
2. Hydrated Lime
  - a. ASTM C 207, Type S
3. Aggregate for Mortar
  - a. ASTM C 144, except for joints less than ¼ inch use aggregate graded with 100 percent passing the No. 16 sieve.
4. Aggregate for Grout
  - a. ASTM C 404
5. Water
  - a. Clean and potable.

F. REINFORCING STEEL

1. General
  - a. Provide reinforcing steel complying with requirements of referenced unit masonry standard and this article.
2. Steel Reinforcing Bars
  - a. Material and grade as follows:
  - b. Billet steel complying with ASTM A 615
3. Deformed Reinforcing Wire
  - a. ASTM A 496

G. INSULATION

1. Loose Granular Perlite Insulation
  - a. ASTM C 549, Type II (surface-treated for water repellency and limited moisture absorption) or IV (surface-treated for water repellency and to limit dust generation).



## H. MASONRY CLEANERS

1. Job-Mixed Muriatic Solution
  - a. Solution of 1 part muriatic acid and 10 parts clean water, mixed in a nonmetallic container with acid added to water.

## I. MORTAR AND GROUT MIXES

1. General
  - a. Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  - b. Do not use calcium chloride in mortar or grout.
2. Mortar for Unit Masonry
  - a. Comply with ASTM C 270, Proportion Specification, for types of mortar indicated below:

## III. EXECUTION

### A. EXAMINATION

1. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting performance of unit masonry.
2. Examine existing conditions and built-in construction to verify actual locations of sizes of items to be inserted.

### B. INSTALLATION, GENERAL

1. Comply with referenced unit masonry standard and other requirements indicated applicable to each type of installation included in Project.
2. Thickness
  - a. Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of nominal thickness indicated.
3. Build chases and recesses as shown or required to accommodate items specified in this and other Sections of the Specifications. Provide not less than 8 inches of masonry between chase or recess and jamb of openings and between adjacent changes and recesses.

4. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match construction immediately adjacent to the opening.
5. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting where possible.
6. Matching Existing Masonry
  - a. Match coursing, bonding, color, and texture of new masonry with existing masonry.

C. CONSTRUCTION TOLERANCES

1. Comply with construction tolerances of referenced unit masonry standard.

D. HORIZONTAL JOINT REINFORCEMENT

1. General
  - a. Provide continuous horizontal joint reinforcement as indicated on the drawings.
2. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
3. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

E. MOVEMENT (CONTROL AND EXPANSION) JOINTS

1. General
  - a. Install control and expansion joints in unit masonry where indicated on the drawings. Build in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

F. APPEARANCE

1. All masonry shall be built to the lines and plans intended, shall be uniform in appearance. Vertical dimensions shall be controlled by using a story pole or equal method.
2. Provide cuts and fitting around built-in items and inserts. Install bearing plates and anchors as show on the drawings. Grout for bearing plates shall be pea gravel concrete, 10" slump, 2500 psi mix.

3. Build in all door frames and windows solidly with adequate anchoring of frames per manufacturer's recommendations.
4. Maintain position of built-in frames and structural units until the masonry surrounding walls are completed.
5. Provide openings and chases as required for other trades. Cooperate fully with other trades in establishing locations of openings and in the notification of the others regarding sequencing of the built-in items.

G. REPAIRING, POINTING, AND CLEANING

1. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units and in fresh mortar or grout, pointed to eliminate evidence of replacement.
2. Pointing
  - a. During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints including corners, openings, and adjacent construction to provide a neat, uniform appearance, prepared for application of sealants.
3. Final Cleaning
  - a. After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - b. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - c. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
  - d. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
  - e. Clean brick by means of bucket and brush hand-cleaning method described in BIA "Technical Note No. 20 Revised" using the following masonry cleaner:
4. Protection
  - a. Provide final protection and maintain conditions in a manner acceptable to Installer, that ensure unit masonry is without damage and deterioration at time of Substantial Completion.



**I.F.B. 17-524-RAD**  
**DIVISION 5**  
**SECTION 05120**  
**MISCELLANEOUS METALS & STRUCTURAL STEEL**

I. GENERAL

A. RELATED DOCUMENTS

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

B. SUMMARY

1. This Section includes fabrication and erection of structural steel work, as shown on drawings including schedules, notes, and details showing size and location of members, typical connections, and types of steel required.
  - a. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.
  - b. Material: ASTM, A-36, Manual of Steel Construction, AISC, 9th Edition.
  - c. Fabrication: Unless otherwise shown or specified herein, fabricate structural steel in accordance with current edition of specifications adopted by American Institute of Steel Construction. Do all punching and drilling of steel required for attachment of other materials thereto.
  - d. Erection: Unless otherwise shown or specified, erect steel in accordance with specifications adopted by AISC.

C. SUBMITTALS

1. General
  - a. Submit the following in accordance with Conditions of Contract and Division 1 specification sections.
2. Product data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
  - a. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
  - b. High-strength bolts (each type), including nuts and washers.
  - c. Include Direct Tension Indicators if used.
  - d. Structural steel primer paint
  - e. Shrinkage-resistant grout

3. Shop drawings prepared under supervision of a licensed Structural Engineer, including complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams.
  - a. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols and show size, length, and type of each weld.
  - b. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.
4. Test reports conducted on shop- and field-bolted and welded connections. Include data on type(s) of tests conducted and test results

D. QUALITY ASSURANCE

1. Codes and Standards
  - a. Comply with provisions of following, except as otherwise indicated.
  - b. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges."

E. DELIVERY, STORAGE, AND HANDLING

1. Deliver materials to site at such intervals to ensure uninterrupted progress of work.

II. PRODUCTS

A. MATERIALS

1. Metal Surfaces, General
  - a. For fabrication of work that will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes.
2. Structural Steel Shapes, Plates and Bars
  - a. ASTM A 36.
3. Cold-Formed Steel Tubing
  - a. ASTM A 500, Grade b.
4. Hot-Formed Steel Tubing
  - a. ASTM a 501.

5. Steel Pipe
  - a. ASTM A 53, Type E or S, Grade B; or ASTM A 501.
6. Steel Castings
  - a. ASTM A 27, Grade 65-35, medium-strength carbon steel.
7. Headed Stud-Type Shear Connectors
  - a. ASTM A 108, Grade 1015 or 1020, cold-finished carbon steel with dimensions complying with AISC Specifications.
8. Anchor Bolts
  - a. ASTM A 307, non-headed type unless otherwise indicated.
9. High Strength Threaded Fasteners
  - a. Heavy hexagon structural bolts, nuts, and washers, complying with ASTM A 325.
  - b. Where indicated as galvanized, provide units that are zinc coated, either mechanically deposited complying with ASTM B 695, Class 50, or hot-dip galvanized complying with ASTM A 153.
  - c. Quenched and tempered alloy steel bolts, nuts, and washers, complying with ASTM A 490.
10. Structural Steel Primer Paint
  - a. SSPC - Paint 2; red lead-iron oxide, oil alkyd.
11. Cement Grout
  - a. Portland cement (ASTM C 150, Type I or Type III) and clean, uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum water required for placement and hydration.

## B. FABRICATION

1. Shop Fabrication and Assembly
  - a. Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.
  - b. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.

2. Connections
  - a. Weld or bolt shop connections, as indicated.
  - b. Bolt field connections, except where welded connections or other connections are indicated.
  - c. Provide high-strength threaded fasteners for principal bolted connections, except where unfinished bolts are indicated.
3. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.
4. Expansion Joints
  - a. Provide expansion joints in steel shelf angles when part of structural steel frame: locate at vertical brick expansion joints as indicated on drawings.

C. SHOP PAINTING

1. General
  - a. Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel that is partially exposed on exposed portions and initial 2 inches of embedded areas only.

III. EXECUTION

A. ERECTION

1. Temporary Shoring and Bracing
  - a. Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connection are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.
2. Temporary Planking
  - a. Provide temporary planking and working platforms as necessary to effectively complete work.
3. Setting Bases and Bearing Plates
  - a. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
  - b. Set loose and attached base plates and bearing plates for trial members on wedges or other adjusting devices.



- c. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
  - d. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
  - e. For proprietary grout materials, comply with manufacturer's instructions.
4. Field Assembly
- a. Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
5. Level and plumb individual members of structure within specified AISC tolerances.
6. Erection Bolts
- a. On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.
  - b. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.



**I.F.B. 17-524-RAD**  
**DIVISION 6**  
**SECTION 06100**  
**ROUGH CARPENTRY**

I. GENERAL

A. RELATED DOCUMENTS

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

B. SUMMARY

1. This Section includes the following:
  - a. Framing with dimension lumber.
  - b. Framing with engineered wood products.

C. RELATED SECTIONS

1. The following Sections contain requirements that relate to this Section:
  - a. Division 6 Section "Prefabricated Metal-Plate-Connected Wood Trusses."
  - b. Division 6 Section "Finish Carpentry" for nonstructural carpentry items exposed to view and not specified in another section.
  - c. Division 12 Section "Kitchen Casework" countertops fabricated for this project.
  - d. Division 7 "Insulation" for extruded polystyrene insulation board.

D. DEFINITIONS

1. Rough Carpentry - includes carpentry work not specified as apart of other Sections and generally not exposed, unless otherwise specified.

E. SUBMITTALS

1. General
  - a. Submit the following in accordance with conditions of Contract and Division 1 Specification Sections.
2. Product Data - for the following products:
  - a. Engineered wood products
  - b. Underlayment
  - c. Metal framing anchors
  - d. Construction adhesives

3. Material Certificates for Dimensional Lumber
  - a. Specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use as well as design values approved by the Board of Review of American Lumber Standards Committee.
4. Wood Treatment Data
  - a. As follows including chemical treatment manufacturer's instructions for handling, storing, installation, and finishing treated material.
  - b. For each type of preservative treated wood product include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.

F. QUALITY ASSURANCE

1. Single-Source Responsibility for Engineered Wood Products
  - a. Obtain each type of engineered wood products from one source from a single manufacturer.
2. Single-Source Responsibility for Fire Retardant Treated Wood
  - a. Obtain each type of fire-retardant-treated wood products from one source for both treatment and fire-retardant formulation.

G. DELIVERY, STORAGE, AND HANDLING

1. Delivery and Storage
  - a. Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

II. PRODUCTS

A. LUMBER, GENERAL

1. Lumber Standards
  - a. Furnish lumber manufactured to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.
2. Inspection Agencies
  - a. Inspection agencies and the abbreviations used to reference them with lumber grades and species include the following:

- b. RIS - Redwood Inspection Service
- c. NLGA - National Lumber Grades Authority (Canadian)
- d. SPIB - Southern Pine Inspection Bureau
- e. WCLIB - West Coast Lumber Inspection Bureau
- f. WWPA - Western Wood Products Association

3. Grade Stamps

- a. Provide lumber with each piece factory-marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying trading agency, grade, species, moisture content at time for surfacing, and mill.

4. Nominal Sizes - are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

B. DIMENSION LUMBER

- 1. For light framing - provide "Stud," No. 3," or "Standard" grade lumber for stud framing (2 to 4 inches thick, 2 to 4 inches wide, 10 feet and shorter) and "Stud" or "No. 3" grade for other light framing (2 to 4 inches thick, 2 to 6 inches wide), any species.
- 2. For structural light framing - (2 to 4 inches thick, 2 to 4 inches wide), provide the following grade and species:
  - a. "No 2" grade or better
  - b. Same species as indicated for structural framing grade below.
- 3. For structural framing - (2 to 4 inches thick, 5 inches and wider), provide the following grade and species
  - a. "No. 2" grade or better
  - b. Hem-Fir graded under WWPA rules

C. MISCELLANEOUS LUMBER

- 1. General
  - a. Provide lumber for support or attachment of other construction including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.
- 2. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.
- 3. Moisture Content
  - a. 19 percent maximum for lumber items not specified to receive wood preservative treatment.

4. Grade
  - a. "Standard" grade light-framing-size lumber of any species or board-size lumber as required. "No. 3 Common" or "Standard" grade boards per WCLIB or WWPA rules or "No. 2 Boards" per SPIB rules.

D. ENGINEERED WOOD PRODUCTS

1. General
  - a. Provide engineered wood products for which current model code evaluation/research reports exist that are acceptable to authorities having jurisdiction and that evidence compliance for the application indicated with specified requirements and the building code in effect for this Project.
2. Laminated Veneer Lumber
  - a. Lumber manufactured by laminating wood veneers in a continuous press using an exterior-type adhesives complying with ASTM D 2559 to produce members with grain of  
  
veneers parallel with their lengths and complying with the following requirements:
  - b. Veneer Characteristics - Douglas fir or southern pine veneers of varying thickness by widths and lengths standard with manufacturer, end-jointed with a lap-joint, butt joint, or scarf joint.
  - c. Allowable Design Stresses - As published by manufacturer, determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing laboratory.
3. Allowable Design Stresses
  - a. As follows, determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing laboratory:
  - b. Extreme Fiber Stress in Bending (Fb): 2500 psi (for 12-inch deep members).
  - c. Modules of Elasticity (E): 2,000,000 psi.
  - d. Tension parallel to Grain (Ft): 1850 psi.
  - e. Compression Parallel to Grain (Fc): 2800 psi.
  - f. Compression Perpendicular to Grain: 400 psi and 500 psi perpendicular and parallel to flue line.
  - g. Horizontal Shear (Fv): 285 psi and 190 psi perpendicular and parallel to glue line.
4. Sizes
  - a. 1-3/4 inches thick by depth and length indicated.
  - b. Sizes - as indicated on the drawings.

5. Prefabricated Wood I Joists
  - a. Units manufactured by bonding stress-graded lumber flanges to APA-Performance-Rated panel webs with exterior-type adhesives complying with ASTM D 2559, to product I-shaped joists complying with the following requirements:
  
6. Allowable Design Stresses
  - a. As published by manufacturer, determined according to ASTM D 5055, and demonstrated by comprehensive testing performed by a qualified independent testing laboratory.
  - b. Sizes - depths and widths as indicated, with flanges not less than 1½ inches wide.
  
7. Prefabricated Wood I Joists
  - a. TMI Joist 2x4
  - b. Truss Joist
  - c. Lamwood TIM-2 System
  - d. Boise Cascade-BCI Joists

E. CONSTRUCTION PANELS, GENERAL

1. Construction Panel Standards
  - a. Trademark - furnish construction panels that are each factory-marked with APA trademark evidencing compliance with grade requirements.

F. CONCEALED PERFORMANCE-RATED CONSTRUCTION PANELS

1. General
  - a. Where construction panels are indicated for the following concealed types of applications, provide APA Performance-Rated Panels complying with requirements designated under each application for grade designation, span rating, exposure durability classification, edge detail (where applicable), and thickness.
  
2. Floor Sheathing
  - a. Span Rating: 24 o.c.
  - b. Thickness: 3/4" (23/32)
  - c. Plywood: C/D plugged.
  
3. Roof Sheathing
  - a. Exposure Durability Classification - EXTERIOR
  - b. Span Rating: 40/20
  - c. Thickness: 5/8" O.S.B.
  
4. Wall Sheathing
  - a. Exposure Durability Classification – EXTERIOR
  - b. Thickness 3/4" O.S.B.

G. AIR INFILTRATION BARRIER

1. Polyethylene Sheet

a. 0.0061 inch thick, formed by spinning continuous strands of fine high density polyethylene interconnected fibers and bonding them together by heat and pressure; with a moisture vapor transmission rate of 400 grams/sq. meter/24 hrs. per ASTM E 96, procedure B; flame spread and smoke developed ratings of 5 and 10 per ASTM E 84.

2. Products

- a. Subject to compliance with requirements, provide one of the following:
- b. "Barricade Building Wrap," Simplex Products Division, Anthony Industries, Inc.
- c. "Tyvek Housewrap," Fibers Department, Du Pont Company.

H. FASTENERS

1. General

- a. Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
- b. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of AISI Type 304 stainless steel.

2. Nails, Wire, Brads, and Staples: FS FF-N-105.

3. Power Driven Fasteners: National Evaluation Report NER-272.

4. Wood Screws: ANSI B18.6.1.

5. Lag Bolts: ANSI B18.2.1.

6. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.

7. Roof Clips: Seismic and Hurricane Ties – Simpson Co. No. H2.

I. METAL FRAMING ANCHORS

1. General

- a. Provide metal framing anchors of type, size, metal, and finish indicated that comply with requirements specified including the following:



2. Current Evaluation/Research Reports
  - a. Provide products for which model code evaluation/research reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with the building code in effect for this Project.
3. Allowable Design Loads
  - a. Provide products for which manufacturer publishes allowable design loads that are determined from empirical data or by rational engineering analysis and that are demonstrated by comprehensive testing performed by a qualified independent testing laboratory.
4. Galvanized Steel Sheet
  - a. Steel sheet zinc-coated by hot-dip process on continuous lines prior to fabrication to comply with ASTM A 525 for Coating Designation G60 and with ASTM A 446, Grade A (structural quality); ASTM A 526 (commercial quality); or ASTM A 527 (lock-forming quality); as standard with manufacturer for type of anchor indicated.

#### J. MISCELLANEOUS MATERIALS

1. Sill Sealer Gaskets
  - a. Glass fiber resilient insulation fabricated in strip form for use as a sill sealer; 1 inch nominal thickness compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated; in rolls of 50 feet or 100 feet in length.

### III. EXECUTION

#### A. INSTALLATION, GENERAL

1. Discard units of material with defects that impair quality of rough carpentry construction and that are too small to use in fabricating rough carpentry with minimum joints or optimum joint arrangement.
2. Set rough carpentry to required levels and lines, with members plumb and true to line and cut and fitted.
3. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
4. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.
5. Countersink nail heads on exposed carpentry work and fill holes.

6. Use common wire nails, unless otherwise indicated (ring shank nails at floor sheathing). Use finishing nails for finish work. Select fasteners of size that will not penetrate member where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

**B. WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS**

1. Install wood grounds, nailers, blocking, and sleepers where shown on the drawings and where required for screening or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.
2. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to form work before concrete placement.
3. Install permanent grounds of dressed, preservative treated, key-bevelled lumber not less than 1"x2" wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

**C. WOOD FURRING**

1. Anchor and nail as shown, and to comply with the following:
  - a. "Table No. II - Recommended Nailing Schedule" of the Uniform Building Code.

**D. STUD FRAMING**

1. General
  - a. Arrange studs so that wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Install single bottom plate and double top plates using 2-inch-thick member whose widths equal that of stud; except single top plate may be used for non-load-bearing partitions. Nail or anchor plates to supporting construction.
2. For exterior walls install 2-inch by 6-inch wood studs spaced 16 inches o.c.
3. For interior walls install 2-inch by 4-inch wood studs spaced 24 inches o.c.
4. For interior partitions and walls install 2-inch by 4-inch wood studs spaced 24 inches o.c.

5. Construct corners and intersections with not less than 3 studs. Construct corners and intersections with not less than (3) studs. Use California corners, intersections use 2x6 (turned 90<sup>0</sup>) full length or ladder framing behind first partition stud. Install miscellaneous blocking and framing as shown and as required for support of facing materials, fixtures, specialty items, and trim.
6. For nonbearing partitions, install double-jamb studs and headers per 2009 IRC Table R502.5(1).
7. For loadbearing partitions, install double-jamb studs for openings 6 feet and less in width, and triple-jamb studs for wider openings. Install headers of depth shown, or if not shown, as recommended by 2009 IRC Table R502.5(1). NOTE: Header in exterior wall shall be insulated w/R-value of "5".
8. Install diagonal bracing in stud framing of exterior walls, except as otherwise indicated. Brace both walls at each external corner, full story height, at a 45 degree angle, using either a let-in 1 by 4 or 2 by 4 blocking or metal diagonal bracing required by the Uniform Building Code.
9. Framing limited at all windows and doors\*
  - a. Limit framing to a maximum of one pair of king studs per window opening.
  - b. Limit framing to a maximum of one pair of jack studs per window opening to support the header and window sill.
  - c. Install additional jack studs only as needed for structural support and cripple studs only as needed to maintain on-center spacing of studs.
  - d. Limit framing to necessary structural requirements for each door opening.

Maximum Span (ft)	Header or Lintel Size (in.)*
3 ½	2 – 2x6
5	2 – 2x8
6 ½	2 – 2x10
8	2 – 2x12
16' garage door	2 – 1¾ x ½ micro-lam opening

\*Space between 2 x with continuous piece 1/2" plywood

## E. FLOOR JOIST FRAMING

### 1. General

- a. Install floor joists with crown edge up and support ends of each member with not less than 1½ inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:
- b. To wood bearing members by toe nailing or metal framing anchors.
- c. To wood supporting members with wood ledges as shown, or if not shown, with metal joist hangers.
- d. FOOTNOTE: framing at windows shall be limited to a maximum of one pair of king studs and one pair jack studs per window opening to support the header and window sill. Additional jack studs shall be used only as needed for structural support and cripple studs only as needed to maintain on-center spacing of studs.

2. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 4 feet.

3. Anchor members paralleling masonry with ¼ inch by 1¼ inch metal strap anchors spaced not more than 8 feet o.c. Extend anchors at least 4 inches into masonry, turn up 4 inches and extend over and fasten to 3 joists.

4. Under jamb studs at openings, install solid blocking between joist.

5. Install bridging of type indicated below between joists where nominal depth-to-thickness ratio exceeds 6, at intervals of 8 feet.

- a. Steel bridging installed to comply with bridging manufacturer's directions.

## F. INSTALLATION OF CONSTRUCTION PANELS

### 1. General

- a. Comply with applicable recommendations contained in Form No. E30, "APA Design/Construction Guide-Residential & Commercial," for types of construction panels and applications indicated.

### 2. Fastening Methods

- a. Fasten panels as indicated below:
- b. Subflooring: Glue and ring shank nail to framing throughout.
- c. Sheathing: Nail to framing.

G. AIR INFILTRATION BARRIER

1. Cover interior framing with air infiltration barrier as follows:
  - a. Apply plastic sheet to comply with manufacturer's printed directions.
  - b. As indicated on the drawings, to be applied full height of interior studs and below underlayment and over sub-flooring. Lap minimum 6" carefully cutting all openings and lapping excess into the window openings.

H. FULLY ALIGNED AIR BARRIERS

1. A solid material that blocks air flow between conditioned space and unconditioned space.
  - a. Install insulation without misalignment, compressions, gaps or voids in all exterior wall cavities behind all tubs and shower.
  - b. Seal all seams, gaps and holes of the air barrier with caulk or foam.
2. Additional required locations of air aligned air barriers
  - a. Skylights
  - b. Walls adjoining porch roof (air barrier is installed prior to porch attic framing)
  - c. Garage rim/band joist adjoining conditioned space.
  - d. Soffits (kitchen)
  - e. Sloped ceilings.
3. Approved materials
  - a. Thermo pan



**I.F.B. 17-524-RAD**  
**DIVISION 6**  
**SECTION 06192**  
**PREFABRICATED METAL-PLATE-CONNECTED**  
**WOOD TRUSSES**

I. GENERAL

A. RELATED DOCUMENTS

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

B. SUMMARY

1. This Section includes the following:
  - a. Gable-shaped trusses
  - b. Hip and girder trusses at hip ends of roof
  - c. Scissors trusses
  - d. Monopitch trusses
2. Roof sheathing is specified in Division 6 Section "Rough Carpentry."

C. DEFINITIONS

1. Prefabricated metal-plate-connected wood trusses include planar structural units consisting of metal-plate-connected members that are fabricated from dimension lumber and that have been cut and assembled prior to delivery to the project site.

D. SUBMITTALS

1. General
  - a. Submit the following in accordance with conditions of Contract and Division 1 Specification Sections.
2. Product Data - for lumber, metal connector plates, hardware, fabrication process, and fasteners.
3. Shop Drawings indicating species, species group, sizes, and stress grades of lumber to be used; pitch, span, camber, configuration, and spacing for each type of truss required; type, size, material, finish, design values, and location of metal connector plates; and bearing details.
  - a. To the extent engineering design considerations are indicated as fabricator's responsibility, include design analysis indicating loading, assumed allowable stress, stress diagrams and calculations, and other information needed for review that have

- been signed and sealed by a qualified professional engineer responsible for their preparation.
- b. Provide shop drawings that have been signed and stamped by a qualified professional engineer.
4. Product certificate, signed by officer of fabricating firm, certifying that metal-plate-connected wood trusses supplied for project comply with specified requirements.
- a. As follows including chemical treatment manufacturer's instructions for handling, storing, installation, and finishing treated material.
  - b. For each type of preservative treated wood product include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.

E. QUALITY ASSURANCE

1. TPI Standards
  - a. Comply with applicable requirements and recommendations of the following Truss Plate Institute (TPI) publications:
  - b. "Design specification for Metal Plate Connected Wood Trusses."
  - c. "Design Specification for Metal Plate Connected Parallel Chord Wood Trusses"
  - d. "Commentary and Recommendations for Handling and Erecting Wood Trusses"
  - e. "Commentary and Recommendations for Bracing Wood Trusses"
  - f. "Quality Standard for Metal Plate Connected Wood Trusses"

F. DELIVERY, STORAGE, AND HANDLING

1. Handle and store trusses with care and comply with manufacturer's instructions and TPI recommendations to avoid damage from bending, overturning, or other cause which trusses are not designed to resist or endure.

G. SEQUENCING AND SCHEDULING

1. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying work of other trades whose work must follow erection of trusses.

II. PRODUCTS

A. LUMBER, GENERAL

1. Factory mark each piece of lumber with type, grade, mill, and grading agency.



2. Lumber Standards
  - a. Furnish lumber manufactured to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.
3. Nominal Sizes - are indicated, except as shown by detail dimensions.
4. Provide dressed lumber, S4S, manufactured to actual sizes required by PS 20 to comply with requirements indicated below:
5. Moisture Content
  - a. Seasoned, with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.
  - b. Group III species, "Fb" f 875 psi for single member use and of 1000 psi for repetitive member use, and "E" of 1,300,000 psi.

B. METAL CONNECTOR PLATES

1. General
  - a. Fabricate connector plates from metal complying with requirements indicated in this article.
2. Hot-Dip Galvanized Steel Sheet
  - a. Structural (physical) quality steel sheet complying with ASTM A 446, Grade ; zinc coated by hot-dip process to comply with ASTM A 525, Designation G60; minimum coated metal thickness indicated but not less than 0.036 inch.

C. FASTENERS

1. General
  - a. Provide metal framing anchors of type, size, metal, and finish indicated that comply with requirements specified including the following:
  - b. Current Evaluation/Research Reports: Provide products for which reports exist from a model code organization acceptable to authorities having jurisdiction that evidence compliance of metal framing anchors for application indicated with the building code in effect for this project.
  - c. Allowable Design Loads: Provide products for which manufacturers publishes allowable design loads that are determined from empirical data or by rational engineering analysis and that are demonstrated by comprehensive testing performed by a qualified independent testing laboratory.

2. Galvanized Steel Sheet
  - a. Steel sheet zinc-coated by hot-dip process on continuous lines prior to fabrication to comply with ASTM A 525 for coating Designation G60 and with ASTM A 446, Grade A (structural quality); ASTM A 526 for coating Designation G60 and with ASTM A 446, Grade A (structural quality); ASTM A 526 (commercial quality); or ASTM A 527 (lock-forming quality); as standard with manufacturer for type of anchor indicated.

#### D. FABRICATION

1. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints with wood-to-wood baring in assembled units.
2. Fabricate metal connector plates to size, configuration, thickness, and anchorage details required to withstand design loadings for types of joint designs indicated.
3. Assemble truss members in design configuration indicated using jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances specified in TPI "Quality Standard for Metal Plate Connected Wood Trusses." Position members to produce design camber indicated.
4. Connect truss members by means of metal connector plates accurately located and securely fastened to each side of wood members by means indicated or approved.

### III. EXECUTION

#### A. INSTALLATION

1. General
  - a. Erect and brace trusses to comply with applicable requirements of referenced TPI standards.
2. Where trusses do not fit, return them to fabricator and replace with trusses of correct size, do not alter trusses in the field.
3. Erect trusses with plane of truss webs vertical (plumb) and parallel to each other, located accurately at design spacings indicated.
4. Hoist trusses in place by means of lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
5. Anchor trusses securely at all bearing points to comply with methods and details indicated.

6. Install permanent bracing and related components to enable trusses to maintain design spacing withstand live and dead loads including lateral loads, and to comply with other indicated requirements.
7. Do not cut or remove truss members.



**I.F.B. 17-524-RAD  
DIVISION 6  
SECTION 06200  
FINISH CARPENTRY**

I. GENERAL

A. RELATED DOCUMENTS

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

B. DESCRIPTION OF WORK

1. Definition: Finish carpentry includes carpentry work which is exposed to view, is non-structural, and which is not specified as part of other sections.
2. Types of finish carpentry work in this section
  - a. Exterior running and standing trim
  - b. Interior running and standing trim
3. Rough carpentry is specified in Section 06100.
4. Builders hardware and wood doors are specified in Section 08710.
5. Kitchen casework and countertops are specified in Section 12372.

C. QUALITY ASSURANCE

1. Factory-mark each piece of lumber and plywood with type, grade, and mill and grading agency identification; except omit marking from surfaces to receive transparent finish, and submit mill certificate that material has been inspected and graded in accordance with requirements if it cannot be marked on a concealed surface.

D. SUBMITTALS

1. Product Data
  - a. Submit manufacturer's specifications and installation instructions for each item of factory-fabricated siding and paneling.
2. Samples
  - a. Submit the following samples for each species and cut or pattern of finish carpentry.

## E. PRODUCT DELIVERY, STORAGE AND HANDLING

1. Protect finish carpentry materials during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
2. Do not deliver finish carpentry materials, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

## F. JOB CONDITIONS

1. Conditioning
  - a. Installer shall advise Contractor of temperature and humidity requirements for finish carpentry installation areas. Do not install finish carpentry until required temperature and relative humidity conditions have been stabilized and will be maintained in installation areas.
2. Maintain temperature and humidity in installation area as required to maintain moisture content of installed finish carpentry within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period. The fabricator of woodwork shall determine optimum moisture content and required temperature and humidity conditions.

## II. PRODUCTS

### A. WOOD PRODUCT QUALITY STANDARDS

1. Softwood Lumber Standards
  - a. Comply with PS 20 and with applicable grading rules of the respective grading and inspecting agency for the species and product indicated.
2. Plywood Standard
  - a. Comply with PS 1/ANSI A199.1.
3. Wood Products
  - a. Recycled content of medium-density fiberboard and particleboard: provide products with an average recycled content so postconsumer recycled content plus on-half of preconsumer recycled content is not less than 25 percent.
  - b. Hardboard: AHA A135.4
  - c. Medium-Density Fiberboard: ANSI A 208.2, Grade MD, made with binder containing no urea formaldehyde.

- d. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
- e. Softwood Plywood: DOC PS 1, Medium Density Overlay.
- f. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

B. MATERIALS

1. General

- a. Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed or worked and dressed lumber, as applicable, manufactured to the actual sizes as required by PS 20 or to actual sizes and patterns as shown, unless otherwise indicated.

2. Moisture Content of Softwood Lumber

- a. Provide seasoned (KD) lumber having a moisture content from time of manufacture until time of installation not greater than values required by the applicable grading rules of the respective grading and inspecting agency for the species and product indicated.

3. Lumber for Painted Finish

- a. At Contractor's option, use pieces which are either glued-up lumber or made of solid lumber stock.

4. For Exterior Finish Carpentry Work use glued-up lumber complying with PS 56 for "wet use" and certified so by respective grading and inspecting agency for species and product indicated.

B. EXTERIOR FINISH CARPENTRY

1. Standing and Running Trim

- a. For trim in form of boards and worked products, provide lumber complying with the following requirements including those of the grading agency listed with species.

2. Species

- a. Grade: Finger Jointed

C. INTERIOR FINISH CARPENTRY

1. Miscellaneous Materials

- a. Fasteners and Anchorages: Provide nails, screws and other anchoring devices of the type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible, and complying with applicable Federal Specifications.

- b. Where finish carpentry is exposed on exterior or in areas of high relative humidity, provide fasteners and anchorages with a hot-dipped zinc coating (ASTM A 153).

### III. EXECUTION

#### A. PREPARATION

1. Condition Wood Materials to average prevailing humidity conditions in installation areas prior to installing.
2. Backprime Lumber for painted finish exposes on the exterior and interior. Comply with requirements of section on painting within Division 9 for primers and their application.

#### B. INSTALLATION

1. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or which are of defective manufacturer with respect to surfaces, sizes or patterns.
2. Install the Work Plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'0" for plumb and level countertops; and with 1/16" maximum offset in flush adjoining 1/8" maximum offsets in revealed adjoining surfaces.
3. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
4. Standing and Running Trim
  - a. Install with minimum number of joints possible, using full-length pieces (from maximum lengths of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners, to produce tight fitting joints with full surface contact throughout length of joint. Use scarf joints for end-to-end joints.
  - b. All jamb pieces to left 1/8" off of the underlayment to allow for installation of resilient vinyl wall tile.
  - c. Make exterior joints water-resistant by careful fitting.
5. Anchor Finish Carpentry Work to anchorage devices or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fasteners heads are required, use fine finishing nails for exposed nailings, countersunk and filled flush with finished surface, and matching final finish where transparent is indicated.



C. ADJUSTMENT, CLEANING, FINISHING AND PROTECTION

1. Repair damaged and defective finish carpentry work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.
2. Clean Finish Carpentry Work on exposed and semi-exposed surfaces. Touch-up shop-applied finishes to restore damaged or soiled areas.
3. Refer to Division-9 sections for final finishing of installed finish carpentry work.
4. Protection
  - a. Installer of finish carpentry work shall advise Contractor of final protection and maintained conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.



**I.F.B. 17-524-RAD  
DIVISION 7  
SECTION 07160  
DAMPPROOFING**

**I. GENERAL**

**A. Test Data**

1. Dampproofing meets and/or exceeds the following AST tests:
  - a. ASTM D 2939 - 1998 (Section 15) Method A - Resistance TO Water. Rating Number 1 - No-Softening - no loss of Adhesion, or re-emulsification
  - b. ASTM D 2939 - 1998 (Section 16) "Flexibility" Rating Number 1 - No cracks hairline or otherwise, no loss of Adhesion
  - c. ASTM D 6489-1998 "Water Absorption"
  - d. ASTM C 836- 2000 Film thickness On vertical Surface
  - e. ASTM D 2665 - 1999 Color Fastness of Surface Coating -UV Resistance
  - f. ASTM D 3273-94 Resistance to Mold Growth of surface coating

**B. LIMITATION**

1. Do not let product freeze. Do not dilute dampproofing. Store indoors at temperatures above 32 degrees Fahrenheit. It is recommended that the temperature should be 28 degrees Fahrenheit and rising before application. Do not apply dampproofings when the threat of rain is imminent dampproofing is not designed to be used as a waterproofing coating to stop moisture penetration caused by cracks or holes in the surface.

**C. INSTALLATION**

1. Dampproofing can be applied to poured concrete walls after the forms have been removed.
2. Coverage
  - a. Approximately 115 to 140 square feet per gallon depending on the porosity of the surface.
3. Preparation
  - a. Repair all structural deficiencies before applying dampproofing. Protect areas on surfaces not to be coated, such as doors, windows, and floors, prior to applying dampproofing. Concrete tie locations below grade that create holes or recesses into the wall, shall be sealed with an approved material or method.

4. Application
  - a. Dampproofing, without dilution, with an airless sprayer. For spraying application, and depending upon sprayer equipment used, it is recommended that an orifice size of 0.027 to 0.031 inches be used for testing to insure proper material application. Material must be completely dry to the substrate before any type of protection board is applied or before backfill operations can begin.

D. MAINTENANCE

1. No maintenance required.

II. PRODUCTS

A. Materials

1. Semi-mastic fiber reinforced black bituminous compound.
2. Accepted manufacturer's include:
  - a. Karnak 83
  - b. Sonneborn Hydrocide 700 for trowel application, 700 B for brush/spray application.
  - c. Deco 20

**I.F.B. 17-524-RAD**  
**DIVISION 7**  
**SECTION 071915**  
**ICE AND WATER SHIELD**

I. GENERAL

A. DESCRIPTION

1. Scope: includes the furnishing of all labor, materials, and equipment required for the completion of ice and water shield waterproof membrane shown on the drawings and specified herein.
2. The General Conditions, the Supplementary General Conditions, and the General Requirements are a part of the requirements of this section.

B. REGULATIONS, REFERENCES, AND STANDARDS

1. Applicable sections and referenced sections of the following standards, latest edition in effect on date of Invitation for Bids, form a part of these specifications.
  - a. American Society for Testing and Materials (ASTM)
  - b. Occupational Safety and Health Administration (OSHA)
  - c. Federal Specifications (FS)
  - d. Underwriters Laboratory (UL)

C. PRODUCT DELIVERY, STORAGE, AND HANDLING

1. All materials: shall be delivered to the site in original, unopened containers.
2. Waterproofing materials: shall be kept dry at all times. Where materials must be stored outdoors, the materials shall be covered with polyethylene tarps or other suitable waterproof tarps.

D. SHOP DRAWINGS

1. Submit: the manufacturer's specifications and samples of materials proposed for installation.

## II. PRODUCTS

### A. MANUFACTURERS

1. Approved manufacturer: W.R. Grace

### B. MATERIALS

1. Membrane: W.R. Grace Ice and Water Shield
  - a. Color: Gray-Black
  - b. Thickness (mils): 40 minimum
  - c. Tensile strength (psi): 250 minimum, ASTM D412 (Die C) modified
  - d. Elongation-ultimate failure of rubberized asphalt (%): 250 minimum, ASTM D412 (Die C) modified
  - e. Pliability: 180° bend (1" mandrel at -25°F): Unaffected, ASTM D146
  - f. Adhesion to plywood (lb/inch width): 3.0 minimum

## III. EXECUTION

### A. PREPARATION

1. Inspect: the area for defects or irregularities in the surfaces to receive ice and water shield that would preclude the proper installation of the single-ply membrane roofing system.
  - a. Report any unacceptable conditions to the General Contractor. Do not proceed until substrate is acceptable.

### B. APPLICATION

1. The membrane should not be folded over the roof edge unless the edge is protected by a gutter, flashing, or fascia board.
2. Apply ice and water shield only in fair weather at air temperatures of 35° or higher.
3. Ice and water shield must not be left permanently exposed to sunlight. It must always be adhered directly to the plywood structural deck and be covered by shingles or other roofing materials.
4. Ice and water shield is a vapor barrier. If the entire deck is covered by the membrane, space under the deck must be properly ventilated.

**I.F.B. 17-524-RAD**  
**DIVISION 7**  
**SECTION 07200**  
**INSULATION**

I. GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
2. Rough Carpentry, Section 06100, fully-aligned air barriers.

B. DESCRIPTION OF WORK

1. Extent of insulation work is shown on drawings and indicated by provisions of this section.
2. Applications of insulation specified in this section include the following:
  - a. Board-type building insulation, concealed
  - b. Blanket-type building insulation
  - c. Loose-fill building insulation

C. QUALITY ASSURANCE

1. Thermal Conductivity
  - a. Thickness indicated are for thermal conductivity (k-value at 75° or 24° C) specified for each material. Provide adjusted thicknesses as directed for equivalent use of material having a different thermal conductivity. Where insulation is identified by "R" value, provide thickness required to achieve indicated value.
2. Fire and Insurance Ratings
  - a. Comply with fire-resistance, flammability and insurance ratings indicated, and comply with regulations as interpreted by governing authorities.
3. Federal Specifications
  - a. Where compliance with FS standard is indicated, specified requirements for marking individual boards/batts/blankets are waived, provided packages of units are labeled to show compliances.

## D. SUBMITTALS

1. Product Data
  - a. Submit manufacturer's product specifications and installation instructions for each type of insulation and vapor barrier material required.
  - b. Certified Tests - with product data, submit copies of certified test report showing compliance with specified performance values, including k-values (aged values for plastic insulations), densities, compression strengths, burning characteristics, perm ratings, water absorption ratings and similar ratings.
2. Test Reports
  - a. Submit laboratory test report on each frothed or foamed-in-place insulation sample, indicating required test results, general location of work represented by sample, and date of sample.

## E. PRODUCT HANDLING

1. General Protection
  - a. Protect insulations from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.
2. Protection for Plastic Insulation
  - a. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
  - b. Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time. Complete installation and concealment of plastic materials as rapidly as possible in each area of work.

## II. PRODUCTS

### A. MATERIALS

1. Extruded Polystyrene Board Insulation (EPsBD-Ins)
  - a. Rigid, closed-cell, tongue and groove polystyrene foam insulation board, R-value of  $5.0 \bullet F \bullet ft^2 \bullet h / BTU$  (min) per inch of thickness when tested at 75° F mean temperature in accordance with ASTM C518. Minimum compressive strength of 25lb./in<sup>2</sup> when tested in the vertical direction in accordance with ASTM D 1621. Maximum water adsorption 1% by volume. Use 9' long sheets to tightly fit at trusses per drawings.



2. All Batt Insulation
  - a. Shall be rot proof, vermin and insect proof, and odorless.
  - b. Shall comply with ASTM C-665, Type 1, Type 2, or Type 3.
  - c. Shall be thickness shown on the drawings with the following minimum R-factors:
    - i. 3 ½” batt – R-11
    - ii. 6 ¼” batt – R-19
    - iii. 9 ½” batt – R-30
  
3. Blanket Insulation Facing
  - a. Flame resistant, foil-faced, fiberglass batt insulation:
    - i. Comply with: ASTM C-665, Type 3, Class A
    - ii. Flame spread rating: 0 to 25
    - iii. Smoke density: Less than 450
  - b. Non-rated, foil-faced, fiberglass batt insulation: NOT PERMITTED except where noted on the drawings.
  - c. Non-rated, kraft-faced, fiberglass batt insulation: NOT PERMITTED except where noted on the drawings as “Non-rated, kraft-faced, fiberglass batt insulation.”
    - i. Comply with: ASTM C-665, Type 2, Class C
  - d. Unfaced fiberglass batt insulation:
    - i. Comply with: ASTM C-665, Type 1, Class C
  - e. Sound attenuation batts: shall be 3” thick, unfaced fiberglass batts.
  - f. Nails, wire, staples, and miscellaneous rough hardware: as required for the intended application.
  - g. Adhesive: for use with glue chips shall be fast curing type and as recommended by manufacturer for the purpose. Adhesive shall be fire resistant.
  - h. Polyethylene Vapor Barrier: 8-mil polyethylene film, with laboratory tested vapor transmission rating of 0.2 perms, natural color.

## B. INSTALLATION

1. General
  - a. Nailing of EPS sheets - use plasticpa insulation nails, at 24" o.c. at exterior studs at 10" o.c., total (18) fasteners per 4'x9' sheet. Conform to FHA/HUD Bulletin #71. (1977).
  - b. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.
  - c. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.
  - d. Protect insulation on vertical surfaces (from damage during back-filling) by application of protection board. Set in adhesive in accordance with recommendations of manufacturer of insulation.

2. General Building Insulation
  - a. Place loose fiber insulation into spaces and onto surfaces as shown, either by pouring or by machine-blowing. Level horizontal applications to uniform thickness as indicated, lightly settled to uniform density, but not excessively compacted.
  - b. Stuff loose mineral fiber insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40% of normal maximum volume (to a density of approximately 2.5 lbs. per cu. ft.).
3. Vapor Barrier Installations
  - a. General: Extend vapor barriers to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage. Extend vapor barriers to cover miscellaneous voids in insulated substrates, including those which have been stuffed with loose fiber-type insulation.
  - b. Seal joints/seams in vapor barriers, seal to objects penetrating barriers, and seal to other surfaces at extremities of coverage by lapping with adhesive or taping to form a continuous barrier.
  - c. Lap edges of sheets of vapor barrier not less than 4" so as to provide complete coverage of protected areas.
  - d. Repair punctures and tears in vapor barriers, immediately before concealment by other work. Cover with adhesively applied vapor barrier material or with self-adhesive vapor barrier tape.

#### C. PROTECTION

1. General
  - a. Protect installed insulation and vapor barriers from harmful weather exposures and from possible physical abuses, where possible by nondelayed installation of concealing work or, where that is not possible, by temporary covering or enclosure. Installer shall advise Contractor of exposure hazards, including possible sources of deterioration and fire hazards.

#### D. CERTIFICATION

1. General
  - a. Immediately after insulation has been completed, insulation sub-contractor shall place a certification card, stapled to the truss directly above the attic access containing the following information:
    - Name of installer.
    - Date of installation.
    - "F" values installed at all locations.
    - Types of insulation materials installed at all locations.
    - Manufacturers of insulation installed at all locations.

### III. MANUFACTURERS

#### A. Extruded Poly Styrene

1. Dow Chemical “Styrofoam” TG.

#### B. Batt Insulation

1. Owens Corning
2. Manville
3. Certainteed



**I.F.B. 17-524-RAD**  
**DIVISION 7**  
**SECTION 072127**  
**SPRAY-APPLIED FOAM INSULATION CLOSED CELL**

**I. GENERAL**

**A. DESCRIPTION**

1. Scope: includes all labor, materials, equipment, tools, and accessory items required to complete the installation of spray-applied insulation where shown on the drawings and specified herein.
2. The General Conditions, the Supplementary General Conditions, and the General Requirements are a part of the requirements of this section.

**B. REFERENCES, REGULATIONS, AND STANDARDS**

1. Applicable sections and referenced sections of the following standards, latest edition in effect on date of Invitation for Bids, form a part of these specifications American Society for Testing and Materials (ASTM).
  - a. ASTM C518: Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
  - b. ASTM E84: Test Method for Surface Burning Characteristics of Building Materials.
  - c. ASTM E96/E96M: Test Method for Water Vapor Transmission of Materials.
  - d. ASTM E283: Test Method for Determining Air Leakage of Air Barrier Assemblies.
2. National Fire Protection Association (NFPA):
  - a. NFPA 285 [2006]: Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus.
  - b. NFPA 286 [2006]: Standard Methods for Fire Tests for Evaluating Room Fire Growth Contribution of Wall and Ceiling Interior Finish.
3. Federal Specifications (FS)
4. Underwriters Laboratory (UL)

**C. SHOP DRAWINGS**

1. Submit shop drawings: Manufacturer's data showing compliance with the requirements of these specifications, including the following:
  - a. Manufacturer's recommended application procedures.

- b. Manufacturer's recommended coverage.
- c. Manufacturer's recommended number of coats.

#### D. DELIVERY, HANDLING, AND STORAGE

1. Deliver and store Product in original packaging, bearing manufacturer's name, quantity, expiry date, log number, and other appropriate technical indicators and references. Any package having containers showing damage that may affect condition of contents is not acceptable.
2. Cold Weather Storage: Store materials during cold weather in heated storage areas following the manufacturer's guidelines for minimum and maximum temperatures.

## II. PRODUCTS

### A. MATERIALS

1. ICYNENE MD-C-200 Closed Cell Insulation or approved equal.  
Spray Polyurethane Foam: Two-component spray polyurethane cellular plastic foam, complying with the following methods and meeting the following physical properties.
  - a. Core Density (ASTM D1622): 2.5 pcf
  - b. Thermal Resistance (ASTM C518): 140 degreeF/90day Aged R-Value, measured 75F mean Temp: Minimum R6.5/inch.
  - c. Flame Spread (ASTM E84, Class A): 25 or less.
  - d. Smoke Developed (ASTM E84, Class A): 450 or less.
  - e. Compressive Strength minimum (ASTM D1621, (20 psi)
  - f. Closed Cell Content (ASTM D2856): minimum 95 percent.
  - g. Water absorption by Volume maximum: (ASTM D2842): 2.5 percent
  - h. Water Vapor Permeability maximum ASTM E96: 2.5 perm-inches
2. Acceptable Products
  - a. ICYNENE MD-C-200 Closed Cell Insulation or approved equal
3. Approved Manufacturers:
  - a. ICYNENE
  - b. Substitutions: Approved Equal
4. Primers:
  - a. Follow manufacturer's recommendations for surfaces conditions.
5. For oily steel surface like Z-bar, roof deck, or PVC pipes cleaning, etching or a primer shall be completed before spraying polyurethane foam.

### B. EQUIPMENT

1. Equipment shall be maintained and in good operating conditions and approved by the foam manufacturer for type of application.

### III. EXECUTION

#### A. EXAMINATION

1. Verify existing conditions are ready to receive work.
2. Ensure surfaces are free of frost, oil, grease, oxidation, dirt, loose paint, loose scale, or other deleterious material that would impair bond.
3. Ensure that items required to penetrate sprayed insulation are installed prior to installation of sprayed insulation.
4. Report: any unsatisfactory conditions to the General Contractor. Do not proceed until unsatisfactory conditions have been corrected.
5. Beginning of application implies acceptance of existing conditions.
6. Review placement area to determine final location will not be within 3 inches of any heat source where the temperature will exceed 180 deg F per ASTM C 411 or in accordance with authorities having jurisdiction.
7. Apply foam per manufacturer instructions to thickness necessary to achieve specified wall, ceiling, or attic R-Value, but in no instance shall the thickness of spray-applied foam insulation be more than 4".

#### B. PREPARATION

1. Mask and cover adjacent areas to protect from overspray, fall-out, and dusting of insulation materials.
2. Apply any required primers for special conditions as recommended by manufacturer.
3. Cover wide joints with transition sheet membrane.
4. Clean area of work prior to application of sprayed insulation.
5. Dispose of waste foam daily in location designated by consultant and decontaminate empty drums in accordance with foam manufacturer's instructions.
6. Prepare all surfaces in accordance to manufacturer's recommendations.
7. Post all required warning signs.

#### C. APPLICATION

1. Must be installed by Manufacturer's approved applicator at time of bidding.
2. Apply SPF in accordance with ASTM C1029 and manufacturer's installation guidelines: complying with preparation methods outlined in 3.02.

3. Apply sprayed foam insulation in consecutive layers of not less than (1/2 inch) and not more than (2 inch) thick each to achieve total thickness required (total thickness as indicated per application). For light gage steel and extruded polystyrene board first layer should be a skim coat of (1/2 inch) before adding extra layers. Ensure the substrate is well supported.
4. Avoid formation of sub-layer air pockets.
5. Apply product in overlapping layers, so as to obtain a smooth, uniform surface.
6. Maintain (3 inch) clearance around heating vents, steam pipes, recessed lighting fixtures and other heat sources.
7. Do not apply Product to inside of exit openings or electrical junction boxes.
8. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

#### D. ENVIRONMENTAL REQUIREMENTS

1. Execute the work of this section when the temperature of the air and substrate are within the limits of the data sheets supplied by the manufacturer.
2. Apply the spray foam only when the relative humidity is lower than 80%.

#### E. FIELD QUALITY CONTROL

1. Conduct field inspection and testing in accordance with manufacturers and general contractors instructions.
2. Test completed application daily for core density and cohesion/adhesion to substrate. Record results daily in daily work records.
3. Manufacturer's Qualifications: Product produced in an ISO 9001 registered factory.
4. Single Source Responsibility: Single source product from one manufacturer.
5. Installer Qualifications: Engage an Icynene Licensed Dealer (installer) who has been trained and certified by Icynene.
6. Fire-Test-Response Characteristics: Provide materials specified as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - a. Surface-Burning Characteristics: ASTM E 84



7. Toxicity/Hazardous Materials
  - a. Provide products that contain no urea-formaldehyde
  - b. Provide products that contain no PBDEs
  - c. Provide products that are “Low-emitting”

F. SITE TOLERANCES

1. Maximum Variation in Applied Thickness: minus (1/4 inch), plus (5/8 inch).

G. CLEANING

1. Remove overspray from non-prescribed surfaces without causing damage to surfaces.
2. Remove protective covers from adjacent surfaces.

H. PROTECTION

1. Protect completed installation per manufacturer’s instructions.
2. Protect completed installation from damage repair as required.
3. Any open flame or welding shall not be in contact with the Spray Polyurethane Foam.
4. All plastic insulation must be protected from interior occupancy space by an approved thermal barrier to meet the requirements of local Building Codes.



**I.F.B. 17-524-RAD**  
**DIVISION 7**  
**SECTION 072726**  
**FLUID APPLIED VAPOR PERMEABLE**  
**AIR BARRIER MEMBRANE**

**I. GENERAL**

**A. GENERAL REQUIREMENTS**

1. General Conditions, Supplementary Conditions, Instructions to Bidders and Division One General Requirements shall be read in conjunction with and govern this section.
2. This Specification shall be read as a whole by all parties concerned. Each Section may contain more or less than the complete Work of any trade. The Contractor is solely responsible to make clear to the Subcontractors the extent of their Work.

**B. DESCRIPTION**

1. Supply labor, materials and equipment to complete the Work as shown on the Drawings and as specified herein to bridge and seal the following air leakage pathways and gaps:
  - a. Connections of the walls to the roof air barrier.
  - b. Connections of the walls to the foundations.
  - c. Seismic and expansion joints.
  - d. Openings and penetrations of window and door frames, store front, curtain wall.
  - e. Piping, conduit, duct and similar penetrations.
  - f. Masonry ties, screws, bolts and similar penetrations.
  - g. All other air leakage pathways in the building envelope.
2. Materials and installation methods of the primary water-resistive vapor permeable air barrier membrane system and accessories.

**C. PERFORMANCE REQUIREMENTS**

1. Provide an acrylic base water-resistive vapor permeable air barrier membrane system constructed to perform as a continuous air barrier, and as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration. Membrane system shall accommodate movements of building materials by providing expansion and control joints as required, with

accessory air sealant materials at such locations, changes in substrate, perimeter conditions and penetrations.

#### D. RELATED SECTIONS

1. Cast-in-Place Concrete: Section 03 30 00
2. Unit Masonry: Section 04 20 00
3. Blanket Insulation: Section 07 21 16
4. Spray-on Insulation: Section 07 21 29
5. Built-up Roofing: Section 07 51 00
6. Caulking and Sealants: Section 07 92 10
7. Sheet Metal Flashing: Section 07 62 00
8. Openings: Section 08 11 13 and 08 44 10
9. Gypsum Sheathing: Section 06 16 43

#### E. REFERENCES

1. The following standards are applicable to this section:
  - a. ASTM E 2357: Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
  - b. ASTM E 2178: Standard Test Method for Air Permeance of Building Materials.
  - c. ASTM E 283: Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
  - d. ASTM E 96: Water Vapor Transmission of Materials.
  - e. AATCC 127 Water Resistance Hydrostatic Pressure Test.
  - f. ASTM D 1970: Sealability
  - g. ICC-ES AC 212: Acceptance Criteria for Water Resistive Coatings.

#### F. SUBMITTALS

1. Submit documentation from an approved independent testing laboratory certifying the air leakage rates of the air barrier membranes assembly, including primary membrane, primer and sealants have been tested to meet ASTM E 2357.
2. Submit documentation from an approved independent testing laboratory certifying the air leakage and vapor permeance rates of the air barrier membranes, including primary membrane and transition sheets, exceed the requirements of the Massachusetts Energy Code and in accordance with ASTM E 2178.
  - a. Test report submittals shall include test results on porous substrate and include sustained wind load and gust load air leakage results.

3. Submit manufacturers' current product data sheets for the air barrier membrane system.

#### G. QUALITY ASSURANCE

1. Submit document stating the applicator of the primary water-resistive vapor permeable air barrier membranes specified in this section is qualified by the manufacturer as suitable for the execution of the Work.
2. Perform Work in accordance with manufacturer's written instructions and this specification.
3. Maintain one copy of manufacturer's written instructions on site.
4. Allow access to Work site by the air barrier membrane manufacturer's representative.
5. Components used shall be sourced from one manufacturer, including sheet membrane, water-resistive vapor permeable air barrier sealants, primers, mastics, and adhesives.
6. Single-Source Responsibility:
  - a. Obtain water-resistive vapor permeable air barrier materials from a single manufacturer regularly engaged in manufacturing the product.
  - b. Provide products which comply with all federal, state and local regulations controlling use of volatile organic compounds (VOCs).

#### H. PRE-INSTALLATION CONFERENCE

1. Contractor shall convene one week minimum prior to commencing Work of this section, under provisions of Section 01 31 19 – Project Meetings.
2. Ensure all contractors responsible for creating a continuous plane of air tightness are present.

#### I. DELIVERY, STORAGE AND HANDLING

1. Refer to manufacturer's current material shipping, delivery, and storage recommendations for proper storage and handling.
2. Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.
3. Store role materials on end in original packaging. Protect rolls from direct sunlight until ready for use.

4. Store water-resistive vapor permeable air barrier membranes, adhesives and primers at temperatures of 40 degrees F and rising.
5. Keep solvent away from open flame or excessive heat.
6. Contractor to verify compliance for Volatile Organic Compounds (VOC) limitations of products to comply with all federal, state and local regulations controlling use of volatile organic compounds (VOCs).

#### J. COORDINATION

1. Ensure continuity of the specified membranes throughout the scope of this section.
  - a. Air barrier membrane to include liquid applied water-resistive vapor permeable air barrier, transition membranes and sealant at penetrations.
  - b. Drainage plane to include water resistive barrier and flexible flashings to exterior.

#### K. APPROVED MANUFACTURER

1. Basis of Design: Sika Corporation
2. Submit request for approved equals or substitutions in accordance with Information for Bidders.

#### L. WARRANTY

1. Provide a written warranty from the manufacturer against defects of materials for a period of one (1) year, beginning with date of substantial completion of the project.

### II. PRODUCTS

#### A. MATERIALS

1. Air barrier membrane components and accessories must be obtained as a single-source to ensure total system compatibility and integrity.
2. Acceptable system by Sika Corp, 201 Polito Avenue, Lyndhurst, NJ, 800 933 SIKA (7452), [www.Sikausa.com](http://www.Sikausa.com)

#### B. MEMBRANES (Basis-of-Design)

1. Primary vapor permeable air and rain barrier membrane for temperatures above 40 degrees F and rising shall be Sikagard<sup>®</sup> 530 Liquid Applied Acrylic Vapor Permeable Air Barrier by Sika Corp, a low VOC one component elastomeric acrylic membrane that may be trowel, brush, roller or spray applied. Membrane shall have the following physical properties:

- a. Color: Yellow
  - b. Air permeability: 0.0001CFM/ft<sup>2</sup> @ 1.6 lbs/ft<sup>2</sup> to ASTM E 2178.
  - c. Tested to ASTM E 2357 for Air Leakage of Air Barrier Assemblies
  - d. Water vapor permeance (21 mil dry thickness): 11 perms to ASTM E 96 Method B
  - e. Nominal wet film thickness: 40 mils
  - f. Recycled Content by weight: 25%
  - g. VOC: <50g/l
  - h. Fastener Sealability: Pass to ASTM D 1970
  - i. Water Resistance: Pass to AATCC 127
  - j. May be exposed for up to 6 months
2. Self-adhering membrane for all window jambs, headers, door openings, inside and outside corners, joint treatment and other transitions shall be SikaMultiSeal<sup>®</sup> 515 Self-Adhered Transition Seam Tape by Sika Corp, a self-adhering polyester-backed, synthetic butyl rubber based adhesive membrane for wall construction, specifically designed to be water resistant. Membrane shall have the following physical properties:
- a. Tested to ASTM E 2357 for the air barrier assembly
  - b. Membrane Thickness: 0.0394 inches (40 mils)
  - c. Low temperature flexibility: -30 degrees F
  - d. Elongation: 500% to ASTM D 412-modified

### C. LIQUID SEAM AND PENETRATION SEALANTS

1. Liquid seam sealant shall be Sikaflex<sup>®</sup> 110 Liquid Seam Sealant by Sika Corp, a moisture cure, medium modulus polyether sealing compound having the following physical properties:
- a. Compatible with air barrier, roofing and waterproofing membranes and substrate,
  - b. Set Time: 1 hour @ 72 degrees, 40% RH
  - c. Solids: 100%
  - d. Elongation: 200% to ASTM D 412/C1135
  - e. Joint Movement 12.5%+/- ASTM C 719
  - f. Seals construction joints
2. Penetration sealant shall be Sikasil WS 290 by Sika Corp, a one-part, neutral-curing, ultra low-modulus silicone sealant that cures to a durable, flexible building sealant and having the following physical properties:
- a. Compatible with air barrier, roofing and waterproofing membranes and substrate,
  - b. Tensile Properties (ASTM D-412) at 21 days
  - c. Tensile Stress: 165 psi (1.14 MPa)
  - d. Elongation at Break: 1200%
  - e. Modulus of Elasticity: 100% 42 psi (0.29 MPa)

#### D. PRIMER AND SURFACE CONDITIONER

1. Primer for self-adhering transition and flashing membrane at all temperatures and meeting Test Method ASTM E 2357 shall be Sikagard<sup>®</sup> 510 Transition Seam Tape Primer by Sika Corp, a high tack adhesive primer, quick setting, having the following physical properties:
  - a. Color: White,
  - b. Solids by weight: 37%,
  - c. Drying time (initial set): 30 minutes.
  
2. Surface conditioner for self-adhering transition and flashing membrane at temperatures above 40 degrees F shall be Sikagard<sup>®</sup> 530 Liquid Air Barrier Membrane having the following physical properties:
  - a. Color: Yellow,
  - b. Solids by weight: 64%,
  - c. Application Rate: 160 sq.ft/gallon to a uniform wet film thickness of 10 mils.
  - d. Drying time (initial set): 60 minutes.

### III. EXECUTION

#### A. EXAMINATION

1. Verify that surfaces and conditions are ready to accept the Work of this section. Notify architect in writing of any discrepancies. Commencement of the Work or any parts thereof shall mean acceptance of the prepared substrates.
  
2. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants. Fill voids, gaps and spalled areas in substrate to provide an even plane. Strike masonry joints flush.
  
3. Where curing compounds are used they must be clear resin based without oil, wax or pigments.
  
4. Do not proceed with application of air barrier membrane when rain is expected within 24 hours.
  
5. Condition materials to room temperature prior to application to facilitate handling.



## B. SURFACE PREPARATION

1. Ensure all preparatory Work is complete prior to applying primary air barrier membrane.
2. Mechanical fasteners used to secure sheathing boards or penetrate sheathing boards shall be set flush with sheathing and fastened into solid backing.
3. Mechanical penetrations (piping, conduit & vents) shall be secured solid and fastened into solid backing.
4. New concrete should be cured for no less than 14 days prior to the application of primer and self-adhered transition seam tape.
5. Thoroughly mix primary vapor permeable air and rain barrier membrane prior to installation.

## C. INSTALLTION OF AIR BARRIER SYSTEM

### 1. JOINT TREATMENT

- a. Seal joints  $\frac{1}{4}$  inch and less between panels of exterior grade gypsum or DensGlass Gold with liquid seam sealant.
  - i. Fill joint between sheathing with approved liquid seam sealant ensuring contact with all edges of sheathing board.
- b. Seal gaps and voids or irregular joints greater than  $\frac{1}{4}$  inch between panels of exterior grade gypsum or DensGlass Gold with a strip of self-adhering transition membrane lapped a minimum of 3 inches on both sides of the joint.
  - i. Prepare and/or prime surfaces as appropriate to achieve surface adhesion and allow to dry prior to placement of self-adhering transition membrane.
  - ii. Align and position self-adhering transition membrane, remove protective film and press firmly into place. Ensure minimum 2 inches overlap at all end and side laps of membrane.
  - iii. Roll all laps and membrane with a counter top roller to ensure seal.

### 2. INSIDE AND OUTSIDE CORNERS

- a. Seal inside and outside corners with a strip of self-adhering transition membrane extending a minimum of 3 inches on either side of the corner detail.
  - i. Prepare and/or prime surfaces as appropriate to achieve surface adhesion and allow to dry prior to placement of self-adhering transition membrane.

- ii. Align and position self-adhering transition membrane, remove protective film and press firmly into place. Ensure minimum 2 inches overlap at all end and side laps of membrane.
    - iii. Roll all laps and membrane with a counter top roller to ensure seal.
- 3. CRACK TREATMENT – MASONRY AND CONCRETE
  - a. Seal inside and outside corners with a strip of self-adhering transition sealant applied over the crack.
    - i. Fill joint between sheathing with approved liquid seam sealant ensuring contact with all edges of sheathing board.
  - b. Seal cracks and voids in masonry and concrete greater than ¼ inch with a strip of self-adhering transition membrane lapped a minimum of 3 inches on both sides of the joint.
    - i. Prepare and/or prime surfaces as appropriate to achieve surface adhesion and allow to dry prior to placement of self-adhering transition membrane.
    - ii. Align and position self-adhering transition membrane, remove protective film and press firmly into place. Ensure minimum 2 inches overlap at all end and side laps of membrane.
    - iii. Roll all laps and membrane with a counter top roller to ensure seal.
- 4. TRANSITION AREAS
  - a. Tie-in to structural beams, columns, floor slabs and intermittent floors, parapet curbs, foundation walls, roofing systems and at the interface of dissimilar materials as indicated in drawings with self-adhering transition membrane.
    - i. Prime surfaces as per manufacturers' instructions and as appropriate to achieve surface adhesion and allow to dry prior to placement of self-adhering transition membrane.
    - ii. Align and position self-adhering transition membrane, remove protective film and press firmly into place. Provide minimum 3 inch lap to all substrates.
    - iii. Ensure minimum 2 inch overlap at all end and side laps of membrane.
    - iv. Roll all laps and membrane with a counter top roller to ensure seal.
- 5. WINDOWS AND ROUGH OPENINGS
  - a. Wrap jamb of rough openings with specified self-adhering transition membrane as detailed.
  - b. Extend specified self-adhering transition membrane into rough window openings sufficient to provide a connection to interior vapor retarder.
    - i. Prepare and/or prime surfaces as appropriate to achieve surface adhesion and allow to dry prior to placement of self-adhering transition membrane.

- ii. Align and position self-adhering transition membrane, remove protective film and press firmly into place. Ensure minimum 2 inches overlap at all side laps and minimum 3 inches overlap at all end laps of membrane.
- iii. Roll all laps and membrane with a counter top roller to ensure seal.

#### 6. PRIMARY AIR BARRIER

- a. Apply by brush, roller, spray or flat trowel a complete and continuous unbroken film of liquid vapor permeable air and rain barrier membrane.
  - i. For temperatures above 40 degrees F and rising, apply one component acrylic water-resistive vapor permeable air barrier membrane at a rate of 40 sq.ft/gallon to a uniform wet film thickness of 40 mils.
- b. Spray apply or brush around all projections and penetrations ensuring a complete and continuous air barrier membrane.
- c. Allow air barrier membrane to dry as per manufacturers recommendations prior to placement of cladding materials.
- d. Subject to porosity of substrate, recommend to back roll spray applications.

#### D. APPLICATION OF PENETRATION SEALANT

- 1. Seal membrane terminations, heads of mechanical fasteners, masonry tie fasteners, around penetrations, duct work, electrical and other apparatus extending through the primary vapor permeable air and rain barrier membrane and around the perimeter edge of membrane terminations at window and door frames with specified penetration sealant.
- 2. Seal the leading edge of membrane terminations and reverse laps.

#### E. INSTALLATION OF INSULATION

- 1. Coordinate with Cavity Wall Insulation Sections 07 21 16 and 07 21 29 for insulating materials.

#### F. PROTECTION

- 1. Damp substrates must not be inhibited from drying out. Drying time vary depending on interior and exterior temperature, and interior and exterior relative humidity. Do not expose the backside of the substrate to moisture or rain.
- 2. Cap and protect exposed back-up walls against wet weather conditions during and after application of membrane. Protect uncured air barrier Work against wet weather conditions for a minimum of 24 hours. Protect air barrier membrane from damage and inclement weather during the construction phase.

3. Air barrier membranes are not designed for permanent exposure. Good practice calls for covering as soon as possible. Membrane exposure to UV not to exceed 6 months.

**I.F.B. 17-524-RAD  
DIVISION 7  
SECTION 07310  
SHINGLES**

I. GENERAL

A. RELATED DOCUMENTS

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

B. DESCRIPTION OF WORK

1. Extent of shingles as shown on the drawings and hereby defined to include units employed as weather protection for roofs.
2. Types of shingle applications specified in this section include the following:
  - a. Asphalt shingle materials

C. QUALITY ASSURANCE

1. UL Listing
  - a. Provide labeled materials which have been tested and listed by UL for Class and Rating indicated for each shingle type required.

D. SUBMITTALS

1. Product Data
  - a. Submit technical product data, installation instructions and recommendations from shingle manufacturer, including data that materials complying with requirements.
2. Samples
  - a. Submit full range of samples for color and texture selection. After selection, submit 2 full-size shingles for verification of each color/style/texture selected.
3. Mock-Up
  - a. Construct 4' x 4' panel to serve as standard of quality. Accepted mock-up may serve as part of completed work.

E. DELIVERY, STORAGE AND HANDLING

1. Deliver materials in manufacturer's unopened, labeled containers.
2. Store materials to avoid water damage, and store rolled goods on end. Comply with manufacturer's recommendations for job-site storage and protection.
3. Unsatisfactory conditions - should be reported to Owner if any conditions which will not allow roofing of the unit to take place.

F. JOB CONDITIONS

1. Substrate
  - a. Proceed with shingle work only after substrate construction and penetrating work have been completed.
2. Weather Conditions
  - a. Proceed with shingle work only when weather conditions are in compliance with manufacturer's recommendations and when substrate is completely dry.

G. SPECIFIED PRODUCT WARRANTY

1. Provide shingle manufacturer's warranty on installed work, agreeing to pay for repair or replacement of defective shingles as necessary to eliminate leaks. Period of warranty is 25 years (minimum) from date of substantial completion.

II. PRODUCTS

A. ASPHALT SHINGLE MATERIALS

1. Staggered Butt Edge Strip Shingles, with Tabs, UL Class "A"
  - a. Mineral-surfaced, self-sealing, fiberglass based asphalt strip shingles with tabs and stagger-cut butt edge, complying with UL Class "A" external fire exposure label. Color as selected by Architect.
2. Available Products
  - a. Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
3. Products
  - a. Subject to compliance with requirements, provide one of the following:
  - b. GAF Timberline Shingles

- c. Tamko Heritage II
- d. Pinnacle I - Atlas Roofing Corp.
- e. Prestique II - Elk Corp.

4. Asphalt-Saturated Roofing Felt

- a. No. 30, unperforated organic felt, complying with ASTM D 226, 36" wide, approximate weight 30 lbs./square.

5. Asphalt Plastic Cement

- a. Fibrated asphalt cement complying with ASTM D 2822, designed for trowel application.

6. Hip and Ridge Shingles

- a. Manufacturer's standard factory pre-cut units to match shingles.

7. Nails

- a. Aluminum or hot-dip galvanized 11 or 12-gauge sharp pointed conventional roofing nails with barbed shanks, minimum 3/8" diameter head, and of sufficient length to penetrate minimum 3/4" into solid decking or to penetrate through plywood sheathing.

8. Metal Drip Edge

- a. Minimum .024" mill finish aluminum sheet, brake-formed to provide 3" roof deck flange, and 1½" fascia flange with 3/8" drip at lower edge. Furnish in 8' or 10' lengths. **Use prefinished metal drip edge where exposed to view at gable ends where no gutters exist. Match prefinished metal fascia.**

9. Metal Flashing

- a. .024" galvanized sheet metal, factory primed. Job-cut to sizes and configurations required.

III. EXECUTION

A. INSPECTION

- 1. Installer of shingles must examine substrate and conditions under which shingling work is to be performed and must notify Owner in writing of unsatisfactory conditions. Do not proceed with shingling work until unsatisfactory conditions have been corrected in manner acceptable to Installer. This includes any damaged gutters or downspouts that should be replaced by Owner.

B. PREPARATION OF SUBSTRATE

- 1. Clean substrate of any projections and substances detrimental to shingling work. Cover knotholes or other minor voids in substrate with sheet metal flashing secured with roofing nails.

2. Coordinate installation of shingles with flashing and other adjoining work to ensure proper sequencing. Do not install shingle roofing until all vent stacks and other penetrations through roofing have been installed and are securely fastened against movement.
3. The removal of all existing shingles down to existing deck will be required on the entire project. Notify Contract Coordinator of any substrate requiring replacement prior to the installation of new shingle roofing.

C. INSTALLATION

1. General
  - a. Comply with instructions and recommendations of shingle manufacturer, except to extent more stringent requirements are indicated.
2. Asphalt Shingles
  - a. Underlayment - Apply two layers of felt horizontally over entire surface, lapping succeeding course 2" minimum and fastening with sufficient nails to hold in place until shingle application.
3. Shingles
  - a. Install starter strip of roll roofing or inverted shingles with tabs removed; fasten shingles in manufacturer's recommended pattern, weather exposure and number of fasteners per shingle. Use horizontal and vertical chalk lines to ensure straight coursing.
  - b. Comply with installation details and recommendations of shingle manufacturer and NRCA Steep Roofing Manual.
4. Flashing and Edge Protection
  - a. Install metal flashing, vent flashing and edge protection as shown and in compliance with details and recommendations of the NRCA Steep Roofing Manual.



**I.F.B. 17-524-RAD  
DIVISION 7  
SECTION 07600  
FLASHING AND SHEET METAL**

I. GENERAL

A. RELATED DOCUMENTS

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

B. SUMMARY

1. This Section includes the following:
  - a. Metal counter flashing and base flashing.
  - b. Gutters and downspouts (rain drainage).
  - c. Exposed metal trim/fascia units.
  - d. Exposed soffits.
2. Roof Accessory Units of premanufactured, set-on type are specified in Division 7 Section "Roof Accessories."

C. SUBMITTALS

1. General
  - a. Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
2. Samples of the following sheet metal flashing vinyl coated soffit and accessories:
  - a. 8-inch-square samples of specific sheet materials to be exposed as finished surfaces.
  - b. 12-inch-long samples of factory-fabricated products exposed as finished work. Provide complete with specified factory finish.
3. Shop drawings showing layout, profiles, methods of joining, and anchorages details including major counterflashings, trim/fascia units, prefinished soffit, gutters, downspouts, scuppers, and expansion joint systems. Provide layouts at ¼ inch scale and details at 3 inch scale.

## D. PROJECT CONDITIONS

1. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

## II. PRODUCTS

### A. SHEET METAL FLASHING AND TRIM MATERIALS

1. Zinc-Coated Steel
  - a. Commercial quality with 0.20 percent copper, ASTM A 526 except ASTM A 527 for lock-forming, G90 hot-dip galvanized, 0.0359 inch thick (20 gage) for flashings.
2. Prefinished Gutter and Downspout
  - a. Aluminum coil stock forming joint-free continuous lengths, straight back. .027 gauge -5" nominal. Available in standard colors.

### B. FABRICATED UNITS

1. General Metal Fabrication
  - a. Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed aluminum metal work without excessive oil-canning, buckling, and tool marks, true to line and level indicated, with exposed edges folded back to form hems.
2. Seams
  - a. Fabricate nonmoving seams in metal with flat-lock seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.
3. Expansion Provisions
  - a. Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

4. Sealant Joints
  - a. Where movable, nonexpansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
  
5. Separations
  - a. Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

### III. EXECUTION

#### A. INSTALLATION REQUIREMENTS

1. General
  - a. Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with SMACNA.



**I.F.B. 17-524-RAD  
DIVISION 7  
SECTION 077123  
RAIN GUTTERS AND DOWNSPOUTS**

I. GENERAL

A. DESCRIPTION

1. Scope: includes all labor and materials necessary to provide and install rain gutters and downspouts where called for on the drawings and specified herein.
2. The General Conditions, the Supplementary General Conditions, and the General Requirements are a part of this section.

B. SHOP DRAWINGS

1. Submit: for color, shop drawings including manufacturing catalog cuts, descriptive data, and color selection.

II. PRODUCTS

A. MATERIALS

1. Gutters and downspouts: shall be seamless aluminum with baked enamel finish. Color to be selected by the Architect.
  - a. Aluminum shall be .032.
2. Size: shall be 5"
3. Face design: shall be Standard O-ge curve.
4. Gutters: shall have hidden hangers with 3" nails at 32" o.c.
5. Downspouts: shall have 3 anchor straps.



**I.F.B. 17-524-RAD  
DIVISION 7  
SECTION 078443  
FIRE SEALANT**

I. GENERAL

A. DESCRIPTION

1. Scope: Furnish all labor, materials scaffolding, equipment, and incidentals required to complete installation of fire sealant to seal penetrations at floors and walls.
2. Location: The following is a general listing of locations where fire sealant is required. Review the drawings for wall and floor fire ratings.
  - a. Around ducts where ducts penetrate the rated assembly.
  - b. Around pipes where pipes penetrate the rated assembly.
  - c. Around conduits where conduits penetrate the rated assembly.
3. The General Conditions, the Supplementary General Conditions, and the General Requirements are a part of the requirements of this section.

B. REGULATIONS, REFERENCES, AND STANDARDS

1. Applicable sections and referenced sections of the following standards, latest edition in effect on date of Invitation for Bids, form a part of these specifications.
  - a. American Society for Testing and Materials (ASTM)
  - b. Federal Specifications (FS).

C. SHOP DRAWINGS

1. Submit manufacturer's data for:
  - a. Manufacturer and type of sealant.
  - b. Show compliance with referenced specification.
  - c. Show material is applicable to the intended use.
2. Warranty: Submit written warranty agreeing to repair or replace sealants that fail in adhesion or deteriorate in any manner.

## D. DELIVERY, STORAGE, AND HANDLING

1. Deliver: materials to job site in manufacturer's original, sealed, factory labeled containers. Sealant containers shall bear manufacturer's name and product designation. Do not use packages of materials showing evidence of water or damage.
2. Store: in protected area in accordance with manufacturer's recommendations. Store in manufacturer's unbroken packages.

## II. PRODUCTS

### A. MATERIALS

1. Silicone foam: Dow Corning medium density, two part RTV Foam.
2. Putty: 3M Brand, one part Fire Barrier Putty 303.
  - a. Use putty only at small cracks and openings where foam is not effective.
3. Foam board: Mineral Composition Board
4. Primer: Dow Corning 1200 RTV Prime Coat.

### B. MIXING

1. Mix: two component materials in strict accordance with manufacturer's instructions. Use only manufacturer's established proportions without use of thinners or other additives. Thoroughly clean mixing equipment before mixing each batch.

## III. EXECUTION

### A. PREPARATION

1. Remove: all loose material from the opening and surfaces involved.
2. Cut: form board to fit tight around pipe, conduit, or ducts and span the gap to the structure. Form board shall form a barrier for the foam application.
  - a. Follow manufacturer's instructions.
3. Use: primer where a tight mechanical seal is not attainable and adhesion is required for proper seal.



B. INSTALLATION

1. Apply: fire sealant in strict accordance with manufacturer's instructions to completely fill and fire seal penetration openings.
  - a. Apply sealant at temperatures and atmospheric conditions recommended by manufacturer.
  - b. Apply sealant to comply with required fire rating of penetrated assembly.

C. CLEAN UP

1. Clean: excess material off adjacent surfaces.
2. Remove: cartons and debris from the site.



**I.F.B. 17-524-RAD**  
**DIVISION 7**  
**SECTION 07951**  
**CAULKING AND SEALANT**

I. GENERAL

A. DESCRIPTION

1. Scope
  - a. Furnish all labor, materials, scaffolding, equipment, and incidentals required to complete all caulking and sealant work and to completely seal the building exterior envelope.
2. The General Conditions, the Supplementary Conditions, and the General Requirements are a part of the requirements of this section.

B. LOCATIONS

1. The following is a partial listing of locations where caulking is required. Review the plans for other locations where caulking and sealing is required.
2. Exterior Locations
  - a. Doors and windows and door and window frames
  - b. Sheet metal duct penetrations at exterior walls
  - c. Joints in sheet metal ducts anywhere on roof.
  - d. Exterior louvers, vents, and grilles
  - e. Drywall and stucco joints abutting adjacent construction
  - f. Joints between masonry or concrete and any metal or wood
  - g. Under thresholds
  - h. Around all pipes and other items penetrating exterior walls
  - i. As otherwise required to make the building watertight and weathertight
3. Interior Locations
  - a. Door frames and window frames meeting drywall.
  - b. All drywall edge abutting shower panels
  - c. At bottom and top of wood base and door trim
  - d. Expansion joints or control joints of any kind
  - e. At all joints required to be caulked around fixtures and equipment in kitchen areas, restrooms, janitors closets, and "wet" areas
  - f. All sill plates adjacent to conditioned space sealed to foundation (foam gasket also placed beneath sill plate)
  - g. Top of walls adjoining unconditioned spaces continuous top plated or sealed blocking.
  - h. Directly between sheetrock and top plate or to the seam between the two from the attic above.

- i. Sill plate at sub floor.
- j. Top plate to drywall connection sealed from attic.
- k. Around windows and doors between sheetrock and studs.

C. REGULATIONS, REFERENCES, AND STANDARDS

- 1. Applicable sections and referenced sections of the following standards, latest edition in effect on date of Invitation for Bids, form a part of these specifications.
  - a. American Society for Testing and Materials (ASTM)
  - b. Federal Specifications (FS)

D. SHOP DRAWINGS

- 1. Submit Manufacturer's Data for
  - a. Color selection
  - b. Manufacturer and type of sealant
  - c. Show compliance with referenced specification
  - d. Show material is applicable to the intended use
- 2. Warranty
  - a. Submit written warranty agreeing to repair or replace sealants that fail in adhesion, or deteriorate in any manner from exposure to weather.
  - b. Warranty shall be in effect for a period of two (2) years from the date of building acceptance.

E. DELIVERY, STORAGE, AND HANDLING

- 1. Deliver materials to job site in manufacturer's original sealed factory labeled containers. Sealant containers shall bear manufacturer's name and product designation. Do not use packages of materials showing evidence of water or damage.
- 2. Store in protected area in accordance with manufacturer's recommendations. Store in manufacturer's unbroken packages.

II. PRODUCTS

A. MATERIALS

- 1. VOC Content Interior Sealants
  - a. Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24).
  - b. Architectural Sealants: 250 g/L

- c. Sealant Primers for Nonporous Substrates: 250 g/L
- d. Sealant Primers for Porous Substrates: 775 g/L
- 2. Polysulfide Sealant (Exterior)
  - a. Two component polysulfide liquid polymer. Conform to Federal Specification TT-S-00227E, Type 2, Class A, color as selected.
- 3. Polyurethane Sealant (Exterior)
  - a. Two component polyurethane. Conform to Federal Specification TT-S-00227E, Type 2, Class A, color as selected.
- 4. Silicone Sealant
  - a. Conform to Federal Specification TT-S-1543, Class B, Gun Grade Consistency, color as selected.
- 5. Acrylic
  - a. One part acrylic latex non sag. Conform to ASTM C-834, color selected by Architect.
- 6. Backup Material
  - a. Extruded closed cell polyethylene foam rod or other closed cell resilient material recommended by approved sealant manufacturer.
- 7. Bond Preventative Material
  - a. Polyethylene tape with pressure sensitive adhesive one side.
- 8. Primer
  - a. Non-staining primer recommended by approved sealant manufacturer.

B. MIXING

- 1. Mix two component materials in strict accordance with manufacturer's instructions. Use only manufacturer's established proportions without use of thinners or other additives. Thoroughly clean mixing equipment before mixing each batch.

III. EXECUTION

A. APPLICATION

- 1. Use Polysulfide or Polyurethane Sealant Compound where indicated on drawings and as follows:
  - a. At exterior locations listed under Paragraph I.B.2.

2. Use Silicone Sealant
  - a. At interior locations at all joints required to be caulked around fixtures and equipment in "wet" areas.
  - b. At interior locations at control or expansion joints.
3. Use Acrylic Sealant
  - a. At interior locations other than those listed above where only slight movement is expected.

B. INSTALLATION

1. Preparation
  - a. Inspect surfaces and joints to receive caulking.
  - b. Report any unsatisfactory conditions to the General Contractor.
  - c. do not proceed until any unsatisfactory conditions have been corrected.
2. General
  - a. Sealants shall be applied by skilled mechanics under competent supervision. Follow manufacturer's printed instructions. All joints to receive caulking shall be masked on both sides of joint. Clean all joints free of dust, dirt, moisture, loose aggregate, paint, protective coatings, or other contaminants. Immediately after cleaning, mask joint and thoroughly prime all porous joint surfaces by brush.
3. Joint Width
  - a. To be ¼" minimum to ½" maximum. Depth of joint to be equal to width except do not exceed ½" depth. Use backup material or bond preventive material to control depth of joint and to assure that sealant will bond on two sides only, not on back of joint.
4. Use Guns
  - a. With proper nozzle size for indicated joint width. Apply sealant under sufficient pressure to expel air and fill joint solidly to indicated depth. Work from bottom to top or from inside to outside to avoid entrapping air. Immediately tool joints slightly concave to compress sealant into joint and assure complete contact for good bond.
5. Remove Masking
  - a. Remove masking and clean surfaces adjoining joints of all smears or other soiling resulting from caulking operations.
6. Apply sealant when ambient temperature is between 40°F and 100°F.

**I.F.B. 17-524-RAD  
DIVISION 8  
SECTION 08111  
STANDARD STEEL DOORS AND FRAMES**

**I. GENERAL**

**A. RELATED DOCUMENTS**

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

**B. SUMMARY**

1. This Section includes the following products manufactured in accordance with SDI Recommended Standards:
2. Doors
  - a. Composite construction standard steel doors for exterior locations.
3. Frames
  - a. Pressed steel frames for doors exterior openings of following type:
4. Assemblies
  - a. Provide standard steel door and frames assemblies as required for the following:
  - b. Thermal rated (insulated)
  - c. Sound rated (acoustical)
  - d. Provide factory primed doors and frames to be field painted.
5. Painting primed doors and frames is specified in Division 9 section "Painting."
6. Wood doors are specified in another Division 8 Section.
7. Door hardware is specified in another Division 8 Section.

**C. SUBMITTALS**

1. General:
  - a. Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

2. Product data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.
3. Shop drawings showing fabrication and installation of standard steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
  - a. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.
  - b. Indicate coordinate of glazing frames and stops with glass and glazing requirements.

D. QUALITY ASSURANCE

1. Provide doors and frames complying with Steel Door Institute "Recommended Specifications Standard Steel Doors and Frames" ANSI/SDI-100 and as herein specified.

E. DELIVERY, STORAGE, AND HANDLING

1. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
2. Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.
3. Store doors and frames at building site under cover. Place units on minimum 4-inches high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide ¼ inch spaces between stacked doors to promote air circulation.

II. PRODUCTS

A. ACCEPTABLE MANUFACTURERS

1. Available Manufacturers
  - a. Subject to compliance with requirements, manufacturers offering standard steel doors and frames which may be incorporated in the work include; but are not limited to, the following:



2. Manufacturer
  - a. Acceptable manufacturers: as manufactured by General Products Co., Fredericksburg, VA w/split steel frame design.
  - b. Approved equals according to Division-1.

B. MATERIALS

1. Cold-Rolled Steel Sheets
  - a. Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.
2. Inserts, Bolts, and Fasteners
  - a. Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize in compliance with ASTM A 153, Class C or D as applicable.
3. Shop Applied Paint
  - a. Apply after fabrication.
  - b. Primer - Rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints complying with ANSI A224.1, "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames."

C. DOORS

1. Provide metal doors of types and styles or grades and models indicated on drawings or schedules.
2. Provide metal doors of SDI grades and models specified below:
  - a. Panels 1 3/4" thick, 24 gauge galvanized steel with zinc coating. Galvanized sheets ASTM A526, with ASTM 525 mill phosphate. Both sides 24 gauge factory primed with embossed design.
  - b. Fabrication, rigid panels straight and free from defects warp or buckle. Exposed welds smooth, flush and invisible.

D. FRAMES

1. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 16-gage cold-rolled steel at interior of split jamb, and 20 gauge at exterior of split jamb.

E. FABRICATION

1. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site. Comply with ANSI/SDI-100 requirements.
  - a. Internal Construction - Manufacturer's standard honeycomb, polyurethane, polystyrene, unitized steel grid, vertical steel stiffeners, or rigid mineral fiber core with internal sound deadener on inside of face sheets where appropriate in accordance with SDI standards.
  - b. Clearances - Not more than 1/8 inch at jambs and heads except between non-fire-rated pairs of doors not more than 1/4 inch. Not more than 3/4 inch at bottom.
2. Tolerances
  - a. Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."
3. Thermal-Rated (Insulating) Assemblies
  - a. At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal insulating door and frame assemblies and tested in accordance with ASTM C 236 or ASTM C 976 on fully operable door assemblies.
  - b. Unless otherwise indicated, provide thermal-rated assemblies with U factor of 0.41 Btu/(hr. x sq. ft. x deg F.) or better.
4. Hardware Preparation
  - a. Prepare doors and frames to receive preparation for hardware in accordance with final Door Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ASNI A115 Series Specifications for door and frame preparation for hardware.
  - b. For concealed overhead screen door closers, provide reinforcing and provisions for fastening in top rail of frames, as applicable.
5. Reinforce Doors and Frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at project site.
6. Locate Hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware on Standard Steel Doors and Frames," published by Door and Hardware Institute.

7. Painting
  - a. Clean, treat, and paint exposed surfaces of steel door and frame units, including galvanized surfaces.
  - b. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.
  - c. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.
  
8. Glazing Stops
  - a. Minimum 20-gage steel or .040 inch thick aluminum.
  - b. Provide non-removable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
  - c. Provide screw applied removable glazing beads on inside of glass, louvers, and other panels in doors.

### III. EXECUTION

#### A. INSTALLATION

1. General
  - a. Install standard steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.

#### B. ADJUST AND CLEAN

1. Prime Coat Touch-up
  - a. Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.
  
2. Protection Removal
  - a. Immediately prior to final inspection, remove protective plastic wrappings from prefinished doors.
  
3. Final Adjustments
  - a. Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.



**I.F.B. 17-524-RAD  
DIVISION 8  
SECTION 08211  
SIX-PANEL DOORS**

I. GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
2. Painting, Section 09900.

B. SUMMARY

1. Extent and location of each type of six panel door is indicated on drawings and in schedules.
2. Types of doors required include the following:
  - a. Hollow core panel wood door with hardboard faces.

C. SUBMITTALS

1. Product Data
  - a. Door manufacturer's technical data for each type of door, including details of core and edge construction, trim for openings and louvers, and factory-finishing specifications.
2. Shop Drawings
  - a. Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for factory finishing and other pertinent data.
3. Samples
  - a. Submit samples, 1-0" square or as indicated, for the following:
  - b. Factory Finished Doors - Each type of factory finish required.

D. QUALITY ASSURANCE

1. a. Obtain doors from a single manufacturer.

E. PRODUCT DELIVERY, STORAGE, AND HANDLING

1. Protect doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of NWWDA pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors", as well as with manufacturer's instructions.
2. Identify each door with individual opening numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable or concealed markings.

F. PROJECT CONDITIONS

1. Conditioning
  - a. Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period to comply with the following requirements applicable to project's geographical location:
  - b. Referenced AWI quality standard including Section 100-S-3 "Moisture Content".

G. WARRANTY

1. General
  - a. Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.
2. Door Manufacturer's Warranty
  - a. Submit written agreement on door manufacturer's standard form signed by Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup or twist) or that show telegraphing of core construction in face veneers, or do not conform to tolerance limitations of referenced quality standards.
  - b. Warranty shall also include reinstallation which may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.
  - c. Warranty shall be in effect during following period of time after date of Substantial completion.

## II. PRODUCTS

### A. MANUFACTURERS

1. Available Manufacturers
  - a. Subject to compliance with requirements, manufacturers offering doors which may be incorporated in the work include, but are not limited to, the following:
2. Manufacturer
  - a. Subject to compliance with requirements, provide doors of one of the following:
  - b. Six panel textured by Masonite Mildred Panel Series Division of International Paper

### B. INTERIOR WOOD DOORS

1. Door Facings
  - a. Comply with the following requirements:
  - b. Masonite Doorskin: .125 thickness. Conform to basic hardboard standards PS-58-731.
2. Hollow Core
  - a. Comply with the following requirements:
  - b. Framed construction with mesh or cellular type core. Comply with (NWMA).
  - c. Stiles - Shall be 1" net after sizing of kiln dried softwood (no finger joints).
  - d. Rails - Shall be 2¼" net after sizing of kiln dried softwood (no finger joints).
  - e. Edges - All exposed edges shall match door finish.
  - f. Faces: - Embossed Hardboard

## III. EXECUTION

### A. EXAMINATION

1. Examine Installed Door Frames prior to hanging door.
  - a. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
  - b. Reject doors with defects.
2. Do Not Proceed with installation until unsatisfactory conditions have been corrected.

B. INSTALLATION

1. Hardware

- a. For installation see Division 8 "Finish Hardware" section of these specifications.

2. Manufacturer's Instructions

- a. Install wood doors to comply with manufacturer's instructions and of referenced AWI standard and as indicated.

3. Job-Fit Doors

- a. align and fit doors in frames with uniform clearances and bevels as indicated below; do not rim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.

4. Fitting Clearances for Non-Rated Doors

- a. Provide 1/8" at jambs and heads; 1/16" per leaf at meeting stiles for pairs of doors; and 1/8" from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold.

5. Bevel Non-rated Doors 1/8" in 2" at lock and hinge edges.

6. Prefit Doors

- a. Fit to frames for uniform clearance at each edge.

C. ADJUSTING AND PROTECTION

1. Operation

- a. Rehang or replace doors which do not swing or operate freely.

2. Finished Doors

- a. Refinish or replace doors damaged during installation.

3. Protect Doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at time of substantial completion.



**I.F.B. 17-524-RAD**  
**DIVISION 8**  
**SECTION 08572**  
**FIBERGLASS SINGLE-HUNG WINDOWS**

I. **GENERAL**

A. **SECTION INCLUDES**

1. Fiberglass single hung windows.

B. **RELATED SECTIONS**

1. Section 01300 – Submittals
2. Section 06100 - Rough Carpentry
3. Section 06200 - Finish Carpentry
4. Section 07951 - Caulking and Sealants

C. **REFERENCES**

1. American Architectural Manufacturers Association (AAMA)
  - a. AAMA 502 - Voluntary Specification for Field Testing of Windows and Sliding Doors.
  - b. AAMA 613 - Voluntary Performance Requirements and Test Procedures for Organic Coatings on Plastic Profiles.
2. American Society for testing and Materials (ASTM):
  - a. ASTM C 1036 - Flat Glass
  - b. ASTM C 1048 - Heat-Treated Flat Glass–Kind HS, Kind FT Coated and Uncoated Glass.
  - c. ASTM D 3656 - Insect Screening and Louver Cloth woven from Vinyl-Coated Glass Yarns.
  - d. ASTM E 283 - Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Differential.
3. Screen Manufacturers Association (SMA):
  - a. SMA 1201 - Specifications for Insect Screens for Windows, Sliding Doors and Swinging Doors.
4. Window and Door Manufacturers Association (WDMA):
  - a. ANS/AAMA/NVWDA 101/I.S.2 Voluntary Specifications for Aluminum, vinyl (PVC) and Wood Windows and Glass Doors.

D. **SYSTEM DESCRIPTION**

1. **Windows**
  - a. Fiberglass sections, factory fabricated, vision glass, related flashings, anchorage and attachment devices.

2. Configuration
  - a. [single hung] sash.
  - b. fixed

E. PERFORMANCE REQUIREMENTS

1. Unit performance when tested in accordance with AAMA 101/I.L.2.97
  - a. Windows shall meet Rating H-LC30-50 specifications in accordance with ANSI/AAMA/NWDA 101/I.S.2.
  - b. Window Air Leakage, ASTM E 283: Window air leakage when tested at 1.57 psf (25 mph) shall be 0.25 cfm/ft<sup>2</sup> of frame or less.
  - c. Window Water Penetration, ASTM E 547: No water penetration through window when tested under static pressure of 4.5 psf (42 mph) after 4 cycles of 5 minutes each, with water being applied at a rate of 8 gallons per hour per square foot.
2. Thermal Performance
  - a. Total unit U-factor: [.33-.37]

F. SUBMITTALS FOR REVIEW

1. Submit under provisions of Section 01300
2. Product Data
  - a. Provide component dimensions, anchorage and fasteners, glass, and internal drainage details.
3. Shop Drawings
  - a. Indicate opening dimensions, framed opening tolerances, anchorage, hardware locations, and installation details.
4. Submit (1) full size sample finished as specified and identical with the material proposed.

G. SUBMITTALS FOR INFORMATION

1. Certification
  - a. Provide certification by a recognized independent testing laboratory or agency showing that each type, grade, and size of window unit complies with performance requirements indicated.

## H. QUALITY ASSURANCE

1. Provide full size mockup to determine acceptability of window installation methods. Approved mockup shall be left in place until completion of the work.

## I. DELIVERY, STORAGE, AND PROTECTION

1. Section 01600 - Material and Equipment: Transport, handle, store, and protect products.
2. Protect finished surfaces from abrasion.

## J. WARRANTY

1. All windows for single family residences shall be warranted for life to the original purchaser of the dwelling. Warranty shall be non-prorated and includes parts, materials, glazing unit seal and labor.
2. 20-year transferable.

## II. PRODUCTS

### A. MANUFACTURERS

1. Pella Corporation
2. Anderson
3. Requests for substitutions will be considered in accordance with provisions of Article 3.3 Instructions to Bidders.

### B. MATERIALS

1. Single Hung Windows: Pella Impervia (or approved equal)
  - a. Factory-assembled window with sash installed in frame.
  - b. Frame and Sash Material: Duracast. 5-layer, pultruded-fiberglass material, reinforced with interlocking mat.
2. Frame
  - a. Type: new construction frame
  - b. Overall Frame Depth: 3 inches
  - c. Nominal Wall Thickness of Fiberglass Members: 0.050 inch to 0.070 inch.
  - d. Frame Corners:
    - i. Mitered
    - ii. Joined and bonded with thermoset polyurethane adhesive, nylon corner lock, and mechanically fastened.

- e. Sill: fitted with weep valve assemblies
  - f. Jamb: Factory-drilled, counter-bored, installation screw holes.
3. Sash
- a. Lower vent sash: Removable for cleaning exterior glass
  - b. Upper sash: Fixed
  - c. Sash Corners:
    - i. Mitered
    - ii. Bonded and sealed with injected thermoset polyurethane adhesive.
4. Glazing
- a. Float glass: ASTM C 1036, Quality 1.
5. Tempered Glass
- a. ASTM C 1048
  - b. Type: Polyurethane reactive (PUR) hot-melt glazed. Expanded cellular foam tape-glazed, 11/16 inch thick, insulating glass; clear tempered, multi-layer Low-E coated with argon tempered (obscure tempered).
6. Weather stripping
- a. Vent Sash: Dual weather-stripped around perimeter with fin-type, dual-pile, and weather stripping.
7. Hardware
- a. Balances:
    - i. Galvanized steel block and tackle balances.
  - b. Lock
    - i. Type: self-aligning, cam-action lock
    - ii. Windows 37 inches high or greater: 2 locks
    - iii. Standard finish: match window interior; optional finishes (bright brass), (satin nickel), (oil-rubbed bronze).
8. Tolerances
- a. windows shall accommodate the following opening tolerances:
    - i. Horizontal Dimensions Between High and Low Points: Plus 1/4 inch, minus 0 inch.
    - ii. Width Dimensions: Plus 1/4 inch, minus 0 inch.
    - iii. Building columns or Masonry openings: Plus or minus 1/4 inch from plumb.
9. Finish
- a. Exterior and interior Duracast Finish: Factory-Applied Powder-Coat Paint, comply with AAMA 613.
    - i. Tan

10. Installation Accessories
  - a. Flashing/Sealant Tape: Pella SmartFlash
    - i. Aluminum-foil-backed butyl window and door flashing tape
    - ii. Maximum total thickness: 0.013 inch
    - iii. UV resistant
    - iv. Verify sealant compatibility with sealant manufacturer
  - b. Exterior Perimeter Sealant: Geocel Proflex Tripolymer Sealant
  - c. Insulating-Foam Sealant: Low-pressure, polyurethane window and door insulating-foam sealant.
  - d. Block Frame Installation Accessories: (Vinyl installation fin), Vinyl installation fin w/head drip flashing), (Offset vinyl installation fin), (installation clips), (installation screws for frame screw applications).
11. Source Quality Control
  - a. Factory Testing: Factory test individual standard operable windows for air infiltration in accordance with ASTM E 283, to ensure compliance with this specification.

### III. EXECUTION

#### A. EXAMINATION

1. Examine areas to receive windows. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

#### B. INSTALLATION

1. Install windows in accordance with manufacturer's instructions.
2. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
3. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and align with adjacent work.
4. Coordinate attachment and seal of perimeter air and vapor barrier materials.
5. Install perimeter sealant to backing materials in accordance with Manufacturer's recommendations, and the drawings.

C. ADJUSTING

1. Adjust operating sash and hardware for smooth operation and secure weather tight closure.

D. CLEANING

1. Remove protective materials from pre-finished surfaces.
2. Wash surfaces by method recommended and acceptable to sealant and window manufacturer, rinse and wipe surfaces clean.

E. EXTRA PARTS

1. Supply the following upon completion of the work as extra parts:
  - a. Single hung windows
    - i. (10) sash balances per window size
    - ii. (2) screens per window size
    - iii. (10) window cam locks

**I.F.B. 17-524-RAD  
DIVISION 8  
SECTION 08710  
FINISH HARDWARE**

I. GENERAL

A. RELATED DOCUMENTS

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

B. DESCRIPTION OF WORK

1. Definition: "Finish Hardware" includes items known commercially as finish hardware which are required for swinging, sliding and folding doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame.
2. Extent of finish hardware required is indicated on drawings and in schedules.
3. Types of finish hardware required include the following:
  - a. Hinges
  - b. Lock cylinders and keys
  - c. Lock and latch sets
  - d. Bi-fold door hardware
  - e. Weatherstripping for exterior doors
  - f. Thresholds
4. Silencers included integral with hollow metal frames are specified with door frames elsewhere in Division 8.
5. Weatherstripping included integral with hollow metal frames are specified with door frames elsewhere in Division 8.
6. Thresholds for aluminum entrance doors are specified with entrance doors elsewhere in Division 8.

C. QUALITY ASSURANCE

1. Manufacturer
  - a. Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.

D. SUBMITTALS

1. Product Data
  - a. Submit manufacturers technical product data for each item of hardware in accordance with Division-1 section "Submittals". Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finish.
  
2. Hardware Schedule
  - a. Submit final hardware schedule in manner indicated below. Coordinate hardware with doors, frames and related work to ensure proper size, thickness, hand, function and finish of hardware.
  - b. Final hardware schedule content - based on finish hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
    - i. Type, style, function, size and finish of each hardware item.
    - ii. Name and manufacturer of each item.
    - iii. Fastenings and other pertinent information.
    - iv. Location of hardware set cross-referenced indications on Drawing both on floor plans and in door and frame schedule.
    - v. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
    - vi. Mounting locations for hardware.
    - vii. Door and frame sizes and materials.
  
3. Samples
  - a. Prior to submittal of the final hardware schedule and prior to final ordering of finish hardware, submit one sample of each type of exposed hardware unit, finished as required, and tagged with full description for coordination with schedule.
  - b. Samples will be returned to the supplier. Units which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.
  
4. Templates
  - a. Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.



E. PRODUCT HANDLING

1. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.
2. Provide Secure Lock-up for hardware delivered to the project, but not yet installed. Control handling and installation of hardware items which are not immediately replaceable, so that completion of the work will not be delayed by hardware losses, both before and after installation.

II. PRODUCTS

A. SCHEDULED HARDWARE

1. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of finish hardware is indicated in the Finish Hardware Data Sheet and Hardware Schedule at the end of this section. Products are identified by using hardware designation number of the following:
2. ANSI/BHMA Designations used elsewhere in this section or in schedules to describe hardware items or to define quality or function are derived from the following standards. Provide products complying with these standards and requirements specified elsewhere in this section.
  - a. Butts and Hinges: ANSI A156.1 (BHMA 101)
  - b. Locks & Lock Trim: ANSI A156.2 (BHMA 601)
  - c. Materials & Finishes: ANSI A156.18 (BHMA 1301)

B. MATERIALS AND FABRICATION

1. General
2. Hand of Door
  - a. Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
3. Fasteners
  - a. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.

4. Furnish Screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

C. HINGES, BUTTS AND PIVOTS

1. Screws
  - a. Furnish Phillips flat-head or machine screws for installation of units, except furnish Phillips flat-head or wood screws for installation of units into wood. Finish screw heads to match surface of hinges or pivots.
3. Hinge Pins
  - a. Exterior doors - non-removable pins.
  - b. Interior doors - non-rising pins
  - c. Number of hinges - provide number of hinges indicated but not less than 3 hinges for exterior door.

D. LOCK CYLINDERS AND KEYING

1. General
  - a. Supplier will meet with Owner to finalize keying requirements and obtain final instructions in writing.
2. Existing System
  - a. Grand masterkey the locks to the Owner's existing system, with a new masterkey for the project.
3. Review the Keying System with the Owner and provide the type required (grandmaster), either new or integrated with Owner's existing system.
4. Equip Locks with manufacturer's standard 6-pin tumbler cylinders.
5. Final hardware may not be used for construction locks. Security of project will be with Contractor's own construction locks.
6. Comply with Owner's Instructions for masterkeying and, except as otherwise indicated, provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.
  - a. Permanently inscribe each key with number or lock that identifies cylinder manufacturer key symbol, and notation "DO NOT DUPLICATE".

7. Key Quantity
  - a. Furnish 2 change keys for each lock and 5 grandmaster keys for each grandmaster system.
  - b. Deliver keys to Architect.
8. Provide a Key Control System including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of the number of locks required for the project.

E. LOCKS, LATCHES AND BOLTS

1. Strikes
  - a. Provide standard (open) strike plates for interior doors of residential units where wood door frames are used.
  - b. Provide dust-proof strikes for foot bolts, except where special threshold construction provides non-recessed strike for bolt.
  - c. Provide roller type strikes where recommended by manufacturer of the latch and lock units.
2. Lock Throw
  - a. Provide 1" minimum throw of latch and deadbolt used on parts of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.

F. HARDWARE FOR "BARN DOOR"

1. General
  - a. Provide manufacturer's standard hardware for interior bi-fold doors which are not furnished as a "package" complete with hardware.
2. Operating Hardware
  - a. Provide manufacturer's complete sets, consisting of overhead extruded aluminum track, captive nylon shoe or roller guides, rubber bumpers in truck, adjustable pivots, hinges and door aligners; all designed to accommodate the number, size, thickness and weight of door leaves indicated.
  - b. Provide bottom extruded aluminum track.

G. WEATHERSTRIPPING

1. General
  - a. Except as otherwise indicated, provide continuous weatherstripping at each edge of every exterior door leaf. Provide type, sizes and profiles shown or scheduled. Provide non-corrosive fasteners as recommended by manufacturer for application indicated.

2. Replaceable Seal Strips
  - a. Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.

#### H. THRESHOLDS

1. General
  - a. Except as otherwise indicated provide standard metal threshold unit of type, size and profile for each exterior door, as provided with manufacturer door package.

#### I. HARDWARE FINISHES

1. Provide Matching Finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set (or push-pull units if no latch-lock sets) for color and texture.
2. Provide Finishes Which Match those established by BHMA or, if none established, match the Architect's sample.
3. Provide Quality of Finish, including thickness of plating coating (if any), composition, hardness and other quality complying with manufacturer's standards, but in no case less than specified for the applicable units of hardware by referenced standards.
4. Provide Protective Lacquer Coating on all exposed hard finishes of brass, bronze and aluminum, except as otherwise indicated. The suffix "-NL" is used with standard finish designations to indicate "no lacquer".

### III. EXECUTION

#### A. INSTALLATION

1. Mount Hardware Units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect.

2. Mount Hardware Units at heights indicated in "Recommended Locations for Builders Hardware for Custom Steel Doors and Frames: by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.
3. Install Each Hardware Item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division 9 sections. Do not install surface-mounted items until finishes have been completed on the substrate.
4. Set Units Level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
5. Drill and Countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
6. Set Thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant.

B. ADJUST AND CLEAN

1. Adjust and Check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
2. Clean Adjacent Surfaces soiled by hardware installation.
3. Final Adjustment
  - a. Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.



**I.F.B. 17-524-RAD  
DIVISION 9  
SECTION 09200  
PORTLAND CEMENT PLASTERING (STUCCO)**

I. GENERAL

A. RELATED DOCUMENTS

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

B. SUMMARY

1. This Section includes the following:
  - a. Portland Cement Plastering (stucco)

C. SUBMITTALS

1. General
  - a. Submit the following in accordance with Conditions of Contract and Division 1 specification sections.
2. Product data consisting of manufacturer's product specifications and installation instructions for each product, including data showing compliance with the requirements.
3. Samples for Initial Selection Purposes in form of manufacturer's color charts consisting of actual units or sections of units at least 12 inches square showing full range of colors, textures, and patterns available for each type of finish indicated.
  - a. Where finish involves normal color and texture variations, include sample sets composed of two or more units showing full range of variations expected.
  - b. Include similar samples of material for joints and accessories involving color selection.

D. QUALITY ASSURANCE

1. Field Constructed Mock-Up
  - a. Prior to installation of stucco work, fabricate panels for selection of finish. Build mock-ups to comply with the following requirements, using materials indicated for final unit of work.

- b. Locate mock-ups on site in location and size indicated by Architect.
2. Erect mock-ups on site in location and size indicated or, if not indicated, directed by Architect.
3. Erect 4-foot-by-4-foot-by-full-thickness mock-up in presence of Architect using materials, including lath and support system, indicated for final work.
4. Demonstrate the proposed range of aesthetic effects including color, texture, and workmanship to be expected in completed work.
5. Obtain Architect's acceptance of mock-ups before start of plaster work.
6. Retain and maintain mock-ups during construction in undisturbed condition as a standard for judging completed plaster work.
7. When directed, demolish and remove mock-ups from project site.

E. DELIVERY, STORAGE, AND HANDLING

1. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer.
2. Store Materials inside, under cover, and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, aging, corrosion, and damage from construction traffic and other causes.
3. Handle Lath to prevent damage to edges, ends, or surfaces. Protect metal corner beads and trim from being bent or damaged.

F. PROJECT CONDITIONS

1. Cold Weather Protection
  - a. When ambient outdoor temperatures are below 40° F (4.4° C), maintain continuous uniform temperature of not less than 40° F (4.4° c) nor more than 80° F (26° C) for not less than 1 week prior to beginning stucco application, during its application, and until plaster is dry but for not less than one week after application is complete. Distribute heat evenly; prevent concentrated or uneven heat from contacting plaster near heat source.



## II. PRODUCTS

### A. Available Manufacturers

- a. Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

#### 1. Products

- a. Portland Cement - comply with ASTM C 150, Type I.
- b. Stucco Finish Coat - exterior stucco with integral specified color.
- c. Lime - comply with ASTM C 206, type S and FS SS-L-351, Type F.
- d. Sand - clean, sharp, complying with ASTM C 35 (base coats). For job mixed sand float finish, sand shall be graded Silica sand.
- e. Water - clean, potable water shall be used.
- f. Expanded Metal Lath - 20 gauge 1/2" mesh, galvanized steel sheet.
- g. Casing Bead - No. 66 square edge expanded flange bead, 24 gauge galvanized steel.
- h. Corner Bead - Fabricated from zinc-coated steel.
- i. Expansion Joints - U.S.G. zinc-coated one piece "M" control joint. Required location as shown on drawings. Stucco mesh to be cut behind all expansion joints.
- j. Nails and Staples - as required and recommended by the Metal Lath Manufacturer's Assoc.
- k. Corner Reinforcing - galvanized Kal Korner Gold Bond.
- l. Wire - cold drawn, annealed, galvanized, provide gauges #8, #14, and #18.
- m. Galvanized Stucco Stop - 24 ga. galvanized stucco stop as required at grade, as noted on drawings.

### B. PLASTER ACCESSORIES FOR PORTLAND CEMENT PLASTER

#### 1. General

- a. Comply with material provisions of ASTM C 1063; coordinate depth of accessories with thicknesses and number of coats required.

## III. EXECUTION

### A. INSTALLATION OF LATHING

#### 1. Portland Cement Plaster Stucco Lathing Instruction Standards

- a. Install lathing and furring materials indicated for Portland cement plaster stucco to comply with ASTM C 1063.

B. INSTALL STUCCO LATH

1. General

a. All work shall be two coat work. Total Thickness  $\frac{3}{4}$ ".

2. First Coat or Scratch Coat

a. 1 part by volume Portland Gray Cement

b. 3 parts by volume sand

c. Special finishing hydrated lime 10% by weight or 25% by volume of Portland Cement.

d. Total thickness – 1/2".

3. Second Coat or Finish Coat

a. 1 part white Portland Cement

b. 3 parts 30 mesh sand

c. Special finishing hydrated lime or lime putty, not to exceed 25% by volume of cement.

d. Shall be applied not sooner than seven (7) days after the application of the preceding coat.

e. Color - as selected by Architect from Manufacturer's range of colors.

C. CUTTING AND PATCHING

1. Cut, patch, point up, and repair plaster as necessary to accommodate other work and to restore cracks, dents, and imperfections. Repair or replace work to eliminate blisters, buckles, excessive crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to the substrate has failed.

2. Sand smooth-Troweled finished lightly to remove trowel marks and arises.

D. CLEANING AND PROTECTION

1. Remove temporary protection and enclosures of other work. Promptly remove plaster form door frames, windows, and other surfaces that are not to be plastered. Repair concrete walks, walls, and other surfaces that have been stained, marred, or otherwise damaged during the plastering stucco work. When work is completed, remove unused materials containers, and equipment and clean floors of plaster debris.

2. Provide final protection and maintain conditions, in a manner suitable to Installer that ensure plaster work's being without damage or deterioration at time of Substantial Completion.

**I.F.B. 17-524-RAD  
DIVISION 9  
SECTION 09250  
GYPSUM DRYWALL**

I. GENERAL

A. RELATED DOCUMENTS

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

B. SUMMARY

1. Extent of each type of gypsum drywall construction required is indicated on Drawings.
2. This Section includes the following types of gypsum board construction:
  - a. Gypsum board nail-attached to wood framing and furring members.
3. Wood Framing and Furring are specified in the following division 6 sections:
  - a. "Rough Carpentry."
  - b. Prefabricated Wood Trusses."

C. DEFINITIONS

1. Gypsum Board Construction Terminology
  - a. Refer to ASTM C 11 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this section or other referenced standards.

D. SUBMITTALS

1. Product Data from manufacturers for each type of product specified.

E. QUALITY ASSURANCE

1. Fire-Resistance Ratings
  - a. Where indicated, provide materials and construction which are identical to those of assemblies whose fire resistance rating has been determined per ASTM E 119 by a testing and inspecting organization acceptable to authorities having jurisdiction.

2. Single Source Responsibility
  - a. Obtain each type of gypsum board and related joint treatment materials from a single manufacturer.

F. DELIVERY, STORAGE, AND HANDLING

1. Deliver Materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
2. Store Materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.
3. Handle Gypsum Boards to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

G. PROJECT CONDITIONS

1. Environmental Conditions, General
  - a. Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer's recommendations.
2. Minimum Room Temperature
  - a. For non-adhesive attachment of gypsum board to framing, maintain not less than 40° F (4° C). For adhesive attachment and finishing of gypsum board maintain not less than 50° F (10° C) for 48 hours prior to application and continuously thereafter until drying is complete.
3. Ventilate building spaces to remove water not required for drying joint treatment materials. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

II. PRODUCTS

A. MANUFACTURERS

1. Available Manufacturers
  - a. Subject to compliance with requirements, manufacturers offering product which may be incorporated in the Work include, but are not limited to, the following:
2. Manufacturer
  - a. Subject to compliance with requirements, provide products of one of the following:

3. Gypsum Boards and Related Products
  - a. Centex American Gypsum Co.
  - b. Domtar Gypsum Co.
  - c. Georgia-Pacific Corp.
  - d. Gold Bond Building Products Div., National Gypsum Co.
  - e. United States Gypsum Co.

B. GYP SUM BOARD

1. General
  - a. Provide gypsum board of types indicated in maximum lengths available to minimize end-to-end joints.
  - b. Thickness - provide gypsum board in 5/8 inch thicknesses to comply with ASTM C 840 for application system and support spacing indicated.
2. Gypsum Wallboard
  - a. ASTM C 36, and as follows:
  - b. Type - Regular, at interior walls.
  - e. Edges - Tapered W.R. at bathrooms, exterior rated at porch ceilings.
3. Available Products
  - a. Subject to compliance with requirements, products which may be incorporated in the Work where Type X gypsum wallboard is indicated include, but are not limited to, the following:
4. Products
  - a. Subject to compliance with requirements, provide one of the following products where Type X gypsum wallboard is indicated:
  - b. "Gyprock Fireguard 'C' Gypsum Board"; Domtar Gypsum Co.
  - c. "Fire-Shield G", Gold Bond Building Products Div., National Gypsum Co.
  - d. "SHEETROCK Brand FIRECODE 'C' Gypsum Panels"; United States Gypsum Co.
5. Water Resistant Gypsum Backing Board
  - a. ASTM C 630, and as follows:
    - b. At shower walls and ceilings and behind lavatory and water closets.
  - c. Thickness - 5/8 inch, unless otherwise indicated.
6. Exterior Gypsum Soffit Board
  - a. ASTM C 931, with manufacturer's standard edges, of type and thickness indicated below:

C. TRIM ACCESSORIES

1. Cornerbead and Edge Trim for Interior Installation
  - a. Comply with ASTM C 840 and the following:
2. Cornerbead formed from zinc alloy, with flanges knurled and perforated or of fine-mesh expanded metal.
  - a. 3/4" bullnose at all outside corners, finished openings, and soffits.
3. Steel Edge Trim formed from galvanized steel, types per Fig. 1 of ASTM C 840 as follows:
  - a. Roll-formed zinc
  - b. Extruded vinyl
  - c. Either roll-formed zinc or extruded vinyl

D. GYPSUM BOARD JOINT TREATMENT MATERIALS

1. General
  - a. Provide materials complying with ASTM C 475, ASTM C 840, and recommendations of manufacturer of both gypsum board and joint treatment materials for the application indicated.
2. Setting-Type Joint Compounds
  - a. Factory-prepackaged, job-mixed, chemical-hardening powder products formulated for uses indicated.
  - b. Where setting-type joint compounds are indicated for use as taping and topping compounds, use formulation for each which develops greatest bond strength and crack resistance and is compatible with other joint compounds applied over it.
  - c. For prefilling gypsum board joints, use formulation recommended by gypsum board manufacturer for this purpose.
  - d. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer for this purpose.

E. MISCELLANEOUS MATERIAL

1. General
  - a. Provide auxiliary materials for gypsum drywall construction which comply with referenced standards and the recommendations of the manufacturer of they gypsum board.
2. Gypsum Board Screws
  - a. ASTM C 1002

3. Concealed Acoustical Sealant
  - a. Nondrying, nonhardening, nonskinning, nonstaining, nonbleeding, gunnable sealant complying with requirement specified in Division 7 section "Joint Sealers."

F. TEXTURE FINISH MATERIALS

1. Primer
  - a. Of type recommended by manufacturer of texture finish.

III. EXECUTION

A. EXAMINATION

1. Examine Substrates to which drywall construction attaches or abuts, preset hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of drywall construction. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. INSTALLATION OF WOOD FOR WALLS AND PARTITIONS

1. Install Polyethylene Vapor Retarder on interior of framing members of exterior insulated walls to comply with the following requirements:
  - a. Extend vapor retarder to extremities of exterior insulated walls and to cover miscellaneous voids in insulated substrates, including those which have been stuffed with loose thermal insulation.
  - b. Seal joints in vapor retarder caused by pipes, conduits, electrical boxes and similar items penetrating vapor retarders with cloth or aluminized tape which bonds permanently to vapor retarder.
  - c. Repair any tears or punctures in vapor retarder immediately before concealment by application of gypsum board or other construction.

C. APPLICATION AND FINISHING OF GYPSUM BOARD, GENERAL:

1. Gypsum Board Application and Finishing Standard
  - a. Install and finish gypsum board to comply with ASTM C 840.
2. Locate Exposed End-butt Joints as far from center of walls and ceilings as possible, and stagger not less than 24 inches in alternate courses of board.
3. Install Ceiling Boards across framing in the manner which minimizes the number of end-butt joints, and which avoids end joints in the central area of each ceiling. Stagger end joints least 24 inches.

4. Install Wall/Partition Boards in manner which minimizes the number of end-butt joints or avoids them entirely where possible. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs.
5. Install Exposed Gypsum Board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends not more than 1/16 inch open space between boards. Do not force into place.
6. Locate Either Edge or End Joints over supports, except in horizontal applications where intermediate supports or gypsum board back-blocking is provided behind end joints. position boards so that like edges abut, tapered edges against tapered edges and mill-cut or filed-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
7. Attach Gypsum Board to Supplementary Framing and Blocking provided for additional support at openings and cutouts.
8. Floating Construction
  - a. Where feasible, including where recommended by manufacturer, install gypsum board over wood framing, with "floating" internal corner construction.
9. Space Fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations.

D. METHODS OF GYPSUM BOARD APPLICATION

1. Single-Layer Application
  - a. Install gypsum wallboard as follows:
  - b. On ceilings apply gypsum board prior to wall/partition board application to the greatest extent possible.
  - c. On partitions/walls apply gypsum board vertically (parallel to framing), unless otherwise indicated, and provide sheet lengths which will minimize end joints.
  - d. On partitions/walls 8"-1" or less in height apply gypsum board horizontally (perpendicular to framing); use maximum length sheets possible to minimize end joints.
2. Single-Layer Fastening Methods
  - a. Apply gypsum boards to supports as follows:
  - b. Fasten with screws



E. INSTALLATION OF DRYWALL TRIM ACCESSORIES

1. General

a. Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.

2. Install Corner Beads at external corners.

3. Install Metal Edge Trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where "U" bead (semi-finishing type) is indicated.

F. FINISHING DRYWALL

1. General

a. Apply joint treatment at gypsum board joints (both directions); flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects and elsewhere as required to prepare work for decoration.

2. Prefill Open Joints and rounded or beveled edges, if any, using setting-type joint compound.

3. Apply Joint Tape at joints between gypsum boards, except where trim accessories are indicated.

4. Finish Interior Gypsum Wallboard by applying the following joint compounds in 3 coats (not including prefill of openings in base), and sand between coats and after last coat:

a. Embedding and first coat - setting-type joint compound.

b. Fill (second) coat - setting-type joint compound.

c. Finish (third) coat - Ready-mix drying-type all-purpose or topping compound.

d. Prime painting of interior gypsum board after finish coat has dried is specified in Division 9 Section "Painting." Prime before final pray on texture.

G. APPLICATION OF TEXTURE FINISH

1. Surface Preparation and Primer

a. Prepare and prime drywall and other surfaces in strict accordance with texture finish manufacturer's instructions. Apply primer to all surfaces prior to texture finish.

2. Finish Application
  - a. Mix and apply finish to drywall and other surfaces indicated to receive finish in strict accordance with manufacturer's instructions to produce a uniform texture and matching Architect's sample without starved spots or other evidence of thin application, and free of application patterns. Final texture shall be heavy sprayed finish chosen from (3) samples given to the Architect.
3. Remove Any Texture Droppings or Overspray from door frames, windows and other adjoining construction.

H. PROTECTIONS

1. Provide Final Protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall construction being without damage or deterioration at time of substantial completion.

**I.F.B. 17-524-RAD**  
**DIVISION 9**  
**SECTION 096519**  
**RESILIENT TILE AND RESILIENT SHEET FLOORING**  
**AND ACCESSORIES**

**I. GENERAL**

**A. RELATED DOCUMENTS**

1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to this Section.
2. Other Division 9 sections for floor finishes related to this section, but not the work of this section
3. Division 7 Thermal and Moisture Protection; not the work of this section.

**B. DESCRIPTION OF WORK**

1. Flooring and accessories as shown on the drawings and schedules and as indicated by the requirements of this section.

**C. QUALITY ASSURANCE AND REGULATORY REQUIREMENTS**

1. Select an installer who is competent in the installation of resilient sheet vinyl and plank flooring.
2. If required, provide resilient flooring and accessories supplied by one manufacturer, including leveling and patching compounds, and adhesives.
3. If required, provide flooring material to meet the following fire test performance criteria as tested by ASTM International.
  - a. ASTM E 648 Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I.
  - b. ASTM E 662 (Smoke generation) Maximum Specific Optical Density of 450 or less.
  - c. ASTM F 1482, Standard Guide to Wood Underlayment Products available for Use Under Resilient Flooring.

D. SUBMITTALS

1. Submit shop drawings, seaming plan, coving details, and manufacturer's technical data, installation and maintenance instructions for flooring and accessories.
2. Submit the manufacturer's standard samples showing the required colors for flooring and applicable accessories.
3. If required, submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required fire tests.

E. ENVIRONMENTAL CONDITIONS

1. Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.
2. Store materials in a clean, dry, enclosed space off the ground, and protected from the weather and from extremes of heat and cold. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed or at least 48 hours before beginning installation.
3. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65° F (18° C) and a maximum temperature of [100° F (38° C)] [85° F (29° C) for Epoxy Adhesive] for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55° F (13° C) in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances.
4. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring. Do not install flooring until clean and sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond and moisture tests.

## II. PRODUCTS

### A. RESILIENT SHEET FLOORING MATERIALS

1. Heterogeneous sheet flooring shall conform to the requirements of ASTM F1303 Standard Specification for Sheet Vinyl Floor Covering with Backing, Type I, Grade 1, with Class A Backing. Width: 6 ft. (1.83 m). Length: up to 82 lineal feet (25 meters). Thickness: 0.080 in. (2.0 mm).

### B. RESILIENT PLANK FLOORING MATERIALS

1. Provide standard luxury solid vinyl plank flooring 4" x 36" having a nominal total thickness of 0.125 in. (3.2 mm gauge,)], consisting of a tough, clear, unfilled, polyurethane- coated, 0.020 in. (0.5 mm) thick wear layer composed of polyvinyl chloride resins, plasticizers, stabilizers, and processing aids over a printed film on an intermediate layer over a filled vinyl backing. Flooring shall meet composition, size, thickness, squareness, flexibility, residual indentation, resistance to chemicals, resistance to heat and resistance to light requirements of ASTM F 700, "Standard Specification for solid Vinyl Tile," Class III, Type B – Embossed.

### C. ADHESIVES (Low Voc)

1. Adhesives, primers, fillers, and waxes: Type and brand recommended by the manufacturer of resilient material for conditions of installation; adhesive shall not contain asbestos. Provide S-240 High –Performance Epoxy, 70 g/l.

### D. ACCESSORIES

1. Provide threshold of thickness and width as shown on the drawings.
2. Provide resilient edge strips of width shown on the drawings, of equal gauge to the flooring, homogeneous vinyl or rubber composition, tapered or bullnose edge, with color to match or contrast with the flooring, or as selected by the Architect from standard colors available.
3. Provide vinyl stair edge strips of width shown on the drawings and of required thickness to protect exposed edges the plank flooring. Provide units of maximum available length to minimize the number of joints.
4. Underlayment: Underply by Marland Co.

5. Provide solid color vinyl weld rod as produced by the flooring manufacturer, and intended for heat welding of seams. Color shall be compatible with field color of flooring or as selected by Architect to contrast with field color of flooring. Color selected from the range currently available from the manufacturer.

### III. MANUFACTURERS

- A. Armstrong
- B. Burke
- C. Amtico

### IV. EXECUTION

#### A. INSPECTION

1. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.
2. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.
3. Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
4. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

#### B. PREPARATION

1. Remove paint, varnish, oils, release agents, sealers, and waxes. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the compound manufacturer's recommendations for flooring. Avoid organic solvents.

2. Vacuum or broom-clean surfaces to be covered immediately before the application of flooring. Make subfloor free from dust, dirt, grease, and all foreign materials.
3. The installation and preparation of wood and board-type underlayments shall follow the current edition of ASTM F1482, "Standard Practice for Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring."

C. INSTALLATION OF FLOORING

1. Install flooring in strict accordance with the manufacturer.
2. Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.
3. If required, install flooring on pan-type floor access covers. Maintain continuity of color and pattern within pieces of flooring installed on these covers. Adhere flooring to the subfloor around covers and to covers.
4. Scribe, cut, and fit to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.
5. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.

D. INSTALLATION OF ACCESSORIES

1. Fill voids with plastic filler along the top edge of the resilient wall base or integral cove cap on masonry surfaces or other similar irregular substrates.
2. Place resilient edge strips tightly butted to flooring, and secure with adhesive recommended by the edge strip manufacturer. Install edge strips at edges of flooring that would otherwise be exposed.
3. Apply vinyl edge strips where shown on the drawings, before flooring installation. Secure units to the substrate, complying with the edge strip manufacturer's recommendations.

E. CLEANING AND PROTECTION

1. Perform initial maintenance according to the manufacturer.
2. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings.



**I.F.B. 17-524-RAD  
DIVISION 9  
SECTION 098112  
SOUND BATTS/SOUND BLANKETS**

**I. GENERAL**

**A. DESCRIPTION**

1. Scope: includes all labor, materials, and equipment required to install and complete all blanket insulation work shown on the drawings and specified herein whether it is referred to as sound batt or sound blankets.
2. The General Conditions, the Supplementary General Conditions, and the General Requirements are a part of the requirements of this section.

**B. REFERENCES, REGULATIONS, AND STANDARDS**

1. Applicable sections and referenced sections of the following standards, latest edition in effect on date of Invitation for Bids, form a part of this section.
  - a. American Society for Testing and Materials (ASTM)
  - b. Federal Specifications (FS)
  - c. Underwriters Laboratory (UL)

**C. SHOP DRAWINGS**

1. Submit: manufacturer's data showing compliance with the requirements of these specifications.

**D. DELIVERY, HANDLING, AND STORAGE**

1. Deliver: in ample time to coordinate with the progress of the job.
2. Store: in dry place protected from weather and damage.

**II. PRODUCTS**

**A. MATERIALS**

1. All sound batts:
  - a. Shall be rot proof, vermin and insect proof, and odorless.
  - b. Shall comply with ASTM C-665, Type 1, Type 2, or Type 3.

2. Flame resistant batts:
  - a. Flame spread rating: 0 to 25
3. Unfaced fiberglass sound attenuation batts:
  - a. Shall comply with ASTM C-665, Type 1
  - b. Thickness: 6"
  - c. Manufacturer:
    - i. Owens Corning
    - ii. Manville
4. Nails, wire, staples, and miscellaneous rough hardware: as required for the intended application.

### III. EXECUTION

#### A. INSTALLATION AT FRAMED SPACES

1. Where noted on the drawings: install sound attenuation blankets in joist cavities. Butt ends of blankets closely together and fill all voids.

**I.F.B. 17-524-RAD**  
**DIVISION 9**  
**SECTION 09900**  
**PAINTING**

I. GENERAL

A. RELATED DOCUMENTS

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

B. SUMMARY

1. This Section includes surface preparation, painting, and finishing of exposed interior and exterior items and surfaces.
  - a. Surface preparation, priming, and finish coats specified in this section are in addition to shop priming and surface treatment specified under other sections.
2. Exterior surfaces in addition to materials noted on the drawings.
  - a. Wood trim and wood of any kind exposed to the exterior.
  - b. Metal trim.
  - c. Handrails, brackets.
  - d. Steel lintels, steel beams, steel columns, etc., exposed to the exterior.
  - e. Gypsum board exposed to the exterior.
  - f. Wood and steel doors, frames, trim and interior window frames.
3. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels.
  - a. Prefinished items not to be painted include with the exception of factory primed items which require two (2) coats of finish.
4. Interior surfaces in addition to materials noted on the drawings.
  - a. Wood trim and all unfinished wood surfaces of any kind.
  - b. Metal trim.
  - c. Wood and metal handrails, brackets, guardrails.
  - d. Pipe of any kind exposed to view.
  - e. Wood and steel doors, frames, and trim.
  - f. Wood and steel windows, frames, and trim.
  - g. Shelves, including brackets and standards.

C. DEFINITIONS

1. "Paint" includes coating systems materials, primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate, or finish coats.

D. SUBMITTALS

1. Product Data
  - a. Manufacturer's technical information, label analysis, and application instructions for each material proposed for use.
  - b. List each material and cross-reference the specific coating and finish system and application. Identify each material by the manufacturer's catalog number and general classifications.
2. Samples for Initial Color Selection in the form of manufacturer's color charts.
  - a. After color selection, the Architect will furnish color chips for surfaces to be coated.
  - b. Painted wood - provide two twelve by 12-inch samples of each color and material on hardboard.
  - c. Ferrous metal - provide two 4-inch-square samples of flat metal and two 8-inch-long samples of solid metal for each color and finish.
3. Submit OTC Compliant Products Only.

E. QUALITY ASSURANCE

1. Single-Source Responsibility
  - a. Provide primers and undercoat paint produced by the same manufacturer as the finish coats.
2. Field Samples
  - a. On wall surfaces and other exterior and interior components, duplicate finishes of prepared samples. Provide full-coat finish samples on at least 100 sq. ft. of surface until required sheen, color and texture are obtained; simulate finished lighting conditions for review of in-place work.
  - b. Final acceptance of colors will be from job-applied samples.
  - c. The Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted. Apply coatings in this room or surface in accordance with the schedule or as specified. After finishes are accepted, this room or surface will be used for evaluation of coating systems of a similar nature.
3. Material Quality
  - a. Provide the manufacturer's best quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable. (Product ID Example: Sherwin Williams Pro Green 200-Low Voc EG-SHEL Paint).

- b. Proprietary names used to designate colors or materials are not intended to imply that products named are required or to exclude equal products of other manufacturers.
- c. Products that comply with qualitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, may be considered for use when acceptable to the Architect. Furnish material data and manufacturer's certificate of performance to Architect for proposed substitutions.

F. DELIVERY, STORAGE, AND HANDLING

- 1. Deliver Materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
  - a. Product name or title of material
  - b. Product description (generic classification or binder type).
  - c. Manufacturer's stock number and date of manufacture
  - d. Contents by volume, for pigment and vehicle constituents
  - e. Thinning instructions
  - f. Application instructions
  - g. Color name and number
- 2. Store Materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45° F (7° C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.
  - a. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

G. JOB CONDITIONS

- 1. Apply Water-Based Paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50° F (10° C) and 90° F (32° C).
- 2. Apply solvent-Thinned Paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45° F (7° C) and 95° F (35° C).
- 3. Do Not Apply Paint in snow, rain, fog, or mist, when the relative humidity exceeds 85 percent, at temperatures less than 5° F (3° C) above the dew point, or to damp or wet surfaces.
  - a. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

## II. PRODUCTS

### A. MANUFACTURERS

1. Available Manufacturers
  - a. Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to the following:
2. Manufacturer
  - a. Subject to compliance with requirements, provide products of one of the following:
  - b. Devoe and Reynolds Co. (Devoe)
  - c. The Glidden Company (Glidden)
  - d. Benjamin Moore and Co. (Moore)
  - e. PPG Industries, Pittsburgh Paints (Pittsburgh)
  - f. Pratt and Lambert (P & L)
  - g. The Sherwin-Williams Company (S-W)
  - h. Kwall Howell

### B. GENERAL

1. Material Compatibility
  - a. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. 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.

### C. CHEMICAL

1. Components of field-applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:
2. Flat Paints and coatings: VOC content of not more than 50 g/L.
3. Nonflat Paints and coatings: VOC content of not more than 150 g/L.
4. Aromatic compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).

5. Restricted Components: Paints and coatings shall not contain any of the following:
- a. Acrolein
  - b. Acrulonitrile
  - c. Antimony
  - d. Benzene
  - e. Butyl benzyl phthalate
  - f. Cadmium
  - g. Di (2-ethylhexyl) phthalate
  - h. Di-n-butyl phthalate
  - i. Di-n-octyl phthalate
  - j. 1,2-dichlorobenzene
  - k. Diethyl phthalate
  - l. Dimenthl phthalate
  - m. Ethylbenzene
  - n. Formaldehyde
  - o. Hexavalent chromium
  - p. Isophorone
  - q. Lead
  - r. Mercury
  - s. Metyl ethyl ketone
  - t. Methyl isobutyl ketone
  - u. Methylene chloride
  - v. Naphthalene
  - w. Toluene (methylbenzene)
  - x. 1,1,1-trichloroethane
  - y. Vinyl chloride

D. PRIMERS

- 1. Exterior Primer Coating
  - a. Exterior alkyd wood primer used for priming mineral-fiber-reinforced cement panels under a flat acrylic emulsion finish:
- 2. Interior Flat Latex-Based Paint
  - a. Flat latex paint used as a primer over concrete and masonry under alkyd flat and semi-gloss enamel:
- 3. Interior Flat Latex-Based Paint
  - a. Flat latex paint used as a primer on plaster under flat semigloss, and full-gloss alkyd finishes:
- 4. Exterior Primer Coating
  - a. Exterior alkyd wood primer for priming wood under alkyd gloss enamels, flat lusterless finish, and wood trim under medium shade or deep color high-gloss alkyds.

5. Synthetic, Rust-Inhibiting Primer
  - a. Quick-drying, rust-inhibiting primer for priming ferrous metal on the exterior under full-gloss and flat alkyd enamel and on the interior under flat latex paint or odorless alkyd semi-gloss or alkyd gloss enamels:
6. Alkyd-Type Zinc Chromate Primer
  - a. Primers used for priming ferrous metals on the exterior under high-gloss alkyd enamels.
7. Galvanized Metal Primer
  - a. Primer used to prime interior and exterior zinc-coated (galvanized) metal surfaces:

E. EXTERIOR FINISH PAINT MATERIAL

1. Exterior Acrylic Emulsion
  - a. Quick-drying, flat, acrylic paint for use on the exterior over prime-coated wood and sealed and prime-coated painted plywood:
2. Deep Color Alkyd Resin Exterior Trim Paint
  - a. Deep color, ready-mixed alkyd paint for use on the exterior over prime-coated ferrous metal.

F. INTERIOR FINISH PAINT MATERIAL

1. Latex Based Interior Semi-Gloss Paint on Wood & Trim
  - a. Ready-mixed, latex-based paint for use as a flat finish over concrete and masonry surfaces, including filled concrete masonry block, mineral-fiber-reinforced cement panels, and plaster and over prime-coated gypsum drywall, ferrous metal, and zinc-coated (galvanized) metal surfaces. (Eggshell on ceilings and walls).
2. Oil-Type Interior Wood Stain
  - a. slow-penetrating oil-type wood stain for general use on interior wood surfaces under varnishes or wax finished.
3. Cut Shellac
  - a. Quick-drying, rosin-free, clear, general-purpose shellac varnish for use on the interior over stained and natural-finished woodwork for a clear finish as specified on the finish schedule.
4. Paste Wood Filler
  - a. Solvent-based, air-drying, paste-type wood filler for use on open-grain wood on interior wood surfaces.



5. Oil Rubbing Varnish
  - a. Clear, oil-type rubbing varnish for use on interior stained or natural-finished woodwork.

### III. EXECUTION

#### A. EXAMINATION

Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Do not begin paint application until unsatisfactory conditions have been corrected.

Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

#### B. PREPARATION

##### 1. General Procedures

- a. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items in place that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items if necessary for complete painting of the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.
- b. Clean surfaces before applying paint or surface treatments. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

##### 2. Surface Preparation

- a. Clean and prepare surfaces to be painted in accordance with the manufacturer's instructions for each particular substrate condition and as specified.
- b. Provide barrier coats over incompatible primers or remove and reprime. Notify architect in writing of problems anticipated with using the specified finish-coat material with substrates primed by others.

##### 3. Wood

- a. Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
- b. Scrape and clean small, dry, seasoned knots and apply a thin coat of whit shellac or other recommended knot sealer before application of primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.

- c. Prime, stain, or seal wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood that is to be used in finish carpentry.
- d. When transparent finish is required, back prime with spare varnish.
- e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately upon delivery.

5. Ferrous Metals

- a. Clean non-galvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council.

6. Galvanized Surfaces

- a. Clean galvanized surfaces with non-petroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

7. Materials Preparation

- a. Carefully mix and prepare paint materials in accordance with manufacturer's directions.
- b. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
- c. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
- d. Use only thinners approved by the paint manufacturer, and only within recommended limits.

8. Tinting

- a. Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

C. APPLICATION

- 1. Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
- 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

3. Paint colors, surface treatments, and finishes are indicated in "schedules." Provide finish coats that are compatible with primers used.
4. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce an even smooth surface, in accordance with the manufacturer's directions.
5. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
6. The term "exposed surfaces" includes area visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas as required to maintain the system integrity and provide desired protection.
7. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.
8. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
9. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
10. Scheduling Painting
  - a. Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
  - b. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure and where application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
11. Minimum Coating Thickness
  - a. Apply materials at not less than the manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire system as recommended by the manufacturer.

D. FIELD QUALITY CONTROL

1. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:
  - a. The Owner will engage the services of an independent testing laboratory to sample the paint material being used. Samples of material delivered to the project will be taken, identified, sealed, and certified in the presence of the Contractor.

E. CLEANING

1. Cleanup
  - a. At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

F. PROTECTION

1. Protect work of other trades, whether to be painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
2. Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.
  - a. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

G. EXTERIOR PAINT SCHEDULE

1. General
  - a. Provide the following paint systems for the various substrates indicated.
2. Medium-Shade, High-Gloss Alkyd Finish
  - a. Two (2) finish coats over primer.
  - b. Primer: Exterior Primer Coating (FS TT-P-25).
  - c. First coat: Medium-Shade, Ready-Mixed Exterior Oil Paint (FS TT-P-81).
  - d. Second coat: Medium-Shade, Ready-Mixed Exterior Oil Paint (TT-P-81).
3. Ferrous Metal
  - a. Primer is not required on shop-primed items.

4. Full-Gloss Alkyd Enamel
  - a. Two (2) finish coats over primer.
  - b. Primer: Synthetic Rust-Inhibiting Primer (FS TT-P-664).
  - c. First coat: Alkyd Gloss Enamel (FS TT-P-489).
  - d. Second coat: Alkyd Gloss Enamel (FS TT-E-489).

H. OTC-VOC INTERIOR PAINT SCHEDULE

1. General
  - a. Provide the following paint systems for the various substrates, as indicated.
2. Lusterless (Semi-Gloss) Latex Finish (Wood Trim)
  - a. Two (2) coats.
  - b. First coat: Latex-based Interior Semi-Gloss Paint (FS TT-P-29).
  - c. Second coat: Latex-based Interior Semi-Gloss Paint (FS TT-P-29).
3. Lusterless Latex Finish (Walls & Ceilings)
  - a. Two (2) coats Eggshell.
  - b. First coat: Latex-based Interior Eggshell Paint (FS TT-P-29).
  - c. Second coat: Latex-based Interior Eggshell Paint (FS TT-P-29).
4. Semi-Gloss Enamel Finish
  - a. Three (3) coats with total dry film thickness not less than 2.5 mils.
  - b. Primer: Latex-based Interior Flat Paint (FS TT-P-29).
  - c. Undercoat: Interior Enamel Undercoat (FS TT-E-543).
  - d. Finish coat: Interior Semi-gloss Odorless Alkyd Enamel (FS TT-E-506).
5. Full-gloss Enamel Finish
  - a. Two (2) coats over primer with total dry film thickness not less than 2.5 mils.
  - b. Primer: Synthetic Rust-Inhibiting Primer (FS TT-P-664).
  - c. Undercoat: Interior Enamel Undercoat (FS TT-E-543).
  - d. Finish coat: Exterior Alkyd Gloss Enamel (FS TT-E-506).

VOC CONTENT LIMIT FOR ARCHITECTURAL COATINGS

**NOTE:** Limits are expressed in grams of VOC per liter of coating thinned to the manufacturer's maximum recommendation (as indicated on the label or lid of the coating container), excluding the volume of any water, exempt compounds, or colorant added to tint bases.

<u>COATING CATEGORY</u>	<u>VOC CONTENT LIMIT</u>
Flat Coatings	100
Non-Flat Coatings	150
Non-flat - High Glass Coatings	250



**I.F.B. 17-524-RAD**  
**DIVISION 10**  
**SECTION 10800**  
**TOILET AND BATH ACCESSORIES**

**I. GENERAL**

**A. RELATED DOCUMENTS**

1. Drawings and general provisions of Contract, and Division-1 specifications apply.
2. Blocking and Backing Division 6 specification apply.

**B. SUMMARY**

1. This Section includes the following toilet accessory items:
  - a. Toilet tissue dispenser
  - b. Shower curtain rod
  - c. Towel bar and hooks
  - d. Recessed medicine cabinet
  - e. Mirrors
  - f. Toilet paper dispenser

**C. SUBMITTALS**

1. General
  - a. Submit the product data for each toilet accessory item specified including details of construction relative to materials, dimensions, gages, profiles, method of mounting, specified options, and finishes.
  - b. Refer to Division 1 for submittal and shop drawing requirements.

**D. PROJECT CONDITIONS**

1. Coordination
  - a. Coordinate accessory locations, installation, and sequencing with other work to avoid interference and to assure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

**E. WARRANTY**

1. Special Project Warranty
  - a. Provide manufacturer's written 5-year warranty against silver spoilage of mirrors, agreeing to replace any mirrors that develop visible defect within warranty period.

## II. PRODUCTS

### A. ACCEPTABLE MANUFACTURERS

#### 1. Available Manufacturers

- a. Subject to compliance with requirements, manufacturers offering toilet accessories that may be incorporated in the Work include, but are not limited to, the following:

#### 2. Manufacturers

- a. Subject to compliance with requirements, provide toilet accessories by one of the following:
- b. A & J Washroom Accessories
- c. American Specialties, Inc.
- d. Bobrick Washroom Equipment, Inc.
- e. Bradley Corporation
- f. General Accessory Manufacturing Co.

### B. MATERIALS, GENERAL

#### 1. Stainless Steel

- a. AISI Type 302/304, with polished No. 4 finished, 22-gage (.034-inch) minimum thickness, unless otherwise indicated.

#### 2. Galvanized Sheet Steel

- a. ASTM A 3527, G60.

#### 3. Chromium Plating

- a. Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

#### 4. Galvanized Steel Mounting Devices

- a. ASTM A 153, hot-dip galvanized after fabrication.

#### 5. Fasteners

- a. Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

### C. MIRRORS

#### 1. Mirror Glass

- a. 1/4" thick, type I, Class1, Quality q2, conforming to FS DD-G-451, with silvering, copper coating, and protective organic coating complying with FS DD-M-411. With exposed fasteners, size and location as shown on the drawings.



D. SHOWER AND BATH ACCESSORIES

1. Shower Curtain Rod, Heavy-Duty
  - a. 1¼ inches O.D., 18 gage (.050 inch) stainless steel, stain finish; furnish with 3 inches O.D., minimum 20 gage stainless steel flanges with satin finish, designed for exposed fasteners.
2. Towel Bar
  - a. 24 inch long satin finished Type 304 stainless steel tubular (3/4 round) bar stainless steel, stain finish with attached end brackets designed for exposed fasteners.

E. RECESSED MEDICINE CABINET

1. Mirrored swing door 18" w x 24" h x 4 1/4" d w/stainless steel frame. Polystyrene rust-proof body, magnetic catch, and (3) fixed shelves.

F. GRAB BARS

1. Provide: at individual toilet rooms or at toilet compartments noted or graphically indicated as "Handicapped" or where indicated on the drawings.
  - a. 24" long horizontal grab bar on rear wall behind water closet (toilet).
  - b. 42" long horizontal grab bar on side wall or compartment partition adjacent to water closet.
  - c. Mounting: Return to wall at both ends, fasten to walls at both ends, and at center point, with 1 ½" clearance between rail and wall.
  - d. Mounting height: as shown on drawings.
  - e. Size: 1 ½" diameter x length as shown on drawings
  - f. Finish: stainless steel.
  - g. Approved Manufacturer: Bradley 812

G. TOILET PAPER DISPENSER

1. Type 304 stainless steel, flange and post assembly, heavy gauge, 7305-B American Specialties.

H. IDENTIFICATION

1. General
  - a. No names or labels are permitted on exposed faces of toilet and bath accessory units. On either interior surface not exposed to view or on back surface, provide identification of each accessory item by either a printed, waterproof label or a stamped nameplate indicating manufacturer's name and product model number.

### III. EXECUTION

#### A. INSTALLATION

1. Install toilet accessory units in accordance with manufacturers' instructions, using fasteners appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.
2. Secure Mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, in accordance with manufacturer's instructions for type of substrate involved.

#### B. ADJUSTING AND CLEANING

1. Adjust toilet accessories for proper operation and verify that mechanism function smoothly. Replace damaged or defective items.
2. Clean and polish all exposed surfaces in strict accordance with manufacturer's recommendations after removing temporary labels and protective coatings .

**I.F.B. 17-524-RAD**  
**DIVISION 12**  
**SECTION 12372**  
**KITCHEN CABINETS & BATHROOM VANITIES**

I. GENERAL

A. RELATED DOCUMENTS

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

B. SUMMARY

1. This Section includes wood kitchen cabinets and bathroom vanities and countertops.

C. DEFINITIONS

1. Exposed Surfaces
  - a. Surfaces visible when drawers and opaque doors are closed; behind clear glass doors; bottoms of casework 43 inches or more above finished floor.
2. Semi-exposed Surfaces
  - a. Surfaces which become visible when opaque doors are open or drawers are extended; bottoms of casework are more than 30 inches and less than 42 inches above finished floor.
3. Concealed Surfaces
  - a. Surfaces considered concealed when surfaces not visible after installation; bottoms of casework less than 30 inches above finished floor; tops of casework over 78 inches above finished floor and not visible from an upper level; stretchers, blocking, and components concealed by drawers.
4. Reveal Overlay
  - a. Door and drawer faces partially cover cabinet frame.
5. Flush
  - a. Door and drawer faces panel design w/solid oak stiles and rails.

D. SUBMITTALS

1. General
  - a. Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
2. Product data for each casework type specified.

3. Product data for each hardware type specified.
4. Shop Drawings for casework showing location and size, accessories, materials, finishes, and filler panels. Include fully dimensioned plans, elevations, and anchorage details to countertop and walls.
5. Shop drawings for countertops showing sizes, shapes, edge and backsplash profiles, cutouts for plumbing fixtures, and methods of joining.
6. Samples for initial selection purposes in the form of manufacturer's color charts consisting of sections of units showing full range of colors, textures, and patterns available for each type of material indicated or exposed to view.
7. Samples of verification purposes in full size units of each type of material indicated; in sets for each color, texture, and pattern specified, showing full range of variations expected in these characteristics.
  - a. 12 inch square samples of wood with transparent finish for each species.
  - b. 12 inch square samples of veneered plywood with transparent finish.
  - c. 12 inch square samples of plastic laminate for countertops.
  - d. 12 inch samples of plastic laminate for casework finish.
  - e. 6 inch square samples of filled polymer for countertops.
  - f. One unit of each type of exposed hardware.
8. Product certificates signed by the manufacturer certifying that materials furnished comply with specified requirements.
9. Maintenance data for kitchen casework for inclusion in Maintenance Manual specified in Division 1.

E. QUALITY ASSURANCE

1. Kitchen Casework
  - a. Comply with ANSI/NKCA A161.1 and HUD "Minimum Property Standards," Housing 4910.1, paragraph 611-1.1.
  - b. NKCA Certification - provide kitchen casework with National Kitchen Cabinet Association (NKCA) "Certified Cabinet" seal affixed in a semi-exposed location of each unit, evidencing compliance with above standard.
2. Single Source Responsibility
  - a. Obtain kitchen casework from one source from a single manufacturer.

F. DELIVERY, STORAGE, AND HANDLING

1. Deliver casework as a factory assembled unit, packaged individually, and shipped each in its own carton.

G. PROJECT CONDITIONS

1. Environmental Conditions
  - a. comply with casework manufacturer's recommendations for optimum temperature and humidity conditions during storage and installation. Do not install casework until these conditions have been attained and stabilized.
2. Field Measurements
  - a. Verify casework dimensions by field measurements. Verify kitchen casework can be installed in compliance with the original design and referenced standards.
3. Field Measurements
  - a. Verify countertop size and shape prior to fabrication by field measurements taken after base units are installed.

II. PRODUCTS

A. MANUFACTURERS

1. Manufacturers
  - a. Subject to compliance with requirements, provide products by one of the following:
2. Kitchen Cabinets and Bathroom Vanities
  - a. Crystal
  - b. Crestwood
  - c. Evans
  - d. Crown
  - e. Mid Continent
  - f. Kraft Maid
3. Manufacturers not listed shall be pre-approved prior to bidding as per Instructions to Bidders, Article 3.3 Substitutions.

B. MATERIALS, GENERAL

1. Sizes, dimensions, and thicknesses given are minimum dimensions.

2. Particleboard
  - a. ANSI A208.1, mat-formed Particleboard, Grade 1-M-2 with minimum density of 40 PFC, internal bond of 60 psi, and minimum screw holding capacity of 225 lbs. on faces and 200 lbs. on edges.
3. Hardwood Plywood
  - a. ANSI/HPMA HP hardwood and decorative plywood, Good Grade (1) or better, of thickness, species, and cut.
4. Particleboard Core Plywood
  - a. ANSI/HPMA HP hardwood and decorative plywood, Good Grade (1) or better, of thickness, species, and cut.
5. Solid Wood
  - a. Clear, dry, sound, and free of defects selected from First Grade lumber as defined by NHLA.
6. Hardboard
  - a. ANSI A135.4 Class 1, tempered.
7. Plastic Laminate
  - a. NEMA LD 3; in thicknesses indicated and colors or patterns, and finishes as selected from approved samples.
8. Thermoset Decorative Finish
  - a. ALA 1985; Melamine or polyester.

C. WOOD CASEWORK SPECIES AND STYLE

1. Solid Wood and Face Veneer Species
  - a. Red oak
2. Face Style
  - a. Straight panel

D. WOOD CASEWORK FABRICATION

1. Frame of Plywood
  - a. 3/4" x 2" wide stiles and rails, all mortised and tenoned, glued and pinned together.
2. The Label
  - a. Shall identify the manufacturer's name or symbol and indicate compliance with the applicable standards.

3. Doors
  - a. Solid oak stiles and rails surrounding oak veneer plywood w/felt silencers.
4. Hardware
  - a. Provide heavy duty roller suspension with ball bearing side rollers at drawer glides.
5. Pulls
  - a. Provide thumb pull undercut door and drawers.
6. Finish
  - a. Prefinished stain. All cabinets shall be the same finish selected by the Architect from standard range.
7. Drawers
  - a. Drawer box the sides, back, and front to be minimum 7/16" thick prefinished hardboard, bottom minimum prefinished 1/4" tempered hardboard. The drawer bottom to be glued and stapled with bottom dado cut into box sides. The drawer face to be separate from box, NOT dovetailed to the box, and the drawer face attached with screws to drawer box and to match doors.
8. Wood Casework Fabrication
  - a. Toe Kick - continuous 1/4" thick tempered hard board toe kick @ base cabinets, color black supplied by manufacturer.

E. WOOD CASEWORK FINISHES

1. Factory Finishing
  - a. To the greatest extent possible, finish casework at factory. Defer only final touch up until after installation.
2. Finish
  - a. Provide selections made by Architect from full range of standard finishes available.

F. COUNTERTOPS, PLASTIC LAMINATE

1. General
  - a. Comply with ANSI A161.2.
2. Countertop, Backsplash, and Endsplash Fabrication
  - a. Plastic laminate PF .042 thick
3. Configuration
  - a. Provide countertops with the following front style, cove, and backsplash style.

4. Front Style
  - a. Rolled
5. Cove
  - a. Direct bond
6. Backsplash and Endsplash Style
  - a. Curved or waterfall shape with scribe.

G. COUNTERTOPS, FILLED POLYMER

1. Filled Polymer
  - a. Ratings - no change and no lasting effect.
2. Countertop Thickness
  - a. 3/4"
3. Backsplash and Endsplash Thickness
  - a. 3/4"

III. EXECUTION

A. INSTALLATION

1. Install casework with no variations in flushness of adjoining surfaces, using concealed shims. Where casework abuts other finished work, scribe, and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match casework face.
2. Install casework without distortion so that doors and drawers fit openings properly and are aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessories as indicated.
3. Install casework and countertop level and plumb to a tolerance of 1/8" in 8 feet.
4. Fasten unit of casework to adjacent unit and into structural support members of wall construction with #10 sheet metal or wood screws with washer head or washer.
5. Fasten plastic laminate countertops by screwing through corner blocks in base units into underside of countertop. Spline and glue joints in countertops and provide concealed mechanical clamping of joint.



6. Fasten filled-polymer countertops by screwing through corner blocks in base units into underside of countertop. Align adjacent surfaces. Form seams 1/8" wide and adhere with manufacturer's recommended joint adhesive in color to match countertop.

B. ADJUSTING AND CLEANING

1. Adjust hardware to center doors and drawers in openings and lubricate to provide unencumbered operation.
2. Clean casework on exposed and semi-exposed surfaces. Touch up factory applied finishes to restore damaged or soiled areas.



**I.F.B. 17-524-RAD**  
**DIVISION 12**  
**SECTION 12500**  
**WINDOW TREATMENT**

I. **GENERAL**

A. **DESCRIPTION OF WORK**

1. **Scope**
  - a. Include all labor and materials necessary to provide and install all window covering, blinds where called for on the drawings or as specified herein.
2. The General Conditions, Supplementary General Conditions, and the General Requirements are part of this section.

B. **SHOP DRAWINGS**

1. Submit shop drawing including manufacturing catalog cuts, descriptive data, color selection and drawings showing size and location of each.

C. **DELIVERY, STORAGE, AND HANDLING**

1. Deliver blinds to the site marked for mounting location, stored in safe and dry location, just prior to use.

II. **PRODUCTS**

A. **MATERIALS**

1. **Headrail**: 1" high x 1½" deep heavy duty w/.024 rolled formed steel.
2. **Slat**: .008" thick painted aluminum with a crown of .080".
3. **Bottom Rail**: .034 rolled formed steel.
4. **Tilter**: Injection molded plastic housing w/steel want hook, gear ratio of 9 to 1; metal rivet for added strength.
5. **Cordlock**: Injection molded plastic - smooth brass fixed roller; knurled floating brass roller.
6. Center support brackets for blinds 58" wide and over.
7. Color: As selected from manufacturer's standard list of colors.

8. Manufacturers: As submitted prior to bid to meet the specifications.
  - a. Hunter Douglas
  - b. Royal Textile

### III. EXECUTION

#### A. INSTALLATION

1. Premeasure each window type with actual field condition to fit neatly in cased window openings.
2. Locate tract at window head as shown on drawing details with manufacturer recommended mounting hardware.

**PLUMBING – DIVISION 21**

**SPECIFICATION INDEX**

Section #	Section Title
21 05 00	Fire Protection Systems

**PLUMBING – DIVISION 22**

**SPECIFICATION INDEX**

Section #	Section Title
22 05 00	Common Work Results for Plumbing
22 07 00	Plumbing Insulation
22 10 23	Facility Natural Gas Piping
22 11 13	Facility Water Distribution Piping
22 13 16	Sanitary Waste and Vent Piping
22 40 00	Plumbing Fixtures



## SECTION 21 05 00

### FIRE PROTECTION SYSTEMS

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED

- A. Fire sprinkler system.

##### 1.02 QUALITY ASSURANCE

- A. Contractor Qualifications: Work shall be performed by a Contractor regularly engaged in the design and installation of fire protection systems in accordance with NFPA requirements and having at least three years continuous experience in this type of work.
- B. Design Criteria: Provide fire protection systems of types, pressure, flow and densities required by regulatory agencies having jurisdiction.
  - 1. Systems shall be calculated and of configuration acceptable to regulatory agencies.
- C. Pipe sizes shown on drawings may be larger than minimum required. This is to accommodate additional partitioning. Do not reduce sizes.
- D. Requirements of Regulatory Agencies: Total system shall be acceptable upon completion and testing to the following:
  - 1. Jurisdictional Code Enforcement Agencies.
  - 2. Jurisdictional Insurance Agency or Underwriter.
- E. Certificate of Installation: Submit certificate upon completion of fire protection work, stating that the work has been completed and tested in accordance with the specified standards, that there are no defects in the system and it is operational.

##### 1.03 CODES AND STANDARDS

- A. In addition to those specified in this section, comply with local fire department regulations and with the following:
  - 1. Sprinkler System.
    - a. International Building Code
    - b. NFPA-13R.
    - c. Requirements of Owner's insurer.

##### 1.04 SUBMITTALS

- A. Shop Drawings:
  - 1. Sprinkler system.
    - a. Furnish preliminary layout showing head locations only. Locations shall be coordinated with reflected ceiling plan, and soffits.
    - b. Furnish final layout showing piping and heads. Show elevations where necessary to clear ductwork, lights, structural elements, etc.
    - c. Furnish shop drawings which conform to the requirements of the jurisdictional code authorities.
    - d. Final drawing shall bear review stamp of jurisdictional code authorities.

- B. Manufacturer's Data: Submit the following:
  - 1. Sprinkler system.
    - a. Sprinkler heads and devices.
    - b. Valves.
    - c. Specialties.
    - d. Alarm devices.

## **PART 2 - PRODUCTS**

### **2.01 UL LABELS**

- A. Provide fire protection piping products which have been approved and labeled by Underwriter's Laboratories.

### **2.02 FIRE SPRINKLER SYSTEM**

- B. Pipe, Fittings and Valves.
  - 1. Pipe: Any pipe and fittings approved by U.L. for fire protection systems.
- C. Gate Valves.
  - 1. Manufacturers:
    - a. Design Basis: Nibco.
    - b. Other Acceptable Manufacturers:
      - (1) Fairbanks.
      - (2) Kennedy.
      - (3) Milwaukee.
      - (4) Mueller.
      - (5) Watrous.
  - 2. Model: F607-0, cast iron, OS&Y, 175 lb.
- D. Butterfly Valves.
  - 1. Manufacturers:
    - a. Design Basis: TRW Mission.
    - b. Other Acceptable Manufacturers:
      - (1) Kennedy.
      - (2) Milwaukee.
      - (3) Mueller.
  - 2. Model: 3010 with gear actuator, flag indicator hand crank and locking bracket.
- E. Check Valves.
  - 1. Manufacturers:
    - a. Design Basis: Nibco.
    - b. Other Acceptable Manufacturers:
      - (1) Central Sprinkler.
      - (2) Fairbanks.
      - (3) Kennedy.
      - (4) Milwaukee.
      - (5) Mueller.
      - (6) TRW Mission.
  - 2. Model: W-900-W (spring loaded wafer), 250 lb F908B (swing), 175 lb.
- F. Fire Sprinklers.
  - 1. Manufacturers:
    - a. Automatic Sprinkler.
    - b. Central.
    - c. Grinnell.
    - d. Grunau.



- e. Reliable.
  - f. Viking.
  - 2. Type: Solder link, 165 degrees F. except as noted.
  - 3. Finish:
    - a. Finished Areas: Chrome plated.
    - b. Unfinished Areas: Brass.
  - 4. Escutcheons:
    - a. For Removable Ceiling Panels: Split.
    - b. For Permanent Ceilings: Solid.
  - 5. Spare Sprinklers: For each style and temperature range required, furnish additional fire sprinklers, amounting to one unit for every 100 installed units, but not less than five units of each.
  - 6. Sprinkler Cabinet and Wrench: Furnish steel, baked red enameled, sprinkler box with capacity to store sprinklers and wrench sized to sprinklers.
- G. Fire Department Connections:
- 1. Manufacturers:
    - a. Design Basis: Potter-Roemer.
    - b. Other Acceptable Manufacturers:
      - (1) Edwards.
      - (2) Elkhart.
      - (3) Grunau.
      - (4) Croker-Standard.
  - 2. Exposed Wall Type:
    - a. Model: 5710, single clapper, 4" x 2-1/2" x 2-1/2".
    - b. Material: Polished brass.
    - c. Lettering: "AutoSpkr", "Standpipe", or "AutoSprinkler-Standpipe" as required.
    - d. Hose Threads: Local Fire Department standard.
    - e. Escutcheon: Series 5960.
    - f. Caps: Model 5950, red enamel, cast iron, breakable.
- H. Water Flow Indicators.
- 1. Manufacturers:
    - a. Design Basis: Notifier.
    - b. Other Acceptable Manufacturers:
      - (1) Grunau.
      - (2) Potter-Roemer.
      - (3) Reliable.
  - 2. Model: WFD, vane-type, designed for vertical or horizontal piping.
    - a. Provide instantly recycling retard element, adjustable 0 to 60 seconds.
    - b. Provide weatherproof, dust-tight enclosure with red enamel finish.
- I. Water Flow Alarm.
- 1. Manufacturers:
    - a. Design Basis: Automatic Fire-Trols.
    - b. Other Acceptable Manufacturers:
      - (1) Aames Security.
      - (2) Grunau.
      - (3) Reliable Automatic Sprinkler.
  - 2. Model: Farr-Larm.
  - 3. Features: Electric, weatherproof, horn and light, approved for hard-of-hearing areas.
- J. Pressure Gauges.
- 1. Manufacturers:
    - a. Marsh.
    - b. Ernst.
    - c. Potter-Roemer.
  - 2. Type: 3-1/2" diameter, Bourdon-type with brass case and ring.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. Identification:
  - 1. Apply signs to control, drain, test and alarm valves to identify their purpose and function.
  - 2. Provide lettering size and style selected by Architect/Engineer from NFPA's suggested styles.
- B. Flushing: Prior to connecting risers, flush water feed mains and lead-in connections.
- C. Hydrostatic Test:
  - 1. Test piping at 200 psig or 50 psi over maximum static pressure, if it exceeds 150 psig.
  - 2. Repair or replace piping as required.

### **3.02 SPRINKLER LAYOUT**

- A. Sprinkler layout is not shown on drawings.
  - 1. Provide sprinkler layout with shop drawing submittal.
  - 2. Coordinate with ceiling layout, plumbing, electrical, ductwork and structural.

### **3.03 UNDERGROUND PIPING**

- A. Ductile Iron Pipe: Following recommended procedures of Cast Iron Pipe Research Association.
- B. PVC Pipe: Follow manufacturer's published instructions.
- C. Joint Adapters: For joints between ductile iron pipe and other pipe, use standard cast iron adapters and fittings.
- D. Rods and Clamps: After installation, apply a full coat of asphalt or other acceptable corrosion-retarding material to surfaces of rods and clamps.
- E. Concrete Use 2500 lb concrete.
  - 1. Thrust Blocks Provide poured concrete thrust blocks in accordance with NFPA 24 at:
    - a. Tees.
    - b. Plugs.
    - c. Caps.
    - d. Bends.
    - e. Hydrants.
  - 2. Provide poured concrete support at building entrance point to support water line from wall to un-excavated ground.
- F. Interior Inspection: Inspect conduit for line displacement, poor alignment, debris, infiltration or other defects and make corrections.
- G. Cleaning Conduit:
  - 1. Clear the interior of conduit of dirt and other superfluous material as the work progresses.
  - 2. Maintain a swab or drag in the line and pull past each joint as it is completed.
  - 3. Disinfect pipe by adding a teaspoon of sodium hypochlorite powder to each section of underground pipe as it is laid.
    - a. Allow this to remain for two hours after system is filled, then flush it out.
  - 4. Place plugs in the end of uncompleted conduit at the end of the day or whenever work stops.
  - 5. Flush conduit at the rates of flow recommended by NFPA No. 24.

- H. Testing:
1. Perform hydrostatic testing of completed conduit lines in accordance with NFPA No. 24.
  2. Perform operational testing of hydrants and valves by opening and closing under water pressure to insure proper operation.

**END OF SECTION**



## SECTION 22 05 00

### COMMON WORK RESULTS FOR PLUMBING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Piping materials and installation instructions common to most piping systems.
  - 2. Transition fittings.
  - 3. Mechanical sleeve seals.
  - 4. Sleeves.
  - 5. Escutcheons.
  - 6. Grout.
  - 7. Equipment installation requirements common to equipment sections.

##### 1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
  - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
  - 2. CPVC: Chlorinated polyvinyl chloride plastic.
  - 3. PE: Polyethylene plastic.
  - 4. PVC: Polyvinyl chloride plastic.
- G. The following are industry abbreviations for rubber materials:
  - 1. EPDM: Ethylene-propylene-diene polymer rubber.

2. NBR: Acrylonitrile-butadiene rubber.

#### 1.4 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

#### 2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

#### 2.3 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
  - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Mechanical joining method using the Pro Press system:
  - 1. Fitting materials meet requirements of ANSI-ASME B 16.22 and ASTM B 88.
  - 2. Elastomeric seal of synthetic rubber meeting requirements of ASTM D 2000.

3. Fittings installed using the required pressing tool shall be rated for 200 psi and have been certified to 600 psi of pressure.
- F. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- G. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAgl, silver alloy for refrigerant piping, unless otherwise indicated.
- H. Solvent Cements for Joining Plastic Piping:
1. ABS Piping: ASTM D 2235.
  2. CPVC Piping: ASTM F 493.
  3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
  4. PVC to ABS Piping Transition: ASTM D 3138.

## 2.4 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
1. Available Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Metraflex Co.
    - d. Pipeline Seal and Insulator, Inc.
  2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  3. Pressure Plates: Plastic. Include two for each sealing element.
  4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## 2.5 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

## 2.6 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
  1. Finish: Polished chrome-plated.
- E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.
- F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw or spring clips, and chrome-plated finish.
- G. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

## 2.7 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
  1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
  3. Packaging: Premixed and factory packaged.

## PART 3 - EXECUTION

### 3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.



- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
  - 1. New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
    - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
    - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge and set screw.
    - f. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed hinge and set screw or spring clips.
    - g. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.
    - h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
- M. Sleeves are not required for core-drilled holes.
- N. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  - 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
    - b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
    - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

- O. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
  - 2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
  - 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
  
- P. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
  
- Q. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.
  
- R. Verify final equipment locations for roughing-in.
  
- S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### 3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- H. Press fit joints for copper piping:
1. Utilize power tools as provided by the manufacturer of Pro Press systems.
  2. Inspect each fitting for damage or missing O ring seal.
  3. Install per manufacturers instructions.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
  3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
  4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
  5. PVC Nonpressure Piping: Join according to ASTM D 2855.
  6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

### 3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, and at final connection to each piece of equipment.
  2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### 3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

- C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

### 3.5 GROUTING

- A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION

## SECTION 22 07 00

### PLUMBING INSULATION

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Section Includes:
  - 1. Insulation Materials:
    - a. Flexible Elastomeric.
    - b. Mineral fiber.
  - 2. Adhesives.
  - 3. Mastics.
- B. Related Sections include the following:
  - 1. 23-07-00.
  - 2. Division 23 Section "HVAC Insulation."

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

##### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

#### PART 2 - PRODUCTS

##### 2.1 INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
  
- F. Mineral-Fiber, Preformed Pipe Insulation:
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Fibrex Insulations Inc.; Coreplus 1200.
    - b. Johns Manville; Micro-Lok.
    - c. Knauf Insulation; 1000(Pipe Insulation.
    - d. Manson Insulation Inc.; Alley-K.
    - e. Owens Corning; Fiberglas Pipe Insulation.
  - 2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
  - 3. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ FSK jacket complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
  - 4. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. CertainTeed Corp.; CrimpWrap.
    - b. Johns Manville; MicroFlex.
    - c. Knauf Insulation; Pipe and Tank Insulation.
    - d. Manson Insulation Inc.; AK Flex.
    - e. Owens Corning; Fiberglas Pipe and Tank Insulation.
  
- G. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Aeroflex USA Inc.; Areoseal.
    - b. Armacell LCC; 520 Adhesive.
    - c. Foster Products Corporation, H.B. Fuller Company; 85-75.
    - d. RBX Corporation; Rubatex Contact Adhesive.

## 2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Childers Products, Division of ITW; CP-97.
    - b. Foster Products Corporation, H. B. Fuller Company; 81-27/81-93.

- c. Marathon Industries, Inc.; 290.
- d. Mon-Eco Industries, Inc.; 22-30.
- e. Vimasco Corporation; 760.

## 2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Childers Products, Division of ITW; CP-35.
    - b. Foster Products Corporation, H. B. Fuller Company; 30-90.
    - c. ITW TACC, Division of Illinois Tool Works; CB-50.
    - d. Marathon Industries, Inc.; 590.
    - e. Mon-Eco Industries, Inc.; 55-40.
    - f. Vimasco Corporation; 749.
  - 2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
  - 3. Service Temperature Range: Minus 20 to plus 180 deg F.
  - 4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
  - 5. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Childers Products, Division of ITW; CP-10.
    - b. Foster Products Corporation, H. B. Fuller Company; 35-00.
    - c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
    - d. Marathon Industries, Inc.; 550.
    - e. Mon-Eco Industries, Inc.; 55-50.
    - f. Vimasco Corporation; WC-1/WC-5.
  - 2. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
  - 3. Service Temperature Range: Minus 20 to plus 200 deg F.
  - 4. Solids Content: 63 percent by volume and 73 percent by weight.
  - 5. Color: White.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
  - 1. Verify that systems and equipment to be insulated have been tested and are free of defects.

2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  1. Install insulation continuously through hangers and around anchor attachments.
  2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.



- L. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.
  - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
  - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.
    - a. For below ambient services, apply vapor-barrier mastic over staples.
  - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
  - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above ambient services, do not install insulation to the following:
  - 1. Vibration-control devices.
  - 2. Testing agency labels and stamps.
  - 3. Nameplates and data plates.
  - 4. Manholes.
  - 5. Handholes.
  - 6. Cleanouts.

### 3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
  - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
  - 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
  - 1. Comply with requirements in Division 07 Section "Penetration Firestopping"irestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
  - 1. Pipe: Install insulation continuously through floor penetrations.
  - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

### 3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
  - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
  - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
  - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
  6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
  7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
  8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
  9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

### 3.6 MINERAL-FIBER INSULATION INSTALLATION

#### A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. 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.

#### B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
  2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
  2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
  3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
  4. Install insulation to flanges as specified for flange insulation application.

### 3.7 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
1. Drainage piping located in crawl spaces.
  2. Underground piping.
  3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

### 3.8 INDOOR PIPING INSULATION SCHEDULE

- A. Installed Insulation must meet minimum requirements of current International Energy Code requirements.
- B. Domestic Cold Water:
1. NPS 1 and Smaller: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: ½ inch thick.
  2. NPS 1-1/4 and Larger: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- C. Domestic Hot and Recirculated Hot Water:
1. NPS 2" and Smaller: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
  2. NPS 2-1/2 and Larger: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 ½ inch thick.

END OF SECTION

**SECTION 22 10 23**  
**NATURAL GAS PIPING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes: Natural gas piping, valves and specialties,.
  - 1. Gas Meter: The gas meter, regulator and piping upstream of meter will be provided by the Gas Utility Company.
  
- B. Related Documents
  - 1. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to work of this Section.
  - 2. Where contradictions occur between this Section and Division 1, the most stringent of the two shall apply. Engineer shall determine which is more stringent.

**1.02 QUALITY ASSURANCE**

- A. Standards:
  - 1. National Fuel Gas Code, NFPA 54.
  - 2. Uniform Plumbing Code.

**1.03 SUBMITTALS**

- A. Manufacturer's Product Data: Submit for:
  - 1. CSST Gas Piping.
  
- B. Submit specification compliance analysis report:
  - 1. Address each paragraph of the specification by indicating COMPLY or EXCEPTION.
  - 2. Do not indicate COMPLY unless the proposed equipment or system exactly meets the paragraph requirement.
  - 3. If EXCEPTION is indicated, then provide a clear and concise explanation of the variance from the specifications and the effect this has on the specified performance.
  - 4. Engineer retains the right to accept or deny any listed exceptions to the specification.

**PART 2 PRODUCTS**

**2.01 NATURAL GAS PIPING**

- A. Above Grade:
  - 1. Two Inch and Smaller, Exposed Location: Schedule 40 black steel with 150 lb. Malleable iron fittings and threaded joints. Two Inch and smaller, Inaccessible or Unoccupied Location: Schedule 40 black steel with standard weight socket weld fittings and welded joints.
  
- B. Below Grade:
  - 1. Schedule 40 black steel with 150 lb. Forged steel fittings and welded joints. Coat and wrap pipe in accordance with utility company requirements. Provide cathodic protected as required.
  - 2. High density polyethylene pipe with approved fittings, sized and installed per local gas department standards.

- C. In Crawl Spaces:
  - 1. CSST (Corrugated Stainless Steel Tubing). Gas Tite, with approved fittings, sized per manufacturer requirements and installed per manufacturer's and local gas and building department standards and codes.

## **2.02 GAS COCKS AND MANUAL EMERGENCY SHUT-OFF VALVES**

- A. Acceptable Manufacturers: Dezurik or equal.
- B. Description: Corrosion-resistant plug, permanently lubricated, corrosion-resistant bearings, suitable seals for intended service, lever operator.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Remove cutting and threading burrs before assembling piping.
- B. Do not install defective piping or fittings.
  - 1. Do not use pipe with threads which are chipped, stripped or damaged.
- C. Use Teflon tape on male pipe threads.
- D. Plug each gas outlet, including valves with a threaded plug or cap, immediately after installation, and retain until continuing piping or equipment connection is completed.

### **3.02 BURIED PIPE**

- A. Coated Pipe: Follow IAPMO Standard IS 13-84.
- B. Buried piping shall be buried 24" minimum.
  - 1. All buried joints shall be welded and left exposed until testing has been completed.

### **3.03 PRESSURE REGULATING VALVES**

- A. Vent all pressure regulating valves directly to the exterior of the building.
- B. Do not reduce vent size of regulator or install valves in vent piping.

### **3.04 TEST**

- A. After rough-in or prior to initial operation, test and purge fuel gas piping in accordance with Uniform Plumbing Code.
  - 1. Test at 100 psig.
  - 2. Repair or replace piping as required to eliminate leaks, and re-test.
- B. After equipment installation, test all piping and valves up to gas regulator with a "U" tube manometer at 10 psig.

**END OF SECTION**

## **SECTION 22 11 13**

### **PLUMBING PIPING**

#### **PART 1 GENERAL**

##### **1.01 WORK INCLUDED**

- A. Furnish and Install:
  - 1. Domestic Hot and Cold Water Piping
  - 2. Sanitary Drainage and Vent Piping
  - 3. Floor Drainage Piping and Drains
  - 4. Valves and Specialties
  - 5. Cleanouts
  - 6. Anti-Siphon Backflow Equipment
- B. Furnish Only:
  - 1. Access panels for appropriate sections for installation.

##### **1.02 SUBMITTALS**

- A. Shop Drawings and Product Data: Submit for the following in accordance with Section 15010. Include manufacturer's installation instructions.
  - 1. Floor Drains
  - 2. Cleanouts
  - 3. Wall Hydrants and Hose Bibbs
  - 4. Water Hammer Arrestors
- B. Operating and Maintenance Data: Submit for the following in accordance with Section 15010.
  - 1. Water Hammer Arrestors

##### **1.03 DELIVERY, STORAGE AND HANDLING**

- A. Comply with Section 15010. Exercise care to prevent damage to materials and equipment during loading, transporting and unloading. Do not drop pipe or fittings. Deliver package units in original crates.

#### **PART 2 PRODUCTS**

##### **2.01 PIPE AND PIPE FITTINGS**

- A. Domestic Hot and Cold Water - Inside Building:
  - 1. Above grade: Type L copper with wrought copper fittings and no-lead solder joints or ProPress fittings.
  - 2. PEX tubing, Wirsbo Aqua Pex, with valved manifolds, and Pro Pex fittings.

- B. Sanitary Drainage - Inside Building:
  - 1. Above grade: Service weight cast iron no-hub pipe with elastomeric joints and double stainless steel clamps.
  - 2. Below grade: Service weight cast iron bell and spigot pipe with fittings and elastomeric joints.
  - 3. PVC Schedule 40 with solvent cemented fitting and joints.
- C. Vent Piping:
  - 1. Above grade: Standard weight cast iron no-hub pipe with bell and spigot fittings with elastomeric joints and double stainless steel clamps.
  - 2. Below grade: Service weight cast iron bell and spigot pipe with elastomeric joints.
  - 3. PVC schedule 40 with solvent cemented fittings and joints.
- D. Equipment Drains and Overflows: Schedule 40 PVC or Type K hard drawn copper with wrought copper, bronze or cast brass fittings and 50/50 solder joints.
- E. All soil and waste lines below the lower floor slab or that are in trenches within the boundaries of the building shall consist of "S.W." labeled pipe and fittings or PVC to 5' outside the building wall.

## **2.02 UNIONS AND COUPLINGS**

- A. 2" and Under:
  - 1. For threaded ferrous piping: ANSI/ASTM 150 PSI malleable iron ground joint unions.
  - 2. For copper piping: ANSI BIG-22 WROT Copper.
- B. 2-1/2" and Over:
  - 1. For ferrous piping: ASTM 181, Grade I, 150 PSI forged steel slip-on flanges.
  - 2. For copper piping: 150 PSI bronze flanges.
  - 3. Gaskets: 1/16" thick preformed synthetic red rubber for cold water system, black rubber for hot water system.
- C. Dielectric Unions: Use dielectric unions at connections between dissimilar metals, i.e. steel and copper pipe.

## **2.03 PIPE HANGERS AND SUPPORTS**

- A. Provide in accordance with Section 15050 Basic Materials and Methods.



**2.04 VALVES AND SPECIALTIES**

- A. Provide in accordance with Section 15420 Plumbing Valves and Specialties.

**2.05 SELF-CONTAINED CONTROL VALVES**

- A. Pressure Relief Valves:

**2.06 FLOOR DRAINS AND FLOOR SINKS**

- A. General: Provide types, finishes, materials and accessories as scheduled.
- B. Acceptable Manufacturers: (Base Bid)
  - 1. Jay R. Smith
  - 2. Josam
  - 3. Wade
  - 4. Zurn
- C. Strainer Free Area: Provide strainers with free area ratio to drain throat as follows:

<u>Drain Pipe Size</u>	<u>Throat Free Area</u>	<u>Minimum Strainer Free Area</u>
3	7.07	14.14
4	12.56	14.14

- D. Provide sanitary floor drains with 4" deep seal 'P' traps.
- E. Floor Drain Schedule: Refer to Drawings.
- F. Floor Sink Schedule: Refer to Drawings.

**2.08 CLEANOUTS AND CLEANOUT COVERS**

- A. General: Provide types as specified for finishes or areas in which installed. Provide cleanouts full size of pipe. Connections shall match piping.
- B. Acceptable Manufacturers: (Base Bid)
  - 1. Jay R. Smith
  - 2. Josam
  - 3. Wade
  - 4. Zurn
- C. Flashing: Provide 24" x 24" flashing pan with clamp device for each floor cleanout located above slab on grade areas including areas over accessible crawl spaces. Flashing panel shall consist of 4 lb. sheet lead with No. 15 asphalt.
- D. Cleanout Schedule: Refer to Drawings.

## **PART 3 EXECUTION**

### **3.01 INSPECTION**

- A. Inspect preceding work in conformance with Section 15010 Basic Requirements.

### **3.02 PREPARATION**

- A. Take field measurements and clean in accordance with Section 15050.

### **3.03 BASIC METHODS**

- A. Excavate and backfill, cut and patch, sleeve and flash in accordance with Section 15050.
- B. Install piping with hangers and supports in accordance with Section 15050.

### **3.04 WATER DISTRIBUTION SYSTEM**

- A. Installation:
  1. Run piping as direct as possible to required connections, and slope to drain valves at low points for complete system drain down. Locate drain valves at accessible points within the system. Coordinate routing with other trades and with building construction. Make connections to all equipment and fixtures indicated on the Drawings or specified herein.
  2. Sleeve and caulk wall or floor penetrations of water service with non-hardening adhesive sealant compound. Provide ball valves on shock absorbers, stop and drain valves for exterior wall hydrants.
  3. Provide unions at connections to fixtures and equipment including valves when union trim is not furnished as a standard part of the equipment trim or where items cannot be removed from line without unions.
  4. Provide ball valves for branch lines off main, sub-main take-offs and main take-offs.
  5. Provide building shut-off and separate hose end drain valves with vacuum breaker at main service entry and at the lowest main level in the building where service entry is above the lowest floor level.
  6. Provide adequate allowance for expansion, contraction, and vibration in the piping system by isolation, looping and anchoring means. Provide hangers of the same material as the piping system.
  7. Provide dielectric unions at connections between dissimilar piping materials, i.e., iron valves and copper pipes, etc.
  8. Piping shall be insulated, refer Section 15250.
  9. All hot water branch connectors to distribution mains shall be top take-off swing joint type.
  10. On the hot water system, at all high points of the main vertical or horizontal distribution, install air vents consisting of 1/2" gate valve and 12" length of tubing turned down. If inaccessible, provide access panel.
  11. Where possibility of backflow from the drain to the supply fitting exists, install vacuum breakers.
  12. Not more than one (1) lavatory, sink, shower, or similar fixture shall be supplied by a 1/2" branch. Linear dimension not to exceed 10'.

### **3.05 ROUGH-IN**

- A. Furnish and install hot water, cold water, waste and vent rough-ins for fixtures and equipment as indicated and required. Provide sizes as indicated and scheduled on the Drawings.

### **3.06 SANITARY SEWER SYSTEM**

- A. Service: Make connections to existing sanitary as applicable and in accordance with rules and regulations of jurisdictional utility company.

B. Installation:

1. Run soil and waste piping at a grade of not less than 2.08% for piping up to 4" in diameter. Run soil and waste piping 4" and larger at a grade of not less than 1.04%, only to meet existing conditions.
2. Bushings in soil and waste piping will not be permitted. Tapped spigots or tees shall be used when changing from cast iron pipe to steel waste or vent piping.
3. Provide waste connections between fixtures and the waste and vent system of galvanized steel nipples and cast iron drainage fittings. Provide traps for each fixture, floor drain, or equipment indicated, unless detailed or otherwise specified.
4. Provide interior waste and vent piping.
5. Provide vents through roofs of at least the minimum size and height as required flashed with 4 lb. sheet lead (24" x 14" x 4 lb. minimum). All vents protruding through the roof shall be not less than 3" size and extended to not less than 12" above the finished roof. Extend lead 6" above the vent and turned down into vent pipe. Provide vandal proof caps on all vents.
6. Do not install vents within 2' of roof edge, parapet or wall line of an "on-the-roof" structure.
7. Do not install vents within 25' of outside air intakes.
8. Make connections to all equipment and fixtures indicated on Drawings or specified herein.
9. All vent piping shall be so graded and connected as to drip back to the drainage system.
10. No combination waste and vent, horizontal or vertical wet venting systems shall be installed unless specifically approved by the Engineer.

### **3.07 FLOOR DRAINS, AREA DRAINS AND FLOOR SINKS**

- A. Coordinate placement with other trades and building structure for elimination of interface.
- B. Provide test plugs in floor drains at the time of installation. Leave test plugs in for the duration of construction. Install strainers and domes as required immediately after completion of finish floor installation.
- C. Install sanitary floor drains with deep seal 'P' traps and vent as required.

### **3.08 CLEANOUTS**

- A. Provide cleanouts where indicated and at the base of all risers. Provide additional cleanouts where required by local codes and for the convenience of testing and erection at the contractor's option.
- B. Coordinate placement with other trades and building structure for elimination of interference.
- C. Set grade cleanouts located in unpaved areas in 15" x 15" x 4" concrete pad. Provide concrete pad.
- D. Cleanouts which may be rodded both ways shall be used whenever possible. Cleanouts shall be brought up to grade or finished surfaces, and shall be encased in concrete from subgrade to frame and accessible through panels with adequate clearances for rodding.
- E. Locate cleanouts in horizontal lines not more than 50' apart; at changes in pipe direction greater than 45 degrees; in the building drain within 5' of the exterior wall; and as required.
- F. Install cleanout frames and covers flush with the adjoining Architectural finishing material. Provide carpet cleanout markers for cleanouts located in floors with carpeting.
- G. Where existing cleanouts are in conflict with new construction, relocate cleanout to an acceptable location.

### **3.09 PLUMBING SPECIALTIES**

- A. Shock Absorbers: Install each shock absorber in an accessible location with a full sized ball valve.

### **3.10 VALVES**

- A. Install ball valves for shut-off and isolating service, to isolate equipment, part of systems or vertical risers.
- B. Install pressure relief valve at domestic hot water heater as indicated.
- C. Provide drain valves at main shut-off valves, low points of piping and apparatus.

### **3.11 ADJUSTING AND CLEANING**

- A. Domestic Water Systems:
  - 1. Clean piping of dirt, debris, slag, solder, burrs and restrictions by flushing with water or acid to remove or dissolve foreign particles that may be within the piping system.
  - 2. Sterilize potable water piping with a chlorine solution containing not less than fifty (50) parts per million of the pipe volume. Chlorine shall consist of either liquid chlorine or sodium hypochlorite solution. Gas chlorine will not be permitted.
  - 3. Maintain chlorine solution in the system for a period not less than eight (8) hours, during which time, open and close all valves and faucets at least three (3) times.
  - 4. After the sterilization period is completed, Flush the entire system with potable water until the residual chlorine content is no more than 1.0 parts per million.
  - 5. Deliver to the Architect a dated letter certifying sterilization and complete test reports.

**END OF SECTION**

**SECTION 22 40 00**  
**PLUMBING FIXTURES**

**PART 1 GENERAL**

**1.01 WORK INCLUDED**

- A. Furnish and Install:
  - 1. Plumbing Fixtures and trim.
- B. Related Requirements:
  - 1. Basic Requirements: Section 220500

**1.02 SUBMITTALS**

- A. Shop Drawings and Product Data: Submit for the following in accordance with Section 220500. Include manufacturer's installation instructions.
  - 1. Fixtures, Carriers and Trim

**1.03 DELIVERY, STORAGE AND HANDLING**

- A. Comply with Section 220500. Exercise care to prevent damage to materials and equipment during loading, transporting and unloading. Do not drop pipe or fittings. Deliver packaged units in original crates.

**PART 2 PRODUCTS**

**2.01 FIXTURES**

- A. Provide in accordance with the schedule, refer to drawings.

**PART 3 EXECUTION**

**3.01 INSPECTION**

- A. Inspection of preceding work in accordance with Section 220500 Basic Requirements.

**3.02 INSTALLATION**

- A. General: Set plumbing fixture level and plumb, spaced in accordance with dimensioned Drawings, and securely install to be rigid. Provide all necessary materials and labor to connect to plumbing system, all fixtures and equipment having plumbing connections and which are furnished by others or specified in other sections of these specifications.
- B. Install wall mounted lavatories with wall carriers.
- C. Solidly attach floor-mounted water closets to floor with lag screws.
- D. Securely anchor flush valves behind or within walls to be rigid and not subject to movement due to push or pull action on the valve. All supply piping shall be anchored to prevent movement.
- E. Supply pipes to each item of equipment or fixture, except mixing valves, flush valves, or other control valves which are supplied with integral stops, shall be quipped with a shut off ball valve to enable isolation of item.

- F. After plumbing fixtures are set, the crack between the fixture and wall or floor shall be caulked carefully with Tub-Tite as manufactured by American Fluresate company or approved equal.

### **3.03 PLUMBING FIXTURES**

- A. Accessories:
  - 1. Traps: Provide each fixture with trap, easily removable for servicing and cleaning. Provide cast brass 'P' trap with cleanout for each lavatory and sink except as specifically noted.
  - 2. Provide hose faucets and hose connections with vacuum breakers.
  - 3. Finish wall and floor penetrations with set screw type chrome plated cast brass escutcheons.
- B. Securely anchor flush valves behind or within walls to be rigid and not subject to movement due to push or pull action on the valve. All supply piping shall be anchored to prevent movement.
- C. After plumbing fixtures are set, the crack between the fixture and wall or floor shall be caulked carefully with Tub-Tite as manufactured by American Fluresate Company or approved equal.

### **3.04 ADJUSTING AND CLEANING**

- A. Cleaning: Clean strainers, traps, aerators, valves of debris, sand and dirt. At completion, thoroughly clean plumbing fixtures and equipment.
- B. Adjusting: Adjust flush valves, faucets, showers, bubblers for proper flow, after cleaning and flushing operations are accomplished.

### **3.05 PROTECTION**

- A. Protect fixtures and related components from damage before, during and after installation to date of Final Acceptance or Owner move-in. Provide protective coverings or other protection as required. Replace defective or damaged fixtures or components.

**END OF SECTION**

## MECHANICAL – DIVISION 23

### SPECIFICATION INDEX

Section #	Section Title
23 05 00	Common Work Result for HVAC
23 05 29	Hangers and Supports
23 07 00	HVAC Insulation
23 31 13	Metal Ducts
23 33 00	Air Duct Accessories
23 34 23	HVAC Power Ventilators
23 37 13	Diffusers, Registers, and Grilles
23 74 13	Air Handler Split Systems





## SECTION 23 05 00

### COMMON WORK RESULT FOR HVAC

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section includes: Requirements applicable to all Division 23 sections.
- B. Related Documents:
  - 1. Drawings and general provisions of the contract, including General Requirements and Division 01.
  - 2. Where contradictions occur between this Section and Division 01, the most stringent of the two shall apply. Engineer shall determine which is most stringent.

##### 1.2 QUALITY ASSURANCE

- A. Qualification of Contractor:
  - 1. Thoroughly experienced in the installation of heating, cooling and ventilation equipment and systems specified herein.
  - 2. Pre-approved prior to bidding.
    - a. To obtain pre-bid approval submit the following information to the General Contractor at least 14 days prior to the bid date. Approved contractors will be listed in an addendum to the contract documents.
      - 1) Number of years in business under present name.
      - 2) Three similar projects completed in the last 5 years; giving project name and location, Owner's name, phone number and contract amount.
      - 3) Three Mechanical Engineer references and phone numbers which can attest to the Contractors abilities.
- B. Qualification of Products:
  - 1. When products are specified by manufacturer and model number, equivalent products by other manufacturers listed may be provided without prior approval, providing construction and configuration are the same as the specified product. If the alternate product is different, the specified product shall be noted as a base bid item and other products shall be listed as alternates with the differences clearly identified. Products by manufacturers not listed in this Specification may be submitted for prior approval to the Engineer/Architect during the Bidding Period in accordance with Instructions to Bidders General Requirements.
    - a. If any additional manufacturers are approved, they will be listed in an addendum.

##### 1.3 WARRANTIES

- A. Work Included: Provide all labor, materials, equipment and incidentals necessary to complete the work shown, specified, and as otherwise required for a complete operational HVAC system. Examine documents of other trades for any additional work which may be required of Division 23.
- B. Warranty Period: Begins in accordance with General Requirements.

1. During this period, provide labor and materials as required to repair or replace defects at no additional cost to the Owner.
2. Provide certificates for such items of equipment which have warranties in excess of one year.

#### 1.4 GENERAL

#### 1.5 COORDINATION WITHIN DIVISION 23

##### A. Contract Documents:

###### 1. General:

- a. The Contract Documents are diagrammatic, showing certain physical relationships which must be established within the HVAC work and its interface with other work. Such establishment is the exclusive responsibility of the Contractor.
- b. Follow the drawings as closely as possible, but make necessary offsets and transitions required to avoid conflicts.

###### 2. Supplemental Instructions: The exact location for some items in this Specification may not be shown on the Drawings.

- a. Install such items at location established by the Engineer during the progress of the work.

###### 3. Discrepancies:

- a. Examine Drawings and Specifications.
- b. Report any discrepancies to the Engineer and obtain written instructions before proceeding.
- c. Should there be a conflict within or between the Specifications or Drawings, the more stringent or higher quality requirements shall apply.
- d. Items called for in either specifications or drawings shall be required as if called for in both.

##### B. Coordination Drawings: For places where clearances are limited, and for places where several elements of mechanical work (or combinations of mechanical and other work) must be located with precision in order to fit into available space, prepare Coordination Drawings (Shop Drawings) at a suitable scale, showing the required dimensions, and submit this drawing for approval.

##### C. Coordination of Options and Substitutions: Where Contract Documents permit selection from several options, or where substitutions are authorized, coordinate clearance and other interface requirements with mechanical and other work.

###### 1. Provide necessary additional items so that selected or substituted item operates properly and properly fits in the available space.

###### 2. Cost from other trades related to an approved substitution will be charged to the contractor responsible for providing the substituted product. The exception would be:

- a. The extra costs from other trades had been accepted, in writing, by the General Contractor and not passed on to the Owner.
- b. The extra costs from other trades had been authorized in writing by the Owner, Engineer or Architect.

###### 3. Minimum submission information that is required for a product to be considered for substitution.

- a. Original product specification.
- b. Substitute product specification with point by point comparison.
- c. References for the substituted product.
- d. Effect on design.

- e. Effect on other trades.
- f. Effect on clearances.
- g. Reason for not providing specified item.
- h. Is there an additive or credit cost to the project associated with the substituted product.
- i. Is there an additive or credit to the schedule associated with the substituted product.

D. Existing Conditions:

- 1. Inspect existing conditions prior to bidding.
- 2. Provide proper coordination of mechanical work with existing work.

E. Utility Connections:

- 1. Coordinate the connection of mechanical system with utilities and services.
- 2. Comply with regulations of utility suppliers.
- 3. The Contract Documents indicate the available information on existing utilities and services, and on new services (if any) to be provided to the project by utility companies and agencies.
  - a. Notify Engineer immediately if discrepancies are found.
- 4. Coordinate mechanical utility interruptions with the Owner and the Utility Company.
  - a. Plan work so that duration of the interruption is kept to a minimum.

1.6 HVAC AND ELECTRICAL COORDINATION

A. Responsibility: Unless otherwise indicated, all motors and controls for Division 23 equipment shall be furnished, set in place and wired in accordance with the following schedule:

ITEM	Furnished Under Division	Set In Place Under Division	Power Wiring Under Division	Control Wiring Under Division
Equipment Motors	23	23	26	23
Starters/Contactors:				
Separate	26	26	26	23
Factory Mounted	23	23	26	23
In Motor Control Centers	26	26	26	23
Variable Speed Packages	23	23	26	23
Disconnect Switches	26	26	26	
Thermal Overload Switches	26	26	26	
Manual Operating Switches	26	26	26	
Control Relays - Separate	23	23	26	23

ITEM	Furnished Under Division	Set In Place Under Division	Power Wiring Under Division	Control Wiring Under Division
Control Relays - in Packaged Equipment	23	23	26	23
Control Transformers - Separate from Div. 26	26	23	26	23
Control Transformers - in Packaged Equipment	23	23	26	23
Time Switches	23	23	26	23
Thermostats - Separate	23	23	26	23
Thermostat and Controls: Integral with Equipment	23	23	26	23
Equipment in Temperature Control Panels	23	23	26	23
Valves, Dampers	23	23		
Valve Motors, Damper Motors, Solenoid, Valves, etc.	23	23	26	23
EP Switches, P.E. Switches, etc.	23	23	26	23
Smoke Detectors Including Relays for Fan Control	26	26	26	23
Boiler and Water Heaters	23	23	26	23
Boiler and Water Heater Lockable Electrical Disconnect	26	26	26	
Boiler and Water Heater Controls Disconnect	23	23		23

ITEM	Furnished Under Division	Set In Place Under Division	Power Wiring Under Division	Control Wiring Under Division
Smoke Controls - Dampers	23	23	26	26
Smoke Controls - Fans	23	23	26	26

- B. Control Wiring:
  - 1. Consists of wiring for valve and damper operators, and control circuits of contactors, starters, relays, sensing and communication systems.
  - 2. The coil voltage of starters, contactors and power relays provided under Division 26 is generally 120 volt in three phase systems, and line voltage (120 or 277 volt) in single phase systems. Co-ordinate with Division 26 contractor to ensure that control power voltage and coil voltage rating are the same.
  - 3. For single phase devices where power current passes through controller, wiring between controller and device shall be considered control wiring; wiring to device from electric panel shall be considered power wiring.

## 1.7 COORDINATION OF HVAC OPENINGS

- A. General:
  - 1. Coordinate all HVAC openings in walls, floors, roofs, and structural members with the Structural Engineer of Record and the appropriate structural contractor.
  - 2. Transmit all information relating to mechanical openings in a timely manner to avoid construction delays.
- B. Chases, Inserts and Openings:
  - 1. Provide measurements, drawings, and layouts so that openings, inserts and chases in new construction can be built in as construction progresses.
  - 2. Check sizes and locations of openings provided.
  - 3. Perform any cutting and patching made necessary by failure to provide measurements, drawings and layouts at the proper time at no additional cost to the Owner.
- C. Openings in Precast Concrete:
  - 1. Circular Openings: Core drill in the field after the element has been set in place.
    - a. Obtain approval of the structural engineer of precast element before drilling.
  - 2. Rectangular Openings: Saw cut in the field after the element has been set in place.
    - a. Obtain approval of the structural engineer of precast element before cutting.
    - b. Provide reinforcing as required by the structural engineer of precast element.
- D. Openings in Poured-In-Place Concrete:
  - 1. Circular Openings: Install sleeves or core drill in the field.
    - a. Obtain approval of the Structural Engineer of Record before drilling.
  - 2. Rectangular Openings: Provide block-outs or saw cut in the field.
    - a. Obtain approval of the Structural Engineer of Record before cutting.
    - b. Provide reinforcing as required by the Structural Engineer of Record.

## 1.8 COORDINATION WITH OTHER DIVISIONS

- A. General:

1. Coordinate the mechanical work to the progress of the work of other trades.
  2. Complete the entire installation as soon as the condition of the building will permit.
  3. Provide sufficient work crews so that delays are avoided.
- B. Cutting and Patching: Refer to Section 23 05 10.
- C. Support Dimensions:
1. Provide dimensions and drawings so that concrete bases and other equipment supports to be provided under other Sections of the Specifications can be built at the proper time.
  2. Coordinate the placement and hanging of HVAC items with the Structural Engineer of Record.

#### 1.9 COORDINATION WITH EXISTING OCCUPIED AREAS

- A. Minimize disruptions to operation of mechanical systems in occupied areas.
- B. Coordinate disruptions with the Owner.
- C. Provide temporary connections to prevent long disruptions.

#### 1.10 REGULATORY REQUIREMENTS

- A. Codes: Comply with current editions of the following:
  1. International Building Code.
  2. International Mechanical Code.
  3. International Plumbing Code.
  4. ASME CSD - 1 Code
  5. National Electric Code.
  6. Local Modifications to above Codes.
  7. ASME Boiler and Pressure Vessel Code.
  8. Life Safety Code NFPA 101.
  9. Applicable NFPA Pamphlets.
- B. Other Regulations: Comply with the following:
  1. Requirements of Utilities serving the project.
  2. Requirements of Fire Departments serving the project.
  3. Regulations of the Health Department having jurisdiction.
- C. Additional Regulations: Follow additional regulations which appear in individual Sections of these Specifications.
- D. Contradictions: Where Codes are contradictory, follow the most stringent, unless otherwise indicated in Plans or Specifications. Engineer shall determine which is most stringent.
- E. Contract Documents Not in Compliance:
  1. Where the Drawings and Specifications do not comply with the minimum requirements of the Codes, either notify the Engineer in writing during the Bidding Period of the revisions required to meet Code requirements, or provide an installation which complies with the Code requirements.
  2. Follow Drawings and Specifications where they are superior to Code requirements.

- F. Permits:
  - 1. Obtain and pay for all permits required by authorities and agencies having jurisdiction for the work of this Division.
  - 2. Post permits as required.
  
- G. Inspections and Tests:
  - 1. Arrange for all required inspections and tests.
  - 2. Pay all charges.
  - 3. Notify Engineer 48 hours before tests.
  - 4. Submit six copies for Owners records of permits, licenses, inspection reports and test reports.

#### 1.11 PROJECT RECORD DOCUMENTS

- A. General Recording Procedure:
  - 1. Maintain a white-print set of HVAC Contract Drawings in clean, undamaged condition, for mark-up of installations which vary substantially from the Contract Drawings.
  - 2. Record changes drawn to scale and fully dimensioned, in the following:
    - a. Work concealed behind or within other work, in an inaccessible arrangement.
    - b. Mains and branches of piping systems:
      - 1) with valves and control devices located and numbered.
      - 2) with concealed unions located.
      - 3) with items requiring maintenance located (traps, strainers, expansion compensators, tanks, etc).
    - c. Underground piping and ducts, both exterior and interior.
    - d. Ductwork layouts, including locations of coils, dampers, filters, boxes and similar units.
    - e. Concealed control system devices and sensors.
  
- B. Corrected Drawings:
  - 1. Procure AutoCAD files from the Engineer to use in preparing the record drawings.
  - 2. Transmit corrected drawings in AutoCAD version 14 or 2000 format as a submittal to the Engineer for Owner's use and record.

#### 1.12 OPERATING AND MAINTENANCE DATA

- A. Submission:
  - 1. Submit three typed and bound copies of Operating and Maintenance Manuals prior to scheduling systems demonstration for the Owner.
  - 2. Bind each Maintenance Manual in one or more vinyl covered, 3-ring binders, with pockets for folded drawings.
    - a. Mark the back spine and outside front cover of each binder with system identification and volume number.
  
- B. Requirement Contents:
  - 1. Provide index and tab dividers for each major equipment section to facilitate locating information on specific piece of equipment.
  - 2. Identify data within each section with drawing code numbers as they appear on Drawings and Specifications. Include as a minimum the following data:
    - a. Alphabetical list of system components, with the name, address and 24 hour telephone number of the company responsible for

- servicing each item during the first year of operation.
- b. Operating instructions for complete system including:
  - 1) Emergency procedures for fire and failure of major equipment.
  - 2) Major start, operation and shut-down procedures.
- c. Maintenance Instructions for each piece of equipment including:
  - 1) Equipment lists.
  - 2) Proper lubricants and lubricating instructions for each piece of equipment.
  - 3) Necessary cleaning, replacement and/or adjustment schedule.
  - 4) Product Data.
  - 5) Installation instructions.
  - 6) Parts lists.
  - 7) Complete wiring diagrams.
- d. Temperature control diagrams for package equipment (as-built).
- e. Marked or changed prints locating concealed parts and variations from the original system design.
- f. Balancing Report.

### 1.13 TEMPORARY FACILITIES

- A. Refer to Section 01 05 00 and associated sections - Temporary Facilities for specific requirements regarding temporary gas, water, sanitary, storm, heating, cooling and utilities during construction.

## PART - 2 PRODUCTS

### 2.1 PRODUCT UNIFORMITY

- A. Provide identical products for all those covered by the same specification.

### 2.2 GENERAL SUBMITTAL REQUIREMENTS

- A. Coordination and Sequencing:
  1. Coordinate submittals so that work will not be delayed by submittals.
  2. No extension of time will be allowed because of failure to properly coordinate and sequence submittals.
  3. Do not submit product data, or allow its use on the project, until compliance with requirements of Contract Documents has been confirmed by Contractor.
  4. Submittal is for information and record, unless otherwise indicated.
- B. Preparation of Submittals:
  1. Provide permanent marking on each submittal to identify specification, section number, use, project, date, Contractor, Subcontractor, submittal name and similar information to distinguish it from other submittals.
  2. Submittal data shall be OEM sheets or a premium quality first generation photo copy. Data that is of poor copy quality may be rejected at the discretion of the Engineer.
  3. Indicate any portions of work which deviate from the Contract Documents.



- a. Explain the reasons for the deviations.
  - b. Show how such deviations coordinate with interfacing portions of other work.
  - c. Show Contractor's executed review and approval marking.
  - d. Provide space for Engineer's "Action" marking.
4. Submittals which are received from sources other than through Contractor's office will be returned "Without Action".
- C. Quantities: Except as otherwise indicated, submit six copies.
- 1. Multiple System Items: Where a required submittal relates to an operational item of equipment used in more than one system, increase the number of final copies as necessary to complete the Maintenance Manuals for each system.
  - 2. Preliminary Submittal: Provide a preliminary, two-copy submittal for automatic temperature controls and when product data is required (or desired by Contractor) for selection of options by Engineer.
  - 3. General Distribution:
    - a. Provide additional distribution of submittals (not included in foregoing copy submittal requirements) to Subcontractors, Suppliers, Fabricators, Installers, Governing Authorities and others as necessary for proper performance of the work.
    - b. Include such additional copies in transmittal to Engineer where required to receive "Action" marking before final distribution.
      - 1) Show such distributions on transmittal forms.
- D. Response to Submittals: Where standard product data have been submitted, it is recognized:
- 1. That the Submitter has determined that the products fulfill the specified requirements.
  - 2. That the submittal is for the Engineer's information only, but will be returned with appropriate action where observed to be not in compliance with the requirements.

## 2.3 SPECIFIC CATEGORY SUBMITTAL REQUIREMENTS

- A. Manufacturer's Data:
- 1. Where pre-printed data covers more than one distinct product, size, type, material, trim, accessory group or other variation, mark submitted copy with black pen to indicate which of the variations is to be provided.
  - 2. Delete or mark-out significant portions of pre-printed data which are not applicable.
  - 3. Where operating ranges are shown, mark data to show portion of range required for project application.
    - a. For each product, include the following where applicable:
      - b. Sizes.
      - c. Weights.
      - d. Speeds.
      - e. Capacities.
      - f. Piping connection sizes and locations.
      - g. Statements of compliance with the required standards and regulations.
      - h. Performance data.
      - i. Manufacturer's specifications and installation instructions.

- B. Shop Drawings:
  - 1. Prepare Mechanical Shop Drawings, except diagrams, to accurate scale.
    - a. Show clearance dimensions at critical locations.
    - b. Show dimensions of spaces required for operation and maintenance.
    - c. Show interfaces with other work, including structural support.
- C. Test Reports:
  - 1. Submit test reports which have been signed and dated by the firm performing the test.
  - 2. Prepare test reports in the manner specified in the standard or regulation governing the test procedure (if any) as indicated.

## 2.4 COMPATIBILITY

- A. General: Provide products which are compatible with other products of the mechanical work, and with other work requiring interface with the mechanical work.
- B. Altitude Ratings: Except where noted otherwise, all ratings and capacities stated in the Contract Documents are at the altitude of the project not sea level.
- C. Fuel Characteristics:
  - 1. Review fuel characteristics with the Fuel Supplier designated by the Owner.
  - 2. Determine burner or combustion equipment provisions needed for optimum performance.
    - a. Provide equipment accordingly.
- D. Power Characteristics: Where power characteristics are not stated in Division 23 Sections, refer to the Sections of Division 26 and the Electrical Drawings for the power characteristics of each power driven item of mechanical equipment.

## 2.5 SAFETY PROVISIONS

- A. Equipment Nameplates: Provide power-operated mechanical equipment with a permanent nameplate attached by the manufacturer, indicating:
  - 1. The manufacturer.
  - 2. Product name.
  - 3. Model number.
  - 4. Serial number.
  - 5. Speed.
  - 6. Capacity.
  - 7. Power characteristics.
  - 8. Labels of testing, listing, or inspecting agencies.
  - 9. Other similar data.
- B. Guards:
  - 1. Unless equivalent guards are provided integral with the equipment, enclose each belt drive (including sheaves) on both sides in a galvanized, one inch, mesh screen of No. 18 gauge steel wire or expanded metal, fastened to an approved, structural steel frame, securely fastened to the equipment or floor.

2. Provide tachometer holes at shaft centers.
3. Unless equivalent guards are provided integral with the equipment, install a solid guard of No. 20 gauge galvanized steel over the coupling of each item of direct-driven equipment.
  - a. Sides are not required on these guards except to ensure rigidity.

## PART 3 - EXECUTION

### 3.1 WORK METHODS AND CONDITIONS

- A. Fulfill Contractor's responsibility for working conditions on the project.
  1. Ensure that no unsafe working conditions exist or unsafe methods are used.
  2. Engineer is not responsible for working conditions or methods.

### 3.2 COORDINATION OF HVAC INSTALLATION

- A. Inspection and Preparation:
  1. Examine the work interfacing with mechanical work, and the conditions under which the work will be performed and notify the Engineer of conditions detrimental to the proper completion of the work.
  2. Do not proceed with the work until unsatisfactory conditions have been corrected.
- B. Layout:
  1. Layout the mechanical work in conformity with the Contract Drawings, Coordination Drawings and other Shop Drawings, product data and similar requirements so that the entire mechanical plant will perform as an integrated system, properly interfaced with other work, recognizing that portions of the work are shown only in diagrammatic form.
  2. Where coordination requirements conflict with individual system requirements, comply with the Engineer's decision on resolution of the conflict.
  3. Take necessary field measurements to determine space and connection requirements.
  4. Provide sizes and shapes of equipment so the final installation conforms to the intent of the Contract Documents.
- C. Integrate mechanical work in ceiling spaces with suspension system, light fixtures and other work so that required performances of each will be achieved.

### 3.3 PRODUCT INSTALLATION

- A. Manufacturer's Instructions:
  1. Except where more stringent requirements are indicated, comply with the product manufacturer's instructions and recommendations.
  2. Consult with manufacturer's technical representatives, who are recognized as technical experts, for specific instructions on special project conditions.
  3. If a conflict exists, notify the Engineer in writing and obtain his instruction before proceeding with the work in question.
- B. Movement of Equipment:
  1. Wherever possible, arrange for the movement and positioning of equipment so that enclosing partitions, walls and roofs will not be

2. delayed or need to be removed.
  2. Otherwise, advise Contractor of opening requirements to be maintained for the subsequent entry of equipment.
- C. Heavy Equipment:
1. Provide shoring and bracing so that the building structure will not be overloaded during the movement and installation of heavy items.
  2. Where mechanical products to be installed on the roof are too heavy to be hand-carried, do not transport across the roof deck; position by crane or other device so as to avoid overloading the roof deck.
- D. Concrete for HVAC Work: Except as otherwise indicated, comply with applicable provisions of Division 03 Sections for whatever concrete work is necessary or shown specifically for installation of the mechanical work.
- E. Return Air Path: Coordinate mechanical work in return air plenum to avoid obstructing return air path.
1. Do not make changes in layout which will reduce critical return air paths.
  2. Report any obstructions by work of other Divisions to Engineer.
- F. Clearances:
1. Install piping and ductwork:
    - a. Straight and true.
    - b. Aligned with other work.
    - c. Close to walls and overhead structure (allowing for insulation).
    - d. Concealed, where possible, in occupied spaces.
    - e. Out-of-the-way with maximum passageway and headroom remaining in each space.
  2. Do not obstruct windows, doors or other openings.
  3. Give the right-of-way to piping systems required to slope for drainage (over other service lines and ductwork).
- G. Access:
1. Provide for removal, without damage to other parts, of:
    - a. Coils.
    - b. Tube bundles.
    - c. Tubes.
    - d. Shafts.
    - e. Fan wheels.
    - f. Drives.
    - g. Filters.
    - h. Strainers.
    - i. Bearings.
    - j. Other parts requiring periodic replacement or maintenance.
  2. Connect equipment for ease of disconnecting with minimum of interference with other work.
  3. Provide unions where required.
  4. Locate operating and control equipment and devices for easy access.
  5. Furnish all required access panels for installation by others in inaccessible construction where HVAC equipment and valves are concealed by finishes and similar work.
  6. Provide access panels in fire rated assemblies with equal fire rating.

- H. Protection of Work:
  - 1. All pipe ends, valves, ducts and equipment left unconnected shall be capped, plugged or otherwise properly protected to prevent damage or the intrusion of foreign matter.
  - 2. Do not allow any fans in the HVAC system to operate before the area served by the fan has been cleaned and vacuumed of all debris and dust which might enter the system.

#### 3.4 DEMONSTRATION

- A. Conduct a day walk-through of the project.
  - 1. Demonstrate that each system operates properly.
  - 2. Explain the operation of each system to the Owner's Representative.
- B. Date and time of walk-through will be determined by General Contractor/Owner.

END OF SECTION



## SECTION 23 05 29

### HANGERS AND SUPPORTS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. This Section includes hangers and supports for mechanical system piping and equipment.
- B. See Division 15 Section "Noise and Vibration Control" for vibration isolation supports and hangers.

##### 1.02 DEFINITIONS

- A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

##### 1.03 PERFORMANCE REQUIREMENTS

- A. Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design heavy-duty steel trapezes for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

##### 1.04 SUBMITTALS

- A. Product Data: For each type of pipe hanger, channel support system component, and thermal-hanger shield insert.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer for multiple piping supports and trapeze hangers.

##### 1.05 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

#### PART 2 PRODUCTS

##### 2.01 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

##### 2.02 MANUFACTURED UNITS

- A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components.
  - 1. Manufacturers:
    - a. AAA Technology and Specialties Co., Inc.

- b. B-Line Systems, Inc.
  - c. Carpenter & Patterson, Inc.
  - d. Empire Tool & Manufacturing Co., Inc.
  - e. Globe Pipe Hanger Products, Inc.
  - f. Grinnell Corp.
  - g. GS Metals Corp.
  - h. Michigan Hanger Co., Inc.
  - i. National Pipe Hanger Corp.
  - j. PHD Manufacturing, Inc.
  - k. PHS Industries, Inc.
  - l. Piping Technology & Products, Inc.
2. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
  3. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.
1. Manufacturers:
    - a. B-Line Systems, Inc.
    - b. Grinnell Corp.
    - c. GS Metals Corp.
    - d. Michigan Hanger Co., Inc.
    - e. National Pipe Hanger Corp.
    - f. Thomas & Betts Corp.
    - g. Unistrut Corp.
    - h. Wesanco, Inc.
  2. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
  3. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- C. Thermal-Hanger Shield Inserts: 100-psi (690-kPa) minimum compressive-strength insulation, encased in sheet metal shield.
1. Manufacturers:
    - a. Carpenter & Patterson, Inc.
    - b. Michigan Hanger Co., Inc.
    - c. PHS Industries, Inc.
    - d. Pipe Shields, Inc.
    - e. Rilco Manufacturing Co., Inc.
    - f. Value Engineered Products, Inc.
  2. Material for Cold Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.
  3. Material for Hot Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate.
  4. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.
  5. For Clevis or Band Hanger: Insert and shield cover lower 180 deg rees of pipe.
  6. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

### **2.03 MISCELLANEOUS MATERIALS**

- A. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- C. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.



- D. Grout: ASTM C 1107, Grade B, factory-mixed and -packaged, nonshrink and nonmetallic, dry, hydraulic-cement grout.
  - 1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
  - 2. Properties: Nonstaining, noncorrosive, and nongaseous.
  - 3. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

## **PART 3 EXECUTION**

### **3.01 APPLICATIONS**

- A. Specific hanger requirements are specified in Sections specifying equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.
- C. 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 (DN 15 to DN 750).
  - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN 100 to DN 400), requiring up to 4 inches (100 mm) of insulation.
  - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
  - 4. Adjustable Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
  - 5. U-Bolts (MSS Type 24): For support of heavy pipe, NPS 1/2 to NPS 30 (DN 15 to DN 750).
  - 6. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.
  - 7. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 (DN 25 to DN 750), from 2 rods if longitudinal movement caused by expansion and contraction might occur.
  - 8. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42 (DN 50 to DN 1050), if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- D. 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 (DN 20 to DN 500).
  - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.
- E. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
  - 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
  - 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
- F. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
  - 1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
  - 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction to attach to top flange of structural shape.

3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
  6. C-Clamps (MSS Type 23): For structural shapes.
  7. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    - a. Light (MSS Type 31): 750 lb (340 kg).
    - b. Medium (MSS Type 32): 1500 lb (675 kg).
    - c. Heavy (MSS Type 33): 3000 lb (1350 kg).
  8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
  9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- G. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
  2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.
  3. Thermal-Hanger Shield Inserts: For supporting insulated pipe, 360-degree insert of high-density, 100-psi (690-kPa) minimum compressive-strength, water-repellent-treated calcium silicate or cellular-glass pipe insulation, same thickness as adjoining insulation with vapor barrier and encased in 360-degree sheet metal shield.
- H. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
  2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
  3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.

### **3.02 INSTALLATION**

- A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems. Field assemble and install according to manufacturer's written instructions.
- C. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes. Support pipes of various sizes together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- D. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- E. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

- F. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.
- K. Insulated Piping: Comply with the following:
  - 1. Attach clamps and spacers to piping.
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    - c. Do not exceed pipe stress limits according to ASME B31.9.
  - 2. Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
  - 3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span arc of 180 deg rees.
  - 4. Shield Dimensions for Pipe: Not less than the following:
    - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
    - b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
    - c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
    - d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
    - e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
  - 5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.
  - 6. Insert Material: Length at least as long as protective shield.
  - 7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### **3.03 EQUIPMENT SUPPORTS**

- A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor. Place grout under supports for equipment and make smooth bearing surface.

### **3.04 METAL FABRICATION**

- A. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations. Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

### **3.05 ADJUSTING**

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

### **3.06 PAINTING**

- A. Touching Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm). See Division 9 for paint materials and application requirements.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

**END OF SECTION**

## **SECTION 23 07 00**

### **HVAC INSULATION**

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

##### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### **1.2 SUMMARY**

###### **A. Section Includes:**

- 1. Insulation Materials:
  - a. Mineral fiber.
- 2. Adhesives.
- 3. Mastics.

###### **B. Related Sections:**

- 1. Division 22 Section 22-07-00 "Plumbing Insulation."
- 2. Division 23 Section 23-07-00 "Metal Ducts" for duct liners.

##### **1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

##### **1.4 QUALITY ASSURANCE**

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

##### **1.5 COORDINATION**

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

##### **1.6 SCHEDULING**

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

### 2.1 INSULATION MATERIALS

- A. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- B. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- C. 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. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. CertainTeed Corp.; Duct Wrap.
    - b. Johns Manville; Microlite.
    - c. Knauf Insulation; Duct Wrap.
    - d. Manson Insulation Inc.; Alley Wrap.
    - e. Owens Corning; All-Service Duct Wrap.
- D. Mineral-Fiber, Preformed Pipe Insulation:
  - 1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Fibrex Insulations Inc.; Coreplus 1200.
    - b. Johns Manville; Micro-Lok.
    - c. Knauf Insulation; 1000 Pipe Insulation.
    - d. Manson Insulation Inc.; Alley-K.
    - e. Owens Corning; Fiberglas Pipe Insulation.
  - 2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

### 2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Calcium Silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 to 800 deg F.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Childers Products, Division of ITW; CP-97.
    - b. Foster Products Corporation, H. B. Fuller Company; 81-27/81-93.

- c. Marathon Industries, Inc.; 290.
  - d. Mon-Eco Industries, Inc.; 22-30.
  - e. Vimasco Corporation; 760.
- C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Aeroflex USA Inc.; Aero seal.
    - b. Armacell LCC; 520 Adhesive.
    - c. Foster Products Corporation, H. B. Fuller Company; 85-75.
    - d. RBX Corporation; Rubatex Contact Adhesive.
- D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Childers Products, Division of ITW; CP-82.
    - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
    - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
    - d. Marathon Industries, Inc.; 225.
    - e. Mon-Eco Industries, Inc.; 22-25.

## 2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Childers Products, Division of ITW; CP-35.
    - b. Foster Products Corporation, H. B. Fuller Company; 30-90.
    - c. ITW TACC, Division of Illinois Tool Works; CB-50.
    - d. Marathon Industries, Inc.; 590.
    - e. Mon-Eco Industries, Inc.; 55-40.
    - f. Vimasco Corporation; 749.
  - 2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
  - 3. Service Temperature Range: Minus 20 to plus 180 deg F.
  - 4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
  - 5. Color: White.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
  - 1. Verify that systems and equipment to be insulated have been tested and are free of defects.
  - 2. Verify that surfaces to be insulated are clean and dry.
  - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply corrosion coating to insulated surfaces as follows:
  - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
  - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F. with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.



- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.
  - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
  - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
    - a. For below ambient services, apply vapor-barrier mastic over staples.
  - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
  - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above ambient services, do not install insulation to the following:
  - 1. Vibration-control devices.
  - 2. Testing agency labels and stamps.
  - 3. Nameplates and data plates.

4. Manholes.
5. Handholes.
6. Cleanouts.

### 3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
  1. Seal penetrations with flashing sealant.
  2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
  4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
  1. Seal penetrations with flashing sealant.
  2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
  4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

### 3.5 MINERAL-FIBER INSULATION INSTALLATION

- A. Insulation Installation on Straight Pipes and Tubes:
  1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
  2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
  3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
  4. 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.
- B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

E. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
  - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
  - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
  - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
  - d. Do not overcompress insulation during installation.
  - e. Impale insulation over pins and attach speed washers.
  - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of

insulation segment. Secure laps to adjacent insulation section with 1/2- inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory-or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

- a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
  - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.
5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
  6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
  7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

### 3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
  1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
  2. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.

### 3.7 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
  1. Indoor, concealed supply and outdoor air.
  2. Indoor, exposed supply and outdoor air.
  3. Indoor, concealed return located in nonconditioned space.
  4. Indoor, exposed return located in nonconditioned space.
  5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
- B. Items Not Insulated:
  1. Fibrous-glass ducts.

2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

### 3.8 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, round and flat-oval, supply-air duct insulation shall be the following:
  1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- B. Concealed, rectangular, supply-air duct insulation shall be the following:
  1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- C. Concealed, rectangular, return-air duct insulation shall be the following:
  1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- D. Concealed, rectangular, exhaust-air duct insulation between isolation damper and penetration of building exterior shall be the following:
  1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

END OF SECTION



## SECTION 23 31 13

### METAL DUCTS

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### 1.02 SUMMARY

###### A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Duct liner.
4. Sealants and gaskets.

###### B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

##### 1.03 SUBMITTALS

###### A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

##### 1.04 QUALITY ASSURANCE

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6.4.4 - "HVAC System Construction and Insulation."

#### PART 2 - PRODUCTS

##### 2.01 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved,

duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

## 2.02 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Lindab Inc.
    - b. McGill AirFlow LLC.
    - c. SEMCO Incorporated.
    - d. Sheet Metal Connectors, Inc.
    - e. Spiral Manufacturing Co., Inc.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 1. Transverse Joints in Ducts Larger Than **60 Inches** in Diameter: Flanged.
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 1. Fabricate round ducts larger than **90 inches** in diameter with butt-welded longitudinal seams.
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."



## 2.03 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: **G60**.
  - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
  - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- D. Tie Rods: Galvanized steel, **1/4-inch** minimum diameter for lengths **36 inches** or less; **3/8-inch** minimum diameter for lengths longer than **36 inches**.

## 2.04 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
  - 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. CertainTeed Corporation; Insulation Group.
    - b. Johns Manville.
    - c. Knauf Insulation.
    - d. Owens Corning.
  - 2. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
    - a. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."
  - 1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
  - 2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
  - 3. Butt transverse joints without gaps, and coat joint with adhesive.
  - 4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
  - a. Fan discharges.
  - b. Intervals of lined duct preceding unlined duct.
  - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
  - a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

## 2.05 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

## PART 3 - EXECUTION

### 3.01 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

### 3.02 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

### 3.03 DUCT SEALING

- A. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
  - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 2. Unconditioned Space, Supply-Air Ducts in Pressure Classes **2-Inch wg** and Lower: Seal Class B.
  - 3. Unconditioned Space, Exhaust Ducts: Seal Class C.
  - 4. Unconditioned Space, Return-Air Ducts: Seal Class C.
  - 5. Conditioned Space, Supply-Air Ducts in Pressure Classes **2-Inch wg** and Lower: Seal Class C.
  - 6. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than **2-Inch wg**: Seal Class B.
  - 7. Conditioned Space, Exhaust Ducts: Seal Class C.
  - 8. Conditioned Space, Return-Air Ducts: Seal Class C.

### 3.04 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

### 3.05 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
  - 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual."
- C. Duct System Cleanliness Tests:
  - 1. Visually inspect duct system to ensure that no visible contaminants are present.

2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness.

### 3.06 START UP

- A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

### 3.07 DUCT SCHEDULE

#### A. Supply Ducts:

1. Ducts Connected to Fan Coil Units, and Terminal Units:
  - a. Pressure Class: Positive **2-inch wg**.
  - b. Minimum SMACNA Seal Class: C.
  - c. SMACNA Leakage Class for Rectangular: 24.
2. Ducts Connected to Variable-Air-Volume Air-Handling Units:
  - a. Pressure Class: Positive **3-inch wg**.
  - b. Minimum SMACNA Seal Class: B.
  - c. SMACNA Leakage Class for Rectangular: 3.

#### B. Return Ducts:

1. Ducts Connected to Fan Coil Units, and Terminal Units:
  - a. Pressure Class: Positive or negative **2-inch wg**.
  - b. Minimum SMACNA Seal Class: C.
  - c. SMACNA Leakage Class for Rectangular: 24.
2. Ducts Connected to Air-Handling Units:
  - a. Pressure Class: Positive or negative **2-inch wg**.
  - b. Minimum SMACNA Seal Class: C.
  - c. SMACNA Leakage Class for Rectangular: 24.

#### C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
  - a. Pressure Class: Negative **1-inch wg**.
  - b. Minimum SMACNA Seal Class: C if negative pressure, and A if positive pressure.
  - c. SMACNA Leakage Class for Rectangular: 24.

#### D. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
  - a. Velocity **1000 fpm** or Lower:
    - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
    - 2) Mitered Type RE 4 without vanes.
  - b. Velocity **1000 to 1500 fpm**:
    - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
    - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
    - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
  - c. Velocity **1500 fpm** or Higher:

- 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
  - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
  - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
    - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
    - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
    - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
  3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."
    - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
      - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
      - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
      - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
      - 4) Radius-to Diameter Ratio: 1.5.
    - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
    - c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

#### E. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."
  - a. Rectangular Main to Rectangular Branch: 45-degree entry.
  - b. Rectangular Main to Round Branch: Spin in.
2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.
  - a. Velocity 1000 fpm or Lower: 90-degree tap.
  - b. Velocity 1000 to 1500 fpm: Conical tap.
  - c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION

## SECTION 23 33 00

### AIR DUCT ACCESSORIES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Section Includes:
  - 1. Backdraft and pressure relief dampers.
  - 2. Manual volume dampers.
  - 3. Turning vanes.
  - 4. Flexible connectors.

##### 1.3 SUBMITTALS

- A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

##### 1.4 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with AMCA 500-D testing for damper rating.

#### PART 2 - PRODUCTS

##### 2.1 MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: G60(Z180).
  - 2. Exposed-Surface Finish: Mill phosphatized.
- C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- D. Tie Rods: Galvanized steel, **1/4-inch** minimum diameter for lengths **36 inches** or less; **3/8-inch** minimum diameter for lengths longer than **36 inches**.

## 2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Air Balance Inc.; a division of Mestek, Inc.
  - 2. American Warming and Ventilating; a division of Mestek, Inc.
  - 3. Cesco Products; a division of Mestek, Inc.
  - 4. Duro Dyne Inc.
  - 5. Greenheck Fan Corporation.
  - 6. Lloyd Industries, Inc.
  - 7. Nailor Industries Inc.
  - 8. NCA Manufacturing, Inc.
  - 9. Pottorff; a division of PCI Industries, Inc.
  - 10. Ruskin Company.
  - 11. SEMCO Incorporated.
  - 12. Vent Products Company, Inc.
- B. Description: Gravity balanced.
- C. Maximum Air Velocity: **2000 fpm**.
- D. Maximum System Pressure: **1-inch wg**.
- E. Frame: **0.052-inch-** thick, galvanized sheet steel.
- F. Blades: Multiple single-piece blades, center-pivoted, maximum **6-inch** width, **0.025-inch-** thick, roll-formed aluminum with sealed edges.
- G. Blade Action: Parallel.
- H. Blade Seals: Neoprene, mechanically locked.
- I. Blade Axles:



1. Material: Nonferrous metal.
  2. Diameter: **0.20 inch**.
- J. Tie Bars and Brackets: Aluminum.
- K. Return Spring: Adjustable tension.
- L. Bearings: Steel ball or synthetic pivot bushings.
- M. Accessories:
1. Adjustment device to permit setting for varying differential static pressure.
  2. Counterweights and spring-assist kits for vertical airflow installations.
  3. Electric actuators.
  4. Chain pulls.
  5. Screen Material: Galvanized steel.
  6. Screen Type: Bird.
  7. 90-degree stops.

## 2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
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. Air Balance Inc.; a division of Mestek, Inc.
    - b. American Warming and Ventilating; a division of Mestek, Inc.
    - c. Flexmaster U.S.A., Inc.
    - d. McGill AirFlow LLC.
    - e. METALAIRE, Inc.
    - f. Nailor Industries Inc.
    - g. Pottorff; a division of PCI Industries, Inc.
    - h. Ruskin Company.
    - i. Trox USA Inc.
    - j. Vent Products Company, Inc.
  2. Standard leakage rating, with linkage outside airstream.
  3. Suitable for horizontal or vertical applications.
  4. Frames:
    - a. Hat-shaped, galvanized-steel channels, **0.064-inch** minimum thickness.
    - b. Mitered and welded corners.
    - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
  5. Blades:

- a. Multiple or single blade.
  - b. Parallel- or opposed-blade design.
  - c. Stiffen damper blades for stability.
  - d. Galvanized-steel, 0.064 inch thick.
6. Blade Axles: Galvanized steel.
7. Bearings:
- a. Oil-impregnated bronze.
  - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Tie Bars and Brackets: Galvanized steel.
- B. Low-Leakage, Steel, Manual Volume Dampers:
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. Air Balance Inc.; a division of Mestek, Inc.
  - b. American Warming and Ventilating; a division of Mestek, Inc.
  - c. Flexmaster U.S.A., Inc.
  - d. McGill AirFlow LLC.
  - e. METALAIRE, Inc.
  - f. Nailor Industries Inc.
  - g. Pottorff; a division of PCI Industries, Inc.
  - h. Ruskin Company.
  - i. Trox USA Inc.
  - j. Vent Products Company, Inc.
2. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
3. Suitable for horizontal or vertical applications.
4. Frames:
- a. Hat shaped.
  - b. Galvanized-steel channels, 0.064 inch thick.
  - c. Mitered and welded corners.
  - d. Flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
- a. Multiple or single blade.
  - b. Parallel- or opposed-blade design.
  - c. Stiffen damper blades for stability.
  - d. Galvanized, roll-formed steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel.
7. Bearings:
  - a. Oil-impregnated bronze.
  - b. Dampers in ducts with pressure classes of **3-inch wg** or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Blade Seals: Neoprene.
9. Jamb Seals: Cambered aluminum.
10. Tie Bars and Brackets: Galvanized steel.
11. Accessories:
  - a. Include locking device to hold single-blade dampers in a fixed position without vibration.

C. Jackshaft:

1. Size: **1-inch** diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

D. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of **3/32-inch-** thick zinc-plated steel, and a **3/4-inch** hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

## 2.4 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Ductmate Industries, Inc.
  2. Duro Dyne Inc.
  3. METALAIRE, Inc.
  4. SEMCO Incorporated.
  5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vaness and Vane Runners," and 2-4, "Vane Support in Elbows."

- C. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

## 2.5 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Ductmate Industries, Inc.
  - 2. Duro Dyne Inc.
  - 3. Ventfabrics, Inc.
  - 4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
  - 1. Minimum Weight: 26 oz./sq. yd..
  - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
  - 3. Service Temperature: Minus 40 to plus 200 deg F.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install control dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
  - 1. Install steel volume dampers in steel ducts.
  - 2. Install aluminum volume dampers in aluminum ducts.

- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G.
- H. Install flexible connectors to connect ducts to equipment.
- I. For fans developing static pressures of **5-inch wg** and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- J. Install duct test holes where required for testing and balancing purposes.

END OF SECTION



## SECTION 23 34 23

### HVAC POWER VENTILATORS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Centrifugal roof ventilators.

##### 1.3 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base fan-performance ratings on 6100feet in elevation.
- B. Operating Limits: Classify according to AMCA 99.

##### 1.4 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
  - 1. Certified fan performance curves with system operating conditions indicated.
  - 2. Certified fan sound-power ratings.
  - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
  - 4. Material thickness and finishes, including color charts.
  - 5. Dampers, including housings, linkages, and operators.
  - 6. Roof curbs.
  - 7. Fan speed controllers.
- B. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

##### 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.
- C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
- D. UL Standard: Power ventilators shall comply with UL 705.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.
- B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.

## PART 2 - PRODUCTS

### 2.1 CENTRIFUGAL ROOF VENTILATORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Panasonic.
  - 2. Greenheck.
  - 3. Loren Cook Company.
- B. Description: Direct- or belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.
- C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.
- D. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:
  - 1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
  - 2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
  - 3. Pulleys: Cast-iron, adjustable-pitch motor pulley.
  - 4. Fan and motor isolated from exhaust airstream.
- E. Roof Curbs: Galvanized steel; mitered and welded corners; **1-1/2-inch**- thick, rigid, fiberglass insulation adhered to inside walls; and **1-1/2-inch** wood nailer. Size as required to suit roof opening and fan base.

### 2.2 CEILING-MOUNTING VENTILATORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:



1. Broan Mfg. Co., Inc.
  2. Carnes Company HVAC.
  3. Dayton Electric Manufacturing Co.; a division of W. W. Grainger, Inc.
  4. FloAire.
  5. Greenheck.
  6. JencoFan; Div. of Breidert Air Products.
  7. Loren Cook Company.
  8. NuTone Inc.
  9. Penn Ventilation.
- B. Description: Centrifugal fans designed for installing in ceiling or wall or for concealed in-line applications.
- C. Housing: Steel, lined with acoustical insulation.
- D. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.
- E. Grille: Plastic, louvered grille with flange on intake and thumbscrew attachment to fan housing.
- F. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 07 Section "Roof Accessories" for installation of roof curbs.
- C. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

#### 3.2 CONNECTIONS

- A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

### 3.3 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
  - 1. Verify that shipping, blocking, and bracing are removed.
  - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
  - 3. Verify that cleaning and adjusting are complete.
  - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
  - 5. Adjust belt tension.
  - 6. Adjust damper linkages for proper damper operation.
  - 7. Verify lubrication for bearings and other moving parts.
  - 8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
  - 9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
  - 10. Shut unit down and reconnect automatic temperature-control operators.
  - 11. Remove and replace malfunctioning units and retest as specified above.
- B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

### 3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
- D. Replace fan and motor pulleys as required to achieve design airflow.
- E. Lubricate bearings.

**END OF SECTION 23-34-23**

## SECTION 23 37 13

### DIFFUSERS, REGISTERS, AND GRILLES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

###### A. Section Includes:

1. Rectangular and square ceiling diffusers.
2. Louver face diffusers.
3. Under floor diffusers.

###### B. Related Sections:

1. Division 08 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

##### 1.3 SUBMITTALS

###### A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

- B. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

#### PART 2 - PRODUCTS

##### 2.1 CEILING DIFFUSERS

- A. Rectangular and Square Ceiling Diffusers:

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. Hart & Cooley
  - b. Price Industries.
  - c. Titus.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel.
4. Finish: Baked enamel, white.
5. Face Size: 24 by 24 inches (600 by 600 mm).
6. Face Style: Four cone.
7. Mounting: T-bar.
8. Pattern: Adjustable.

B. Louver Face Diffuser:

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. Krueger
  - b. Price Industries.
  - c. Titus.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel.
4. Finish: Baked enamel, white.
5. Mounting: T-bar.
6. Pattern: Two-way.

## 2.2 UNDERFLOOR AIR DISTRIBUTION DIFFUSERS

A. Round Induction Diffusers:

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. Krueger.
  - b. Price Industries.
  - c. Titus.
2. Airflow Principle: Swirl-pattern induction.
3. Material: Plastic, high impact, and resistant to cart and foot traffic.
4. Color: Gray.
5. Components:
  - a. Diffuser core.
  - b. Flow regulator.
  - c. Dirt and liquid catch pan.
  - d. Spacer flange.

- e. Gasketed, underfloor compression ring.

B. Linear Floor Diffuser Plenums:

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. Krueger.
  - b. Price Industries.
  - c. Titus.
2. Material: Steel.
3. Finish: White baked acrylic.
4. Deflection: 15 degrees.
5. Components:
  - a. Aluminum diffuser core.
  - b. Diffuser frame.
  - c. Plenum, 0.034-inch (0.85-mm) steel.

## 2.3 REGISTERS AND GRILLES

A. Adjustable Bar Grille:

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. Krueger.
  - b. Price Industries.
  - c. Titus.
2. Material: Steel Aluminum.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Horizontal] [Vertical] spaced [3 inches (76 mm)] [1-1/2 inches (38 mm)] [3/4 inch (19 mm)] [1/2 inch (13 mm)] apart.
5. Core Construction: [Integral] [Removable].

B. Fixed Face Grille:

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. Krueger.
  - b. Price Industries.
  - c. Titus.
2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face Arrangement: 1/2-by-1/2-by-1/2-inch (13-by-13-by-13-mm) grid.
5. Core Construction: Integral.

6. Frame: 1-1/4 inches (32 mm) wide.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 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. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

#### 3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

## SECTION 23 74 13

### AIR HANDLER SPLIT SYSTEMS

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Hydronic Air Handler.
- B. 13 Seer Condensing Units.

##### 1.02 RELATED SECTIONS

- A. Section 15250 -- Ductwork Insulation.

##### 1.03 REFERENCES

- A. ANSI/Z223.1 (NFPA 54) -- National Fuel Gas Code.

##### 1.04 SUBMITTALS

- A. Submit drawings indicating components, assembly, dimensions, weights, required clearances, location and size of field connections.
- B. Submit product data indicating capacities, weights, specialties, accessories, electrical requirements and a wiring diagram.
- C. Submit schedule of equipment typically indicating sizes and number of units, including capacity data.
- D. Submit Manufacturer's Installation Instructions. Indicate rigging, assembly, and installation instructions.

##### 1.05 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data
- B. Include manufacturer's descriptive literature, operating instructions, maintenance instruction and unit parts.

##### 1.06 WARRANTY

- A. Provide one year manufacturer's parts warranty. Provide ten year manufacturer's parts warranty for the heat exchanger. Provide five year manufacturer's parts warranty for the compressors.

#### PART 2 PRODUCTS

##### 2.01 HYDRONIC AIR HANDLER

- A. Manufacturers:
  - 1. AirMark.
- B. Units:
  - 1. Units shall be completely factory assembled, piped wired and tested.
  - 2. Factory installed heating hydronic heating coil with low flow, high head circulating pump designed to work with Rinnai's tankless water heater.

3. All units shall be UL certified for electrical safety in compliance with UL 1995 safety standard for heating, ventilating and cooling equipment.
  4. The fan section shall contain supply fan, fan motor, and one inch filter.
  5. Electrical junction box.
  6. Provide insulated heavy gauge steel cabinet construction with baked on enamel finish.
  7. Factory mounted control for heating cooling control.
- C. Air Handling:
1. Centrifugal fan shall be direct drive, forward curved, statically and dynamically balanced with double inlet.
  2. Provide a multispeed motor that will switch speeds on demand from system thermostat.
  3. Provide a blower door safety switch to terminate and prevent furnace operation when the blower door is removed.
- D. Hydronic Heating Coil:
1. Serpentine copper tube coil with aluminum fins.
- E. Circulating Pump:
1. All bronze construction.
  2. Factory mounted and wired.
  3. Cartridge type, replaceable including seals.
- F. Filter shall be one-inch Throwaway type and shall be easily removable.
- G. Controls:
1. A 24-volt transformer.
  2. Integrated system control shall total control of air handler sensors, blowers, fan and pump, flame control and self diagnostics.
- H. Operating Controls
1. Room thermostat shall be low voltage, single-stage to control burner operation, to maintain temperature setting. Include fan control switch auto-on.

## **2.02 Condensing Unit and Cased Coil**

- A. Manufacturers:
1. Carrier.
  2. Trane.
- B. Units:
1. Units shall be completely factory assembled, wired and tested.
  2. Unit to ship fully charged from the factory with R-410.
  3. Unit to be designed for operation at ambient temperatures as high at 115 degrees F.
  4. Unit to be UL listed.
- C. Performance Ratings: Unit shall have a nominal efficiency rating of 16 SEER.
- D. Unit casing to be constructed of heavy gauge, galvanized steel and painted with a weather-resistant powder paint.
- E. Compressor:
1. Provide an internal over temperature and pressure protection device.
  2. Provide total dipped hermetic motor and thermostatically controlled sump heater.
  3. Provide a centrifugal oil pump.
  4. Provide a liquid line filter drier



- F. Condenser Coil:
  - 1. Provide 3/8" OD seamless aluminum glued continuous aluminum fin.
  - 2. Coils to be lab tested to withstand 2,000 pounds of pressure per square inch.
  - 3. Coil to be protected on all four sides by louvered panels.
- G. Low Ambient Cooling:
  - 1. Evaporator Defrost Controller for operation to 40°F.
- H. Controls:
  - 1. A 24-volt transformer and high limit shall be provided.
- I. Cased DX Coil
  - 1. Provide a cased DX Coil to match the width of the furnace.
  - 2. Provide a flow control/check valve assembly.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that the space is ready for installation of units and openings are as indicated on submittal drawings.
- B. Verify that proper power supply is available.
- C. Verify refrigerant line set and length and size per manufacturer's requirement for each specific installation.

#### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install to NFPA 90A.
- C. Install devices furnished by manufacturer but not factory mounted. Furnish copy of manufacturers wiring diagram, and sequence of controls.

**END OF SECTION**



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for  
UPLAND TOWNHOMES

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SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01 GENERAL

- A. Provisions of the General Conditions, Supplementary Conditions and Division 1 - General Requirements, and applicable provisions elsewhere in the Contract Documents apply to the work of Division 26 - Electrical.
- B. Articles contained in this section apply to all Division 26 Sections.
- C. New materials and equipment shall be approved and labeled or listed by Underwriters Laboratories or an equivalent testing facility wherever such labels or listings are available.

1.02 SUMMARY OF WORK

- A. Work Included: Unless specified otherwise, provide all labor, materials and equipment necessary for completely finished and operational systems. Provide all minor incidental items such as offsets, fittings, etc. required as part of the work even though not specified or indicated.
- B. Description of Systems: The work of Division 26 includes but is not limited to:
  - 1. Service and Power Distribution
  - 2. Interior and Exterior Lighting
- C. Related Requirements:
  - 1. General Requirements: Division 1 - All Sections
  - 2. Division 26: All Sections
  - 3. Mechanical and Electrical Coordination: Section 23 05 00.
- D. Work Under Other Divisions:
  - 1. Painting Except Electrical Identification Systems: Section 09 91 00.
  - 2. Wall Openings and Chases: Under the applicable Division according to information furnished under Division 26.
  - 3. Fixed Concrete Bases for Electrical Equipment: Section 03 30 00. Anchor bolts, setting diagrams, base size and other required information furnished under Division 26.
- E. Examination: Examine work preceding or interfacing with the work of Division 26 Sections and report any known or observed defects that affect the work to the General Contractor. Do not proceed with the work until the defects are corrected. No waiver of responsibility for defective work will be allowed due to failure to report unfavorable conditions affecting the work.
- F. Existing Utilities: Are indicated as accurately as possible on the Drawings. Work on utilities encountered and not indicated on the Drawings will be directed by change order

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after being brought to the attention of the Architect. Close openings and repair damage in an acceptable manner to utilities encountered.

1.03 COORDINATION

- A. General: Coordinate and order the progress of Electrical work to conform to the progress of the work of the other trades. Complete the entire installation as soon as the condition of the building will permit.
- B. Installation Procedures: Confer and cooperate with other trades and coordinate the work in proper relation with theirs. Coordinate ceiling cavity space carefully with other trades.
- C. Coordination with Mechanical Work: Section 23 05 00.
- D. Utility Interruptions: Coordinate electric utility interruptions with the Owner and Utility Company. Plan work so that duration of the interruption is kept to a minimum.
- E. Cutting and Patching: Section 26 05 10.
- F. Drawings and Specifications: The Drawings and Specifications are complementary; what is called for in either of these is binding as though called for by both. The Electrical Drawings indicate the general design and arrangement of lines, equipment, systems, etc. Information shown is diagrammatic in character and does not necessarily indicate every required offset, fitting, etc. Do not scale Drawings for dimensions. Take dimensions, locations, levels, etc. from Architectural Drawings and equipment to be furnished. No extra compensation will be allowed on account of differences between actual dimensions and those indicated on the Drawings.
- G. Discrepancies:
  - 1. Examine Drawings and Specifications for other parts of the work, and if any discrepancies occur between the plans for the work of this Division and the plans for the work of others, report such discrepancies to the General Contractor and obtain written instructions for any changes necessary.
  - 2. Make changes, at no additional cost to the Owner, to the work of Division 26 made necessary by the failure or neglect to report such discrepancies. However, it is not the intent of the Specifications that the Contractor be responsible for the correct design of the electrical system.
- H. Order of Precedence: The precedence of electrical construction documents is as follows:
  - 1. Addenda and modifications to the Drawings and Specifications take precedence over the original Drawings and Specifications.
  - 2. Should there be a conflict within the Specifications or with Drawings of the same scale, the more stringent or higher quality requirement shall apply.
  - 3. In the Drawings, the precedence shall be Drawings of larger scale over those of smaller scale, figured dimensions over scaled dimensions and noted material over graphic indications.
  - 4. Should a conflict arise between the Drawings and the Specifications, the

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Specifications shall have precedence.

5. Should there be a conflict in the dimensions or locations between Electrical Drawings and Architectural Drawings, the Architectural Drawings shall have precedence.

1.04 SUBMITTALS

- A. Submit samples, shop drawings and product data as required by various sections of Division 26 in accordance with Section 01 33 23. Make submittals to Architect. Do not make submittals directly to Engineer. Include one additional copy above the requirements of Section 01 33 23.

1.05 QUALITY ASSURANCE

- A. Preparation: Base final installation of materials and equipment on actual dimensions and conditions at the project site. Field measure for materials or equipment requiring exact fit.
- B. Workmanship: Perform work in accordance with good commercial practice. The good appearance of finished work shall be of equal importance with its mechanical efficiency.
- C. Supervision: Be responsible for and coordinate the work of all sub-contractors working under Division 26.
- D. Properly locate anchors chases, recesses and openings required for the proper installation of the work. Arrange with the proper contractors for the building of anchors, etc. and for the leaving of the required chases, recesses and openings.
- E. Install equipment and material in accordance with manufacturer=s instructions unless specifically indicated otherwise, or where local codes or regulations take precedence.

1.06 REGULATORY REQUIREMENTS

- A. Pay for permit and inspection fee costs applicable to work of Division 26.
- B. Comply with State and local requirements and ordinances. Comply with requirements of the Utility Companies. Call for inspections required by local building inspection authority. Submit certificate of occupancy or final acceptance by inspection authority.
- C. Applicable Building Codes and Ordinances: Including but not limited to the following:
  1. IRC, 2015 Edition
  2. IBC, 2015 Edition
  3. Governing Fire Department Requirements
  4. Utility Company Requirements
  5. State of Colorado Energy Standards
  6. State Department of Labor Requirements
  7. State Department of Health Requirements
  8. National Fire Protection Association Standards
  9. State and Federal Safety and Health Laws

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10. NFPA 70 2014 Edition - National Electrical Code
11. NFPA 72 2013 Edition - National Fire Alarm Code
12. NFPA 101 - Life Safety Code
13. Enterprise Green Communities Certification

D. Discrepancies: If discrepancies occur between these Specifications, local codes, local Utility requirements, etc., the most stringent requirements shall apply.

1.07 REFERENCE STANDARDS

A. References:

1. For products or workmanship specified by association, trade, or Federal Standards, comply with the requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
2. The date of the standard is that in effect at the bid date, or date of Owner/Architect Agreement when there are no bids, except when a specific date is specified.
3. When required by individual Specification Section, obtain copy of standard. Maintain copy at job site during work until Substantial Completion.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store materials and equipment in manufacturer's unopened containers fully identified with manufacturer's name, trade name, type, class, grade, size, and color.
- B. Protection: Store materials and equipment off the ground and under cover, protected from damage.
- C. Large Items: Make arrangements with other contractors on the job for introduction into the building for equipment too large to pass through finished openings.
- D. Acceptance: Check and sign for materials to be furnished by others for installations under Division 26 upon delivery. Assume responsibility for the storage and safekeeping of such material from time of delivery until final acceptance.

1.09 CLEANING

- A. Cleaning: Comply with Section 01 74 23. Clean exposed surfaces of conduit, hangers, lighting fixtures, and other electrical equipment of grease, dirt, etc. Clean the inside of panelboard enclosures prior to installing the front cover. Remove shipping labels. Carefully and thoroughly clean all items of equipment. At completion of the work, remove rubbish and debris resulting from the operations and leave equipment spaces clean and ready for use.

1.10 PROJECT RECORD DOCUMENTS

- A. Job Site Documents: Maintain at job site, one record copy of the following:
  1. Drawings
  2. Specifications



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3. Addenda
  4. Reviewed Shop Drawings
  5. Change Orders
- B. Do not use record documents for construction purposes. Maintain documents in clean, dry, legible condition, apart from documents used for construction.
- C. Record Information: Label each document Record Document. Mark information with contrasting color using ink. Keep each record current. Do not permanently conceal any work until required information is recorded.
- D. Record the following Information on the Specifications:
1. Manufacturer, trade name, catalog number and supplier of each product or item of equipment actually installed.
  2. Changes by change order or field order.
  3. Other matters not originally specified.
- E. Record the following information on the Drawings:
1. Horizontal and vertical location of underground utilities.
  2. Location of internal utilities and appurtenances concealed in construction.
  3. Field changes of dimension and detail.
  4. Changes by change order or field order.
  5. Details not on original Contract Drawings.
- F. Shop Drawings: Maintain Shop Drawings as record documents recording changes made after review as specified for Drawings above.
- G. Submittal: At completion of project, deliver Project Record Documents to General Contractor.
- 1.11 OPERATING AND MAINTENANCE DATA
- A. General: Comply with Section 01 77 10.
- B. Submission: Submit (3) typed and bound copies of Operating and Maintenance Manual, 8 2" x 11" in size, to the Architect for approval prior to scheduling any systems demonstration to the Owner.
- C. Requirement Contents: Manual shall have index and tab dividers for each major equipment section. Include as minimum the following data:
1. Alphabetical list of system components, with name, address, and 24 hour telephone number of the company responsible for servicing each item during the first year of operation.
  2. Operating Instructions for complete System including:
    - a. Emergency procedures for fire or failure of major equipment.
    - b. Major start, operation and shutdown procedures.

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3. Maintenance Instructions Including:
  - a. Tags and other identified equipment lists.
  - b. Proper lubricants and lubricating instruction for each piece of equipment.
  - c. Necessary cleaning, replacement and/or adjustment schedule.
4. Product Data on Each Piece of Equipment Including:
  - a. Installation Instructions
  - b. Drawings and Specifications
  - c. Parts Lists
  - d. Complete wiring diagrams (as built)
  - e. Marked or changed prints locating concealed parts and variations from the original system design.
5. Floor plans and/or wiring diagrams indicating component parts and system wiring.

1.12 WARRANTIES

- A. Warranty: Provide a written warranty to the Owner covering the entire electrical work (except lamps) to be free from defective materials, equipment and workmanship for a period of one year after date of acceptance. Refer to Section 26 50 00 for specific warranty requirements for fluorescent ballasts. During this period, provide labor and materials required to repair or replace defects and pay for any damage to other work resulting there from, at no additional cost to the Owner. Provide certificates for such items of equipment which have warranties in excess of one year. Submit to the General Contractor for transmittal to the Owner.

1.13 CERTIFICATES, KEYS, AND SPARE PARTS

- A. Certificates: Upon completion of the work, secure in triplicate, certificates from any State or Local governing bodies having jurisdiction in dictating that the work is in strict accordance with applicable codes and deliver same to the General Contractor for transmittal to the Owner.
- B. Keys: Upon completion of the work, submit keys for electrical equipment, panels, etc. to the General Contractor. Obtain receipt for same.
- C. Spare Parts: Upon completion of the work, submit spare parts to the Owner. Obtain receipt for same. Store where directed or as specified.

1.14 ELECTRICAL SERVICE MAINTENANCE

- A. Include (2) complete service and maintenance calls plus emergency calls spaced at reasonable intervals throughout the one year warranty period. Maintain a log of corrective actions taken at each service call.

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END OF SECTION



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SECTION 26 05 01 – BASIC MATERIAL AND METHODS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Conduit
- B. Wires and Cables
- C. Boxes
- D. Cabinets
- E. Wiring Devices

1.02 RELATED SECTIONS

- A. Section 31 00 00: Earthwork
- B. Section 03 30 00: Cast-in-Place Concrete
- C. Section 08 31 16: Access Panels
- D. Section 09 91 00: Painting

1.03 DESCRIPTION

- A. Install wiring in complete raceway systems unless specifically indicated otherwise.
- B. Provide galvanized rigid conduit throughout except as allowed below:
  - 1. Electrical metallic tubing thinwall may be installed concealed in furred ceilings and walls, embedded in poured concrete walls and floors, embedded in poured gypsum, or exposed at least 5 feet above the floor, provided such areas are dry.
  - 2. Use plastic conduit or corrosion protected GRC for locations in or directly below concrete slab-on-grade, in earth or gravel.
  - 3. Electrical non-metallic tubing may be used in non-plenum ceiling spaces, stud and hollow masonry partitions.
  - 4. Non-Metallic Cable may be utilized in Residential Units for branch circuit requirements ONLY!
- C. Circuits #4 and larger are classified as feeder circuits.
- D. Circuits #6 and smaller are classified as branch circuits.
- E. Conductors installed in high ambient conditions such as near boiler breeching, directly under roofing, exposed on roof, etc., shall be rated 90 degrees C minimum.
- F. Low voltage wire and cables may be installed in accessible ceiling locations without conduit if cable is approved for use in environmental air plenums.

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1.04 REFERENCES

- A. American National Standards Institute (ANSI)
  - 1. C-80.1 Galvanized Rigid Conduit
  - 2. C-80.3 Electrical Metallic Tubing
- B. Federal Specifications
  - 1. W-S 896E Switch, Toggle, and Locks
  - 2. WW-C 581-d Specification for Galvanized Rigid Conduit
  - 3. WW-C 563 Specification for Electrical Metallic Tubing
- C. National Electrical Manufacturer's Association (NEMA)
  - 1. WD 1-79 General Purpose Wiring Devices
  - 2. TC-6 Schedule 40 Polyvinyl Chloride Conduit
  - 3. RN1-74 PVC Externally Coated Rigid Conduit
- D. Underwriters Laboratories, Inc. (UL)
  - 1. UL 514-79 Outlet Boxes and Fittings
  - 2. UL 817-77 Cord Sets and Power Supply Cords
  - 3. UL 894-77 Switches for use in Hazardous Locations
  - 4. UL 493-72 Ground Fault Circuit Interrupters

1.05 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01 32 19.
- B. Submit product data for all plenum rated cable installed.
- C. Submit product data for low voltage switching equipment.
- D. Submit shop drawings and product data for modular wiring.
- E. Submit product data for aluminum wire.

PART 2 PRODUCTS

2.01 CONDUIT

- A. Galvanized Rigid Conduit: Fed. Spec. WW-C581-d, and ANSI C-80.1.
- B. Electrical Metallic Tubing: Fed. Spec. WW-C563, and ANSI C-80.3.
- C. Plastic Conduit: Rigid heavy wall, Schedule 40, meeting NEMA Standard TC-6.
- D. Plastic Coated GRC: Fed. Spec., ANSI and NEMA Standard RN1-1974 for PVC externally coated conduit min. 20 mil thickness.

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- E. EMT Fittings: Set screw or compression gland type only.
- F. Conduit Bushings: Metal insulating type, including grounding bushings, on 1-1/4" and larger; non-metallic insulating type, 1" and smaller. Metal insulating type bushing to have molded phenolic insulation equivalent to OZ specification grade.
- G. Liquid-tight Flexible Conduit: Constructed of a galvanized steel core with PVC cover; Anaconda Seal-tite or equivalent. Use fittings of same manufacturer as conduit.

2.02 WIRE AND CABLE

- A. Feeder Conductors: Compacted strand, AA8000 grade aluminum, or copper, minimum insulation rating 75 degrees C (THW, THWN, THWN-2, XHHW, XHHW2).
- B. Branch Circuit Conductors: Copper, #12 minimum, THWN or THHN insulated only for Commercial Space (Site Laundry) or #14 minimum NMC for Unit Branch Circuits.
- C. Other class 1 control circuits may be #16.
- D. Wiring in Fluorescent Fixtures: 90 degrees C rated, approved for use (THHN, THW).
- E. MC Cable: Interlocking aluminum or galvanized steel armor over THHN insulated copper conductors with green equipment ground wire. Color code conductors as directed under Article 3.02 of this Section.

2.03 OUTLET, JUNCTION, AND PULLBOXES

- A. Boxes Up to 150 Cubic Inches: Standard, one piece, zinc-coated, or cadmium plated steel.
- B. Lighting Fixture Outlet Boxes: Not less than 4 inches octagonal with 3/8" no-bolt fixture studs.
- C. Junction Boxes for Recessed Fixtures: Four inches square minimum with blank cover.
- D. Wiring Device Outlets: Four inch minimum with appropriate ring or Steel City series GW tile box. Sectional switch boxes not permitted.

2.04 CABINETS

- A. Metal construction; conforming to National Electrical Code; finish painted; equipped with locking door; concealed flush hinges, lock, and catch assembly. All locks keyed alike.
- B. Backboard: Three quarter inch plywood, one piece per cabinet. Finish matte black.

2.05 MANUFACTURERS - WIRING DEVICES

- A. Hubbell
- B. Arrow-Hart

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- C. Pass & Seymour
- D. General Electric
- E. Bryant
- F. Eagle
- G. Leviton
- H. Substitutions: Under provisions of the Information for Bidders.

2.06 WIRING DEVICES

- A. Provide Ivory Colored Devices. Final Approval by Architect
- B. Wall Switches: Fed. Spec. W-S 896E and NEMA Standard Test WD-1. All switches rated 20 ampere minimum, AC quiet type.
- C. Receptacles: NEMA Standard Test WD-1. Provide commercial grade or better, in NEMA configuration (Min. 5252 class) only.
- D. Heavy-duty Duplex Receptacles: 20 amp where wired to a dedicated circuit.
- E. Pilot Switches: An assembly of wall switch and 120 volt pilot light mounted in a two gang box with a two gang plate.
- F. Weatherproof Receptacles: An assembly of GFCI receptacle as indicated on Contract Drawings, and weatherproof die cast aluminum plate with self closing cover, Bell 5000 series, TayMac #20310 series or Intermatic #WP1020 rain tight while outlet is in use, or specifically approved equivalent.

2.07 DEVICE PLATES

- A. Provide a device plate for each outlet installed, and blank plates or covers for junction boxes or empty outlets.
- B. Flush Device Plates: Smooth ivory plastic with metal, oval head screws finished to match plate. Color to match device.
- C. Surface Plates: Galvanized steel, 1.25 oz/sq.ft. minimum coating, pressure formed with round corners for smooth edge and fit to box.

PART 3 EXECUTION

3.01 PREPARATION

- A. Supports:
  - 1. Support raceways, cabinets, boxes etc., in accordance with Section 26 05 03, Supporting Devices.
  - 2. Where outlets are installed in steel stud type systems, provide additional cross



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bracing, bridging, and/or straps as required to make the outlet completely rigid prior to application of the wall facing material.

B. Sleeves:

1. Install sleeves where raceways pass through concrete construction. Locate sleeves accurately.
2. Have a man present during the pouring of concrete to make sure the location of sleeves is not disturbed during the pour.
3. Provide pipe sleeves through concrete floors with top of sleeves a minimum of 2 inch above finished floor surface. Block outs for multiple conduits or individual conduits not allowed.

C. Excavation and Backfill:

1. Be responsible for all trenching and backfilling in connection with the electrical work. Backfill earth in thin layers, compacting in accordance with Section 022000, Earthwork.
2. Lay all raceways on solid earth. Remove all rocks and stones from bottom of trench and backfill material.
3. When trenching is routed through specially treated areas, such as blacktop, etc., be responsible for restoring the surface to its original condition.
4. Verify locations of all existing and/or new underground utilities prior to trenching and, if damaged, replace immediately in an approved manner at no expense to Owner.

D. Cutting and Patching:

1. Coordinate and supervise all cutting and patching under this Division. Do not cut without the approval of the Architect as to location, method, and extent of the cutting.
2. Patching in every instance consists of completing the work to match and blend in with adjoining existing work insofar as methods, materials, colors, and workmanship are concerned. Patches which are clearly obvious on completion will be rejected and ordered redone.
3. Execute patching by craftsmen qualified and skilled in the particular type of work involved.
4. Cut openings for which sleeves are omitted with rotary type drill or other approved method. Hole cut with pneumatic hammer will not be accepted.
5. Pay all costs of cutting and/or patching caused by improper coordination.

3.02 INSTALLATION

A. Conduits:

1. Install raceways concealed except at surface cabinets, for motor and equipment connections, and in mechanical areas. Install embedded raceways with 1 inch minimum encasement. Lay out work in advance to avoid excessive concentrations of multiple conduit runs and so as not to endanger the strength of any structural member or unduly interfere with other trades. Install 1 inch and larger raceways in or through structural members (beams, slabs, etc.) Only when approved by the Architect. Secure embedded conduits prior to concrete placement.
2. Take particular care when installing plastic conduits to permit the movement due to their high coefficient of expansion. Install underground conduits 30 inches minimum below grade. Provide conduits installed below concrete slab with complete earth cover.

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3. Install steel elbows in runs of plastic conduit greater than 100 feet or runs containing more than two quarter bends.
4. Cross expansion joints with expansion fittings and bonding conductor.
5. Space supports for exposed raceways and raceways installed above accessible ceilings not more than 7 feet on center.
6. Route exposed conduit parallel or perpendicular to walls and structural members, with neat right angle bends or change direction with conduit fitting.
7. Install conduits at least 6 inches from parallel runs of flues, steam lines, or other heated lines.
8. Effectively seal conduit penetrations through fire walls and floors through the use of rated fittings such as OZ 'CFSF' series fittings or equivalent.
9. Provide waterproofing for all conduits, outlets, fittings, etc., which penetrate the roof by use of flashing and counter flashing or pitch pockets.
10. Provide double locknuts and bushings on all rigid conduit terminations.
11. Provide short extensions of flexible liquid-tight metallic conduit for makeup of motor, transformer, or equipment conn.
12. Limit telephone raceways to not more than 270 degrees of offsets and bends between any two outlets.

B. Wire and Cable:

1. Do not install wire in incomplete conduit runs nor until after concrete work and/or plastering is completed.
2. Make branch circuit conductor terminations with insulated pressure type connectors such as Ideal Industries 'Wing Nut', '3M Company Scotchlok', or 'Buchanan B-Cap'.
3. Provide #10 AWG minimum wire for branch circuits whose length from panel to first outlet exceeds 75 feet for 120 volt circuits.
4. Color code power and signal conductors. Sizes #6 and smaller, factory colored. Sized larger than #6 may be color coded by field painting or color taping of exposed ends.

120/240V

Phase A - Black

Phase B - Red

Neutral - White

Ground – Green

A system of numbers may be used for signal circuits in lieu of color coding.

5. Provide an insulated equipment grounding conductor in all feeder and power branch circuits. Size conductor to table 250-95 of the NEC unless indicated otherwise on the Contract Drawings.
6. Provide insulating grommets as mfg'd. By Arlington Industries or equivalent, in steel stud openings when installing MC or NM cables through pre-punched or field punched stud openings.
7. Terminate aluminum conductors only with tin-plated aluminum bodied compression connectors. Prefill with anti-oxidant compound prior to installation.
8. Aluminum conductors may be connected to copper conductors at termination points for use with other than compression lugs by the use of reducing connectors such as T&B 60900 series compression sleeves, or may be adapted by compression pig-tail adapters such as T&B 61900 series, or solid compression adapters such as 'Burndy AYP Hyplug', or 'Anderson Versa Plug'.
9. Bolt aluminum lugs to equipment with properly sized high strength aluminum bolt or

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an assembly of plated steel bolt, flat washer, and plated Belleville washer.

C. Outlets and Boxes

1. Install flush boxes plumb, within 1/8 inch of finished surface. Install exposed boxes plumb, securely anchored to ceiling or wall.
2. Install outlets serving recessed fixtures in non-accessible ceilings at ceiling level within 6 inches of edge of opening.
3. Adjust height of outlets in concrete block walls (consistent in one direction) to course out. Coordinate heights of outlets of all systems in any single viewing location, including electrical outlets specified under Divisions.
4. Coordinate locations of junction boxes and pull boxes with other trades so that boxes as accessible remain so.

D. Cabinets

1. Coordinate depth of flush cabinets with wall thickness prior to purchase.
2. Set enclosure at maximum 6 feet 3 inches above the floor.

E. Wiring Devices and Plates:

1. Where device plate does not cover the outlet opening, grout/patch opening, or use special oversize device plate. Sectional device plates are not permitted.
2. Provide telephone plates with bushed center hole or telephone jack opening in finish to match other plates in area.

F. Empty Raceway Systems:

1. Provide a pulling string, such as installed by a jetliner gun or equivalent, in all completed conduit runs. Terminate strings in outlet or pull boxes, or secured to end of conduit by a metal ring in greater diameter than the conduit when no box is provided at the conduit termination.
2. Provide blank plates or cover on flush outlets. Provide galvanized blank covers on surface outlets.

G. Systems Identification:

1. Identify empty conduit systems for future use at ends not terminating in a box with a suitable tag and string inside of conduit, held in place with a plastic push penny and plastic bushing. Provide sufficient information to fully identify conduit use and termination points.
2. Identify junction and pillboxes with labels of embossed metal or plastic tape affixed to their cover and side. Identify the electrical system it serves, i.e., Emergency Power, etc.

END OF SECTION



DIVISION 26 ELECTRICAL – UPLANDS TOWNHOMES  
SECTION 26 05 02 – EQUIPMENT WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical connections to equipment specified under other Sections or furnished by Owner.

1.02 RELATED WORK

- A. Division 23 - Mechanical Equipment.

1.03 REFERENCE

- A. FS W-C-596 - Electrical Power Connector, Plug, Receptacle and Cable Outlet.
- B. NEMA WD 1 - General Purpose Wiring Devices.
- C. NEMA WD 5 - Specific Purpose Wiring Devices.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Conform to Section 26 05 11 - Basic Materials and Methods

2.02 CORDS AND CAPS

- A. Straight-blade Attachment Plugs: NEMA WD-1
- B. Locking-blade Attachment Plug: NEMA WD 5.
- C. Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.
- D. Cord Construction: Oil-resistant thermoset insulated Type SJO SO multi-conductor flexible cord with identified equipment grounding conductor, suitable for extra hard usage in damp location.
- E. Cord Size: Suitable for connected load of equipment and rating of branch overcurrent protection.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that equipment is ready for electrical connection, wiring and energization.

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SECTION 26 05 02 – EQUIPMENT WIRING CONNECTIONS

3.02 PREPARATION

- A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.03 INSTALLATION

- A. Use wire and cable with insulation suitable for temperature encountered in heat-producing equipment.
- B. Make conduit connections to equipment using flexible conduit. Use liquid tight, flexible, conduit in damp or wet locations.
- C. Install pre-finished cord set where connection with attachment plug is indicated or specified, or use attachment plug with suitable strain-relief clamps.
- D. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.
- E. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated.
- F. Install disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches as indicated. Connect with conduit and wiring as indicated.

END OF SECTION

DIVISION 26 ELECTRICAL – UPLANDS TOWNHOMES  
SECTION 26 05 03 – EQUIPMENT WIRING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Conduit Supports.
- B. Box and Cabinet Supports.
- C. Anchors.
- D. Cable Supports.

PART 2 PRODUCTS

2.01 CONDUIT SUPPORTS

- A. Single Runs: Galvanized one hole or two straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized steel hangers.
- B. Multiple Runs: Rack on channel supports. Vertical Runs: Channel support.

2.02 BOX AND CABINET SUPPORTS

- A. Flush Wall Outlet Boxes: Galvanized one piece stamped steel stud bridges.
- B. Flush Ceiling Outlet Boxes: Adjustable steel channel fasteners.
- C. Outlets in Ceiling Cavity: Spring steel clips designed to attach to drop wires attached to structure or directly attached to structure. Attaching to drop wires supporting suspended ceilings is not permitted.
- D. Flush Cabinets in Stud Walls: Channel support, bridging studs top and bottom. Surface Mounted Cabinets: Minimum of four anchors.

2.03 ANCHORS

- A. Hollow Masonry: Toggle bolts or spider type expansion anchors.
- B. Solid Masonry: Lead expansion anchors or preset inserts.
- C. Metal Surfaces: Machine screws, bolts or welded studs.
- D. Concrete Surfaces: Self-drilling anchors or powder driven studs.

PART 3 EXECUTION

3.01 PREPARATION

- A. Obtain permission from the Architect before using powder actuated anchors or

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SECTION 26 05 03 – EQUIPMENT WIRING SYSTEMS

drilling structural members.

- B. Lay out to maintain headroom, neat mechanical appearance, and to support equipment loads required.

3.02 INSTALLATION

- A. Support exposed metallic conduits and metallic conduits installed above accessible ceilings not more than 7 feet on center. Support conduits from building roof or floor structure. Do not support from ceiling suspension support systems.
- B. Support boxes independent of conduit unless a cast box is connected to galvanized rigid conduits where conduit is supported within 12 inches of box.
- C. Support surface mounted cabinets with a minimum of four anchors.
- D. Support electrical non-metallic tubing a maximum of 3 feet on center.

END OF SECTION



DIVISION 26 ELECTRICAL – UPLANDS TOWNHOMES  
SECTION 26 05 26 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 - General Requirements, apply to this Section.
- B. Section 26 05 00 – Common Work Results applies to work of this Section.

1.02 SECTION INCLUDES

- A. Metal Building Frames.
- B. Electrical Power Systems.
- C. Raceways and Enclosures.
- D. Service Equipment.

1.03 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. Institute of Electrical and Electronics Engineers (IEEE):
  - 1. ANSI/IEEE 142, 1982 (Revised 1991), Recommended Practice for Grounding of Industrial and Commercial Power Systems® (copyrighted by IEEE, ANSI approved).
- C. Underwriters Laboratories, Inc. (UL):
  - 1. UL 467, 1984 (Revised 2007), “Grounding and Bonding Equipment”.
  - 2. UL 486 A, 1908 (Revised 2003), “Wired Connectors and Soldering Lugs for Use with Copper Conductors”.
- D. American Society for Testing Materials (ASTM):
  - 1. ASTM B3, 1981 (Revised 2007), “Standard Specification for Soft or Annealed Copper Wire”.
  - 2. ASTM B8, 1986, (Revised 2011) “Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-hard, or Soft”.
  - 3. ASTM B33, 1981 (Revised 2010), “Standard Specification for Tinned Soft or annealed Copper Wire for Electrical Purposes”.

PART 2 PRODUCTS

2.01 CONDUCTORS

- A. General: Grounding conductors shall be stranded, medium drawn copper or as shown on the drawings or required by this specification.
- B. Conductivity: Copper conductors shall have a conductivity of not less than 98 percent at

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20 degrees C. Conductor resistance values shall be in accordance with the value in IPECEA S-68-516.

- C. Stranded Conductors: Stranded conductors shall comply with the following requirements:
  - 1. Individual Conductors: ASTM B-3.
  - 2. Stranded Assembly: ASTM B-8.
- D. Insulation: Provide insulation same as specified in section 26 05 00.

2.02 BONDING JUMPERS

- A. Flexible Bonding Cable: Provide flexible flat cable constructed of 480 strands of 30 gauge copper wires, 3/4 inch wide by 1/8 inch thick.
- B. Flexible Bonding Strips: Provide flexible flat conductor, constructed of 480 strands of 30 gauge bare copper wires with bolt hole ends. Strap size shall be 3/4 inch wide by 10 inches long.

2.03 CONNECTORS

- A. Exothermic Welds: Exothermic welds shall be a thermite reaction system employing copper oxide and aluminum powder reaction to melt and fuse copper conductors into welded connections.
- B. Cable to Cable Connector:
  - 1. Connector shall be copper alloy, "U" bolt type.
  - 2. Acceptable Manufacturer: OZ Gedney - Type ABG or CG.
- C. Pipe Connectors:
  - 1. Connectors shall be copper alloy, "U" bolt type.
  - 2. Acceptable Manufacturer: OZ Gedney - Type ABG or CG.
- D. Ground Bushings:
  - 1. Bushings shall be malleable iron, cadmium plated, insulated throat with screw type wire connector.
  - 2. Acceptable Manufacturer: OZ Gedney - Type IGB.

PART 3 EXECUTION

3.01 PREPARATION

- A. Examine areas and conditions under which the work is to be installed, and notify General Contractor, in writing, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 COORDINATION

- A. Coordinate with other work to ensure that installation is not vulnerable to physical damage.

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3.03 SAFETY GROUNDING SYSTEM

- A. Ground service equipment, conduit systems, supports, cabinets, raised computer floor, equipment, fixtures, etc., and the grounded circuit conductor in accordance with the NEC. Provide bonding jumpers, grounding bushings, clamps, etc., as required for a complete grounding system. Route grounding conductors to provide the shortest and most direct path. Install grounding conductors in conduit. Bond conduit enclosing the grounding electrode conductor to the conductor at both ends.
- B. Provide a grounding electrode system consisting of connection to the metallic water pipe (provide jumper around water meter) and a made electrode consisting of not less than 20 feet of not less than #4 bare copper conductor embedded in 2 inch minimum concrete at the bottom of the building footer (UFER Ground per NEC Article 250).
- C. Provide a separate grounding conductor, securely grounded, on each run of non-metallic conduit and flexible conduits.
- D. Provide a green or bare grounding jumper from the ground screw of outlet boxes to the ground screw of wiring devices.

3.04 INSTALLATION

- A. Comply with applicable requirements of UL 467, ANSI/IEEE 80, and applicable NEMA standards, to ensure that products fulfill requirements.
- B. Exothermic Welds:
  - 1. Provide exothermic welds for the following:
    - a. Cable to Cable (below grade).
    - b. Cable to Structural Steel.
  - 2. Comply with AWS Code for procedures, appearance, and quality of welds, and for methods used in correcting welding work. The manufacturer's specific instructions and molds shall be used for every weld.
- C. Connectors: Provide mechanical connections for the following:
  - 1. Cable to Pipe.
  - 2. Cable to Ground Bus or as otherwise noted on the Drawings.
- D. Bonding Jumpers: Bonding jumper shall be installed where continuity of piping of metal must be maintained or as required by the NEC.
- E. Ground Bushings: Where a conduit enters a metal enclosure without a ground bus, a ground bushing shall be provided to terminate ground conductor.

END OF SECTION



DIVISION 26 ELECTRICAL – UPLANDS TOWNHOMES  
SECTION 26 05 28 – FIRE STOPPING for ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Sleeves.
  2. Mechanical sleeve seals.
  3. Fire stopping relating to electrical work.
  4. Fire stopping accessories.

1.2 REFERENCES

- A. ASTM International:
1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
  2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
  3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
  4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.
- B. FM Global:
1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.
- C. National Fire Protection Association:
1. NFPA 70 - National Electrical Code.
- D. Underwriters Laboratories Inc.:
1. UL 263 - Fire Tests of Building Construction and Materials.
  2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
  3. UL 1479 - Fire Tests of Through-Penetration Firestops.
  4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
  5. UL - Fire Resistance Directory.
- E. Intertek Testing Services (Warnock Hersey Listed):
1. WH - Certification Listings.

1.3 DEFINITIONS

- A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

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1.4 SYSTEM DESCRIPTION

- A. Fire stopping Materials: to achieve fire ratings as noted on Drawings or not less than 1 hour fire rating.
  - 1. Ratings may be 3-hours for fire stopping in through-penetrations of 4-hour fire rated assemblies unless otherwise required by applicable codes.

1.5 SUBMITTALS

- A. Section 01 33 23 – Shop Drawings and Samples: Requirements for Shop Drawings.
- B. Fires topping Product Data: Submit data on product characteristics, performance and limitation criteria.
- C. Manufacturer's Fire stopping Installation Instructions: Submit preparation and installation instructions.

1.6 QUALITY ASSURANCE

- A. Through Penetration Fire stopping of Fire Rated Assemblies: UL 1479 with 0.10 inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
  - 1. Wall Penetrations: Not less than 1-hour.
  - 2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings not less than 1-hour.
- B. Through Penetration Firestopping of Non-Fire Rated Floor [and Roof] Assemblies: Materials to resist free passage of flame and products of combustion.
  - 1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.
  - 2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.
- C. Surface Burning Characteristics: 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Section 01 50 13 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

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- C. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 50 13 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not apply fire stopping materials when temperature of substrate material and ambient air is below 60 degrees F.
- C. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.
- D. Provide ventilation in areas to receive solvent cured materials.

PART 2 PRODUCTS

2.1 SLEEVES

- A. Sleeves for Through Non-fire Rated Floors: 18 gauge thick galvanized steel.
- B. Sleeves for Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gauge thick galvanized steel.
- C. Sleeves for Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.
- D. Stuffing fire-stopping Insulation: Glass fiber type, non-combustible.

2.2 FIRESTOPPING

- A. Manufacturers:
  - 1. Dow Corning Corp.
  - 2. Fire Trak Corp
  - 3. Hilti Corp.
  - 4. International Protective Coating Corp.
  - 5. 3M fire Protection Products.
- B. Specified Technology, Inc Substitutions:
- C. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
  - 1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
  - 2. Foam Firestopping Compounds: Single component foam compound.

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3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
4. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber stuffing insulation with silicone elastomer for smoke stopping.
5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
7. Firestop Pillows: Formed mineral fiber pillows.

D. Color: By Architect.

### 2.3 FIRESTOPPING ACCESSORIES

- A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.
- B. Dam Material: Permanent:
  1. Mineral fiberboard.
  2. Mineral fiber matting.
  3. Sheet metal.
  4. Plywood or particle board.
  5. Alumina silicate fire board.
- C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
- D. General:
  1. Furnish UL listed products Select products with rating not less than rating of wall or floor being penetrated.
- E. Non-Rated Surfaces:
  1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where conduit is exposed.
  2. For exterior wall openings below grade, furnish modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between conduit and cored opening or water-stop type wall sleeve.



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SECTION 26 05 28 – FIRE STOPPING for ELECTRICAL SYSTEMS

PART 3 EXECUTION

3.1 EXAMINATION

- A. Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive sleeves.
- C. Verify openings are ready to receive fire stopping.

3.2 INSTALLATION

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring fire stopping.
- B. Apply primer where recommended by manufacturer for type of fire stopping material and substrate involved, and as required for compliance with required fire ratings.
- C. Apply fire stopping material in sufficient thickness to achieve required fire and smoke rating.
- D. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.
- E. Fire Rated Surface:
  - 1. Seal opening at floor, wall, and roof as follows:
    - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
    - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
    - c. Pack void with backing material.
    - d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
  - 2. Where cable tray, conduit, wireway, penetrates fire rated surface, install fire stopping product in accordance with manufacturer's instructions.
- F. Non-Rated Surfaces:
  - 1. Seal opening through non-fire rated wall, floor, and roof opening as follows:
    - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
    - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.

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- c. Install type of fire stopping material recommended by manufacturer.
2. Install escutcheons floor plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
3. Exterior wall openings below grade: Assemble rubber links of mechanical seal to size of conduit and tighten in place, in accordance with manufacturer's instructions.
4. Interior partitions: Seal pipe penetrations at laboratories, computer rooms, telecommunication rooms, data room. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

### 3.3 INSTALLATION - SLEEVES

- A. Exterior watertight entries: Seal with adjustable interlocking rubber links.
- B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.
- C. Set sleeves in position in forms. Provide reinforcing around sleeves.
- D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- E. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.
- F. Where conduit or raceway penetrates floor, ceiling, or wall, close off space between conduit or raceway and adjacent work with fire stopping insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- G. Install stainless steel escutcheons at finished surfaces.

### 3.4 FIELD QUALITY CONTROL

- A. Section 01 77 10 - Execution and Closeout Requirement: Field inspecting, testing, adjusting, and balancing.
- B. Inspect installed fire stopping for compliance with specifications and submitted schedule.

### 3.5 CLEANING

- A. Section 01 77 10 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean adjacent surfaces of fire stopping materials.

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3.6 PROTECTION OF FINISHED WORK

- A. Section 01 77 10 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect adjacent surfaces from damage by material installation.

END OF SECTION



DIVISION 26 ELECTRICAL – UPLANDS TOWNHOMES  
SECTION 26 05 53 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Directory Cards.
- B. Engraved Nameplates.
- C. Tape Labels.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Engraved Plastic Nameplates: Black letters on a white background with self-adhesive back.
- B. Engraved Metal Nameplates: Black paint filled engraving on a brushed aluminum or stainless steel
- C. Adhesive Tape Labels: Black imprinted letters on a clear tape as made by a tape imprinting machine such as the Brother AP-Touch® or approved equivalent.
- D. Directory Cards: Manufacturer's standard pre-printed form under clear plastic protective cover.
- E. Device Plate Engraving: Laser etching, nominal 1/8 inch high lettering on plastic or nylon plates; black paint filled engraving on metal plates.

PART 3 EXECUTION

3.01 PREPARATION

- A. No temporary type of markings which are visible on equipment are permitted. Repaint trims, housing, etc. where such markings cannot readily be removed. Defaced finishes must be refinished.
- B. Thoroughly clean surface to which pressure sensitive type tape labels are applied to assure adherence of label.

3.02 INSTALLATION

- A. Do not use abbreviations in labeling without specific permission.
- B. Label panelboards as designated on electrical drawings.
- C. Directory cards, nameplates, and labels shall indicate the general area and type of electrical load served by each circuit.

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3.03 SCHEDULE OF LABELS

- A. Provide 2 inch minimum height letters engraved in plastic laminate nameplates to identify the equipment item for:
  - 1. Branch and distribution panelboards.
  - 2. Lighting and/or power control cabinets.
  - 3. Telephone cabinets.
  - 4. Motor control centers.
  
- B. Provide 1/4 inch minimum height letters engraved in plastic laminate nameplates, or adhesive labels to identify circuits, switches, or circuit breakers in:
  - 1. Switchboard or panelboard (service equipment).
  - 2. Distribution panels.
  - 3. Motor control centers and/or motor starter panelboards.
  - 4. Separately mounted motor starters.
  - 5. Disconnect switches.
  - 6. Miscellaneous contractors and relays.
  - 7. Time clocks.
  
- C. Provide 1/8 inch minimum height laser etched or engraved device plates identifying function or equipment controlled for:
  - 1. Exhaust fans.
  - 2. Light switches controlling lights that are out of sight.
  - 3. Remote test/indicator devices associated with smoke detectors.
  
- D. Provide 1/8 inch minimum height lettering identifying panel and circuit number laser etched on the front surface of plastic or nylon plates and adhesive labeled to the front of metal plates.
  
- E. Provide neatly typed directories or identification labels. Use 12 or 15 pitch type as appropriate to assure adequate information is included in small spaces. Use on:
  - 1. Branch circuit panelboard directories.
  - 2. Terminal strips.
  
- F. Identify on panel schedule or adjacent to specific breakers, which circuits serve unit emergency equipment in conformance with Article 700-12(e.).

END OF SECTION

DIVISION 26 ELECTRICAL – UPLANDS TOWNHOMES  
SECTION 26 24 16 – ELECTRICAL SERVICE AND DISTRIBUTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Service Equipment.
- B. Loadcenters.
- C. Safety Switches.

1.02 REFERENCES

- A. La Junta Power & Light Guidelines.

1.01 DESCRIPTION

- A. Arrange with utility company to provide 120/240/1Ph-3w Service Transformers and final connection requirements of Service Lateral. Consult with utility company as to the extent of their work and costs involved.
- B. Distribute power to all loads from New Building Service Entrance Meterstacks. Sizes as indicated on Drawings and Specifications herein.

1.02 SUBMITTALS

- A. Submit product data under provisions of Section 01 32 19 - Submittals.
- B. Submit product data for:
  - 1. Service Equipment.
  - 2. Panelboards.
  - 3. Safety Switches.

1.03 OPERATING AND MAINTENANCE DATA

- A. Submit provisions of Section 26 05 00.
- B. Submit product data for:
  - 1. Service Equipment.
  - 2. Panelboards.

PART 2 PRODUCTS

2.01 MANUFACTURERS - SWITCHBOARDS, PANELBOARDS, DISC. SWITCHES

- A. Square D.
- B. Siemens.
- C. General Electric.
- D. Cutler Hammer.

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- E. Substitutions: Under provisions of the Information for Bidders.

2.02 SERVICE EQUIPMENT

- A. Meterstack: Size and Configuration per Construction Documents. Nema 3R Enclosure(s). Equipment to have 'SUSE' Label.
- B. Short Circuit Rating: Not less than 22,000 amps. RMS symmetrical throughout unless indicated otherwise on Construction Documents.
- 1. Main Overcurrent Device: Main Circuit Breakers or Main Lugs as indicated on the Contract Documents.

2.03 LOAD CENTERS

- A. Enclosure: Dead front, flush mounted as indicated on panel schedules. Provide directory card under protective plastic.
- B. Bussing: Copper or aluminum. Provide equipment ground bus, insulated neutral bus.
- C. Breakers: Thermal magnetic, plug-in breakers. Multi-pole breakers must have common trip. Tie handles are not permitted. Breakers for 120/208 volt service to be rated at 10,000 A.I.C. at 120/240 volts, unless noted otherwise. "Series Rating with Service Entrance Equipment Main and Feeder Breakers is allowed. Identify as required by the NEC.

2.04 SAFETY SWITCHES

- A. Type: Enclosed, fusible and non-fusible, heavy duty, UL labeled and in proper NEMA type enclosure for the environment in which it is installed. Operating handles must be capable of being locked in the off position.
- B. Motor Disconnects: Horsepower rated, non-fusible, except where two or more motors and/or other loads are connected to the same circuit.

PART 3 EXECUTION

3.01 PREPARATION

- A. Excavation:
  - 1. Perform all trenching and backfilling required by work performed under this Division as herein specified and under the supervision of the General Contractor. Excavate trenches to a depth required for the utilities involved. Grade the trench bottom true and free from stones and soft spots.



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2. Perform all excavation and backfill to meet the requirements Aquila Excavation Guidelines.
- B. Backfill: After approval by Architect, backfill, tamp, and compact to insure against the possibility of differential settling. Use approved backfill material that is free of stones. Repair any trenches where settlement occurs and restore the surface. Dispose of surplus backfill as approved by Architect.
- C. Verify location of existing and new utilities and, if damaged by the Contractor, replace at Contractor's own expense.

3.02 INSTALLATION

- A. Install conductors and raceways under provisions of Section 26 05 10.
- B. Meterstacks:
  1. Mount against wall aligning top surfaces of all sections.
  2. Verify wall space Width and Height) prior to installation of equipment. A unistrut rack system may be required due to second floor overhangs. Construct such that the structure is on a concrete base and attached to the building at the top.
- C. Load Centers:
  1. Mount branch circuit panels 6 feet 3 inches (to top of trim) above finished floor.
  2. Verify depth of walls for flush panels PRIOR to purchase. Notify Architect of conflict.
  3. Install feeder conductors in panels to provide a minimum of 12 inches of exposed conductor between the conduit bushing and the final termination.
  4. Identify conductor color coding used. Provide tape label or other permanent means to indicate colors by phase and affix to inside of panel door.
  5. Identify on panel schedule or adjacent to specific breakers, which circuits serve unit emergency equipment in conformance with Article 700-12(f).

END OF SECTION



DIVISION 26 ELECTRICAL – UPLANDS TOWNHOMES  
SECTION 26 50 00 – LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior Lighting.
- B. Exterior Lighting.

1.02 RELATED SECTIONS

- A. Section 03 30 00: Cast-in-Place Concrete for Bases for Lighting Poles.

1.03 DESCRIPTION

- A. Provide all luminaries, lighting equipment, and components shown on the plans, listed in the Fixture Schedule, and specified herein. Furnish complete with suspension accessories, canopies, plaster frames, recessing boxes, etc.
- B. Deliver luminaries and lighting equipment to the building complete with accessories, canopies, plaster frames, recessing boxes, etc.
- C. Furnish and install lamps and accessory wiring as required.

1.04 REFERENCES

- A. ANSI C82.2 - Specifications for Electronic Fluorescent Lamp Ballasts.
- B. ANSI C82.4 - Specifications for High Intensity Discharge Lamp Ballasts (Multiple Supply Type).
- C. FS W-F-414 - Fixture, Lighting (Fluorescent, Alternating Current, Pendant Mounting).

1.05 SUBMITTALS

- A. Submit product data under provision of Section 01 32 19.
- B. Submit product data for: Luminaires, poles, special suspension systems, etc.

1.06 EXTRA MATERIALS

- A. Provide Owner with additional fixture lenses on the basis of 5% of the number installed with a minimum of one of each type.

1.07 WARRANTY

- A. Warrant fluorescent ballasts and lamps for a minimum of two years.
- B. Warrant LED Lamps for a minimum of 5 years.
- C. Warrant LED drivers for minimum of 5 years.

DIVISION 26 ELECTRICAL – UPLANDS TOWNHOMES  
SECTION 26 50 00 – LIGHTING

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Specific types of manufacturers are listed in the Lighting Fixture Schedule. Fixtures shall bear name of manufacturer.
- B. Substitutions: Under the provision of the Information for Bidders subject to limitations listed on Fixture Schedule.

2.02 EXTERIOR FIXTURES

- A. Fixtures: Types specified on plans and Fixture Schedule.
- B. Assembly to provide reliable starting down to -20 degrees F.
- C. Fixtures shall be UL approved for locations installed, i.e., damp locations or wet locations, and so labeled.

2.03 LIGHTING STANDARDS

- A. Poles: Designed to withstand 100 mph winds with fixtures specified. Furnish with anchor bolts, template, bolt covers, ground lug. Finish in exterior metal finishing paint.
- B. Hand hole: Provide near pole base with gasketed cover.

2.04 MANUFACTURERS - LAMPS

- A. General Electric.
- B. Osram/Sylvania.
- C. Philips.
- D. Substitutions: Under provisions of the Information for Bidders.

2.05 FLUORESCENT LAMPS

- A. All 260 425 430 800 1500 ma, shall be of the same manufacturer.
- B. Two foot nominal 17 watt program start:
  - 1. Minimum initial lumens -2850.
  - 2. Relative color temperature - 3000 degrees Kelvin.
  - 3. Minimum color rendering index (CRI) - 82.
- C. Other fluorescent lamps: As indicated on Fixture Schedule. Where available, provide relative color to the basic rapid start lamp.

DIVISION 26 ELECTRICAL – UPLANDS TOWNHOMES  
SECTION 26 50 00 – LIGHTING

2.06 MANUFACTURERS - ELECTRONIC FLUORESCENT BALLASTS

- A. Valmont.
- B. Advance.
- C. Motorola.
- D. Substitutions: Under provisions of the Information for Bidders.

2.07 BALLASTS

- A. Nominal 260ma Program Start: Nominal 60Hz, AC solid state totally electronic with maximum 1.5 crest factor, having less than 10% total harmonic distortion, and suitable for NEMA Class 2 installation.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate locations of interior fixtures with Architectural Reflected Ceiling Plans. Coordinate recessed fixtures for ceiling cavity clearance and suspended ceiling construction prior to delivery to job site. Pay extra costs resulting from failure of Contractor to properly coordinate.
- B. Verify that fluorescent fixture lenses meet specifications prior to installation. Replace lenses not meeting specification. Pay extra costs associated with lens replacement.

3.02 INSTALLATION

- A. Space recessed portion of enclosures other than at points of support at least 2 inch from combustible materials. Tap connections in 3.8 inch flexible metal conduit not less than 4 feet, nor more than 6 feet in length.
- B. Install surface mounted fixtures in a rigid manner.
- C. Install exterior poles plumb. Use double nut method of aligning poles. Grout in space between pole base and top of concrete base.
- D. Connect equipment ground conductor to inside of pole.
- E. Install bolt covers securely.

END OF SECTION



DIVISION 27 ELECTRICAL – UPLANDS TOWNHOMES  
SECTION 27 13 40 – TELEPHONE RACEWAY SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Conduits and Boxes.

1.02 SYSTEM DESCRIPTION

- A. Provide telephone raceways, outlets, device plates, and terminal cabinets in conformance with respective Sections. Consult with the telephone company, and comply with their requirements.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Conform to Section 26 05 11: Basic Materials and Methods.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Conduit runs less than 100 feet from point-to-point shall not contain more than 2 - 90 degree standard factory bends, or 3 - 90 degree, 24 inch radius bends.
- B. Conduit runs exceeding 100 feet from point-to-point or exceeding 2 - 90 degree bends shall contain accessible pull boxes.
- C. Feeder conduits to telephone terminals shall enter top or bottom on the extreme right or left side of box.
- D. Cast conduit fittings (LB's etc.) not permitted.
- E. Provide a polyethylene pulling string in all completed raceways.

END OF SECTION

