

**Bid Form**

Item No.	Specification Item No.	Item w/Unit Bid Price Written in Words	Unit of Measure	Approx. Quantity	Unit Price	Extended Price
		per Lump Sum				
1		Pre Engineered Metal Building Complete-in-Place, in Accordance with the Specifications	LS	1		
		@				
		per Lump Sum				
2		Foundation for PEMB Complete-in-Place, in Accordance with the Specifications	LF	1		
		@				
		per Linear Foot				
3		Fencing for Kennels, Complete-in-Place, in Accordance with the Specifications	LS	1		
		@				
		per Lump Sum				
4		HVAC for PEMB, Complete-in-Place, in Accordance with the Specifications	LS	1		
		@				
		per Lump Sum				
5		Plumbing for PEMB, Complete-in-Place, in Accordance with the Specifications	LS	1		
		@				
		per Lump Sum				
6		Electrical for PEMB, Complete-in-Place, in Accordance with the Specifications	LS	1		
		@				
		per Lump Sum				
7		Build Out PEMB includes Insulation, Ceilings, Drywall, Paint, Cabinets & Trim, Countertops, and Appliances and Accessories Complete-in-Place, in Accordance with the Specifications	LS	1		
		@				
		per Lump Sum				

**Total Base Bid Proposal of** \_\_\_\_\_

Sum of Items 1 through 7

(Total base bid in words) \_\_\_\_\_

# Item 190

## Reinforcement Steel

### 190.01 General

This item shall govern deformed reinforcement; plain reinforcement; pre-stressing tendons; and reinforcement consisting of structural steel, steel pipe, or steel tubing as specified herein.

Reinforcement to be welded is indicated on the drawings. Reinforcement of the specified ASTM steel, except for ASTM A-706, shall require a report of material properties conforming to "Reinforcing Steel Welding Code" (AWS D12.1) of the American Welding Society.

### 190.02 Materials

#### 1. Deformed Reinforcement

- a. Deformed reinforcing bars shall conform to one of the following specifications, except as provided in Section 1.b below
  - i. "Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement" (ASTM A-615), Grade 60.
  - ii. "Specification for Rail-Steel Deformed and Plain Bars for Concrete Reinforcement" (ASTM A-616), Grade 60.
  - iii. "Specification for Axle-Steel Deformed and Plain Bars for Concrete Reinforcement" (ASTM A-617), Grade 60.
  - iv. "Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement" (ASTM A-706).
  
- b. Deformed reinforcing bars shall conform to the following exceptions to the ASTM specifications listed in Section 1.a above.
  - i. For ASTM A-615, and A-617, yield strength shall correspond to that determined by tests on full size bars.
  - ii. For ASTM A-615, A-616, and A-617, bend test requirements for all bar sizes #3 through #11 shall be based upon 180 deg. Bends of full size bars around pins with diameters specified in Table 1. If #14 or #18 bars meeting these specifications are to be bent, full size bar specimens shall be bend tested 90 deg. At a minimum temperature of 60 deg. F around a 9D<sub>b</sub> pin without

cracking of the bar. However, if #14 and #18 bars as used in the structure are required to have bends exceeding 90 deg., specimens shall be tested 180 deg. With other criteria the same as for 90 deg.

Table 1  
Bend Test Requirements

Bar Designation	Pin Diameter for Bend Test
#3, #4 and #5	3-1/2d <sub>b</sub>
#6, #7 and #8	5d <sub>b</sub>
#9, #10 and #11	7d <sub>b</sub>
#9, #10 and #11 (of Grade 40)	5d <sub>b</sub>

- c. Bar and rod mats for concrete reinforcement shall conform to "Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement" (ASTM A-184).
- d. Deformed wire for concrete reinforcement shall conform to "Specifications for Deformed Steel Wire for Concrete Reinforcement" (ASTM A-496)
- e. Welded deformed wire fabric for concrete reinforcement shall conform to "Specification for Welded Deformed Steel Wire Fabric for Concrete Reinforcement" (ASTM A-497).
- 2. Plain Reinforcement
  - a. Plain Bars for spiral reinforcement shall conform to the specification listed in Section 1.a (1), (2), or (3) including additional requirements of Section 1.b.
  - b. Smooth wire for spiral reinforcement shall conform to "Specification for Cold-Drawn Steel Wire for Concrete Reinforcement" (ASTM A-82).
  - c. Welded smooth wire fabric for concrete reinforcement shall conform to "Specification for Welded Steel Wire Fabric for Concrete Reinforcement" (ASTM A-185).
- 3. Pre-stressing Tendons
  - a. Wire, strands, and bars for tendons in pre-stressed concrete shall conform to one of the following specifications:
    - i. "Specification for Uncoated Stress-Relieved Wire for Pre-Stressed Concrete" (ASTM A-421)
    - ii. "Specification for Uncoated Seven-Wire Stress-Relieved Strand for Pre-Stressed Concrete" (ASTM A-416).
    - iii. "Specification for Uncoated High-Strength Steel Bar for Pre-Stressing Concrete" (ASTM A-722).

- b. Wire, strands, and bars not specifically listed in ASTM A-421, A-416, or A-722 may be used provided they conform to minimum requirements of these specifications and do not have properties that make them less satisfactory than those listed in ASTM A-421, A-416, or A-722.
4. Structural Steel, Steel Pipe, or Tubing
- a. Structural steel shall conform to one of the following specification:
    - i. "Specification for Structural Steel" (ASTM A-36).
    - ii. "Specification for High-Strength Low-Allow Structural Steel" (ASTM A-242).
    - iii. "Specification for High-Strength Low Allow Structural Manganese Vanadium Steel" (ASTM A-441).
    - iv. "Specification for High-Strength Low Alloy Columbium-Vanadium Steels of Structural Quality" (ASTM A-572), Grade 60.
    - v. "Specification for High-Strength Low Alloy Structural Steel with 50,000 psi Minimum Yield Point to 4in. Thick" (ASTM A-588).
  - b. Steel pipe or tubing shall conform to one of the following specifications:
    - i. Grade B of "Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless" (ASTM A-53).
    - ii. "Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes" (ASTM A-500), Grade B
    - iii. "Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing" (ASTM A-501).

#### **190.03 Sizes and Weights**

The nominal sizes and areas, and the theoretical weights of deformed bars shall not be less than the current standard of the Concrete Reinforcing Steel Institute.

#### **190.04 Bending**

Reinforcement bars shall be bent cold to the shapes indicated on the plans.

All bending of hard grade new billet and rail steel bars shall be done in the shop; other grades shall preferably be bent in the shop. Bends shall be made around pins; the diameter of pins shall be not less that four (4) times the minimum thickness of the bar. Heating for

bending shall be employed only when authorized specifically.

#### **190.05 Storage**

Reinforcement shall be stored above the ground surface upon skids, platforms, or other supports, and shall be protected from mechanical injury and from deterioration by exposure to the weather. When placed in the work, the reinforcement shall be free from dirt, loose rust, scale, paint, oil or other foreign material.

#### **190.06 Splices**

No splices of bars, except when shown on the plans, will be permitted except upon the written approval of the Engineer. Splices which are permitted shall have a length of not less than that required by the ACI Code, and shall be well distributed or else located at points of low tensile stress. The spacing between bars shall meet the recommendation of the ACI Code for anchorage bond and placing concrete.

Where welded splices may be required, they shall conform to AWS D 12.1 "Recommended Practices for Welding reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction." Welded splices shall develop intension at least 125% of the specified yield strength of the reinforcing bar. Splices shall transfer the entire computed stress from bar to bar without exceeding three-fourths of the permissible bond. Welded wire fabric shall be lapped not less than two mesh, i.e., the length of the lap shall be at least equal to the spacing of wires parallel to the lap.

Bars shall be rigidly clamped or wired at all splices in a manner approved by the Engineer.

#### **190.07 Rejection**

Reinforcement may be rejected for failure to meet any of the requirements of this specification on account of any of the following:

- 1) Reinforcement exceeding the allowable variations in size of weight.
- 2) Reinforcement with bends not in conformity with the details.
- 3) Reinforcement with a coating of dirt, loose rust, scale, paint, oil or other foreign substance at time of placing in the work.
- 4) Twisted bars

#### **190.08 Detailing**

- 1) Completely detailed shop drawings and schedules shall be submitted by the Contractor for approval of the Engineer in accordance with requirements specified for working drawings.

- 2) The bars shall be supplied in lengths which will allow them to be conveniently placed in the work and provide sufficient lap at joints. Dowels of proper length, size, and shape shall be provided for tying walls, beams, floors, and the like together where shown, specified, or ordered.
- 3) Steel reinforcement shall be of the type and size, cut to lengths, and bend to shape as indicated on the plans. Where dimensions of hooks are not shown, the diameter of the hook shall equal size (6) times the bar diameter for bar sizes #3 through #8 and 8 times for #9, #10 and #11, with a straight length of bar at the end of the hook equal to four (4) times the bar diameter, or 2 ½" minimum, whichever is greater.

### **190.09 Placing Reinforcement**

Reinforcement, before being placed, shall be thoroughly cleaned of mill and rust scale and of coatings that will destroy or reduce the bond with the concrete. When there is a delay in concreting operations and the reinforcement has been in place in excess of two (2) days, it shall be reinspected and, when necessary, cleaned.

Metal reinforcement shall be accurately positioned and dimensioned in accordance with the plans and specifications. The bars and mesh shall be tightly secured against displacement by using annealed wire of not less than No. 16 gauge and suitable clips at intersections. The reinforcement shall be supported in a manner that will keep all metal away from the interior surfaces of forms, or the surface against which the concrete is placed, in accordance with the "clear" dimensions as shown on the plans or as specified. Single layer reinforcement in slabs shall be placed at mid-depth unless otherwise dimensioned in plans.

Nails shall not be driven into the outside forms to support reinforcement, nor shall any other device for this purpose come in contact with outside form, except that wood strips shall be inserted between the reinforcement and the forms at intervals to maintain the required clear distances between the reinforcement and the outside surfaces of the concrete. These wood strips shall be pulled up and removed as the level of the concrete rises in the forms. In the case of slabs and beams, metal chairs, spacers, and other metal accessories necessary to provide the required clear distances and proper alignment and spacing between bars shall be used subject to the approval of the Engineer. Precast concrete blocks wired to the reinforcing bars will not be permitted as supports or spacers.

### **190.10 Concrete Protection for Reinforcement**

Steel reinforcement shall be placed and held in position so that the concrete cover as measured from the surface of the bar, shall be the following, except as otherwise shown, specified, or directed:

Slabs:

¾ inch, in general, top and bottom;

1 ½ inches at surfaces troweled as floor finish, walkway, or driveway;

1 ½ inches at bottom for slabs over water;

Footings:

3 ½ inches at top of footings;

3 inches at bottom, sides, and end of footings;

Walls:

2 inches on surfaces against earth;

1 inch on interior surfaces;

1 ½ inches on interior surfaces contacting water;

3 inches at top surface;

Beams and Girders:

1 ½ inch minimum for stirrup steel, top and bottom; 2 inch minimum to main longitudinal steel;

Columns:

2 inches, in general to main vertical reinforcement

# Item 220

## General Concrete Specifications

### 220.01 Scope

These specifications shall govern for the materials used, for the storing, measuring and handling of materials, and for the proportioning and mixing of concrete for construction as required on this project.

### 220.02 General

Concrete shall be of the class indicated in the plans and shall be composed of Portland cement, mineral filler if necessary, fine aggregate, coarse aggregate, and water proportioned and mixed as specified herein.

### 220.03 Materials

Cement shall be Type I Portland Cement, the composition, marking, handling and storage of which shall conform with ASTM C-150. Type III (Highly Early Strength) cement may be used if approved by the Engineer. Cement that has become damp, lumpy or otherwise affected so as to reduce its strength shall not be used in the work. The Contractors shall furnish the Engineer with Certified Mill Test Reports for all cement used in the work.

Aggregates shall be clean, uncoated, and free of any impurities other than nominal amounts of fine clay, the limits of which are specified herein. Aggregates shall conform with ASTM C-33 except that the gradation shall be within limits specified below:

<u>Fine Aggregate</u>		<u>Coarse Aggregate</u>			
<u>Sieve Size</u>	<u>Passing</u>	<u>Sieve Size</u>	<u>1-1/2"</u>	<u>1"</u>	<u>3/4"</u>
4	95-100	1-1/2"	95-100		
100	0-5	1"		90-100	
		3/4"	40-70		90-100
		1/2"	25-60		
		3/8"	10-30		
		#4	0-10	0-10	0-10
	Clay - 3% Max.		Clay - 1% Max.		

Water shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances.

Bar Supports (chairs) shall be plastic, plastic protected wire, stainless steel, or precast concrete supports. Precast concrete bar supports shall be wedge-shaped, not larger than

3-1/2 x 3-1/2 inches of thickness equal to that indicated for concrete cover and shall have an embedded hooked tie wire for anchorage.

Metal Accessories shall be spacers, chairs, ties, and other approved devices necessary for properly assembling, spacing and supporting the reinforcement in place.

Expansion Joint Material shall be premolded saturated felt, or other approved material, not less than plan thickness and as wide as the slab depth.

#### **220.04 Mixing and Proportioning**

Concrete may be proportioned and mixed on the job, dry-batched for mixing on the job, or procured from a "ready mixed" concrete plant.

If "ready mixed", the mixing and transportation operations shall conform with ASTM C-94. Mixing water shall not be added after a truck has left the plans. No concrete shall be used in the work which has been held longer than one hour in a mixer truck.

If dry-batching to the job site, the batching plant operation shall conform with ASTM C-94. Transportation of dry materials shall be performed in such manner as to prevent loss, segregation or contamination of the ingredients.

If job-proportioned and mixed, the aggregate shall be stockpiled separately and handled in such a manner as to prevent the inclusion of any foreign materials. Cement shall be stored in a watertight building with the floor off the ground. Except for emergency hand mixing under approved conditions, all concrete shall be machine-mixed in an approved type mixer for a minimum period of 1-1/2 minutes in a drum rotating at the peripheral speed of about 200 feet per minute.

Aggregate shall be proportioned by weight unless a satisfactory volumetric method of measure is approved by the Engineer. The use of fractional sacks of cement will not be permitted unless the cement is proportioned by weight. Free moisture content of aggregate shall be included as a portion of the mix water required.

Retamping of partially hardened concrete or mortar will not be permitted.

The concrete shall be uniform and workable. The minimum cement content, maximum allowable water content and slump, and minimum strength shall conform to the following:

Class Min. Of <u>Concrete</u>	Compressive Strength @ 28 days <u>PSI</u>	Minimum Flexural Strength @ 7 days <u>PSI</u>	Min. Cement Content <u>Sacks</u>
A	3,000	550	5.0
B	2,000	375	4.0
C	3,600	600	6.0
D	1,500	250	3.0

Class Of <u>Concrete</u>	Maximum Aggregate <u>Size</u>	Max. Water Cement <u>Ratio</u>	Max. Allowable Slump (In)	
			<u>For Hand Placement</u>	<u>For Machine Placement</u>
A	1-1/2"	6.5	4	2
B	1-1/2"	8.0	3	1-1/2
C	1-1/2"	6.0	4	2
D	2-1/2"	11.0	2-1/2	2

To conform with the requirements of these specifications, the average of all the strength tests representing each class of concrete as well as the average of any five consecutive strength tests representing each class of concrete shall be equal to or greater than the specified strength and not strength test shall be less than 80 percent of the specified strength.

#### 220.05 Testing

During the progress of the work the Contractor or his testing lab of choice will cast test cylinders or beams of the number and type for testing to maintain a check on the compressive and flexural strength of the concrete actually being places. One beam shall be required for each 1,000 square yards of pavement.

The Contractor or his testing lab of choice shall provide and maintain curing facilities for eh purpose of curing all concrete test specimens.

The cost of providing and maintaining curing facilities, testing, and furnishing of test results to the Owner's Engineer shall be included in the unit price bid for concrete of the various classes.

#### 220.06 Forms

General: Forms shall be so constructed that the finished concrete will conform to the shape, line, grades, and dimensions indicated on the drawings. Lumber used in the forms for exposed surfaces shall be dressed to a uniform thickness and shall be horizontal or vertical. Lumber once used in forms, or used lumber, shall be cleaned and satisfactorily reconditioned.

Design: (a) Forms shall be sufficiently tight to prevent the leakage of mortar. They shall be properly shored, braced, and otherwise supported so as to maintain the desired position and shape during and after placing concrete.

(b) Bolts and rods shall be used for interval ties; they shall be so arranged that when the forms are removed, not metal shall be within one (1") inch of any surface

(c) If conditions are favorable, the Engineers may permit the use of earth forms for trenches or footings; in which case the bottom shall be level, clean and without fill; and the sides shall be even and clean and unless otherwise shown, shall be vertical.

Molding: Suitable moldings or bevels shall be placed in the angles of forms to round or bevel the edges of the concrete where such shaping is shown on the drawing or where directed by the Engineer.

Oiling: The inside of forms shall be coated with a non-staining mineral oil or other approved material. Oil shall be applied before the reinforcement is placed.

Clean-out Opening: Temporary openings shall be provided at the base of column and wall forms and at other points where necessary to facilitate cleaning and inspection immediately before depositing concrete.

Form Removal: The removal of forms shall be subject to the Engineer's approval and shall not be started until the concrete has attained the necessary strength to support its own weight and any construction live loads.

## **220.07 Depositing Concrete**

General: No concrete shall be placed until the forms and other conditions are approved by the Engineer, and until all pipes, conduits, sleeves, thimbles hangers, flashing and other items required to be placed in the concrete have been properly installed.

Temperature: Concrete may be placed when the temperature is 45 degrees F, or more and rising, provided there is no reason to expect a drop in temperature to below 45 degrees F within 12 hours of the placement of the pour. Concrete may not be placed when the temperature of the concrete is more than 90 degrees F.

Cleaning: Hardened concrete and foreign materials shall be removed from the inner surfaces of mixing and conveying equipment before any concrete is mixed.

Before depositing concrete, forms shall be thoroughly wetted and all debris removed.

Removal of Water: Water shall be removed from the space to be occupied by concrete and any continuous flow of water shall be diverted to a slump or removed by pumping.

Handling: Concrete during and immediately after depositing shall be thoroughly compacted by means of suitable tools. The use of approved type of mechanical vibration is recommended and urged.

Depositing Continuously: Concrete shall be deposited continuously or in layers of such thickness that no concrete shall be deposited against concrete which has hardened. If a section cannot be placed continuously, construction joints may be located at points as provided for in the drawings or approved by the Engineer. Before depositing new concrete against old, the forms shall be retightened, the hardened surfaces cleaned and covered with a coating of mortar or neat cement grout.

## 220.08 Curing and Protection

General: All concrete shall be cured by an approved method for the period of time given below:

Type III Portland Cement	3 days
Type I Portland Cement	7 days
Type II Portland Cement	14 days

Immediately after placement, concrete shall be protected from premature drying, extremes in temperatures, rapid temperature changes, mechanical injury, and injury from rain and flowing water. All materials and equipment needed for adequate curing and protection shall be available and at the job site prior to start of concrete placement. Concrete shall be protected from the damaging effects of rain for 12 hours, flowing water for 14 days and direct rays of the sun for 3 days. All concrete shall be adequately protected from damage. No fire nor excessive heat shall be permitted near nor in direct contact with concrete at any time.

Moist Curing: Concrete moist-cured shall be maintained continuously (not periodically) wet for the entire curing period. If water or curing materials used stain or discolor concrete surfaces which are to be permanently exposed, they shall be cleaned as required by the Engineer. When wooded form sheathing is left in place during curing, the sheathing shall be kept wet at all times.

Horizontal surfaces shall be cured by ponding, by covering with a minimum uniform thickness of two (2") inches continuously saturated sand, or by covering with saturated not-staining burlap or cotton mats or sealed impervious sheet materials...the following exceptions are permitted:

- 1) Horizontal construction joints may be allowed to dry for twelve (12) hours immediately prior to placing of the following lift).
- 2) Where insulation is approved for cold weather protection, all joints in the insulation shall be sealed to prevent moisture loss and maintained sealed throughout curing period.

Membrane Curing: Any surface to which concrete, paint, sack rubbed finish or any subsequent treatment that depends on adhesion or bonding to the concrete shall not be cured with curing compound. Curing compound shall be of an approved pigmented or non-pigmented type. On surfaces permanently exposed to view, the non-pigmented type containing a fugitive dye shall be shaded from direct rays of the sun for the first seven days of the curing period.

The curing compound shall be applied to formed surfaces immediately after the forms are removed and prior to any patching or other surface treatment except the cleaning of loose sand, mortar, and debris from the surface. The surfaces shall be thoroughly moistened with water and curing compound applied to unformed surfaces as soon as free water has disappeared. The curing compound shall be applied in a two-coat continuous operation by approved power spraying equipment and at a uniform coverage of not more than 400 square feet per gallon for each coat. Concrete surfaces on which the curing compound has been applied shall be adequately protected for the duration of the entire curing period from pedestrian and vehicular traffic and from any other cause which will disrupt the continuity of the curing membrane.

## **220.09 Finished Exposed Surfaces**

The type of surface finish shall be one of the three types herein described as called for on the plans or in the special provisions. Where the plans do not specify the type of surface finish, Type I Surface Finish shall be used.

Type I Surface Finish: All railing, curbs, the underside of overhanging beams, the outside and bottom of exterior girders of fascia beams, and all portions of piers, columns, bents, abutments, retaining walls, and culverts which are exposed to view after backfill and roadway embankments are placed shall be surface finished with a first and second rubbing as hereinafter described. The area inside of culvert barrels including both sidewalls and the underside of the top slab shall be a distance equal to one-third (1/3) the clearance height but not less than eighteen (18) inches shall be considered exposed to view.

Forms for all surfaces which are to be finished as specified above shall be face lined with a lining material such as masonite or plywood.

Type II Surface Finish: All concrete portions of railing and the top and roadway faces of all curbs, including ear walls, on bridges and culverts shall be surface finished with a first and second rubbing as hereinafter described.

The following concrete surfaces, while not required to be rubbed, shall be made of smooth and uniform texture by face lining the forms with a lining material such as masonite or plywood; the outside vertical face of curbs and slabs, the underside of overhanging slabs, and all portions of piers, columns, bents, abutments, culverts, and retaining walls which

are exposed to view after backfill.

**Type III Surface Finish:** All concrete portions of railing and top roadway faces of all curbs on bridges and culverts, shall be surface finished with a first rubbing only as hereinafter described. No other rubbing will be required except as hereinafter specified for patching and correcting defective surfaces. No face lining of forms will be required with Type III Surface Finish.

The first rubbings shall be performed as follows: as soon as forms are removed, all necessary pointing shall be done. When the pointing has set sufficiently to permit it, all surfaces requiring surface finish shall be wet with a brush and given a first surface rubbing with No. 16 Carborundum Stone or an abrasive of equal quality. The rubbings shall be continued sufficiently to bring the surface to a paste, to remove all form marks and projections and to produce a smooth dense surface without pits or irregularities. The use of cement to form a surface paste will not be permitted.

Where a second rubbing is not specified, chamfered corners shall be rubbed in the first rubbing and the material which has been ground to a paste in the rubbing process shall be spread uniformly over all rubbed surfaces by striping with a brush and the mortar on the surface shall be allowed to take a re-set. The surface shall be left with a clean, neat, and uniform appearance and shall be uniform in color.

Where a second rubbing is to follow the first rubbing, the material ground into a paste during the first rubbing shall be carefully spread or brushed uniformly over the surface and allowed to take a re-set, but washing down following this first rubbing will not be required. Also, chamfered corners generally shall not be rubbed in the first rubbing if a second rubbing is to follow.

The second rubbing, when required, shall be performed as follows: during the process of conditioning the complete structure for final acceptance, the surfaces of the entire structure required finish shall be given a final finish with a No. 30 Carborundum Stone or an abrasive of equal quality. On completion of this rubbing, the surface shall be neatly striped with a brush, and the mortar on the surface shall be allowed to take a re-set. The surface shall then be washed down with clean water. The entire structure shall be left with a clean, neat and uniform appearing finish and shall be uniform in color. The surface of concrete roadway and sidewalk slabs shall be finished by floating, seeding and belting.

Rubbing of surfaces other than those herein specified will not be required, unless such surfaces are not true or have porous spots or honeycombed areas. In case these defects occur, the areas immediately affected shall be given a first surface rubbing. Such rubbing shall extend over a sufficient area around the blemished portions to blend the rubbed area into the surrounding unfinished surface, but this shall not be construed to require the rubbing of large areas of unblemished surfaces of the portion of the structure in question.

# **Item 500**

## **PRE-ENGINEERED METAL BUILDINGS**

### **STANDARD SPECIFICATIONS METAL BUILDINGS**

#### **CONTENTS**

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#### **SECTION 1. GENERAL**

##### 1.1. Scope

###### 1.1.1.

These specifications cover the materials and the fabrication of metal buildings designed, fabricated, and readily erected to be weather tight.

###### 1.1.2.

These specifications are an outline of performance to insure that the architect, engineer, building and/or owner understands the basis for design, manufacture and application of all the manufacturer's metal building systems.

###### 1.1.3.

Because of a continuing program of research and development, specifications in this manual are subject to change without notice.

##### 1.2. Building Description

###### 1.2.1.

Gable Symmetrical is a continuous frame building with the ridge in the center of the building, consisting of tapered or straight columns and tapered rafters. Sidewall girts may be continuous, by-passing the columns or simple span, flush in the column line. Rafters

may or may not have interior columns. A ridged (double slope) building in which the ridge is in the center of the building.

#### 1.2.2.

Gable Unsymmetrical is a continuous frame building with an off-center ridge, consisting of tapered or straight columns and tapered rafters. Eave height and roof slope may differ on each side of the ridge. Sidewall girts may be continuous, by-passing the columns or simple span, flush in the column line. Building may or may not have interior columns.

#### 1.2.3.

Single Slope is a continuous frame building which does not contain a ridge, but consists of one continuous slope from side to side. Building consists of straight or tapered columns and tapered or straight rafters. Sidewall girts may be continuous, by-passing the columns or simple span, flush in the column line. Building may or may not have interior columns.

#### 1.2.4.

Lean-to (LT) is a building extension which does not contain a ridge, but consists of one continuous slope from side to side. These units usually have the same roof slope and girt design as the building to which they are attached.

#### 1.2.5.

All building types normally have Simple Span endwall girts flush in the column line.

### 1.3. Building Nomenclature

#### 1.3.1.

Roof slope is expressed as inches of rise for each 12" of horizontal run.

#### 1.3.2.

Building "Width" is measured from outside to outside of sidewall girts.

1.3.3. Building "Eave Height" is a nominal dimension measured from the bottom of the base plate on the column to the intersection of the inside of the roof and sidewall sheets.

#### 1.3.4.

Building "Length" is measured from outside to outside of endwall girts.

#### 1.3.5.

Standard "Bay Spacing" shall be 20', 25' or 30' between frame centerlines (except at end bays) unless otherwise specified, for buildings with "Shadow A", "R", or "PBR" panels.

#### 1.3.6.

References to "Architectural" panel shall include "Shadow A" panels.

## 1.4. Drawings and Certifications

### 1.4.1.

Drawings: Manufacturer shall furnish complete erection drawings for the proper identification and assembly of all building components. These drawings will show anchor bolt settings, transverse cross-sections, sidewall, endwall and roof framing, flashing and sheeting, and accessory installation details.

### 1.4.2.

Certifications: Standard drawings and design analysis shall bear the seal of a registered professional engineer upon request. Design analysis shall be on file and furnished by manufacturer upon request.

## **SECTION 2. STRUCTURAL STEEL DESIGN**

### 2.1. General

#### 2.1.1.

The building manufacturer shall use standards, specifications, recommendations, findings and/or interpretations of professionally recognized groups such as AISC, AISI, AAMA, AWS, ASTM, MBMA, Federal Specifications, and unpublished research by MBMA as the basis for establishing design, drafting, fabrication, and quality criteria, practices, and tolerances. For convenience, one or more sources may be referenced in a particular portion of these specifications. In all instances, however, the manufacturer's design, drafting, fabrication and quality criteria, practices, and tolerances shall govern, unless specifically countermanded by the contract documents.

#### 2.1.2.

Structural mill sections or welded up plate sections will generally be designed in accordance with the 9th edition of AISC's "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings", ASD method.

#### 2.1.3.

Cold-Formed steel structural members will generally be designed in accordance with the latest edition of AISI's "Specifications for the Design of Cold-Formed Steel Structural Members".

### 2.2. Design Loads

#### 2.2.1.

Design loads shall be as specified and set forth in the contract and construction drawings, and shall be in accordance with the manufacturer's standard design practices. Design loads may include dead load, roof live loads, wind loads, seismic loads, collateral loads, auxiliary equipment loads, and/or other applied or specified loads.

#### 2.2.2.

Dead Load - the actual weight of the building system supported by a given member.

2.2.3.

Roof Live Loads - loads produced by maintenance activities, rain, erection activities, and other movable or moving loads by not including wind, snow, seismic, crane, or dead loads.

2.2.4.

Roof Snow Loads - gravity load induced by the weight of snow or ice on the roof, assumed to act on the horizontal projection of the roof.

2.2.5.

Wind Loads - the loads on a structure induced by the forces of wind blowing from any horizontal direction.

2.2.6.

Collateral Loads - the weight of any non-moving equipment or material, such as ceilings, electrical or mechanical equipment, sprinkler systems, plumbing, or ceilings.

2.2.7.

Auxiliary Loads - dynamic loads induced by cranes, conveyors, or other material handling systems.

2.2.8.

Seismic Loads -horizontal loads acting in any direction on a structural system due to action of any earthquake.

2.2.9.

Floor Live Loads - loads induced on a floor system by occupants of a building and their furniture, equipment, etc.

## **SECTION 3. BASIC MATERIAL SPECIFICATIONS**

### **3.1. Primary Framing Steel**

#### **3.1.1.**

Steel for hot rolled shapes shall conform to the requirements of ASTM Specifications A-36, with minimum yield of 36, 42, or 50 psi.

#### **3.1.2.**

Steel for built-up sections shall generally conform to the physical requirements of ASTM D529, ASTM 572 or ASTM A36 as applicable, with minimum yield of 42,000, 50,000, or 55,000 psi as indicated by the design requirements.

3.1.3. Steel for endwall "C" sections shall generally conform to the physical requirements of ASTM A607 GR55M or equivalent, and have a minimum yield of 55,000 psi.

### **3.2. Secondary Framing Steel**

#### **3.2.1.**

Steel used to form purlins, girts, eave struts and "C" sections shall be Republic Steel P-55 or equivalent, comparable to the requirements of ASTM A607 Grade 55. Minimum yield shall be 55,000 psi.

### **3.3. Roof And Wall Panel Material**

#### **3.3.1.**

Panel material as specified shall be 26 gauge Galvalume® as manufactured by Bethlehem Steel Corporation, or equal, conforming to the requirements of ASTM A792 Grade 80 or Grade 50. Minimum yield stress shall be 80,000 ksi for Grade 80 and 50,000 ksi for Grade 50.

#### **3.3.2.**

Panel material as specified shall be 24 gauge Galvalume®, conforming to the requirements of ASTM A792 Grade 50 or Grade 80. Minimum yield stress shall be 50,000 ksi for Grade 50.

#### **3.3.3.**

See 5.1.4 for additional material used.

## **SECTION 4. STRUCTURAL FRAMING**

### **4.1. General**

#### **4.1.1.**

All framing members shall be shop fabricated for field bolted assembly. The surfaces of the bolted connections shall be smooth and free from burrs or distortions.

#### **4.1.2.**

All shop connections shall be in accordance with the manufacturer's standard design practices as specified in Paragraph 2.1.1. Certification of welder qualifications will be furnished when required and specified in advance.

#### **4.1.3.**

All framing members, where necessary, shall carry an easily visible identifying mark.

### **4.2. Primary Framing**

#### **4.2.1.**

**Rigid Frame:** All rigid frames shall be welded built-up "I" sections or hot-rolled sections. The columns and the rafters may be either uniform depth or tapered. Flanges shall be connected to webs by means of a continuous fillet weld on one side.

#### **4.2.2.**

**Endwall Frames:** All endwall roof beams and endwall columns shall be cold-formed "C" sections, mill-rolled sections, or built-up "I" sections depending on design requirements.

#### **4.2.3.**

**Plates, Stiffeners, etc.:** All base plates, splice plates, cap plates, and stiffeners shall be factory welded into place on the structural members.

#### **4.2.4.**

**Bolt Holes, etc.:** All base plates, splice and flanges shall be shop fabricated to include bolt connection holes. Webs shall be shop fabricated to include bracing holes.

#### **4.2.5.**

**Connections for secondary structural (purlins and girts)** shall be by means of welded clips.

### **4.3. Secondary Framing**

#### 4.3.1.

Purlins and Girts: Purlins and girts shall be cold-formed "Z" sections with stiffened flanges. Flange stiffeners shall be sized to comply with the requirements of the latest edition of AISI. Purlin and girt flanges shall be unequal in width to allow for easier nesting during erection. They shall be prepunched at the factory to provide for field bolting to the rigid frames. They shall be simple or continuous span as required by design. Connection bolts will install through the webs, not flanges.

#### 4.3.2.

Eave Struts: Eave Struts shall be unequal flange cold-formed "C" sections.

#### 4.3.3.

Base Angle: A base member will be supplied by which the base of the wall covering may be attached to the perimeter of the slab. This member shall be secured to the concrete slab with ram-sets, expansion bolts, or equivalent anchors as shown on the drawings.

### 4.4. Bracing

#### 4.4.1.

Diagonal Bracing: Diagonal bracing in the roof and sidewalls shall be used to remove longitudinal loads (wind, crane, etc.) from the structure. This bracing will be furnished to length and equipped with bevel washers and nuts at each end. It may consist of rods threaded each end or galvanized cable with suitable threaded end anchors. If load requirements so dictate, bracing may be of structural angle and/or pipe, bolted in place.

#### 4.4.2.

Flange Braces: The compression flange of all primary framing shall be braced laterally with angles connecting to the webs of purlins or girts so that the flange compressive stress is within allowable limits for any combination of loading.

#### 4.4.3.

Special Bracing: When diagonal bracing is not permitted in the sidewall, a rigid frame type portal or fixed base columns will be used. Wind bracing in the roof and/or walls need not be furnished where it can be shown that the diaphragm strength of the roof and/or wall covering is adequate to resist the applied wind forces.

## **SECTION 5. ROOF AND WALL COVERING**

### 5.1. General

#### 5.1.1.

Roof panels shall be any of the following: "R", "PBR", or standing seam. "PBR" panels shall have an extended purlin bearing leg. For standing seam see Sections 5.3 and 5.4.

#### 5.1.2.

Wall panels may be either a "R", "PBR", or "Shadow A" profile. Panel profile "Shadow A" is considered an Architectural panel.

#### 5.1.3.

Panels "R", "PBR", or "Shadow A" shall be 26 gauge Galvalume Plus® or pre-coated Galvalume® steel. Panel "PBR" may optionally be 24 gauge Galvalume Plus® or pre-coated Galvalume® steel.

#### 5.1.4.

Standing Seam Roof Panels - see Section 5.3 and 5.4.

### 5.2. Panel Description

#### 5.2.1.

"R" Panel shall have major ribs 1 1/4" high spaced 12" on center. In the flat area between the major ribs are two smaller minor ribs. Each panel shall provide 36" net coverage in width. All sidelaps shall be at least one major rib.

5.2.2. "PBR" (Purlin bearing leg) Panels shall have major ribs 1 1/4" high spaced 12" centers. In the flat area between the major ribs are two smaller minor ribs. Each panel shall provide 36" net coverage in width. All sidelaps shall be at least one major rib.

#### 5.2.3.

Architectural ("Shadow A") Panel shall have a configuration consisting of ribs 1 1/8" or 1 3/16" deep. Major corrugations shall be spaced 12" on center. Panel design produces a decorative smooth shadow line with semi-concealed fasteners. Architectural panels shall provide a 36" net coverage in width. All sidelaps shall be at least one major rib.

5.2.4. "Artisan® 1" Liner/Soffit Panel shall be flat, 1" high and provide 12" net coverage width. Panels shall be interlocking and be fastened with a concealed fastener. Panels are also available with two stiffening ribs.

#### 5.2.5.

Panel Length: All wall panels shall be continuous from sill to roof line and all roof panels shall be continuous from eave to ridge except where lengths become prohibitive for handling purposes. All end laps shall be at least 6" on roof and 4" on walls.

#### 5.2.6.

Endwall Edge Cuts: All endwall panels for buildings with 1:12 or less roof slope shall be square cut. All endwall panels for buildings with more than 1:12 roof slope shall be bevel cut by the erector in the field.

### 5.3. Standing Seam Roof Panel Type – Ultra-Dek® (Snap-Lock) and DoubleLok® (Machine Seamed)

#### 5.3.1.

Standing Seam Roof Panels shall be UL-90 rated, roll-formed, 24 gauge Galvalume®, whether Galvalume Plus® or pre-painted. Galvalume® sheet shall have a coating weight of .5 oz./sq. ft. with a minimum yield of 50,000 ksi and conform to ASTM-792. Pre-painted finish shall be a premium Fluoropon™ coating produced with either Kynar 500® or Hylar 5000® resins and have a full 20 year warranty.

5.3.2.

Panels shall be 24" wide with 2 minor ribs in between seams. Panel seam is 3" high.

5.3.3.

One side of the panel shall be female in configuration, which will have factory applied hot-melt mastic (see 5.3.9) inside the female seam. The female side will snap over the male side. When using Ultra-Dek Standing Seam, this procedure will form a self-locking snap system. If choosing DoubleLok Standing Seam, the male and female seams will be continuously locked together by an electrically powered mechanical seamer, forming a 360 degree Pittsburgh Seam.

5.3.4.

The panels shall be factory notched at both ends so that field installation can commence or terminate from either end of the building. Panels cannot start at both ends of the building and work towards each other.

5.3.5.

Maximum panel length shall be no more than 45'-0" unless otherwise discussed and approved by the sales or manufacturing manager.

5.3.6. Endlaps

5.3.6.1.

Endlaps shall have a 16 gauge backup plate. The panel shall have five pre-punched holes in the flat and dimples in the trapezoidal legs for proper placement of fasteners.

5.3.6.2.

Mastic (see 5.3.5) shall be applied between the panels and secured with 1/4" - #14 x 1 1/4 self drilling fasteners through the panels, and backup plate to form a compression joint.

5.3.6.3.

Endlaps and eaves shall be the only places in the roof system where through the roof fasteners can be used inside the building envelope.

5.3.7. Fasteners

5.3.7.1.

Eave - 1/4" - #14 x 1 1/4" long life self-drilling with sealing washer.

5.3.7.2.

Endlaps - 1/4" - #14 x 1 1/4 long life self-drilling with sealing washer.

5.3.7.3.

Ridge - #14 x 7/8" Lap Tek long life self-drilling with sealing washer.

5.3.7.4.

Clips/to purlin - 1/4" - #14 x 1" Tek 2 long life self-drilling with Hex Washer Head and 5/8" O.D. washer.

5.3.7.5.

Clips/floating to bar joists - #12-24 x 1 1/4" Tek 4.5 self-drilling with Washer Head and 5/8" O.D. washer.

5.3.7.6.

Long Life fasteners, where exposed, are standard when using a Galvalume Plus® roof panel.

5.3.8. Clips

5.3.8.1.

All clips shall have factory applied mastic and be designed so that movement between the panel and the clip does not occur.

5.3.8.2.

Low fixed clips - shall be 3 3/8" in height providing a 3/8" clearance for insulation between the panel and the purlin or joist.

5.3.8.3.

High fixed clips - shall be 4 3/8" in height to accommodate a thermal spacer for added insulation at the purlins.

5.3.8.4.

Low or high floating clips - shall be either 3 3/8" or 4 3/8" in height. Floating clips shall provide a minimum of 2" travel to allow for expansion and contraction.

5.3.9. Sealants And Closures

5.3.9.1.

Factory applied sealant used in panel sidelaps shall be a hot melt, foamable mastic - Q41A.

5.3.9.2.

Field applied sealant used at the endlaps, eave, ridge assembly, and gable flashings shall be 100% solids butyl-based elastomeric tape sealant, furnished in roll form or pre-cut to length. See manual for application.

5.3.9.3.

Outside closures shall be manufactured from the same materials as the roof panels.

5.3.9.4.

Inside closures shall be 18 gauge metal.

5.4. Standing Seam Roof - Architectural Panel Type - BattenLok® and SuperLok® (Machine Seamed)

5.4.1. Panel Description

5.4.1.1.

Standing Seam Roof Panels shall be UL-90 rated, roll-formed, 24 or 22 gauge Galvalume®, whether Galvalume Plus® or pre-painted. Galvalume® sheet shall have a coating weight of .5 oz./sq. ft. with a minimum yield of 50,000 ksi and conform to ASTM-792. Pre-painted finish shall be a premium Fluoropon® coating produced with either Kynar 500® or Hylar 5000® resins and have a full 20 year warranty.

5.4.1.2.

Panel profiles shall be 2" inches high x 16" wide. Panel seam is 2" high. All panels shall be striated.

5.4.1.3.

One side of the panel shall be female in configuration, which will have factory applied hot-melt mastic (see 5.4.5) inside the female seam. The female side will fit over the male side and be continuously locked together by an electrically powered mechanical seamer.

5.4.1.4.

Maximum panel length shall be no more than 45'-0" unless otherwise discussed and approved by the sales or manufacturing manager.

5.4.2. Endlaps

5.4.2.1.

Endlaps shall have pre-punched holes in panels and a 16 gauge backup plate for proper placement of fasteners.

5.4.2.2.

Mastic (see 5.4.5) shall be applied between the panels and secured with #14 x 1" Long Life self drilling fasteners with sealing washer, through the upper panel, mastic, lower panel and backup plate to form a compression joint.

5.4.2.3.

Endlaps and eaves shall be the only places in the roof system where through-the-roof exposed fasteners will be used inside the building envelope.

5.4.3.

Fasteners

5.4.3.1.

Eave - #12 x 1" long life self-drilling with sealing washer.

5.4.3.2.

Endlaps - #14 x 1 1/4" long life self-drilling with sealing washer.

5.4.3.3.

Ridge - #14 x 7/8" Lap Tek long life self-drilling with sealing washer.

5.4.3.4.

Clips to purlin - #12 x 1" Tek 2 self-drilling with Hex Head without washer.

5.4.3.5.

Clips to bar joists - #12-24 x 1 1/4" Tek 4.5 self-drilling with Hex Head without washer.

5.4.3.6.

Long Life fasteners, where exposed, either self-drilling or self-tapping, utilizing corrosion resistant head with an extended long life warranty, are standard. These fasteners are recommended for use when using a Galvalume Plus® roof panel.

5.4.3.7.

Special applications may require the use of other fastener types than what are listed above. Review Erection Manual.

5.4.4. Clips

5.4.4.1.

All clips shall have factory applied mastic.

5.4.4.2.

Fixed clips - shall be either 2 3/8" or 3" in height and are to be used with blanket insulation.

5.4.4.3.

Floating clips - shall be either 2 3/8" or 3" in height and are to be used with blanket insulation.

5.4.5. Sealants And Closures

5.4.5.1.

Factory applied sealant used in panel sidelaps shall be a hot melt, foamable mastic - Q41A.

5.4.5.2.

Field applied sealant used at the endlaps, eave, ridge assembly, and gable flashings shall be 100% solids butyl-based elastomeric tape sealer, furnished in roll form or pre-cut to length.

#### 5.4.5.3.

Outside closures shall be manufactured from the same materials as the roof panels.

### **SECTION 6. MISCELLANEOUS MATERIAL SPECIFICATIONS**

#### 6.1. Fasteners

##### 6.1.1.

Structural Bolts: All bolts used in connections of secondary framing to primary framing shall be zinc plated ASTM A307 or ASTM A325 as required by design.

##### 6.1.2.

Fasteners for Roof Panels: All panels shall be attached to the secondary framing members by means of:

a. Option #1: Self-drilling structural screws for roofs shall be carbon steel #12-14 x 1 1/4" Hex Washer Head, cadmium or zinc plated, with or without painted head, assembled with EPDM washer. These fasteners are applicable for use with fiberglass blanket insulation from 1" to 3" thick.

b. Option #2: Self-drilling structural screws shall be carbon steel #12-14 x 1 1/2" Hex Washer Head, cadmium or zinc plated, with or without painted head, assembled with EPDM washer. These fasteners are applicable for use with fiberglass blanket insulation from 3 1/2" to 6" thick.

c. Option #3: Self-tapping screws shall be #14 x 3/4" type "A" or "AB", zinc plated, painted or plain head assembled with a bonded or separate EPDM washer. These fasteners are applicable for use with fiberglass blanket insulation from 1" to 3" thick. Longer lengths are available. Pre-drilling is required.

d. Option #4: Optional Long Life fastener, in either self-tapping or self-drilling fasteners. Recommended when using Galvalume Plus® panels.

##### 6.1.3.

Fasteners for Roof Panel Sidelaps are as follows:

a. Option #1: Self-drilling -#14 x 7/8" Lap Tek zinc plated, painted or plain head assembled with sealing washer.

b. Option #2: Above fasteners in a Long Life finish, either in self-drilling or self-tapping. Corrosion resistant head with a long life extended warranty. These fasteners are

recommended when using Galvalume Plus® panels.

c. Option #3: Self-tapping - #14 x 3/4" type "A" or "AB" zinc plated, painted or plain head assembled with sealing washer.

6.1.4.

Fasteners for the Standing Seam Roof Panels and clips: See Sections 5.3.7 and 5.4.3.

6.1.5.

Fasteners for Wall Panels: All "R" and "Shadow A" Panels shall be attached to the secondary framing members by means of:

a. Option #1: Self-drilling fasteners of carbon steel #12 x 1" without washers as herein described for fiberglass insulation up to 3" thick and #12 x 1 1/2" for fiberglass insulation 3" to 6" thick.

b. Option #2: Corrosion resistant type Long Life fasteners with sealing washers, self-drilling, as herein described.

6.1.6.

Fasteners for Wall Panel Sidelaps:

a. Option #1: Self-drilling - #14 x 7/8" carbon steel screws as herein described.

b. Option #2: Corrosion resistant type Long Life fasteners with sealing washers, self-tapping, as herein described.

6.1.7.

Blind Rivets: All blind rivets shall be 1/8" diameter, high strength stainless steel pull rivet Type ADH.

## 6.2. Sealants And Closures

6.2.1.

Closure Strips: the corrugations of the roof and wall panels shall be filled with solid or closed-cell, pre-formed rubber, neoprene or polyethylene closures along the eave, ridge rake or base when required for weather tightness. Closures must be ordered separately.

6.2.2.

Standing Seam Roof Closures: See Sections 5.3.9 and 5.4.5.

6.2.3.

Sealants: Roof panels shall be sealed with 3/32" x 3/8" wide tape sealant. The material shall be a Butyl base elastic compound with a minimum solid content of 99%, Schnee-Moorehead #522 or equal. The sealant shall have good adhesion to metal and be non-

staining, noncorrosive, non-shrinking, non-oxidizing, non-toxic and non-volatile. The service temperature shall be from -60oF to +300oF. Optional 3/32" x 1" tape is available.

#### 6.2.4.

Standing Seam Sealant: See Sections 5.3.9 & 5.4.5.

#### 6.2.5.

Caulk: All gutter and downspout joints, rake flashing laps, ridge flashing laps, doors, windows, and louvers shall be sealed with white, burnished slate, or gray pigmented caulk of Butyl rubber base, or clear silicone.

### 6.3. Gutter, Flashing And Downspouts

#### 6.3.1.

Gutters and Flashing: All standard exterior gutters are 26 gauge Galvalume Plus® steel or with painted finish in standard colors. Standard rake flashing is 26 gauge Galvalume Plus® steel or with painted finish in standard colors.

#### 6.3.2.

Downspouts: All downspouts shall be 26 gauge Galvalume® steel, rectangular in shape.

### 6.4. Flashing And Trim

#### 6.4.1.

Flashing at the rake (parallel to roof panels) and high eave shall not compromise the integrity of the roof system by constricting movement due to thermal expansion and contraction.

#### 6.4.2.

All flashing shall be manufactured from Galvalume® steel, whether pre-painted or Galvalume Plus®.

## **SECTION 7. PAINTING**

### 7.1.

#### Structural Painting

#### 7.1.1.

All uncoated structural steel shall be cleaned of all foreign matter and loose scale in accordance with SSPC-2 and given a one mil coat of red oxide primer. Primer shall be applied by the use of airless handguns. Primer generally meets or exceeds the performance requirements of Federal Specification TT-P-636D.

#### 7.1.2.

Light gauge steel members shall be shot blasted and pre-coated with one coat of red oxide primer. Some hand sprayed shop touch-up may be employed.

### 7.1.3.

Abrasions caused by handling after painting are to be expected. Primer shall be furnished to touch-up or field painting as specified in the contract documents.

## 7.2. Painted Steel Panels

### 7.2.1.

Base metal shall be 26 or 24 gauge Galvalume® steel.

### 7.2.2.

Prime Coat: The base metal shall be pre-treated and then primed with an epoxy type primer for superior adhesion and superior resistance to corrosion. See paint film properties chart on following pages.

## **SECTION 8. ACCESSORIES**

### 8.1. Windows

#### 8.1.1.

Standard Windows shall be horizontal slide units, polished aluminum finish 3'-0" x 3'-0" or 6'-0" x 3'-0". Glazing will be DSB or optional 7/16" thick hermetically sealed insulated glass. They shall be furnished complete with hardware, and half screen. Windows shall be self-flashing to wall panels. They shall be certified by Architectural Aluminum Manufacturers Association for performance requirements of ANSI/AAMA 101-85.

#### 8.1.2.

Slim-Line windows are 2'-0" wide x 7'-0" high with a bronze frame finish. These windows are self-framing to the wall panel.

#### 8.1.3.

Bronze frame finish is available in sliding windows. All windows are available with insulated and/or bronze glass. Please inquire.

### 8.2. Personnel Doors

#### 8.2.1.

Standard personnel doors shall be 3'-0", 4'-0" and 6'-0" x 7'-0" x 1 3/4" manufactured from 20 gauge galvanized steel. Door shall have square edges for non-handed installation. Door shall have an embossed finish with a white or bronze prime coat. Doors shall be flush and have vertical mechanical interlocking seams on both hinge and lock edges. Doors shall be provided with top and bottom inverted 16 gauge galvanized steel channels spot welded within the door. Door leaf cores shall be formed from expanded polystyrene, closed cell, rigid thermoplastic material that serves as insulation from heat or cold. Doors shall be reinforced for applicable hardware. Doors shall be solid or side vision (narrow lite).

#### 8.2.2.

Door frames shall be 16 gauge galvanized steel, pre-painted white or bronze. Door jambs shall be constructed for non-hand installation. Doors shall include weather stripping. Door frames shall be provided with 1-1/2 pair of 4-1/2" x 4-1/2" hinges and reversible ANSI strike plate. Doors and frames shall be reinforced with 7 gauge hinge reinforcements.

#### 8.2.3.

Standard cylindrical lever locksets (levers both sides) shall meet ANSI #A156.2, Series 4000, Grade 2. The lockset selected by owner should be chosen in accordance with all current federal, state and local laws for the type of access required and the nature of use of the building.

#### 8.2.4.

Door threshold shall be aluminum, supplied with flat head fasteners and expansion shields for attachment to masonry floor.

#### 8.2.5.

Factory glazing for side vision leaves shall be 1/8 inch clear, tempered glass with an exposed glass size of 8" x 62" (496 sq. in.).

### 8.3. Overhead Door Framing

#### 8.3.1.

Overhead door support framing shall be designed to resist applicable wind loads and shall consist of channel jambs with a structural header at the top of the opening. Twenty-six gauge galvanized steel flashings, color coordinated, can be provided to conceal panel edges around the opening unless otherwise specified.

### 8.4. Gravity Ridge Ventilators

#### 8.4.1.

Gravity ridge ventilators shall be manufactured from galvanized steel and painted white. The ventilator body shall be 26 gauge and the skirt shall match the roof slope. Chain operated damper will be furnished when specified. Ventilators shall be equipped with standard screens and riveted end caps. Ventilators shall be 10' long and have 9" throat. Twelve inch throat ventilators are available as an option.

### 8.5. Louvers

#### 8.5.1.

Standard Louvers shall have a 26 gauge galvanized steel frame, painted, with 26 gauge blades. Heavy Duty Louver frames shall be 18 gauge galvanized steel frame, painted, with 20 gauge blades. Both Standard and Heavy Duty louvers shall be self-framing and self-flashing.

They shall be equipped with adjustable or fixed blades as specified. Nominal sizes shall be 2'-0" x 2'-0", 3'-0" x 2'-0", 3'-0" x 3'-0" 4'-0" x 3'-0", and 3'-0" x4'-0".

## 8.6. Skylights

### 8.6.1.

High Strength translucent panels are glass fiber reinforced polyester, high strength and may be either:

- a. Type 1, structural (general purpose) conforming to commercial standard CS-214-57 or
- b. Type II, having a burning rate of 2" per minute or less when tested in accordance with UL R3870A.

### 8.6.2.

High strength translucent panels match standard profiles, are 1/16" thick, weight 8 ounces per square foot, and are white with a granitized top surface.

### 8.6.3.

Insulated translucent panels are available in Type 1, "R" panel and Standing Seam panel profiles only. Please inquire.

## 8.7. Insulation

### 8.7.1.

Fiberglass Blanket Insulation shall have a density of 0.75 pcf and shall be available in 3", and 4" thickness. (Other insulation systems are available with thickness up to 8").

### 8.7.2.

Fiberglass insulation facings shall be laminated on one side with one of the facings as shown in chart below.

### 8.7.3.

Rigid Foam Thermal Blocks are cut from high density extruded polystyrene board stock, having a UL 25 flame spread rating. Facing 3.2 Mil Vinyl Vinyl Scrim Foil Foil Scrim Kraft Color White Eg. Wh. Textured White Aluminum Painted White Flame Spread\*  
2525 25 25 25 Perm Rating 1.3 1.3 .02 .02 .02 Surface Temp Min. 0oF 0oF 20oF -10oF -10oF \* NOTE: The numerical flame spread rating is not intended to reflect hazards presented by this or any other material under actual fire conditions.

## **SECTION 9. ERECTION AND INSTALLATION**

### 9.1. Erection and Installation

#### 9.1.1.

The erection of the metal building components shall be performed by a qualified erector,

using proper tools and equipment. Erector shall follow good, sound, safe procedures and guidelines and in accordance with any applicable federal, state or local laws.

9.1.2.

Erection of the roof system shall be in complete accordance with the Manufacturer's Safety and Erection Manual. Any deviation from this manual could result in damage to the roof system, for which Manufacturer will not be liable for repair or replacement.

9.1.3.

The erection manual shall include procedures and trim design variations to accommodate the out-of square and out-of plumb conditions that sometimes occur during the erection and construction process.

## **SECTION 10. BUILDING ANCHORAGE AND FOUNDATIONS**

### 10.1. Building Anchorage and Foundations

10.1.1.

The building anchor bolts shall be designed to resist the maximum column reactions resulting from the specified combinations of loadings. These designs and sizes shall be specified by the manufacturer. Anchor bolts will be supplied by the contractor and NOT by the manufacturer.

10.1.2.

Foundations shall be adequately designed by a qualified foundation engineer to support the building reactions and other loads that may be imposed by the building use. The design shall be based on the specific soil conditions of the building site. The foundation engineer shall be retained by other than the manufacturer. The manufacturer assumes no responsibility for the integrity of the foundation.

## **ITEM 1000**

### **Electrical**

#### **1000.01 General**

A. The Contractor shall furnish equipment, material, labor and tools necessary for assembly, installation and testing of the complete electrical and control systems as shown on the drawings and stipulated in this specification. All work shall be performed by a qualified electrician, licensed to perform electrical construction work in areas subject to inspection under the guidelines of the National Electrical Code.

B. Electric equipment, materials and installation shall be in accordance with the latest edition of the National Electrical Code and with the latest published edition of NFPA 820 "Recommended Practices for Fire Protection in Wastewater and Collection Facilities," 1992 edition or later publication. Electrical equipment and materials shall be new and listed by Underwriter's Laboratories, Inc.

C. The Contractor shall warrant his work free from any defects in material and workmanship for a period of one year from the date of acceptance by the Owner.

#### **1000.02 Qualifications**

The Contractor shall employ the services of a qualified electrical construction contracting company to perform all electrical power and control work. This contractor shall provide satisfactory evidence to the engineer of completion of at least three types of projects similar in nature and scope. This contractor shall warranty his work free from defects in material and workmanship for a period of one year from the date of acceptance by the owner.

#### **1000.03 Drawings and Submittals**

Drawings supplied are general and not electrically specified but are dependent upon detail drawings submitted by the contractor in accordance with provisions of the specifications. It is, therefore, the responsibility of the Contractor to develop all control schematics, wiring diagrams, and motor elementary drawings based on the operational requirements of the facility.

All drawings prepared by the contractor shall be in an 11"x17" format. All terminals and wires shall be identified with numbers, and all equipment will be listed with manufacturer's name and model number. The Contractor shall submit 6 copies of the drawings and submittals to the engineer for approval prior to fabrication. All drawings shall be updated at completion of the project to reflect the As Built condition. Contractor shall submit six (6) copies of the As Built drawings including all manufacturer's data and operation and maintenance manuals to the owner.

The Contractor shall provide laminated copies of the circuit schedules for the control panel

including wire numbers on the inside of the control panel door.

#### **1000.04 Scope of Work**

##### **A. General**

The work shall include furnishing, installing and testing the electrical and control equipment and materials as specified in this Specification and as detailed on the drawings.

1. Construct all conduit runs of the appropriate size with the appropriately sized conductors from the control panel to the wetwell;
2. Construct the conduit run from the existing power pole to the meter enclosure as indicated on the drawings;
3. Coordinate with the utility company and provide all necessary equipment, material and labor necessary for the required electrical power service, service shall be 240/120 vac, 3 phase, 4 wire.
4. Install the necessary grounding system as indicated in the plans and specifications and as required by the National Electrical Code.

#### **1000.05 Materials**

- A. All materials furnished by the contractor shall be new and of the highest quality and as specified in the contract documents. Materials specified by the manufacturer and catalog number are for reference to minimum quality standards.
- B. All power, control and ground wire shall be 600 volt, THWN stranded copper, unless noted otherwise on the Drawings, and sized as necessary to carry the intended load, 120 volt control wiring shall be #12. Insulation of all grounding conductors shall be green. Insulation of power conductors #6 or smaller shall be color coded as noted below. Power conductors greater than #6 shall be coded using electrical tape where colored insulation is not readily available as follows:

White - Neutral

Black - Phase A

Black - Phase B

Black - Phase C

Mark the "B" phase cable with orange tape at enclosure entry point to flat it as the "higher voltage to ground" leg.

- C. Conduit installed underground shall be Schedule 40 PVC installed 18" below ground and encased in three inches of red concrete on all sides. Above ground conduit shall be

aluminum. Aluminum conduit fittings are to be Crouse-Hinds Mark 9 copper-free aluminum or equal.

- D. All fastening hardware including nuts, bolts, screws and washers utilized on electrical and control material and equipment shall be 316 stainless steel
- E. Any miscellaneous or additional material beyond that listed or shown on drawings required for the completion of work, shall be furnished and installed by the Contractor at no additional cost to the Owner.

#### **1000.06 Installation Requirements**

- A. Conduit routing and dimensions shown on drawings are approximate and should be verified by the contractor
- B. Exposed conduit shall run parallel or perpendicular to walls, ceilings, main structural members or vessels such that they are mechanically secure, neat in appearance and continuous. Conduits shall not interfere with the use of passageways, doorways or maintenance areas around equipment, not present a safety hazard.
- C. Underground work shall not be covered until inspected by the Engineer. Conduits entering NEMA 1 enclosures shall be terminated with double locknuts and bushings. All other enclosures shall be furnished with threaded hubs or watertight "Myers" type hubs for exterior installed enclosures.
- D. All openings where conduits pass through walls shall be sealed as per manufacturer's recommendations or with expandable foam.
- E. All conduit interiors must be cleared by pulling a mandrel through the conduit, and shall have high pressure air blown through to eliminate foreign matter which may jeopardize the integrity of the insulation. Wire shall be pulled through conduit utilizing lubricants specified by the manufacturer. No substance may be used such as oil or grease may be used that might damage the conductor insulation.
- F. Should work be required which is not the intent thereof, then, the Contractor shall perform all such work as fully as if it were specifically set forth in the contract documents.
- G. Engraved plastic nameplates are to be installed on panel boards, control devices, and disconnect switches. Nameplates are to bear the item number (and descriptive name where applicable) of the equipment. Nameplates are to be attached with stainless steel screws suitable for permanent attachment in outdoor service.
- H. The grounding system shall be installed in accordance with the latest edition of the National Electrical Code. All conduits, panels, cabinets, transformers, motors, junction boxes, and other electrical equipment shall be permanently and securely connected to the grounding system as shown on the drawings and/or specified herein. Grounding connections shall be of an approved type with high copper alloy bodies and silicon bronze bolts, nuts and lock washers.

#### **1000.07 Testing**

- A. The Contractor shall check all wire terminations for tightness
- B. Proper installation and operation of the electrical and control systems shall be demonstrated to the Engineer. The Contractor shall prove them operational prior to giving the Engineer one week notice of desire to conduct demonstration testing.

**1000.08 Payment**

Payment for electrical items and work shall be as per applicable bid items when provided. Otherwise, payment for electrical items and work shall be considered incidental to applicable bid items. Lump sum payment for electrical work shall be all inclusive for a complete in place project.

# Item 1100

## Heating, Ventilation and Air Conditioning

### PART 1 GENERAL

1. Drawing and general provision of Contract, including General and Supplementary Conditions, apply to work of this section.
2. Related Sections:

Separate electrical components and materials required for field installation and electrical connections are specified in Division 16.

#### B. Description of Work:

1. This section of the Specifications includes all heating, ventilating and air conditioning work and related piping and ducts to complete the work indicated on the Plans and hereinafter specified. All work shall conform to the requirements, and all current revisions, of the Uniform Mechanical code, and all local, state and federal ordinances, codes and regulations. The major items of work include, but are not limited to:
  - a. The furnishing and installation of a heating, ventilating, and air conditioning system as herein specified.
  - b. The furnishing and installation of ductwork, registers and grills.
  - c. The coordination of the installation of concealed piping, ducts, inserts, sleeves, anchors, and other concealed or embedded items, so that this work is properly completed and tested or inspected before being concealed.
  - d. The securing of and paying for all permits and fees required for work performed under this section to complete an operating system.

#### 2. Owner Furnished Equipment:

The following is a list of Owner furnished and installed items. Gas service will be installed by the Mechanical Contractor.

- a. Air Replacement Unit (ARU) (Electric).
- b. Controls, supports and wall sleeve for ARU.

#### C. Quality Assurance:

[Type here]

1. Testing and rating of HVAC unit shall be in accordance with ARI 210 "Standard for Unitary Air- Conditioning Equipment", and provide Certified Rating Seal. Sound testing and rating of units shall be in accordance with ARI 270 "Standard for Sound Rating of Outdoor Unitary Equipment". Unit shall bear Certified Rating Seal.
2. Refrigerating system construction of HVAC unit shall be in accordance with ASHRAE 15 "Safety Code for Mechanical Refrigeration".
3. Energy Efficiency Ration (EER) of HVAC unit shall be equal to or greater than prescribed by ASHRAE 90A "Energy Conservation in New Building Design".
4. HVAC unit shall be listed by UL and have UL label as a unit.
5. HVAC unit shall be designed, manufactured, and tested in accordance with UL requirements.
6. SMACNA Standards:  
  
Comply with SMACNA's "HVAC Duct Construction Standards, Metal and Flexible" for fabrication and installation of metal ductwork.
7. ARI Compliance:  
  
Test and rate air outlets and inlets in accordance with ARI 650 "Standard for Air Outlets and Inlets".

D. Submittals:

1. General:  
  
Submit the following in accordance with Conditions of Contract and Supplementary Conditions section.
2. Product Data:  
  
Submit manufacturer's technical product data for HVAC heating/cooling unit, metal ductwork materials, ductwork accessories, and air outlets, including rate capacities of selected model clearly indicated, dimension, required clearances, weights, furnished specialties and accessories; and installation and start-up instructions.
3. Operation and Maintenance Data:  
  
Submit maintenance data and parts list for HVAC unit, including "troubleshooting" maintenance guide, servicing guide and preventive maintenance schedule and procedures.

E. Delivery, Storage, and Handling:

[Type here]

1. Handle HVAC unit and components carefully to prevent damage. Replace damaged HVAC unit or components with new.
2. Store HVAC unit and components in clean dry place, off the ground, and protect from weather, water, and physical damage.
3. Rig HVAC unit to comply with manufacturer's rigging and installation instructions for unloading HVAC units, and moving them to final location.
4. Protection:

Protect shop-fabricated and factory-fabricated ductwork, accessories and purchased products from damage during shipping, storage and handling. Prevent end damage and prevent dirt and moisture from entering ducts and fittings.

5. Storage:

Where possible, store ductwork inside and protect from weather. When necessary to store outside, store above grade and enclose with waterproof wrapping.

#### **1100.02 - Products**

##### **A. Ductwork Materials:**

1. Exposed Ductwork Materials:

Where ductwork is indicated to be exposed to view in occupied spaces, provide materials that are free from visual imperfections including pitting, seam marks, roller marks, stains and discolorations, and other imperfections, including those which would impair painting.

2. Sheet Metal:

Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ASTM A 527, lock-forming quality; with G90 zinc coating in accordance with ASTM A 525; and mill phosphatized for exposed location.

##### **B. Miscellaneous Ductwork Materials:**

1. General:

Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.

[Type here]

2. Fittings:

Provide radius type fitting, fabricated of multiple sections with maximum 15° change of direction per section. Unless specifically detailed otherwise, use 45° laterals and 45° elbows for branch takeoff connections. Where 90° branches are indicated, provide conical type tees.

3. Duct Liner:

Fibrous glass, complying with Thermal Insulation Manufacturers Association (TIMA) AHC-101; of 1/2" thickness.

4. Duct Liner Adhesive:

Comply with ASTM C 916 "Specifications for Adhesives for Duct Thermal Insulation".

5. Duct Liner Fasteners: Comply with SMACNA HVAC Duct Construction Standards, Article 52.11.

6. Duct Sealant:

Non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.

7. Duct Cement:

Non-hardening migrating mastic or liquid neoprene based cement, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for cementing fitting components, or longitudinal seams in ductwork.

8. Ductwork Support Materials:

Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods straps, trim and angles for support of ductwork.

9. Flexible Ducts:

- a. Either spiral-wound spring steel with flameproof vinyl sheathing, or corrugated aluminum; complying with UL 181.
- b. Where installed in unconditioned spaces other than return air plenums, provide 1" thick continuous flexible fiberglass sheath with vinyl vapor barrier jacket.

C. Fabrication:

1. Shop fabricate ductwork in 4, 8, 10 or 12 foot lengths, unless otherwise indicated or required to complete runs. Pre-assemble work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for reassembly and coordinated installation.
2. Shop fabricate ductwork of gages and reinforcement complying with SMACNA "HVAC Duct Construction Standards".

DELETE ABOVE OR BELOW ACCORDING TO OFFICE PRACTICE

3. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to associated duct width; and fabricate to include turning vanes in elbows where shorter radius is necessary. Limit angular tapers to 30° for contracting tapers and 20° for expanding tapers.
4. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible.
5. Fabricate ductwork with duct liner in each section of duct where indicated. Laminate liner to internal surfaces of duct in accordance with instructions by manufacturers of lining and adhesive, and fasten with mechanical fasteners.

D. Dampers:

Low Pressure Manual Dampers:

Provide dampers of single blade type or multi-blade type, constructed in accordance with SMACNA "HVAC Duct Construction Standards".

E. Turning Vanes:

1. Fabricated Turning Vanes:

Provide fabricated turning vanes and vane runners, constructed in accordance with SMACNA "HVAC Duct Construction Standards".

2. Manufacture Turning Vanes:

Provide turning vanes constructed of 1-1/2" wide curved blades set at 3/4" o.c., supported with bards perpendicular to blades set at 2" o.c., and set into side strips suitable for mounting in ductwork.

F. Duct Hardware: General:

[Type here]

Provide duct hardware, manufactured by one manufacturer for all items or project, for the following:

\* Test Holes: Provide in ductwork at fan inlet and outlet, and elsewhere as indicated, duct test holes, consisting of slot and cover, for instrument tests.

\* Quadrant Locks: Provide for each damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12". Provide extended quadrant locks and extended bearing plates for externally insulated ductwork.

G. Flexible Connections: General:

Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.

H. Ceiling Air Diffusers:

1. General:

Except as otherwise indicated, provide manufacturer's standard ceiling air diffusers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.

2. Performance:

Provide ceiling air diffusers that have, as minimum temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.

3. Ceiling Compatibility:

Provide diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems that will contain each type of ceiling air diffuser.

4. Types:

Provide ceiling diffusers of type, capacity, and with accessories and finishes as

[Type here]

listed. The following requirements shall apply to nomenclature indicated on schedule;

5. Diffusers Faces:

Square(SQ): Square housing, core of square concentric louvers, square or round duct connection.

6. Diffuser Mountings:

Flush (FL): Diffuser housing above ceiling surface with flush perimeter flange and gasket to seal against ceiling.

7. Diffuser Patterns:

4 Way (4-W): Fixed louver face for 4-direction air-flow, directions indicated on drawings.

8. Diffuser Dampers:

Opposed Blade (O-B): Adjustable opposed blade damper assembly, key operated from face of diffuser.

9. Diffuser Accessories:

\* Extractor (EXTR): Curved blades mounted on adjustable frame to produce air scooping action in duct and diffuser take-off.

\* Operator Keys (OP-KY): Tools designed to fit through diffuser face and operate volume control device and/or pattern adjustment.

10. Diffuser Finishes:

White Enamel (W-E): Semi-gloss white enamel prime finish.

11. Manufacturer:

Subject to compliance with requirements, provide diffusers of one of the following: Carnes Co.; Division of Wehr Corp.

Hart and Cooley Co.

Titus Products Division; Philips Industries, Inc. Tuttle & Bailey; Division of Interpace Corp.

J. Registers and Grills:

[Type here]

1. General:

Except as otherwise indicated, provide manufacturer's standard registers and grills where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.

2. Performance:

Provide registers and grills that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.

3. Ceiling Compatibility:

Provide registers and grills with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling construction that will contain each type of register and grill.

4. Types:

Provide registers and grills of type, capacity, and with accessories and finishes as listed. The following requirements shall apply to nomenclature indicated on schedule:

\* Register and Grill Materials:

Steel Construction (ST): Manufacturer's standard stamped sheet steel from and adjustable blades.

\* Register and Grill Faces:

Perforated (PR): Square housing covered with removable perforated panel in frame.

\* Register and Grill Mountings:

Lav-In (L-I): Register housing sized to fit between ceiling exposed suspension tee bars and rest on top surface of tee bar.

K. Register and Grill Dampers:

1. Register and Grill Accessories:

Operating Keys (OP-KY): Tools designed to fit through register or grill face and operate volume control device and/or pattern adjustment.

2. Register and Grill Finishes:

[Type here]

White Enamel (W-E): Semi-gloss white enamel prime finish.

3. Manufacturer:

Subject to compliance with requirements, provide registers and grills of one of the following:

Carnes Co.; Division of Wehr Corp.

Titus Products Division; Philips Industries, Inc. Hart and Cooley Co.

L. SIDE WALL PROPELLER FANS

A. Manufacturers:

1. Acme Engineering and Manufacturing Corp.
2. Greenheck Corp.
3. Loren Cook Company
4. PennBarry

B. Housing: Galvanized-steel sheet with flanged edges and integral orifice ring with baked- enamel finish coat applied after assembly.

C. Steel Fan Wheels: Formed-steel blades riveted to heavy-gage steel spider bolted to cast- iron hub.

D. Fan Wheel: Replaceable, fabricated steel, airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.

E. Fan Drive: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

F. Fan Drive:

1. Resiliently mounted to housing.
2. Statically and dynamically balanced.
3. Selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
4. Extend grease fitting to accessible location outside of unit.
5. Service Factor Based on Fan Motor Size: 1.4.
6. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.

7. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
8. Ball-Bearing Rating Life: ABMA 9, L10 of 100,000 hours.
9. Pulleys: Cast iron with split tapered bushing; dynamically balanced at factory.
10. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
11. Belts: Oil resistant, non-sparking, and non-static; matched sets for multiple belt drives.
12. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.

G. Accessories:

1. Long wall housing, flush exterior with OSHA guard.
2. Motor-Side Back Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
3. Wall Sleeve: Galvanized steel to match fan and accessory size.
4. Weather shield Hood: Galvanized steel to match fan and accessory size with bird screen.
5. Weather shield Front Guard: Galvanized steel with expanded metal screen.
6. Direct drive units shall be provided with motor speed control option.

**1100.03 Part 3 - Execution**

A. Examination:

Examine areas and conditions under which HVAC units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

B. Installation:

[Type here]

1. General:

Install HVAC units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

2. Electrical Connections:

Refer to Division 16 for final connections to equipment and installation of loose-shipped electrical components.

C. Demonstration:

1. Start-Up Services:

Provide the services of a factory-authorized service representative to start-up units, in accordance with manufacturer's written start-up HVAC instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

2. Operating and Maintenance Training:

Provide services of manufacturer's service representative to instruct Owner's personnel in operation and maintenance of HVAC units. Training shall include start-up and shut-down, servicing and preventative maintenance schedule and procedures, and troubleshooting procedures plus procedures for obtaining repair parts and technical assistance.

D. Inspection: General:

Examine areas and conditions under which metal ductwork is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

E. Installation of Metal Ductwork:

1. General:

Assemble and install ductwork in accordance with recognized industry practices that will achieve air-tight (5% leakage for systems rated 3" and under; 1% for systems rated over 3") and noiseless (no objectionable noise) systems, capable of performing each

indicated service. Install each run with minimum number of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling. Support vertical ducts at every floor.

2. Field Fabrication:

Complete fabrication of work at project as necessary to match shop-fabricated work and accommodate installation requirements.

3. Routing:

Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct useable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partition, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

4. Penetrations:

Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1- 1/12". Fasten to duct and substrate.

5. Coordination:

Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.

6. Installation:

Install metal ductwork in accordance with SMACNA HVAC Duct Construction Standards.

F. Installation of Duct Liner: General:

[Type here]

Install duct liner in accordance with SMACNA HVAC Duct Construction Standards.

G. Installation of Flexible Ducts:

1. Maximum Length:

For any duct run using flexible ductwork, do not exceed 6'-0" extended length.

2. Installation:

Install in accordance with Section III of SMACNA's, "HVAC Duct Construction Standards, Metal and Flexible".

H. Equipment Connections: General:

Connect metal ductwork to equipment as indicated, provide flexible connection for each ductwork connection to equipment mounted on vibration isolators, and/or equipment containing rotating machinery. Provide access doors as indicated.

I. Adjusting and Cleaning:

1. Clean ductwork internally, unit by unit as it is installed, of dust and debris. Clean external surfaces of foreign substances that might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.

2. Temporary Closure:

At ends of ducts that are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering that will prevent entrance of dust and debris until time connections are to be completed.

J. Inspection:

Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

L. Installation of Ductwork Accessories:

1. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended

function.

2. Install turning vanes in square or rectangular 90° elbows in supply and exhaust air systems, and elsewhere as indicated.
3. Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter.
4. Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

M. Field Quality Control:

Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leakproof performance.

N. Adjusting and  
Cleaning:

1. Adjusting:

Adjust ductwork accessories for proper settings and adjust for proper action.

2. Cleaning:

Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

O. Inspection:

Examine areas and conditions under which air outlets and inlets are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

P. Installation: General:

1. Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to ensure that products serve intended functions.
2. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.
3. Locate ceiling air diffusers, registers, and grills, as indicated on general construction "Reflected Ceiling Plans". Unless otherwise indicated, locate units in center of acoustical ceiling modules.

**End of Item 1100**

# Item 3000

## DOMESTIC WATER PIPING

### 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.

#### 1.3 SUMMARY

- A. Provide a complete system of plumbing fixtures and trim.
- B. All materials and equipment for the potable water system shall meet the latest mandates and requirements for lead free required by law that goes into effect January 2014.

#### 1.4 SUBMITTALS

- A. Product Data: Submit catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- B. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

#### 1.6 EXTRA MATERIALS

- A. Furnish two sets of faucet washers flush valve service kits lavatory supply fittings shower heads toilet seats.

### PART 2 - PRODUCTS

#### 2.1 TANK TYPE WATER CLOSETS

- A. Fixture Manufacturers:
  1. American Standard Plumbing
  2. Briggs Industries, Inc.
  3. Crane Co.
  4. Eljer Plumbing ware
  5. Kohler Co.

6. Zurn.
- B. Fixture Trim Manufacturers:
1. Bemis
  2. Beneke
  3. Church
  4. American Standard.
  5. Kohler Co.
- C. WC-4A - Bowl: ASME A112.19.2M; floor mounted, siphon jet, vitreous china, 16.5 inches high or 18 inches high for ADA Applications close-coupled closet combination with regular rim, insulated vitreous china closet tank with fittings and lever flushing valve, bolt caps vandal proof cover locking device. Provide Kohler K-3615 "Gabrielle" or as indicated on plumbing fixture schedule.
- D. Seat: White plastic black, open front, extended back, self-sustaining hinge, brass bolts, with without cover. Bemis Model.

## 2.2 LAVATORIES

- A. Fixture Manufacturers:
1. American Standard Plumbing.
  2. Kohler Co
  3. Crane
  4. Eljer
  5. Zurn.
- B. Fixture Trim Manufacturers:
1. Sloan
  2. T & S Brass.
  3. Chicago.
  4. Speakman.
- C. All lavatory faucets and trim shall meet the latest mandates and requirements for lead free required by law that goes into effect January 2014.
- D. L-1, Vitreous China Wall Hung Basin: ASME A112.19.2M; Kohler Model K-2005 vitreous china wall hung lavatory 21 x 15 inch minimum, with four (4) inch high back, 3 deck holes, rectangular basin with splash lip, front overflow, and soap depression. Provide floor mounted carrier for correct lavatory type. Provide as indicated on plumbing fixture schedule.

1. Trim : (Type B)

E. Trims:

1. Supply Fitting: ASME A112.18.1 (Type B); chrome plated brass spout, supply fitting with open grid strainer, water economy aerator with maximum 0.5 gpm flow, ADA compliant. Chicago Faucet Co. Series, or equivalent by T&S Brass, and American Standard. Chicago Mechanical Faucet 420-E2805ABCP or provide as indicated on plumbing fixture schedule.

F. Accessories:

1. Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.
2. Chrome plated 17 gage open grid P. O. plug.
3. Removable key stops.
4. Flexible supplies.
5. Trap and waste insulated and offset to meet ADA compliance.
6. Tempering valve – Power LFe480 series, Acorn, or Leonard.

- G. Floor Mounted Carrier: ASME A112.6.1; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, concealed arm supports, bearing plate and studs. Jay R. Smith 710 Series, or equal by Zurn and watts.

### 2.3 LAVATORY INSULATION KIT

A. Manufacturers:

1. Truebro
2. Plumberex

- B. Product Description: Safety Covers conforming to ANSI A177.1 and consisting of insulation kit of molded closed cell vinyl construction, 3/16 inch thick, white color, for insulating tailpiece, P-trap, valves, and supply piping. Furnish with weep hole and angle valve access covers.

### 2.4 FLOOR DRAINS

A. Manufacturers:

1. Josam Mfg.,
2. Jay R. Smith Mfg.,
3. Wade Spec. Products
4. Zurn Industries
5. Mifab
6. Watts

- B. Floor Drain (FD-1): ASME A112.21.1; Top round floor drain, lacquered cast iron two

piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer. Jay R. Smith Model 2010, 2015 or provide as indicated on plumbing fixture schedule.

- C. Floor Drain (FD-2): ASME A112.21.1; Top round flushing floor drain, lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable square nickel-bronze strainer with removable perforated sediment bucket. Provide as indicated on plumbing fixture schedule.

## 2.5 TRAP SEAL PRIMERS

- A. Trap Seal Primers-electronic Type
  - 1. Vacuum breaker trap primer attached to water supply manifold, similar to Zurn Z- 1020 with copper waterway.
- B. Accessories:
  - 1. Slow closing 24 VAC solenoid valve.
  - 2. 120 – 24 VAC transformer.
  - 3. Brass atmospheric vacuum breaker.
  - 4. Copper connection outlets.

## 2.6 TRENCH DRAIN

- A. TD-1:
  - 1. Design: Provide the following type of drain systems.
    - a. 6" Pre-sloped Stainless Trench Drains.
    - b. Manufacturers:
      - 1) Josam
      - 2) Zurn
      - 3) JR Smith
      - 4) Mifab
      - 5) Duratrench
      - 6) Wade
  - 2. Provide a complete drain system made up of selected components that together shall make a functional trench drain system. The trench drain components provided and installed shall be the trench drain body, load bearing frame, trench drain grate, grate locking mechanism, channel joint sealing, and outlet connection.
  - 3. Trench Body Material: 6" wide stainless steel trench body with flashing collar for membrane applications T304 standard. The trench drain body shall be constructed from 2 mm (min.) T304 stainless steel and have a minimum clear opening as indicated in the plans. Trench invert shall have a vee bottom and shall have 1% slope to open end. Sections shall be up to 48" long (typical), but can be fabricated in longer lengths as required (up to 28' lengths possible). If multiple sections are required, the sections shall bolt together via a flange and can be sealed with a gasket or by on site welding. Each of the sections shall be labeled to indicate proper flow and placement. Trench body shall have a class 2b finish standard. Optional mill or bead blast finish as required on the contract documents.
    - a. Slope:
      - 1) 1.0 percent.
    - b. rate: 6" wide perforated paw proof, T304 stainless steel mesh grate with ADA compliant & heel proof openings

- c. Grate Locking:
  - 1) Welded and threaded cross bar.
- d. Outlet:
  - 1) Low end.
  - 2) Location: side
- e. Joint Sealant:
  - 1) Joints shall be fully sealed with urethane joint sealant. The joint sealant shall be applied to a clean bell and spigot joint. The sealant shall be applied as a continuous 3/8" diameter bead from the top of the joint through the bottom and back to the top on the other side to ensure a proper seal. Additional sealant can be applied to the exterior of the joint as required to provide a positive seal.
- f. Model: Josam Series 46300 - T304 stainless steel mesh grate with ADA compliant & heel proof openings. Grating shall be Josam 46310 heel proof and ADA compliant stainless steel slotted grate.

B. TD-2: See above.

## 2.7 CLEANOUTS

- A. Cleanouts shall be provided where indicated on Drawings and elsewhere as required by code.
  - 1. Cleanouts in pipelines shall consist of cast iron ferrule and heavy duty cleanout plug with square head as scheduled on the Drawings. Where piping is concealed in floors or walls cleanouts shall be installed in or near surface of floor or walls and have countersunk plugs with covers
- B. Cleanouts shall be provided at the base of the stack on all sanitary, waste and drainage stacks. Base of stack cleanouts on piping located within walls or partitions shall be cast iron cleanout tee with countersunk plug and chromium-plated round access cover, J.R. Smith figure or approved equal.
- C. Manufacturers:
  - 1. Josam Mfg.
  - 2. Jay R. Smith Mfg.
  - 3. Wade Spec. Products
  - 4. Zurn Industries
  - 5. Mifab
  - 6. Watts
- D. Floor, Outdoors: Coated cast iron body with gasket seal ABS plug and round cast iron scoriated non-skid cover. Jay R. Smith, Model 4220-F-C-U.
- E. Floor, Indoors (CO): Coated cast iron body with gasket seal ABS plug, threaded top assembly with round nickel bronze scoriated cover in service areas. Jay R. Smith, Model 4025 – F-C-U.
- F. Wall Cleanout (WCO): Line type with lacquered cast iron body with bronze taper thread plug and round stainless steel access cover secured with vandal proof screw. Jay R.

Smith Model 4420-U.

- G. Floor, Stainless Steel Indoors (CO): Coated cast iron body with gasket seal ABS plug, threaded top assembly with round stainless steel scoriated cover in service areas. Jay R. Smith Model 9760 Series.

## 2.8 HOSE BIBS

- A. Manufacturers:
  - 1. Josam Mfg.
  - 2. Jay R. Smith Mfg.
  - 3. Woodford
  - 4. Zurn Industries
  - 5. Chicago
  - 6. Wade
- B. HB-1:
  - 1. Manufacturers: Woodford Model B24 or provide as indicated on plumbing fixture schedule.
  - 2. Interior: Polish brass, anti-siphon, vacuum breaker, enclosed in flush mounted wall box and adjustable brass nut with deep stem guard.

## 2.9 WALL HYDRANTS

- A. Manufacturers:
  - 1. Josam Mfg.
  - 2. Jay R. Smith Mfg.
  - 3. Woodford.
  - 4. Zurn Industries
  - 5. Mifab
  - 6. Watts
- B. Exterior Wall Hydrant (WH-1):
  - 1. Woodford RB65, Non-Freeze, or provide as indicated on plumbing fixture schedule.
  - 2. ASSE 1019; Chrome, non-freeze, self-draining type with lockable recessed box hose thread spout, hand wheel locks shield and removable key, and integral vacuum breaker.

## PART 3 - EXECUTION

### 3.1 EXCAVATION

- A. Refer to Division 2 for excavating, trenching, and backfilling.

### 3.2 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
- B. Fitting Option: Mechanically formed tee-branch outlets and brazed joints may be used on aboveground copper tubing.
- C. Underground Domestic Water Service Piping: Use the following piping materials for each size range:
  - 1. NPS 2 and Smaller: Soft copper tube, Type K; copper pressure fittings; and soldered joints.
- D. Aboveground Domestic Water Piping: Use the following piping materials for each size range:
  - 1. NPS 1-1/2 and Smaller: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
  - 2. NPS 2: Hard copper tube, Type L; copper pressure fittings; and soldered joints.

### 3.3 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  - 1. Shutoff Duty: Use bronze ball valves for piping NPS 2 and smaller.

### 3.4 PIPING INSTALLATION

- A. Refer to Division 2 for site water distribution and service piping.
- B. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.
- C. Extend domestic water service piping to exterior water distribution piping in sizes and locations indicated.
- D. Install underground copper tubing according to CDA's "Copper Tube Handbook."
- E. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.
- F. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside building at each domestic water service. Refer to Division 15 Section "Meters and Gages" for pressure gages, and to Division 15 Section "Plumbing Specialties" for drain valves and strainers.

- G. Install water-pressure regulators downstream from shutoff valves. Refer to Division 15 Section "Plumbing Specialties" for water-pressure regulators.

Fill water piping. Check components to determine that they are not air bound and that piping is full of water.

- I. Perform the following steps before operation:
  - 1. Close drain valves, hydrants, and hose bibs.
  - 2. Open shutoff valves to fully open position.
  - 3. Open throttling valves to proper setting.
  - 4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
  - 5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
- J. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.
- K. Check plumbing specialties and verify proper settings, adjustments, and operation.
  - 1. Water-Pressure Regulators: Set outlet pressure at 60 psig maximum, unless otherwise indicated.

### 3.5 JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Soldered Joints: Use ASTM Standard, water-flushable, lead-free flux; complying with ASTM Standards, lead-free-alloy solder; and ASTM Standards procedure, unless otherwise indicated.

### 3.6 ROUGHING-IN FOR WATER METERS

- A. Rough-in domestic water piping [for water meter installation] [and install water meters] according to utility company's requirements. Water meters will be furnished by utility.

### 3.7 VALVE INSTALLATION

- A. Install sectional valve close to water main on each branch and riser serving plumbing fixtures or equipment. Use ball valves for piping NPS 2 and smaller.
- B. Install shutoff valve on each water supply to equipment and on each water supply to plumbing fixtures without supply stops. Use ball valves for piping NPS 2 and smaller.
- C. Install drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.

### 3.8 HANGER AND SUPPORT INSTALLATION

- A. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:
  - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
- B. Install supports according to Division 15 Section "Hangers and Supports."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch.
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
  - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
  - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
- F. Install supports for vertical copper tubing every 10 feet.

### 3.9 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to exterior water service piping. Use transition fitting to join dissimilar piping materials. Provide exterior water shutoff valve box and (if required by local codes) double check valve assembly with isolation valves.
- D. Connect domestic water piping to service piping with shutoff valve, and extend and connect to the following:
  - 1. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
  - 2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
  - 3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection.

### 3.10 FIELD QUALITY CONTROL

#### A. Inspect domestic water piping as follows:

1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
  - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  - b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

#### B. Test domestic water piping as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced domestic water piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
4. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

### 3.11 CLEANING

#### A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in AWWA Standards or as described below:
  - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
  - b. Fill and isolate system according to either of the following:
    - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.

- 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
  - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
  - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- B. Prepare and submit reports of purging and disinfecting activities.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION 3000

## **SECTION 3010**

### **SANITARY WASTE AND VENT PIPING**

#### **PART 1 - GENERAL**

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. This Section includes soil and waste, sanitary drainage and vent piping inside the building and to locations indicated.
- B. Related Sections include the following:
  - 1. Division 15 Section "Plumbing Specialties" for soil, waste, and vent piping systems specialties.

##### 1.3 DEFINITIONS

- A. The following are industry abbreviations for plastic piping materials:
  - 1. PVC: Polyvinyl chloride plastic.

##### 1.4 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
  - 1. Soil, Waste, and Vent Piping: 10-foot head of water.

##### 1.5 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

##### 1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

#### **PART 2 - PRODUCTS**

## 2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Flexible Transition Couplings for Underground Nonpressure Piping: Complying with ASTM Standards with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.

## 2.2 CAST-IRON SOIL PIPING

- A. Hub-and-Spigot Pipe and Fittings: Complying with ASTM Standards, Service and Extra-Heavy classes.
  - 1. Gaskets: Complying with ASTM Standards, rubber.
- B. Hubless Pipe and Fittings: Complying with ASTM or CISPI Standards.
  - 1. Couplings: Complying with ASTM Standards assembly of metal housing, corrosion-resistant fasteners, and complying with ASTM Standards rubber sleeve with integral, center pipe stop.
    - a. Heavy-Duty, Cast-Iron Couplings: ASTM A 48, 2-piece, cast-iron housing; stainless-steel bolts and nuts; and sleeve.
    - b. Heavy-Duty, Type 301, Stainless-Steel Couplings: ASTM A 666, Type 301, stainless-steel shield; stainless-steel bands; and sleeve.
      - 1) NPS 1-1/2 to NPS 4: 3-inch wide shield with 4 bands.
    - c. Compact, Stainless-Steel Couplings: CISPI 310 with ASTM A 167, Type 301, or ASTM A 666, Type 301, stainless-steel corrugated shield; stainless-steel bands; and sleeve.
      - 1) NPS 1-1/2 to NPS 4: 2-118-inch- wide shield with 2 bands.

## 2.3 PVC PIPING (Where approved by local jurisdiction only)

- A. PVC Pipe: Complying with ASTM Standards, solid-wall drain, waste, and vent. (Acceptable only where applicable under local codes).
  - 1. PVC Socket Fittings: Complying with ASTM Standards, socket type, made to ASTM Standards, drain, waste, and vent patterns.

PVC Special Fittings: Complying with ASTM Standards, drainage-pattern tube and tubular fittings with ends as required for application.

## **PART 3 - EXECUTION**

### 3.1 EXCAVATION

- A. Refer to Division 2 for excavating, trenching, and backfilling.

### 3.2 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
- B. Aboveground, Soil, Waste, and Vent Piping: Use the following piping materials for each size range:
  - 1. NPS 1-1/4 and NPS 1-1/2: Use NPS 1-1/2 hubless, cast-iron soil piping and one of the following:
    - a. Couplings: Heavy-duty, Type 301, stainless steel.
    - b. Couplings: Compact, stainless steel.
  - 2. NPS 2 to NPS 4: Service class, cast-iron soil piping; gaskets; and gasketed joints.
  - 3. NPS 2 to NPS 4: Hubless, cast-iron soil piping and one of the following:
    - a. Couplings: Heavy-duty, Type 301, stainless steel.
    - b. Couplings: Compact, stainless steel.
- C. Underground, Soil, Waste, and Vent Piping: Use the following piping materials for each size range:
  - 1. NPS 1-1/2: Hubless, cast-iron soil piping and one of the following:
    - a. Couplings: Heavy-duty, Type 301, stainless steel.
    - b. Couplings: Compact, stainless steel.
  - 2. NIPS 1-1/2: PVC pipe, PVC socket fittings, and solvent-cemented joints.
  - 3. NPS 2 to NPS 4: Service class, cast-iron soil piping; gaskets; and gasketed joints.
  - 4. NPS 2 to NPS 4: Extra-Heavy class, cast-iron soil piping; gaskets; and gasketed joints.
  - 5. NIPS 2 to NPS 4: Hubless, cast-iron soil piping and one of the following:
    - a. Couplings: Heavy-duty, Type 301, stainless steel.
    - b. Couplings: Heavy-duty, cast iron.
  - 6. NIPS 2 to NPS 4: PVC pipe, PVC socket fittings, and solvent-cemented joints.

### 3.3 PIPING INSTALLATION

- A. Refer to Division 2 for Project-site sanitary sewer piping.
- B. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.
- C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- D. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.
- E. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook,"

#### Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Encase underground piping with PE film according to ASTM or AWWA Standards.
- F. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- G. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- H. Re-verify building drainage piping slope before covering pipe in trench if left uncovered over a 24-hour period or subjected to water. If slope of piping has changed, provide new shoring material to maintain original slope after trench has been covered.
- I. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
  1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
  2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
  3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- J. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- K. Install underground PVC soil and waste drainage piping according to ASTM Standards.
- L. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

#### 3.4 JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
  1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
  2. Hubless Joints: Make with rubber gasket and sleeve or clamp.
- C. Soldered Joints: Use ASTM Standards compliant, water-flushable, lead-free flux; ASTM Standards compliant, lead-free-alloy solder; and ASTM Standards compliant procedure, unless otherwise indicated.
- D. PVC Nonpressure Piping Joints: Join piping according to ASTM Standards.

### 3.5 VALVE INSTALLATION

- A. Refer to Division 15 Section "Valves" for general-duty valves.
- B. Backwater Valves: Install backwater valves in piping subject to sewage backflow.
  - 1. Horizontal Piping: Horizontal backwater valves. Use normally closed type, unless otherwise indicated.
  - 2. Floor Drains: Drain outlet backwater valves, unless drain has integral backwater valve.
  - 3. Install backwater valves in accessible locations.
  - 4. Refer to Division 15 Section "Plumbing Specialties" for backwater valves.

### 3.6 HANGER AND SUPPORT INSTALLATION

- A. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:
  - 1. Vertical Piping: MSS Type 8 or Type 42 clamps.
  - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
- B. Install supports according to Division 15 Section "Hangers and Supports."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
  - 2. NPS 3: 60 inches with 1/2-inch rod.
  - 3. NPS 4: 60 inches with 5/8-inch rod.
- F. Install supports for vertical cast-iron soil piping every 15 feet.
- G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
  - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
  - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
  - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Specialties."
  - 4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

### 3.8 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
  4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
  5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  6. Prepare reports for tests and required corrective action.

### 3.9 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 3010

# SECTION 3020 PLUMBING SPECIALTIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

A. This Section includes the following plumbing specialties:

1. Backflow preventers.
2. Water regulators.
3. Balancing valves.
4. Water tempering valves.
5. Strainers.
6. Outlet boxes.
7. Key-operation hydrants.
8. Trap seal primer valves.
9. Drain valves.
10. Backwater valves.
11. Miscellaneous piping specialties.
12. Sleeve penetration systems.
13. Flashing materials.
14. Cleanouts.
15. Floor drains.

B. Related Sections include the following:

1. Division 15 Section "Meters and Gages" for water meters, thermometers, and pressure gages.

### 1.3 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:

1. Domestic Water Piping: 125 psig.
2. Sanitary Waste and Vent Piping: 10-foot head of water.

### 1.4 SUBMITTALS

A. Product Data: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:

1. Backflow preventers and water regulators.

PLUMBING FIXTURES

2. Dishwasher air-gap fittings.
3. Balancing valves, water filters, and strainers.
4. Water hammer arresters, air vents, and trap seal primer valves and systems.
5. Drain valves, hose bibs, hydrants.
6. Outlet boxes and washer-supply outlets.
7. Backwater valves, cleanouts, floor drains, and open receptors.
8. Vent caps, vent terminals, and roof flashing assemblies.
9. Sleeve penetration systems.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field test reports.

D. Maintenance Data: For plumbing specialties to include in maintenance manuals. Include the following:

1. Backflow preventers and water regulators.
2. Water tempering valves.
3. Trap seal primer valves and systems.
4. Hydrants.

## 1.5 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of plumbing specialties and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

B. Plumbing specialties shall bear label, stamp, or other markings of specified testing agency.

C. 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.

D. ASME Compliance: Comply with all applicable ASME Standards for piping materials and installation.

E. NSF Compliance:

1. Comply with NSF Standards for potable domestic water plumbing specialties.

## 1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Operating Key Handles: Equal to 100 percent of amount installed for each key-operated hose bib and hydrant installed.

## 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. Products: Subject to compliance with requirements, provide one of the products specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

## 2.2 BACKFLOW PREVENTERS

A. Hose-Connection Vacuum Breakers: Complying with ASSE Standards, nickel plated, with nonremovable and manual drain features, and complying with ASME Standards, garden-hose threads on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.

## 2.3 DISHWASHER AIR-GAP FITTINGS

A. Description: Complying with ASSE Standards, fitting suitable for use with domestic dishwashers and for deck mounting; with plastic body, chrome-plated brass cover; and capacity of at least 5 gpm; and inlet pressure of at least 5 psig at temperature of at least 140 deg F. Include 5/8-inch- ID inlet and 7/8-inch-ID outlet hose connections.

## 2.4 WATER REGULATORS

A. Manufacturers:

1. Armstrong-Yoshitake, Inc.
2. FLOMATIC Corp.
3. Watts Industries, Inc.; Water Products Div.

B. General: Complying with ASSE Standards, water regulators, rated for initial working pressure of 150 prig minimum. Include integral factory-installed or separate field-installed, Y-pattern strainer.

1. NPS 2 and Smaller: Bronze body with threaded ends.
  - a. General-Duty Service: Single-seated, direct operated, unless otherwise indicated.
2. Interior Components: Corrosion-resistant materials.
3. Exterior Finish: Polished chrome plate if used in chrome-plated piping system.

## 2.5 BALANCING VALVES

A. Memory-Stop Balancing Valves, NPS 2 and Smaller: Complying with MSS Standards, ball valve, rated for 400-psig minimum CWP. Include two-piece, copper-alloy body with standard or full-port, chrome-plated brass ball, replaceable seats and seals, threaded or solder-joint ends, and vinyl-covered steel handle with memory-stop device.

1. Manufacturers:
  - a. Grinnell Corporation.

- b. Milwaukee Valve Company.
- c. NIBCO INC.
- d. Red-White Valve Corp.

## 2.6 WATER TEMPERING VALVES

### A. Manufacturers:

- 1. Symmons Industries, Inc.
- 2. Holby Valve Co., Inc.
- 3. Sparco, Inc.
- 4. Watts Industries, Inc.; Water Products Div.

### B. General: Manually adjustable, thermostatically controlled water tempering valve; bronze body; and adjustable temperature setting.

### C. System Water Tempering Valves: Piston or discs controlling both hot- and cold-water flow, capable of limited antiscald protection. Include threaded inlets and outlet.

- 1. Finish: Rough bronze.

### D. Limited-Volume, Water Tempering Valves: Solder-joint inlets and NPS 3/4 maximum outlet.

## 2.7 OUTLET BOXES

### A. Icemaker Outlet Boxes: With hose connection and the following:

- 1. Box and Faceplate: Enameled or epoxy-painted steel.
- 2. Shutoff Fitting: Hose bibb.
- 3. Supply Fitting: NPS 1/2 gate, globe, or ball valve and NPS 1/2 copper, water tubing.

## 2.8 KEY-OPERATION HYDRANTS

### A. Manufacturers:

- 1. Josam Co.
- 2. Smith, Jay R. Mfg. Co.
- 3. Woodford Manufacturing Co.

### B. Refer to Plumbing Schedule for specifications.

## 2.9 TRAP SEAL PRIMER VALVES

### A. Supply-Type Trap Seal Primer Valves: Complying with ASSE Standards, water-supply-fed type, with the following characteristics:

- 1. Manufacturers:
  - a. Josam Co.
  - b. MIFAB Manufacturing, Inc.
  - c. Smith, Jay R. Mfg. Co.
- 2. 125-psig minimum working pressure.

3. Bronze body with atmospheric-vented drain chamber.
4. Inlet and Outlet Connections: NPS 1/2 threaded union, or solder joint.
5. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

#### 2.10 DRAIN VALVES

A. Hose-End Drain Valves: Complying with MSS Standards, NPS 3/4 ball valve, rated for 400-psig minimum CWP. Include two-piece, copper-alloy body with standard port, chrome-plated brass ball, replaceable seats and seals, blowout-proof stem, and vinyl-covered steel handle.

1. Inlet: Threaded or solder joint.
2. Outlet: Short-threaded nipple with ASME Standards compliant, garden-hose threads and cap.

B. Stop-and-Waste Drain Valves: Complying with MSS Standards, ball valve, rated for 200-psig minimum CWP or MSS Standards Class 125, gate valve; ASTM Standards compliant bronze body, with NPS 1/8 side drain outlet and cap.

#### 2.11 BACKWATER VALVES

A. Manufacturers:

1. Josam Co.
2. Smith, Jay R. Mfg. Co.
3. Zurn Industries, Inc.; Specification Drainage Operation.

B. Horizontal Backwater Valves: Complying with ASME Standards, cast-iron body, with removable bronze swing-check valve and threaded or bolted cover.

1. Open-Position Check Valve: Factory assembled or field modified to hang open for airflow.
2. Extension: Complying with ASTM Standards, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor, instead of cover.

#### 2.12 MISCELLANEOUS PIPING SPECIALTIES

A. Water Hammer Arresters: Complying with ASSE or PDI Standards, metal-bellows type with pressurized metal cushioning chamber. Sizes indicated are based on ASSE or PDI Standards compliant, Sizes A through F.

1. Manufacturers:

- a. Josam Co.
- b. Smith, Jay R. Mfg. Co.
- c. Tyler Pipe; Wade Div.

B. Hose Bibs: Bronze body with replaceable seat disc complying with ASME Standards compliant for compression-type faucets. Include NPS 1/2 or NPS 3/4 threaded or solder-joint inlet, of design suitable for pressure of at least 125 psig; integral nonremovable, drainable hose-connection vacuum breaker; and garden-hose threads complying with ASME Standards on outlet.

C. Air Vents: Float type for automatic air venting.

1. Bolted Construction: Bronze body with replaceable, corrosion-resistant metal float and stainless-steel mechanism and seat; threaded NPS 1/2 minimum inlet; 125-psig minimum pressure rating at 140 deg F; and threaded vent outlet.
2. Welded Construction: Stainless-steel body with corrosion-resistant metal float, stainless-steel mechanism and seat, threaded NPS 3/8 minimum inlet, 150-psig minimum pressure rating, and threaded vent outlet.

D. Roof Flashing Assemblies: Manufactured assembly made of 6-lb/sq. ft, 0.0938-inch- thick, lead flashing collar and skirt extending at least 8 inches from pipe with galvanized steel boot reinforcement, and counter flashing fitting.

1. Manufacturers:

a. Acorn Engineering Company; Elmdor/Stoneman Div.

2. Open-Top Vent Cap: Without cap.

E. Open Drains: Shop or field fabricate from ASTM Standards, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting, joined with ASTM Standards compliant, rubber gaskets.

F. Deep-Seal Traps: Cast-iron or bronze casting, with inlet and outlet matching connected piping and clear out trap seal primer valve connection.

NPS 2: 4-inch- minimum water seal.

NPS 2-112 and Larger: 5-inch- minimum water seal.

G. Floor-Drain Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.

H. Fixed Air-Gap Fittings: Manufactured cast-iron or bronze drainage fitting with semi open top with threads or device to secure drainage inlet piping in top and bottom spigot or threaded outlet larger than top inlet. Include design complying with ASME Standards that will provide fixed air gap between installed inlet and outlet piping.

Stack Flashing Fittings: Counter flashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.

J. Vent Terminals: Commercially manufactured, shop- or field-fabricated, frost-proof assembly constructed of galvanized steel, copper, or lead-coated copper. Size to provide 1-inch enclosed air space between outside of pipe and inside of flashing collar extension, with counter flashing.

K. Expansion Joints: Complying with ASME Standards, assembly with cast-iron body with bronze sleeve, packing gland, and packing; of size and end types corresponding to connected piping.

## 2.13 SLEEVE PENETRATION SYSTEMS

A. Manufacturers:

1. ProSet Systems, Inc.

B. Description: Complying with UL Standards, through-penetration fire stop assembly consisting of sleeve and stack fitting with fire stopping plug.

1. Stack Fitting: Complying with ASTM Standards, gray-iron, hubless-pattern, wye-branch stack fitting with neoprene O-ring at base and gray-iron plug in thermal-release harness in branch. Include PVC protective cap for plug.

a. Special Coating: Include corrosion-resistant interior coating on fittings for plastic chemical waste and vent stacks.

## 2.14 FLASHING MATERIALS

- A. Lead Sheet: Complying with ASTM Standards, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
1. General Use: 4-113/sq. ft., 0.0625-inch thickness.
  2. Vent Pipe Flashing: 3-lb/sq. ft. (15-kg/sq. m), 0.0469-inch thickness.
  3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

## 2.15 CLEANOUTS

- A. Cleanouts: Comply with ASME Standards.
1. Application: Refer to Plumbing Drawings.
  2. Products:
    - a. Josam Co.
    - b. Smith, Jay R. Mfg. Co.
    - c. Tyler Pipe, Wade Div.
    - d. Zurn Industries, Inc., Jonespec Div.

## 2.16 FLOOR DRAINS

- A. Floor Drains: Comply with ASME Standards.
1. Application: Refer to Plumbing Drawings.
  2. Products:
    - a. Josam Co.
    - b. Smith, Jay R. Mfg. Co.
    - c. Tyler Pipe, Wade Div.
    - d. Zurn Industries, Inc., Jonespec Div.

## **PART 3 - EXECUTION**

### 3.1 INSTALLATION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.
- B. Install vacuum breaker in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
- C. Install trap seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- D. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

- E. Install expansion joints on vertical risers, stacks, and conductors if indicated.
- F. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
  - 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
  - 2. Locate at each change in direction of piping greater than 45 degrees.
  - 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
  - 4. Locate at base of each vertical soil and waste stack.
- G. Install cleanout deck plates with top flush with finished floor, for floor cleanouts for piping below floors.
- H. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.

Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.
- J. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.
- K. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
  - 1. Position floor drains for easy access and maintenance.
  - 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
    - a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    - b. Radius, 30 to 60 inches: Equivalent to 1 percent slope.
    - c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
  - 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
  - 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- L. Install interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.
  - 1. Above-Floor Installation: Set unit with bottom resting on floor, unless otherwise indicated.
- M. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.
- N. Fasten recessed-type plumbing specialties to reinforcement built into walls.
- O. Install wood-blocking reinforcement for wall-mounting and recessed-type plumbing specialties.
- P. Install individual shutoff valve in each water supply to plumbing specialties. Use ball, gate, or globe valve if specific valve is not indicated. Install shutoff valves in accessible locations. Refer

to Division 15 Section "Valves" for general-duty ball, butterfly, check, gate, and globe valves.

- Q. Install air vents at piping high points. Include ball, gate, or globe valve in inlet and drain piping from outlet to floor drain.
- R. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
- S. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

### 3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Connect plumbing specialties to piping specified in other Division 15 Sections.
- D. Ground equipment.
- E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL Standards.
- F. Connect plumbing specialties and devices that require power according to Division 16 Sections.
- G. Interceptor Connections: Connect piping, flow-control fittings, and accessories.
  - 1. Grease Interceptors: Connect inlet and outlet to unit, and flow-control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff-type unit
  - 2. Oil Interceptors: Connect inlet, outlet, vent, and gravity drawoff piping to unit; flow-control fitting and vent to unit inlet piping; and gravity drawoff and suction piping to oil storage tank.
  - 3. Solids Interceptors: Connect inlet and outlet.

### 3.3 FLASHING INSTALLATION

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
  - 1. Lead Sheets: Burn joints of lead sheets 6-lb/sq. ft., 0.0938-inch thickness or thicker.  
Solder joints of lead sheets 4-lb/sq. ft., 0.0625-inch thickness or thinner.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
  - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
  - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.

3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counter flashing or commercially made flashing fittings, according to Division 7.

F. Fabricate and install flashing and pans, sumps, and other drainage shapes.

#### 3.4 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each water tempering valve, trap seal primer system, and grease interceptor.

1. Text: Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.
2. Refer to Division 15 Section "Mechanical Identification" for nameplates and signs.

#### 3.5 FIELD QUALITY CONTROL

#### 3.6 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

Place plugs in ends of uncompleted piping at end of each day or when work stops.

#### 3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain interceptors. Refer to Division 1.

**END OF SECTION 3020**

## SECTION 3030

### ELECTRIC, DOMESTIC WATER HEATERS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. This Section includes the following for domestic water systems:
  1. Commercial, electric water heaters.
  2. Compression tanks.
  3. Accessories.

##### 1.3 SUBMITTALS

- A. Product Data: For each type and size of water heater. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.
- B. Shop Drawings: Detail water heater assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

- C. Product Certificates: Signed by manufacturers of water heaters certifying that products furnished comply with requirements.
- D. Maintenance Data: For water heaters to include in maintenance manuals specified in Division 1.
- E. Warranties: Special warranties specified in this Section.

##### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain same type of water heaters through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of water heaters and are based on specific units indicated. Other manufacturers' products complying with requirements may be considered. Refer to Division 1.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. ASME Compliance: Fabricate and label water heater, hot-water storage tanks to comply with

ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.

E. ASHRAE Standards: Comply with performance efficiencies prescribed for the following:

1. ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings," for commercial water heaters.
2. ASHRAE 90.2, "Energy Efficient Design of New Low-Rise Residential Buildings," for household water heaters.

## 1.5 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of water heaters that fail in materials or workmanship within specified warranty period.
1. Failures include heating elements and storage tanks.
  2. Warranty Period: From date of Substantial Completion:
    - a. Heating Elements: Five years.
    - b. Storage Tanks: 10 years.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Commercial, Storage, Electric Water Heaters:
    - a. Lochinvar Corp.
    - b. Rheem Water Heater.
    - c. Smith: A. O. Smith Water Products Co.
    - d. State Industries.
  2. Water Heater Stand and Drain Pan Units:
    - a. Safety: W. H. Safety Products, Inc.
  3. Compression Tanks:
    - a. Amtrol, Inc.
    - b. Armstrong Pumps, Inc.
    - c. Smith: A. O. Smith; Aqua-Air Div.
    - d. Taco, Inc.
- B. unless otherwise indicated; electric, screw-in, immersion type.

1. Temperature Control: Adjustable thermostat.

C. Anode Rod: Factory installed, magnesium.

D. Drain Valve: Comply with ASSE Standards, corrosion-resistant metal, factory installed.

## 2.2 COMMERCIAL, STORAGE, ELECTRIC WATER HEATERS

A. Description: Comply with UL Standards.

B. Storage Tank Construction: ASME-code steel with 150-psig (1035-kPa) working-pressure rating.

1. Tappings: Factory fabricated of materials compatible with tank for piping connections, relief valve, thermometer, drain, anode rods, and controls as required. Attach tappings to tank shell before testing and labeling.

a. NPS 2 (DN50) and Smaller: Threaded ends according to ASME Standards, pipe threads.

2. Interior Finish: Materials and thicknesses complying with NSF Standards, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.

3. Insulation: Comply with ASHRAE 90.1. Surround entire storage tank except connections and controls.

4. Jacket: Steel, with enameled finish.

C. Heating Elements: Electric, screw-in or bolt-on, immersion type arranged in multiples of three.

1. Exception: Water heaters up to 9-kW input may have 2 or 3 elements.

2. Staging: Input not exceeding 18 kW per step.

3. Temperature Control: Adjustable, immersion thermostat.

4. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.

D. Drain Valve: Complying with ASSE Standards, corrosion-resistant metal, factory installed.

E. Anode Rods: Factory installed, magnesium.

F. Dip Tube: Factory installed. Not required if cold-water inlet is near bottom of storage tank.

G. Special Requirement: Complying with NSF Standards construction.

## 2.3 COMPRESSION TANKS

A. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed, butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

B. Construction: 150-psig (1035-kPa) working-pressure rating.

C. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1, pipe thread.

- D. Tank Interior Finish: Materials and thicknesses complying with NSF Standards, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
- E. Tank Exterior Finish: Manufacturer's standard, unless finish is indicated.
- F. Air-Charging Valve: Factory installed.

#### 2.4 WATER HEATER ACCESSORIES

- A. Combination Temperature and Pressure Relief Valves: ASME rated and stamped and complying with ASME Standards. Include relieving capacity at least as great as heat input and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into tank.
  - 1. Option: Separate temperature and pressure relief valves are acceptable instead of combination relief valve.
  - 2. Exception: Omit combination temperature and pressure relief valve for tankless water heater, and furnish pressure relief valve for installation in piping.
- B. Pressure Relief Valves: ASME rated and stamped and complying with ASME Standards. Include pressure setting less than heat-exchanger working-pressure rating.
- C. Vacuum Relief Valves: Comply with ASME Standards. Furnish for installation in piping.
  - 1. Exception: Omit if water heater has integral vacuum-relieving device.
- D. Water Regulators: Comply with ASSE Standards, water-pressure reducing valve. Set at 25- psig- (172.5-kPa-) maximum outlet pressure.
- E. Shock Absorbers: Comply with ASSE or PDI Standards, Size A water hammer arrester.
- F. Water Heater Stands: Water heater manufacturer's factory-fabricated, steel stand for floor mounting and capable of supporting water heater and water. Include dimension that will support bottom of water heater a minimum of 18 inches (457 mm) above the floor.
- G. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated, steel bracket for wall mounting and capable of supporting water heater and water.
- H. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4 (DN20).
- I. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE 90.1 or ASHRAE 90.2.

### **PART 3 - EXECUTION**

#### 3.1 CONCRETE BASES

- A. Install concrete bases of dimensions indicated. Refer to Division 3 and Division 15 Section "Basic Mechanical Materials and Methods."

#### 3.2 WATER HEATER INSTALLATION

Install commercial water heaters on concrete bases.

1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.
- B. Install water heaters, level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- C. Anchor water heaters to substrate.
- D. Install temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain.
- E. Install pressure relief valves in water piping for water heaters without storage. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain.
- F. Install vacuum relief valves in cold-water-inlet piping.
- G. Install water heater drain piping as indirect waste to spill into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 15 Section "Plumbing Specialties" for drain valves.
- H. Install thermometers on water heater inlet and outlet piping. Refer to Division 15 Section "Meters and Gages" for thermometers.
  1. Exception: Omit thermometers for the following:
    - a. Commercial, point-of-use, water heater inlet piping.
    - b. Water heater with thermometer outlet piping.
  - I. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.
- J. Fill water heaters with water.  
Charge compression tanks with air.

### 3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.  
Install piping adjacent to machine to allow service and maintenance.
- C. Connect hot- and cold-water piping with shutoff valves and unions. Connect hot-water-circulating piping with shutoff valve, check valve, and union.
- D. Make connections with dielectric fittings where piping is made of dissimilar metal.
- E. Electrical Connections: Power wiring and disconnect switches are specified in Division 16. Arrange wiring to allow unit service.
- F. Ground equipment
  1. Tighten electrical connectors and terminals according to manufacturer's published

torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL Standards.

### 3.4 FIELD QUALITY CONTROL

- A. In addition to manufacturer's written installation and startup checks, perform the following:
1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  2. Verify that piping system tests are complete.
  3. Check for piping connection leaks.
  4. Check for clear relief valve inlets, outlets, and drain piping.
  5. Check operation of circulators.
  6. Test operation of safety controls, relief valves, and devices.
  7. Energize electric circuits.
  8. Adjust operating controls.
  9. Adjust hot-water-outlet temperature settings. Do not set above 120 deg F unless piping system application requires higher temperature.
  10. Balance water flow through manifolds of multiple-unit installations.

### 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water heaters.
1. Train Owner's maintenance personnel on procedures for starting and stopping, troubleshooting, servicing, and maintaining equipment.
  2. Review data in maintenance manuals. Refer to Division 1.
  3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

**END OF SECTION 3**

# **Item 4000**

## **PVC COATED CHAIN LINK FENCE AND GATES**

### **PART 1 – GENERAL**

#### **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 SECTION INCLUDES**

- A. PVC-coated chain link fencing, gates, and accessories.

##### **1.3 SUBMITTALS**

- A. Shop Drawings: Indicate materials, dimensions, details, and finish, show locations and installation procedures. Include details of fence and gate joints, attachments, accessories, footings, and clearances.
- B. Product Data: Submit manufacturer's schedules, charts, literature, and illustrations indicating the performance, fabrication procedures, product variations and accessories indicating material compliance and specified options.
- C. Samples: Submit color selection of PVC finishes for Architect's selection. If requested, submit samples of materials (i.e., fabric, wires, and accessories).

##### **1.4 QUALITY ASSURANCE**

- A. Chain link fabric shall have the PVC thermally fused to the galvanized steel core wire. Extruded or bonded and glued chain link fence fabric will not be accepted.
- B. Fence framework shall have the PVC thermally fused in compliance with ASTM F1043.

#### **PART 2 - PRODUCTS**

##### **2.1 MANUFACTURERS**

- A. Specifications are based on products of Anchor Fence, Inc., Baltimore, MD, Phone (410) 633-6500, Fax (410) 633-6506.
- B. Other manufacturers must have a minimum of five (5) years experience manufacturing chain link fencing and gates meeting or exceeding the following specifications for design, size, gauge, finish of metal parts and fabrication and comply with Division 1 requirements for substitutions in order to be considered.
  - 1. American Fence and Supply Co.; League City, TX (281) 332-0511
  - 2. Merchants Metals, Houston, TX; (800) 254-0080

**PVC COATED CHAIN LINK FENCE AND**

## 2.2 CHAIN LINK FENCE MATERIALS

- A. Fence Fabric:
1. PVC coating thermally fused to zinc-coated or zinc-5 percent aluminum-mischmetal alloy- coated steel core wire: ASTM F668 Class 2b, 7 mil thickness thermally fused. Core wire tensile strength 75,000 psi.
  2. Size: Helically wound and woven to height of six (6) feet with two (2) inch diamond mesh, with core wire diameter of 0.148 inch (9 gauge) and a breakload of 1290 lbf . Color shall comply with ASTM F934 as selected by Architect from manufacturer's available colors.
  3. Selvage of fabric shall be knuckled at top and knuckled at bottom.
- B. Fence Framing:
1. Steel pipe - Type I: ASTM F1083, standard weight schedule 40; minimum yield strength of 25,000 psi; sizes as indicated below. Hot-dipped galvanized with minimum average 1.8 oz/ft<sup>2</sup> of coated surface area.
    - a. Line posts: 1.90 inch o.d. up to 6 feet on center; 2.375 inch o.d. up to 10 feet on center.
    - b. Terminal, End, Corner, and Pull posts: 2.375 inch o.d. up to 6 feet on center; 2.975 inch o.d. up to 10 feet on center
    - c. Rails and Braces: 1.660 inch o.d.
  2. PVC finish: In accordance with ASTM F1043, apply supplemental color coating of 10 to 15 mils thermally fused PVC in Grey.
- C. Fence Accessories:
1. Chain link fence accessories: Provide items required to complete fence system. Galvanize each ferrous metal item and finish to match framing.
  2. Post caps: Formed steel, cast malleable iron, or aluminum alloy weathertight closure cap for tubular posts. Provide one cap for each post. (Where top rail is used, provide tops to permit passage of top rail.)
  3. Top rail and brace rail ends: Formed steel, malleable or cast iron, for connection of rail and brace to terminal posts.
  4. Top rail sleeves: 6 inch sleeve allowing for expansion and contraction of top rail.
  5. Wire ties: 9 gauge galvanized steel wire for attachment of fabric to line posts. Double wrap 13 gauge for rails and braces. Hog ring ties of 12-1/2 gauge for attachment of fabric to tension wire.
  6. Brace and tension (stretcher bar) bands: Pressed steel.
  7. Tension (stretcher) bars: One piece lengths equal to 2 inches less than full height of fabric with a minimum cross-section of 3/16 inch x 3/4 inch or equivalent fiber glass rod. Provide tension (stretcher) bars where chain link fabric meets terminal posts.
  8. Tension wire: Thermally fused vinyl applied to metallic coated steel wire, 7 gauge, diameter core wire with tensile strength of 75,000 psi.
  9. Truss rods: Steel rods with minimum diameter of 5/16 inch.
  10. Nuts and bolts are galvanized but not vinyl coated. Color coat nuts and bolts with PVC touch up paint, provided by manufacturer, to match adjacent finishes.

## 2.3 CHAIN LINK SWING GATES (Manual)

- A. Gate frames: Fabricate chain link swing gates in accordance with ASTM F900 using galvanized steel tubular members, 2 inches square, weighing 2.60 lb/ft. Fusion or stainless steel welded connections forming rigid one-piece unit. Vinyl coated frames thermally fused with 10 to 15 mils of PVC in accordance with ASTM 1043. PVC color to

match fence.

- B. Chain link fence fabric: PVC thermally fused to metallic coated steel wire, ASTM F668, Class 2b, in color, mesh, and gauge to match fence. Install fabric with hook bolts and tension bars at all four (4) sides. Attach to gate frame at not more than 15 inches on center.
- C. Hardware materials: Hot dipped galvanized steel or malleable iron shapes to suit gate size. Field coat moveable parts (i.e. hinges, latch, keeper, and drop bar) with PVC touch up paint, provided by manufacturer, to match adjacent finishes.
- D. Hinges: Structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180 degrees inward.
- E. Latch: Forked type capable of retaining gate in closed position and have provision for padlock. Latch shall permit operation from either side of gate.
- F. Keeper: Provide keeper for each gate leaf over five (5) feet wide. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position.
- G. Double gates: Provide drop rod to hold inactive leaf. Provide gate stop pipe to engage center drop rod. Provide locking device and padlock eyes as an integral part of latch, requiring one (1) padlock for locking both gate leaves.
- H. Gate posts: Steel pipe, ASTM F1083, standard weight schedule 40; minimum yield strength of 25,000 psi, 2.875 inches in diameter. Hot-dipped galvanized with minimum 1.8 oz/ft<sup>2</sup> of zinc or respective material finished in accordance with ASTM F1043. PVC color to match fence

#### **2.4 SETTING MATERIALS**

- A. Concrete: Minimum 28 day compressive strength of 3,000 psi.

# **Item 5000**

## **KENNEL ENCLOSURES AND GATES**

### **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. Kennel enclosures, gates, and accessories for complete installation.

#### **1.3 SUBMITTALS**

- A. Product Data:
  - 1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
  - 2. Manufacturer's installation instructions.
  - 3. Manufacturer's operation and maintenance data, as applicable.
- B. Shop Drawings: Show sizes, locations and installation details.

#### **1.4 WARRANTY**

- A. Standard: Warrant Work for three (3) years from defects.

### **PART 2 - PRODUCTS**

#### **2.1 APPROVED MANUFACTURERS**

- A. Specifications are based on Mason Company; (800) 543-5567. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.
  - 1. Shor-Line; (800) 444-1579.

#### **2.2 MATERIALS**

- A. Dividers and Back Panels: Stainless Steel Grid Panels:
  - 1. Perimeter frame and internal bracing shall consist of 1" x 16 gauge (.060" wall) square 304 A-554 welded stainless steel tubing with 180 grit polish. Each corner of the frame shall be TIG welded.
  - 2. Wire grids shall be constructed of 304 stainless steel wire 3/16" in diameter in the vertical direction with 1 5/8" spacing between wires, and 304 stainless steel wire 3/16" in diameter in the horizontal direction with 6" or less spacing between wires. Horizontal and vertical wires shall be resistance welded at each juncture.
- B. Gate and Stall Fronts: Stainless Steel Gates and Stall Fronts:
  - 1. Gate and stall front frames shall consist of 1" x 16 gauge (.060" wall) square 304 A-554 welded stainless steel tubing with 180 grit polish. Each corner of the frame shall be TIG

## **KENNEL ENCLOSURES AND GATES**

- welded.
2. Gate grids shall be constructed of 304 stainless steel wire 3/16" in diameter in the vertical direction with 15/16" spacing between wires, and 304 stainless steel wire 3/16" in diameter in the horizontal direction with 3-5/8" or less spacing between wires.
  3. Horizontal and vertical wires shall be resistance welded at each juncture and each wire shall insert into the framework.
  4. Gate Hinges shall consist of two 3/8" diameter stainless steel hex head screws which shall be threaded into stainless steel tapped plugs inserted into the top and bottom of the door frame. Each plug shall contain a nylon pivot bushing for smooth precision rotation.
  5. Patented stainless steel two-way latch shall open both outward and inward. The latch shall secure automatically when gate is closed from the outward position and from the inward position it shall be able to latch and open from the inside of kennel. It shall be designed to accept a padlock. The two-way latch bar, the latch catch, and the swing pendant shall be made from 304 stainless steel.
  6. Solid internal panels (as required) shall be 1/4" tempered glass or 1/2" FRP framed in an outer framework of 6063-T52 aluminum U-channel 3/4" x 3/4" x 1/8" thick. Panels shall be secured to the frame by means of stainless steel fasteners.
- C. Top Covers: Stainless Steel Top Covers:
1. Perimeter frame and internal bracing shall consist of 1" x 16 gauge (.065" wall) square 304 A-554 welded stainless steel tubing with 180 grit polish. Each corner of the frame shall be TIG welded.
  2. Wire grids shall be constructed of 304 stainless steel wire 1/8" in diameter in both directions with 3" spacing between wire centerlines. All wires shall be resistance welded at each juncture. Wire grid shall be TIG welded securely to the square tubing framework.
- D. Insulated Transfer Doors:
1. Vertical sliding doors shall be 1/4" thick, molded polyester fiberglass. Insulated portion of the fiberglass is 1-1/4" thick filled with 1-1/8" thick foam core with an R value of 8.
  2. Channels shall be solid extruded aluminum 6063-T6. Doors are raised or lowered by pulling or releasing a 3/32" stainless steel wire cable that is secured to the top of the door. Transfer Doors come equipped with cable, "S" hooks or weight assist bone shaped handle, pulleys, and all necessary hardware for easy installation.
  3. Transfer doors are available in three standard sizes:
    - a. Large – for openings up to 29" high x 17" wide.
    - b. Extra-Large – for openings up to 34" high x 17" wide.
    - c. XXL – for openings up to 36" high x 25" wide.
- E. Stainless Steel Bowl Insert:
1. Insert shall be constructed of 1/4" diameter stainless steel wire. Inserts shall be secured in place with stainless steel screws. Bowl wires shall be MIG welded at all intersections. The bowl shall be retained in the insert by a swing down door that shall be made of 16 gauge (.060") stainless steel. The swing down door shall be held in the closed position by means of a stainless steel swing pendant made of 12 gauge (.105") stainless steel. Pendant shall be mounted to the enclosure with a stainless steel screw, Nyloc nut, and a nylon spacer.

## **PART 3 - EXECUTION**

### **KENNEL ENCLOSURES AND GATES**

### **3.1 EXAMINATION**

- A. Verify items fastened to walls have proper blocking or support items installed.
- B. Verify locations for items are ready for their installation.

### **3.2 INSTALLATION**

- A. Install all items in accordance with manufacturer's printed instructions in locations shown on drawings or otherwise indicated.