

# SHORES AT CRYSTAL BEACH PARK EXPANSION

OKALOOSA COUNTY, FLORIDA

September 2026

## TECHNICAL SPECIFICATIONS

Prepared for:  
OKALOOSA COUNTY



1418 W. 23<sup>rd</sup> Street, Suite 200  
Panama City, FL 32405  
EB-0000340

## **TECHNICAL SPECIFICATIONS**

### **Civil**

- *FDOT Standard Specifications for Road and Bridge Construction, Latest Edition*
- Destin Water Users – MISCELLANEOUS WATER AND SANITARY SEWER SPECIFICATIONS  
– See sheets CU-501 through CU-507
- UNDERGROUND STORMWATER RETENTION CHAMBERS – *See sheets C-503 through C-512 for underground stormwater retention chamber specifications. The ADS Stormtech MC-7200 chamber is the basis of design only and is not the required product to be used. However, the contractor is responsible for choosing a system that meets all the requirements as identified as part of the specification.*
- MOST DEPENDABLE FOUNTAINS, INC. TECHNICAL SPECIFICATIONS - *The Most Dependable Fountains, Inc. outdoor shower and bottle filler fountain products are the basis of design for this project.*
- 32 14 33.13 PERMEABLE PLASTIC PAVING - *The TRUEGRID PRO PLUS product from truegridpaver.com is the basis of design only and is not the required permeable paver product to be used. However, the contractor is responsible for choosing a product that meets all the requirements as identified as part of the specification.*
- 02800 FENCING
- 12931 BIKE RACKS

### **Architectural, Structural, Mechanical, Plumbing, Landscaping**

|             |                                    |
|-------------|------------------------------------|
| 02 01 00    | SUBSURFACE INVESTIGATION           |
| 05 60 00    | HANDRAILS                          |
| 06 10 00    | CARPENTRY                          |
| 06 17 53    | SHOP-FABRICATED WOOD TRUSSES       |
| 07 21 00    | SPRAY FOAM INSULATION              |
| 07 41 00    | PREFORMED STANDING SEAM METAL ROOF |
| 07 62 00    | FLASHING AND SHEET METAL           |
| 07 92 00    | WATER PROOFING AND SEALANTS        |
| 08 16 13    | FRP DOORS AND FRAMES               |
| 08 43 00    | ALUMINUM STOREFRONT                |
| 08 71 00    | HARDWARE                           |
| 08 81 00    | GLASS AND GLAZING                  |
| 09 27 00    | CEMENT BACKER BOARDS               |
| 09 30 13    | CERAMIC TILE                       |
| 09 67 23.30 | HIGH-BUILD EPOXY FLOORING          |
| 09 91 00    | PAINTING                           |
| 10 14 00    | INTERIOR AND EXTERIOR SIGNS        |
| 10 22 00    | TOILET PARTITIONS                  |
| 10 28 00    | TOILET ACCESSORIES                 |

|          |                                                        |
|----------|--------------------------------------------------------|
| 22 00 00 | PLUMBING GENERAL                                       |
| 22 05 17 | SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING           |
| 22 05 18 | ESCUTCHEONS FOR PLUMBING PIPING                        |
| 22 05 23 | GENERAL-DUTY VALVES FOR PLUMBING PIPING                |
| 22 05 29 | HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT |
| 22 05 53 | IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT       |
| 22 07 19 | PLUMBING PIPING INSULATION                             |
| 22 11 16 | DOMESTIC WATER PIPING                                  |
| 22 11 19 | DOMESTIC WATER PIPING SPECIALTIES                      |
| 22 13 16 | SANITARY WASTE AND VENT PIPING                         |
| 22 13 19 | SANITARY WASTE PIPING SPECIALITES                      |
| 23 00 00 | MECHANICAL GENERAL                                     |
| 31 22 00 | GRADING                                                |
| 31 23 23 | FILL                                                   |
| 31 62 19 | TIMBER PILES                                           |
| 32 84 23 | UNDERGROUND SPRINKLERS                                 |
| 32 92 23 | SODDING                                                |
| 32 93 00 | PLANTS                                                 |

## **APPLICABLE PERMITS**

FDEP General Sewer Permit

FDEP Notice of Intent to use the General Permit for Construction of Water Main Extensions for PWSs

FDEP Coastal Construction Control Line Permit

FDEP Environmental Resource Permit (ERP)

## **GEOTECHNICAL INVESTIGATION**

Report of Geotechnical Exploration – Crystal Beach Park Okaloosa County, Florida

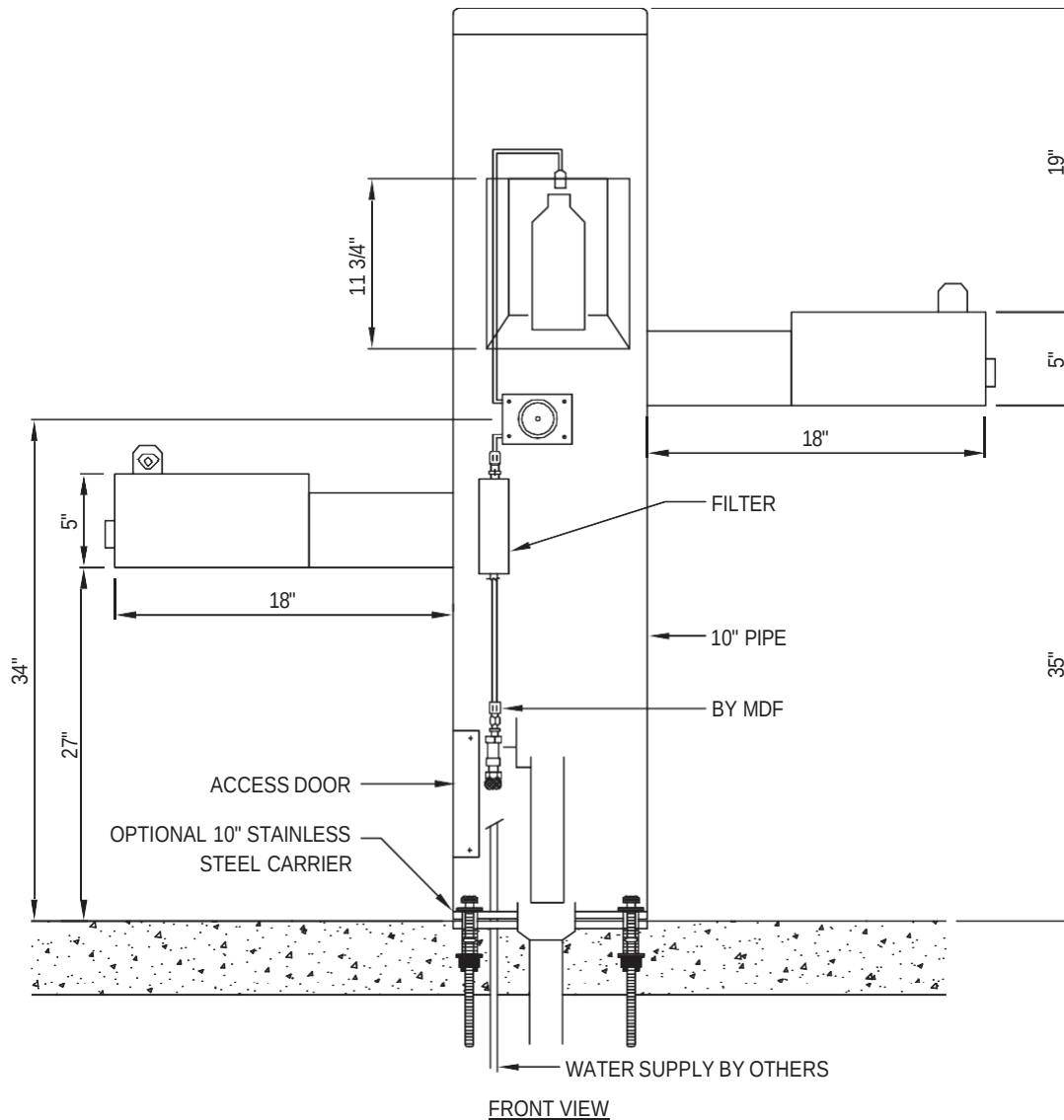
**Most  
Dependable  
Fountains, Inc.**

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**OPERATIONS MANUAL**

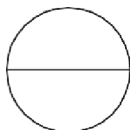
**MODELS:  
10145 SM & 10145 SMSS**

Most Dependable Fountains, Inc™  
5705 Commander Drive  
Arlington, TN 38002  
901-867-0039  
[www.mostdependable.com](http://www.mostdependable.com)



**NOTES:**

1. OPTIONAL STAINLESS STEEL SURFACE CARRIER RECOMMENDED.
2. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
3. DO NOT SCALE DRAWING.
4. THIS DRAWING IS INTENDED FOR USE BY ARCHITECTS, ENGINEERS, CONTRACTORS, CONSULTANTS AND DESIGN PROFESSIONALS FOR PLANNING PURPOSES ONLY. THIS DRAWING MAY NOT BE USED FOR CONSTRUCTION.
5. ALL INFORMATION CONTAINED HEREIN WAS CURRENT AT THE TIME OF DEVELOPMENT BUT MUST BE REVIEWED AND APPROVED BY THE PRODUCT MANUFACTURER TO BE CONSIDERED ACCURATE.
6. CONTRACTOR'S NOTE: FOR PRODUCT AND COMPANY INFORMATION VISIT [www.CADdetails.com/info](http://www.CADdetails.com/info) AND ENTER REFERENCE NUMBER 3354-17.8.



**MODEL 10145SM**

10145SM SHOWN WITH OPTIONAL 10" SS SURFACE CARRIER





# PEDESTAL BOTTLE FILLER SPECIFICATIONS

## WATER QUALITY (LEAD FREE)

Section 9, California Proposition 6 and the Federal Safe Drinking Water Act.

## STANDARD PEDESTAL

One piece weld construction with MDF standard 3/16" wall thickness.

OR

## STAINLESS STEEL PEDESTAL

One piece weld construction with MDF standard 304 schedule 10 stainless steel.

## RECEPTOR BOWL

18 gauge electro-polished stainless steel bowl. Bowl overlaps pedestal, preventing buildup of residue in visual drinking area. Optional stainless steel Bowl Strainer recommended for areas with sand. Not applicable on Model 10125 SMSS.

## BOTTLE FILLER SPOUT

Sanitary recessed nozzle.

## BUBBLER HEAD

Stainless steel anti-squirt head (weighing a pound and a half) mounted with a lock nut and washer to prevent tampering. Lock nut pin holds bubbler in locked position to prevent twisting or turning. The MDF bubbler head has a unique design that features a steady stream trajectory and a built in natural shield from contamination.

## PUSH BAR

304 stainless steel with circumference exceeding 8.6". Mushroom style push bar overlaps and prevents sand and other objects from sticking push bar in the ON position. Stainless steel bubbler housing standard.

## CONTROL VALVE

Requires less than 5 lbs to operate. Non-cartridge O-ring valve delivers steady stream of water through an adjustable valve. This valve design is to operate and function at 30 to 80 PSI. Ideal operating pressure is 60 PSI.

## WATER SUPPLY (LEAD FREE)

Maintenance free reinforced nylobraid tubing - **this tubing is not plastic**. It is supplied with a 1/2" MIP threaded inlet with stainless steel strainer. Union fittings at every connection. Supply line stops above grade. Water Filter is standard on this model.

## DRAIN

1 1/2" schedule 40 PVC pipe. Drain line stops above grade.

## FINISH

Oven baked powder coat. Choice of colors are: ☐ green, ☐ blue, ☐ black, ☐ red, ☐ yellow, ☐ orange, ☐ brown and ☐ white. Textured color choices: ☐ emerald, ☐ sapphire, ☐ pyrite, ☐ text-black, ☐ burgundy, ☐ gold vein, ☐ copper and ☐ sandstone. Stainless steel models are powder coated for added protection. The color ☐ chrome is an available option for stainless steel models only.

## INSTALLATION

**Surface Mount** installation is designed to be anchored on top of a new or existing surface (concrete, etc.) For a new surface, a surface mount carrier is recommended. For an existing surface, anchor bolts are to be used through the attached mounting plate. Surface Mount Fountains come standard with an access door with vandal resistant stainless steel screws.

## WINTERIZATION

Shut off water and drain down. Remove water filter.

## WARRANTY

One year warranty, labor not included.

## SHIPPING WEIGHT

|                     |         |                       |         |                       |         |
|---------------------|---------|-----------------------|---------|-----------------------|---------|
| Model 10125 SM..... | 110 lbs | Model 10125 SMSS..... | 100 lbs | Model 10890 SM.....   | 150 lbs |
| Model 10135 SM..... | 150 lbs | Model 10135 SMSS..... | 150 lbs | Model 10890 SMSS..... | 140 lbs |
| Model 10145 SM..... | 245 lbs | Model 10145 SMSS..... | 235 lbs | Model 10895 SM.....   | 200 lbs |
| Model 10150 SM..... | 245 lbs | Model 10150 SMSS..... | 235 lbs | Model 10895 SMSS..... | 190 lbs |
| Model 10155 SM..... | 195 lbs | Model 10155 SMSS..... | 185 lbs |                       |         |

**MOST DEPENDABLE FOUNTAINS, INC.™**  
5705 COMMANDER DR. • ARLINGTON, TN 38002-0587  
[www.mostdependable.com](http://www.mostdependable.com)  
(901) 867-0039



# INSTALLATION INSTRUCTIONS

Most Dependable Fountains, Inc.™

All SM (**surface mount**) products are designed to be installed on the surface of a new or existing concrete slab. Your contractor needs to provide a 1 1/2" PVC drain line (**when applicable**) and water line thru finish grade. Connections are made to our SM products thru our access door, as shown on detail drawings. The water tubing is provided with a 1/2" male iron pipe connection. This is an excellent location for a cutoff valve. Surface Mount units are anchored to the existing concrete by means of 1/2" concrete shields with bolts or we recommend 1/2" quick bolts.

**Note:** We offer an optional template which is designed to be poured in the concrete slab. It comes with the necessary vandal resistant stainless steel bolts and washers needed to anchor.

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All DB (**direct bury**) products are designed to be installed to a depth of 14" below grade. MDF provides 1 1/2" PVC drain line inside the pedestal (**when applicable**) to point of connection by others. MDF also provides reinforced nylobraid flexible tubing with a 1/2" male iron pipe thread for connection to water supply by others. MDF recommends an optional valve box using a PVC conduit to the pedestal. By using this option you have complete control of your product.

**Individual detail drawings available Online or by request.**



For more information:  
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901-867-0039

# LIMITED PRODUCT WARRANTY

Most Dependable Fountains, Inc.<sup>TM</sup>

Most Dependable Fountains, Inc.<sup>TM</sup> warrants that all of its products are guaranteed against defective material or poor workmanship for a period of **one year from date of shipment**. Most Dependable Fountains, Inc.<sup>TM</sup> liability under this warranty shall be discharged by furnishing without charge any goods, or part thereof, which shall appear to the Company upon inspection to be of defective material or not of first class workmanship. Most Dependable Fountains, Inc.<sup>TM</sup> will not be liable for the cost of repairs, alterations or replacements, or for any expense connected therewith made by the owner or his agents. Most Dependable Fountains, Inc.<sup>TM</sup> will not be liable for any damages caused by defective materials or poor workmanship, except for replacements, as provided above. Buyer agrees that Most Dependable Fountains, Inc.<sup>TM</sup> has made no other warranties either expressed or implied in addition to those above stated. The products manufactured by Most Dependable Fountains, Inc.<sup>TM</sup> is warranted to function if installation and maintenance instructions provided are adhered to. The units also must be used for the purpose for which they were intended.



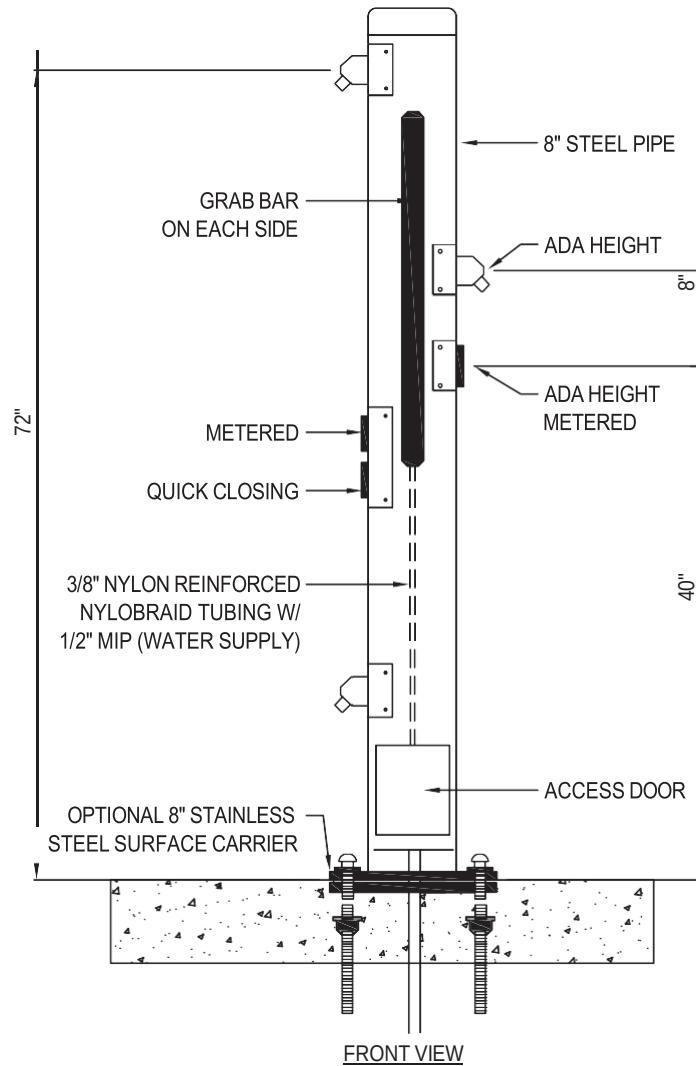
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**OPERATIONS MANUAL**

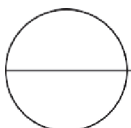
**MODEL:  
564 SM  
& 564 SMSS**

Most Dependable Fountains, Inc<sup>TM</sup>  
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[www.mostdependable.com](http://www.mostdependable.com)



NOTES:

1. OPTIONAL STAINLESS STEEL SURFACE CARRIER RECOMMENDED ON SURFACE MOUNT INSTALLATIONS..
2. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
3. DO NOT SCALE DRAWING.
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**MODEL 564 SM**

SHOWN W/ OPTIONAL 8" SS SURFACE CARRIER



## FOOT & SHOWER TOWER SERIES SPECIFICATIONS

STANDARD PEDESTAL  
OR  
STAINLESS STEEL PEDESTAL

PUSH BAR

SPRAY HEADS

CONTROL VALVE

WATER SUPPLY (LEAD FREE)

INSTALLATION

FINISH

WINTERIZATION

WARRANTY

SHIPPING WEIGHT

One piece weld construction with MDF standard 3/16" wall thickness.

One piece weld construction with MDF standard 304 schedule 10 stainless steel.

304 stainless steel with circumference exceeding 8.6". Mushroom style push bar overlaps and prevents sand and other objects from sticking push bar in the ON position. Stainless steel bubbler housing standard.

1.5 GPM at 60 PSI.

Requires less than 5 lbs to operate. This valve design is to operate and function at 30 to 80 PSI. Ideal operating pressure is 60 PSI.

Maintenance free reinforced nylobraid tubing - this tubing is not plastic. It is supplied with a 1/2" MIP threaded inlet with stainless steel strainer. Union fittings at every connection. Supply line stops above grade.

**Surface Mount** installation, is designed to be anchored on top of a new or existing surface (concrete,etc.) For a new surface, a surface mount carrier is recommended. For an existing surface, anchor bolts are to be used through the attached mounting plate. Surface Mount Fountains come standard with an access door with vandal resistant stainless steel screws.

Oven baked powder coat. Choice of colors are:□ green,□ blue,□ black,□ red, □ yellow,□ orange,□ brown and □ white. Textured color choices:□ emerald, □ sapphire,□ pyrite,□ text-black,□ burgundy, □ gold vein,□ copper and □ sandstone. Stainless steel models are powder coated for added protection. The color □ chrome is an available option for stainless steel models only.

Shut off water and drain down.

One year warranty, labor not included.

|                            |                             |                            |
|----------------------------|-----------------------------|----------------------------|
| Model 500 SM.....100 lbs   | Model 550 SM..... 170 lbs   | Model 575 SM.....155 lbs   |
| Model 500 SMSS.....100 lbs | Model 550 SMSS..... 170 lbs | Model 575 SMSS... 155 lbs  |
| Model 500 WM..... 120 lbs  | Model 564 SM..... 160 lbs   | Model 580 SM.....200 lbs   |
| Model 500 WMSS... 120 lbs  | Model 564 SMSS..... 160 lbs | Model 580 SMSS....200 lbs  |
| Model 525 SM..... 45 lbs   | Model 565 SM..... 185 lbs   | Model 590 SM..... 175 lbs  |
| Model 525 SMSS..... 45 lbs | Model 565 SMSS..... 185 lbs | Model 590 SMSS.... 175 lbs |
| Model 552 SM..... 200 lbs  | Model 552 SMSS..... 200 lbs |                            |

Above specifications apply with these notes:

Model 500 - One shower & one foot spray.

Model 525 - Foot Tower: one head only.

Model 550 - One shower, one foot spray & accessible drinking fountain.

Model 552 - One shower, one foot spray with both high & low ADA drinking fountains.

Model 564 - Accessible shower with one metered head at 72" & a foot wash on one side & one metered accessible head at 49" on back side, with 2 grab bars.

Model 565 - Accessible shower with one metered head at 72", one metered head at 49" & a non-metered foot wash (on same side) with 2 grab bars.

Model 575 - Dual (back to back) shower & foot spray heads.

Model 580 - One shower, one foot spray & trough style accessible drinking fountain.

Model 590 - Four shower heads & one foot spray.

Model 500-8 - Denotes custom: call for more information.

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# INSTALLATION INSTRUCTIONS

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**Note:** We offer an optional template which is designed to be poured in the concrete slab. It comes with the necessary vandal resistant stainless steel bolts and washers needed to anchor.

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All DB (**direct bury**) products are designed to be installed to a depth of 14" below grade. MDF provides 1 1/2" PVC drain line inside the pedestal (**when applicable**) to point of connection by others. MDF also provides reinforced nylobraid flexible tubing with a 1/2" male iron pipe thread for connection to water supply by others. MDF recommends an optional valve box using a PVC conduit to the pedestal. By using this option you have complete control of your product.

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# LIMITED PRODUCT WARRANTY

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Most Dependable Fountains, Inc.<sup>TM</sup> warrants that all of its products are guaranteed against defective material or poor workmanship for a period of **one year from date of shipment**. Most Dependable Fountains, Inc.<sup>TM</sup> liability under this warranty shall be discharged by furnishing without charge any goods, or part thereof, which shall appear to the Company upon inspection to be of defective material or not of first class workmanship. Most Dependable Fountains, Inc.<sup>TM</sup> will not be liable for the cost of repairs, alterations or replacements, or for any expense connected therewith made by the owner or his agents. Most Dependable Fountains, Inc.<sup>TM</sup> will not be liable for any damages caused by defective materials or poor workmanship, except for replacements, as provided above. Buyer agrees that Most Dependable Fountains, Inc.<sup>TM</sup> has made no other warranties either expressed or implied in addition to those above stated. The products manufactured by Most Dependable Fountains, Inc.<sup>TM</sup> is warranted to function if installation and maintenance instructions provided are adhered to. The units also must be used for the purpose for which they were intended.





## PRODUCT GUIDE SPECIFICATION

### SECTION 32 14 33.13 – PERMEABLE PLASTIC PAVING

REV 10-15-2024 v5

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Base material, over sub base prepared by others.
- B. Porous pavement system with S-flexural joints for seasonal expansion and contraction.
- C. Parking, fire lane, and traffic delineation.
- D. Gravel fill.
- E. Grass fill.

##### 1.2 RELATED REQUIREMENTS

- A. Section 31 20 00 – Earth Moving: Subgrade Preparation.
- B. Section 33 41 00 – Subdrainage: Subsurface Drainage.
- C. Section 32 10 00 – Bases, Ballasts, and Paving.
- D. Section 32 80 00 – Irrigation: Irrigation System.
- E. Section 32 30 00 – Site Improvements.
- F. Section 32 92 00 – Turf and Grasses.

### **1.3 PREINSTALLATION MEETINGS**

- A. Convene pre-installation meeting a minimum of two weeks prior to start of porous paving systems Specifier Notes:
- B. Verify project requirements, subbase and base conditions, manufacturer's installation instructions and coordinate with other related work.
- C. Require attendance of parties directly affecting work of this section, including the contractor, architect, engineer, and installer. Manufacturer's representative may attend by phone conference as needed.

### **1.4 SUBMITTALS**

- A. Submit under provisions of Section 01.
- B. Product Data: Submit manufacturer's product data.
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Shop drawings: Submit manufacturer's shop drawings including laying pattern and parking delineation locations.
- D. Samples: Submit two square samples of TRUEGRID Paver units.
- E. LEED and other Sustainable Design Submittals: Provide documentation of how the requirements for credit/certification will be met including, but not limited to: Recycled content, stormwater management, heat-island mitigation, water use reduction, site development, and regional materials.
- F. Manufacturer's Certificates: Certify products meet or specified requirements.
- G. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic fertilizing and maintenance.

## **1.5 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications: Manufacturer with a minimum of five years documented experience with products specified.
- B. Installer Qualifications: Installer experienced in performing work of this section that has specialized in installation of work similar to that required for this project. Installer must also be able to provide skilled workman with satisfactory record of performance on landscaping or paving projects of comparable size and quality.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Protect porous paver units from damage during delivery and store under tarp when the time from delivery to installation exceeds 30 days.
- C. Protect materials during handling and installation to prevent damage.

## **1.7 SEQUENCING**

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

## **1.8 PROJECT CONDITIONS**

- A. Maintain environmental conditions recommended by manufacturer for desired results. Do not install products under conditions outside manufacturer's absolute limits.
- B. Do not begin installation of porous pavements until all hard surface paving adjacent to porous pavement areas, including concrete walks and asphalt paving, is completed.
- C. Install turf when ambient air temperature is at least 55 degrees F.
- D. In wet weather, do not build on wet, saturated or muddy subgrade.

- E. In cold weather, do not use frozen materials or materials coated with ice or frost, and do not build on frozen base or wet, saturated or muddy subgrade.
- F. Protect partially completed porous paving against damage from other construction traffic when work is in progress.
- G. Protect grass fill / sodded paving areas from traffic until grass root system has matured for at least 3 to 4 weeks. Use barricades to only permit access by emergency and fire equipment.

## **1.9 WARRANTY**

- A. Provide the manufacturer's 10-year limited warranty.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Acceptable Manufacturer: Airlite Plastics Co. DBA TRUEGRID Pavers, 6110 Abbott Dr, Omaha, NE 68110. Phone: 1-855-355-GRID. Email: [info@truegridpaver.com](mailto:info@truegridpaver.com) Website: [www.truegridpaver.com](http://www.truegridpaver.com).
- B. Substitutions: Not permitted.

### **2.2 PRODUCTS**

- A. Permeable Pavers, TRUEGRID PRO PLUS for grass or gravel applications.
  - 1. AASHTO H20, HS20 Rated.
  - 2. Manufactured in the USA.
  - 3. High density polyethylene (HDPE): 100 percent post-consumer recycled materials
  - 4. Recycled and recyclable content: 100 percent.
  - 5. S-Flexural joints molded in for soil seasonal expansion and contraction.
  - 6. Color: black- carbon black additive for long-term UV stabilization.
  - 7. Paver size: 24 inches by 24 inches by 1.8 inches.
  - 8. Pre-assembled: 4-foot by 4-foot sections.
  - 9. Cylindrical cell design for column strength.

10. Cell size: 3.30 inch inside diameter.
  11. Co-joined cells at 48 places for strength.
  12. Wall thickness: 0.150 inches /.250-inch nominal.
  13. A minimum of 2 co-joined common walls per cell for structural integrity.
  14. Connections:
    - a. No clips or stakes necessary.
    - b. No additional parts or tools needed.
    - c. Integral male-female three-point locking system.
    - d. Wall thickness at tabs: 0.290 inch.
  15. Molded in X-anchors to stabilize pavers.
  16. Nominal Coverage per Paver: 4 square feet.
  17. Weight per paver: 5.25 lbs.
  18. Permeability of System: 100 percent.
  19. Compressive Strength (filled): 17,729 psi.
  20. Material Safety: Groundwater neutral, 100 percent inert.
  21. Chemical Resistant: Excellent: highly resistant to hydrocarbons, oils.
- B. Parking Delineators: TRUEGRID SuperSpots for grass or gravel applications.
1. H20, HS20 rated.
  2. Domed for high visibility and ribbed for high strength.
  3. 0.90-inch profile above grid.
  4. Long-term UV stabilized.
  5. 3.25-inch diameter.
  6. Available Colors: Yellow, white, blue, and red.
- C. Parking Delineators: TRUEGRID SnowSpots for grass or gravel applications.
1. H20, HS20 rated.
  2. Snow plowable and ADA compliant.
  3. Level (0.00-inch) profile above grid.
  4. Long-term UV stabilized.
  5. 3.25-inch diameter.
  6. Available Colors: Yellow, white, blue, and red
- D. Reflective Parking Delineators: TRUEGRID Reflectors for grass or gravel applications.
1. H20, HS20 rated.

2. Long-term UV stabilized.
  3. 0.90-inch profile above grid.
  4. 3.25-inch diameter.
  5. Available Colors: Translucent yellow, white, and red.
- E. Surface Signage, ADA, Traffic, and Parking Identifiers: TRUEGRID Plates for grass or gravel applications.
1. Durable, long lasting, weather resistant and highly visible.
  2. Snap-fit into TRUEGRID PRO PLUS grid.
  3. 0.20-inch profile above grid
  4. ADA compliant.
- F. Base Material: TRUEGRID PRO PLUS was developed to accept multiple acceptable base materials. Locally sourced angular stone/clean for base material. Crushed granite, sandy gravel material, crushed concrete, and limestone rock are some of the acceptable materials. Common base materials include:
1. Hard, clean, angular, and open-graded (uniform size) drain rock -- from 1" to 1-1/2" (19mm to 38mm). Commonly #4 stone when size limits are met.
  2. Base Course: Graded aggregate base course conforming to the following sieve analysis and requirements:
    - a. Percent Passing: 100 - Sieve Size: 3/4 – 1 inch
    - b. Percent Passing: 85 - Sieve Size: 3/8 inch
    - c. Percent Passing: 60 - Sieve Size: #4
    - d. Percent Passing: 30 - Sieve Size: #40
    - e. Percent Passing: <3 - Sieve Size: #200, or 3 to 8 Percent for Grass Infill
- G. Gravel Fill: Obtain clean, washed angular rock to fill the 1.8-inch-tall TRUEGRID PRO PLUS cells and spaces between. TRUEGRID PRO PLUS should be filled level to the top of the cells or only slightly above for compaction and settling. Fill rock should be 5/8 inch to 3/4-inch diameter.
- H. Base Course for Grass Filled TRUEGRID: Use base course from above *Section 2.2 F 2* or comparable base material suitable for grass growth and traffic loads. Choose materials with neutral pH ranges and avoid sources from recycled/reclaimed concrete or asphalt.

- I. Grass Surface with Soil Fill: A sandy loam or loam soil should be used to fill the empty TRUEGRID PRO PLUS grid. The selection of sandy loam or loam soil should be made based upon the soil requirements of the turf variety selected for the project. Other soils if compatible with type of seed or sod are acceptable.
  - 1. Choose turf grasses with deep-growing vertical roots, high wear capacity, and for the local growing zone and climate.
  - 2. Grass – Choose either sod or seed:
    - a. Seed – The Preferred Method: Hydro-seeding/mulching is recommended with a wood or paper cellulose commercial mulch.
    - b. Sod shall be grown in sand or sandy loam soils only. Sod grown in soils of clay, silt, or high organic materials such as peat, will not be accepted.
- J. Base Course for Sloped Areas Above 3 degrees (5%): Use base course from above *Section 2.2 F 2* or other dense-graded base common for road use.
- K. Geotextile Fabric, Geomembrane, or Geogrid by Others.
  - 1. Choose for properties suitable for soil conditions, loading requirements, and permeability / impermeability requirements.
- L. Anchor Nails by others.
  - 1. 3/8-inch by 10-inch galvanized ring shank nail common for landscape use.
    - a. Choose for high frequency traffic areas, areas with breaking and acceleration, transitions, and areas subject to surface water from other sources.
    - b. For sloped areas above 3 degrees (5%).

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Before beginning installation, verify site conditions are as indicated on the drawings. Notify the Architect if site conditions are not acceptable. Do not begin preparation or installation until unacceptable conditions have been corrected.
- B. Ensure that adjacent hard-surfaced paving work is completed before installing porous pavement system.

## 3.2 PREPARATION

### A. Subgrade:

1. Prepare subgrade as specified in Section 33 41 00. Verify subgrade in accordance with porous paving system manufacturer's instructions.
2. Excavate area allowing for unit thickness and the engineered base depth (where required).
3. Provide adequate drainage from excavated area if area has potential to collect water when working with in-place soils that have poor permeability.
4. Ensure in-place soil is relatively dry and free from standing water.
5. Uniformly grade base.
6. Level and clear base of large objects, such as rocks and pieces of wood.
7. Install irrigation, if applicable, in accordance with Section 32 80 00.
8. Install and secure geotextile fabric, geomembrane, or geogrid mesh as needed for soil stabilization and loading requirements.

### B. Install Base as specified in Section 32 10 00. Verify engineered base is installed in accordance with porous paving system manufacturer's instructions.

1. Coordinate base installation and preparation with subdrains specified in Section 33 41 00.
2. If required, place a geotextile separation layer between the natural ground and the engineered base.
3. Place base course material over prepared sub base to grades indicated on the drawings or from manufacturer's recommended depths per application type.
4. Place in lifts not to exceed 4 inches, compacting each lift separately to 95 percent Modified Proctor for non-open grade material. Open grade base material to be leveled and heavily compacted in 4-inch lifts to settle and lock in angular stone.
5. If required, install irrigation in accordance with Section 32 80 00.
6. Leave minimum 1.8 inches for Permeable Paver unit for final elevation.

## 3.3 INSTALLATION

### A. Install in accordance with manufacturer's instructions.

### B. Install TRUEGRID PRO PLUS Permeable Paver units by placing cells face up. Sheets are preassembled in 4-foot by 4-foot sheets are connected with friction fit interlocking

connectors. No tooling is required to connect or disconnect units. Sheets may be separated into 4 Individual 24 inch by 24-inch pieces and reconfigured as needed. Cut units around curves and organic shapes with an electrical handsaw. Place units to maintain a 1-inch clearance to any pre-installed object or surface structure. Top of cells shall be level (0.00 inch) to 0.5 inch below the surface of adjacent hard-surface pavements. Utilize TRUEGRID's S-Flexural joints for undulations or grade reversals when required by design or in freeze-thaw climates for expansion and contraction.

- C. Parking, Traffic, and Fire Lane Delineators: Install TRUEGRID SuperSpots, TRUEGRID SnowSpots, TRUEGRID Reflectors, and TRUEGRID Plates as indicated on the drawings or per manufacturer's recommendations.
1. Align SuperSpots, SnowSpots, Reflectors, and Plates locking tabs with grooves in TRUEGRID PRO PLUS grid.
  2. Push SuperSpots, SnowSpots, Reflectors, and Plates into TRUEGRID PRO PLUS grid until it locks.
  3. All TRUEGRID delineators and markers can be removed and repositioned by disconnecting the locking tabs and pulling out of the grid.
- D. Anchors: Stake TRUEGRID PRO PLUS to the base as indicated on the drawings or per manufacturer's recommendations.
1. Pre-drill pilot hole with  $\frac{1}{4}$ " (6mm) through a PRO PLUS cell containing an X-Anchor.
  2. Drive anchor until head makes contact with X-Anchor using a hammer or impact hammer with suitable driver head.
- E. Gravel Surfacing: Install Gravel into TRUEGRID cavities by back dumping directly from dump truck or from buckets mounted to tractors. Hand shoveling fill gravel into the cells is also acceptable for smaller jobs.
1. Direct vehicles to exit the site by driving forward. Avoid sharp turns over unfilled rings.
  2. Spread gravel fill using steer loaders, power brooms, blades, flat-bottomed shovels, and/or wide "asphalt rakes" to fill the cells.
  3. Place and maintain infill gravel to be level to the top of the cell walls after settling, natural compaction, and use. A rolling compactor, plate compactor, or hand tamper may be used for final leveling of infill aggregate within the TRUEGRID cells.

F. Grass Surfacing:

1. Install soil into TRUEGRID cavities by back dumping directly from dump truck or from buckets mounted to tractors. Hand shoveling soil mix into the cells is also acceptable for smaller jobs.
  - a. For Seeding Applications: Fill soil mix level to the top of the TRUEGRID PRO PLUS cell wall, 1.8-inch depth.
  - b. For Sodding Applications: Fill soil mix into cells at 1.8-inch *minus* the root (soil) depth of the sod.
2. Hydroseeding/Hydro-Mulch Surfacing: Provide and place as specified in 32 92 00 – Turf and Grasses. Homogeneously mix a combination of water, seed, and fertilizer in a truck mounted tank. Spray the seed mixture onto the site at specification rates. Coverage should be uniform and complete. Following germination of the seed, areas lacking germination larger than 8-inches by 8-inches must be reseeded immediately. Seeded areas must be fertilized and kept moist during development of the turf.

G. Sod: Provide and place as specified in 32 92 00 – Turf and Grasses.

1. Use sod from a reputable grower. Species should be wear-resistant, free from disease, and in excellent condition.
2. Spray the sod rolls until saturated.
3. Use a heavy sod roller over entire sodded area to ensure root contact with the fill soil and TRUEGRID interface.

### 3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Gravel fill: Avoid sharp turns or “jack knives” in trailered vehicles when cells are empty. Damage due to buckling can occur. TRUEGRID can be driven on pre-fill by gravel trucks and construction equipment to speed the installation process.
- C. Grass Fill / Seeded: Protect seeded areas from any traffic, other than emergency vehicles, for a period of 4 to 6 weeks, or until the grass is mature to handle traffic. Avoid sharp turns or “jack knives” in trailered vehicles when cells are empty. Damage due to buckling can occur.

- D. Grass Fill / Sodded: Sodded areas must be protected from any traffic, other than emergency vehicles, for a period of 3 to 4 weeks, or until root system has been established.
- E. Dumpster areas: A concrete pad is recommended for dumpster areas due to the drop and drag action. Permeable pavers are not recommended in these areas under and directly around the dumpster.
- F. Repair or replace damaged products before substantial completion.

### **3.5 MAINTENANCE**

- A. For gravel fill surfaces, maintain the stone fill inside the TRUEGRID to be level to the cell wall height - level to the top of the grid. Surface should be inspected from time to time to identify signs of slight cell infill loss.
- B. Maintain grass in accordance with manufacturer's instructions and as specified in Section 32 92 00 – Turf and Grasses.
  - 1. Maintain the soil or growing media inside the TRUEGRID to be level to the cell wall height -- level to the top of the grid. Do not overfill with soil above grid.
- C. Monitor pavement to ensure traffic frequency and loading does not exceed the pavement design.
- D. When snow removal is required, keep a metal edged plow blade from coming in contact with the surface during plowing operations to avoid causing damage to the units. Use a plow blade a minimum of 1 inch above the surface and with a flexible rubber edge or with skids on the lower outside corners so the plow blade does not come in contact with the units.

**END OF SECTION**

## SECTION 02800 - FENCING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.
- B. Florida Department of Transportation, *Standard Specifications for Road and Bridge Construction* (FDOT Specs), *Section 550, Latest Edition, and Design Standard Index 802*. Work shall comply with requirements of FDOT Specs as modified herein.
- C. GENERAL EXCEPTIONS: Any reference to FDOT *Standard Specifications for Road and Bridge Construction*, Latest Edition, *Division I General Requirements & Covenants* shall be excluded and not applicable to any specification referred herein or otherwise listed in this document.

#### 1.2 SUMMARY

- A. This Section includes, but is not limited to, the following:
  - 1. Wood privacy fence

#### 1.3 PROJECT CONDITIONS

- A. Traffic: Conduct fencing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities and to minimize disturbance of the activities of adjacent property owners. Do not close or obstruct streets, walks, or other occupied or used facilities without prior approval.
- B. Security: Do not leave any fence unfinished or incomplete which might allow the access to a private/public equipment without temporary measures in place during construction.

#### 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver material in manufacturer's original packaging with all tags and labels intact and legible.
- B. Handle and store material in such a manner as to avoid damage.

## PART 2 – PRODUCTS

### 2.1 WOOD PRIVACY FENCE:

- A. Materials shall be of size, type, treatment, etc. as shown in the drawings.
- B. Shall be constructed as per industry standard with proper clearance below fence so as not to impede stormwater flow.

## PART 3 – EXECUTION

### 3.1 WOOD PRIVACY FENCING:

Shall be constructed as per industry standard with proper clearance below fence so as not to impede stormwater flow.

## PART 4 - MEASUREMENT/PAYMENT

### 2.1 METHOD OF MEASUREMENT

#### 2.1.1 GENERAL

The quantities to be paid for will be either the number of gates, the length of each type of fence, the number of corner post assemblies, constructed and accepted or the length of each type of fence with all other items necessary for construction as incidental. In addition, extra payment will be made, for additional lengths of post approved by the Engineer and/or County/CEI.

#### B. MEASUREMENT OF FENCE LENGTH

The length of fence to be paid for will be measured along the bottom of the panels, out-to-out of end posts, in the completed and accepted fence. Measurement for Resetting Fence will be the actual length of existing fence reset, including gates when applicable.

#### C. CORNER POST ASSEMBLIES, PULL, AND END POST ASSEMBLIES

The number of corner post assemblies and of pull and end post assemblies to be paid for will be the number of such post assemblies constructed and accepted.

### 4.2 BASIS OF PAYMENT

#### A. BASIC ITEMS OF FENCING

The contract unit price will be full compensation for all work and materials necessary for the complete installation, including line posts, but not including the corner, end, and pull posts and the assemblies thereof.

B. ITEMS OF POST ASSEMBLIES

The Contract unit prices for the items of Corner Post Assemblies and Pull and End Post Assemblies will include the posts and the complete assemblies therewith for each such item. Approach posts and brace posts will be considered as part of the assembly of the corner, end, or pull post serves as a brace in more than one horizontal line.

C. PAYMENT RATES FOR EXTRA-LENGTH POSTS

For any length of posts in excess of the standard length for each particular type of post, approved by the Engineer as provided above, payment will be made for each foot in excess of the standard length at the percentage of the Contract unit price per foot for the item of Fencing, as shown in the following schedule.

Additional Payment for Each Foot of Post in Excess of the Standard Length  
(in percent of Contract Unit Price for Fencing):

| Total Post Length          | Timber Posts |
|----------------------------|--------------|
| Standard up to 14 ft.      | 60%          |
| Over 14 ft., up to 20 feet | 80%          |
| Over 20 ft.*               | *            |

The standard length of timber posts will be the required length as indicated in the plans for each type and case. The above provisions for extra length payment will apply to end, corner and pull posts.

The payment for additional length of post will include the cost of additional concrete to extend concrete bases, as applicable.

D. GATE PAYMENT

The quantities to be paid for will be full compensation for all labor, materials, posts and associated hardware for the complete installation of the type gate specified in the plans and accepted by the Engineer and/or County/CEI.

END OF SECTION 02800

DIVISION 12  
FURNISHINGS

SECTION: 12931  
BIKE RACKS

PART 1      GENERAL

1.01            RELATED DOCUMENTS:

Drawings and General Provision of the Contract, including General and Supplementary Condition and Division 1 Specification sections, apply to work of this section.

1.02            SCOPE:

This section includes thermoplastic coated, stainless steel, loop type bike racks and all labor, material and equipment required for the proper execution of the work.

1.03    RELATED SECTIONS:

FDOT Standard Specifications for Road and Bridge Construction, Latest Edition: Concrete for the footings for support of bike racks.

1.04            STANDARDS:

A. American Society for Testing and Materials (ASTM) Publications:

1. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
2. ASTM D822 - Tests on Paint and Related Coatings Using Filtered Open-Flame Carbon-Arc Exposure Apparatus.
3. ASTM D1794 - Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
4. ASTM D3363 - Test Method for Film Hardness by Pencil Test.

1.05    SUBSTITUTIONS.

A. Bike racks are by Park n Pool of Lexington, VA (877) 777-3700. Other similar and equal products will be considered if they meet the requirements of this specification and are submitted in accordance with requirements of the city/county.

1.06 SUBMITTALS:

1. Product data for components and accessories.
2. Shop drawings showing layout, dimensions, spacing of components.
3. Copy of warranty specified in Paragraph 1.4 for review by Architect.

## 1.07 WARRANTY

5 years warranty for factory finish against cracking, peeling, and blistering under normal use.

## PART 2 MATERIALS

A. Loop Style

B. Stainless steel

C. Thermoplastic Coating

D. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, and water reducing and plasticizing additives.

E. Provide racks of type and size indicated on Drawings.

1. Construction: 2 3/8" diameter stainless steel bike racks with thermoplastic coating. Provide coated extensions on the racks for setting in a concrete footing.

F. Factory Finish

1. Stainless steel racks are to be coated with 3-coat application of thermoplastic coating.

2. Salt spray resistance tested in accordance with ASTM B117: No undercutting, rusting, or blistering after 500 hours in 5 percent salt spray at 95 degrees F and 95 percent relative humidity and after 1000 hours less than 3/16 inch undercutting.

3. Weather ability tested in accordance with ASTM D822: No film failure and 88 percent gloss retention after 1-year exposure in South Florida with test panels tilted at 45 degrees.

## PART 3 INSTALLATION

1. Install racks in a level and plumb fashion. Set in concrete footing and provide bracing which does not penetrate the coating until concrete is set. Concrete will be laid over mounting pipes. Provide thermoplastic coated escutcheons to trim out around concrete paving.

END OF SECTION

Mike Marshall, 12/2023

02 01 00 SUB-SURFACE INVESTIGATION

PART 1      GENERAL

1.01      RELATED DOCUMENTS:

The General Provision of the Contract, including bidding conditions and contractual conditions, apply to the work specified in this section.

1.02      SCOPE:

The geo-technical exploration, boring log and recommendation of the Soil Engineer is made a part of this specification.



## **REPORT OF GEOTECHNICAL EXPLORATION**

**Crystal Beach Park  
Okaloosa County, Florida**

**Tierra Project No. 4511-22-002**

Prepared for:

**Baskerville-Donovan, Inc.  
449 West Main Street  
Pensacola, Florida 32502  
Attn: Mr. Michael Langston, PE**

Prepared by:

**Tierra, Inc.  
1300 West Main Street  
Pensacola, Florida 32502**

**February 21, 2022**



**1300 West Main Street • Pensacola, FL 32502  
Phone (850) 462-8774 • Fax (850) 462-8784**

# TIERRA

February 21, 2022

Baskerville-Donovan, Inc.  
449 West Main Street  
Pensacola, Florida 32502  
Attn: Mr. Michael Langston, PE

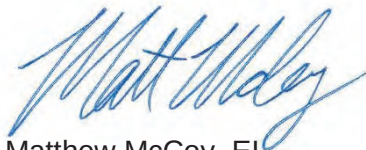
Subject: Crystal Beach Park  
Okaloosa County, Florida  
Tierra Project No. 4511-22-002

Mr. Langston:

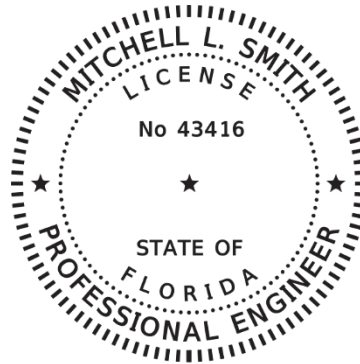
Thank you for choosing Tierra, Inc. (Tierra) as your Geotechnical consultant. Per your authorization, we have completed the Geotechnical exploration for the subject project. The results of the study are discussed in this report.

Should you have any questions regarding the enclosed report or the project in general, please do not hesitate to contact us at (850) 462-8774.

Sincerely,  
**TIERRA, INC.**



Matthew McCoy, EI  
Geotechnical Engineer



*THIS ITEM HAS BEEN DIGITALLY  
SIGNED AND SEALED BY*

*ON THE DATE ADJACENT TO THE SEAL*

*PRINTED COPIES OF THIS DOCUMENT ARE  
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AND THE SIGNATURE MUST BE VERIFIED  
ON ANY ELECTRONIC COPIES.*

TIERRA, INC.  
1300 WEST MAIN STREET  
PENSACOLA, FLORIDA 32502

MITCHELL L. SMITH, P.E. NO. 43416

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### APPENDIX A

Boring Location Plan and Soil Profiles

Falling Head Permeability Test Results

## **1.0 PROJECT INFORMATION**

### **1.1 Project Authorization**

Authorization to proceed on this project was issued by Mr. Michael Langston, PE with Baskerville-Donovan, Inc. (BDI). A formal contract has been executed between Tierra, Inc. (Tierra) and BDI for these services.

### **1.2 Project Description**

Based on the information provided, we understand that a new 600 sf restroom facility will be constructed in the southeast corner of the expanded Crystal Beach Park. The single-story off-grade structure will be founded on timber piles. Based on information provided by the structural engineer, Mr. Steve Leonard, PE (Berube Leonard, LLC), a pile compression capacity on the order of 10 tons is desired.

Two drainage swale areas are proposed to manage stormwater runoff from the proposed improvements. The treatment swales are expected to be relatively shallow (less than 3 feet deep).

If any of the project information noted above is incorrect or has changed, please inform Tierra so that we may amend the recommendations presented in this report, if necessary.

### **1.3 Purpose and Scope of Services**

The purpose of this exploration was to evaluate the subsurface conditions present in the subject area and to render timber pile foundation recommendations as well as parameters for stormwater drawdown analysis for the proposed stormwater treatment facilities.

The exploration consisted of one 35 foot deep Standard Penetration Test (SPT) boring to evaluate the subsurface conditions for the restroom and two 7 foot to 10 foot deep auger borings in the proposed treatment swale areas; laboratory soil testing including water content tests, wash #200 sieve tests, and falling head permeability tests; and a site visit, visual classification of the soil samples, and analysis by our engineering staff.

## **2.0 SITE AND SUBSURFACE CONDITIONS**

### **2.1 Site Location and Description**

The site is located south of Scenic Highway 98 near the intersection of Hutchinson Street in Okaloosa County, Florida. The property fronts the Gulf of Mexico. An aerial photograph depicting the site location is shown on the Boring Location Plan (Appendix A).

At the time of our exploration, a residential property was present immediately east of the existing Crystal Beach park. The eastern-most residential property located near the proposed restroom facility was demolished in preparation for the park expansion.

Based on review of the topographic survey provided as well as the survey data on Google Earth, the site slopes downward from the north (at/near EL +22 feet) to the south (at/near EL +10 feet).

### **2.2 Subsurface Conditions**

The Boring Location Plan and the Soil Profiles of the borings drilled for this study can be found in Appendix A. The borings were field located and staked using a Garmin GPSMap 64ST Global Positioning System (GPS) unit with a reported accuracy of  $\pm 1$  meter. Therefore, the boring locations should be considered approximate.

We have estimated ground surface elevations at the boring locations using the topographic survey provided as well as the topographic information provided in Google Earth. The subsurface conditions encountered will be discussed in general terms below.

The restroom boring (B-1) generally encountered very loose sand from the ground surface (approximately EL +19 feet) to a depth of approximately 18 feet below existing grade (or to approximately EL +1 feet) underlain by dense sand to the bottom of the 35 foot deep boring (terminated at approximately EL -16 feet).

The treatment swale auger borings (AB-1 and AB-2) generally encountered sand from the ground surface (approximately EL +19 feet) to the bottom of the 7 foot to 10 foot deep borings.

The above subsurface descriptions are of a generalized nature, provided to highlight the major soil stratum encountered. The Soil Profiles should be reviewed for specific subsurface conditions at each boring location. The stratification shown on the Soil Profiles represents the subsurface

conditions at the actual boring locations only, and variations in the subsurface conditions can and may occur between boring locations and should therefore be expected. The stratification represents the approximate boundary between subsurface materials, and the transitions between strata may be gradual.

## 2.3 Groundwater Conditions

Groundwater was encountered in SPT boring B-1 at approximately 15 feet below existing grade at the time of drilling, which was during a period of below-normal seasonal rainfall. Based on the ground surface elevation at the boring location estimated from the topographic survey and Google Earth, this corresponds to groundwater elevation of approximately +4 feet NAVD 88.

Groundwater levels will fluctuate with rainfall and tides and could vary several feet during typical seasonal fluctuations. Larger fluctuations are possible under severe weather conditions. We recommend that the Contractor determine the actual groundwater levels at the time of construction to determine potential impacts groundwater can/will have on construction procedures.

## 2.4 Laboratory Soil Testing

Laboratory soil testing consisted of water content tests, wash #200 sieve tests, and falling head permeability tests. The results of the tests can be found on the Soil Profiles opposite the samples tested.

Falling head permeability tests were performed on remolded bulk samples of the more permeable soil strata encountered in the treatment swale borings. The densities to which the samples were remolded were based on the  $N_f$  values obtained from the SPT test boring nearby. The results of the tests are summarized in Table 1 below. The laboratory permeability test data sheets are attached in Appendix A.

| TABLE 1 - LABORATORY FALLING HEAD PERMEABILITY TEST RESULTS |        |                               |                         |         |                  |                               |
|-------------------------------------------------------------|--------|-------------------------------|-------------------------|---------|------------------|-------------------------------|
| Soil Stratum                                                | Boring | Sample Elevation, ft. NAVD 88 | Sample Description      | % Fines | Dry Density, pcf | Vertical Permeability, ft/day |
| 1                                                           | AB-1   | 18.5 to 12                    | Light brown, white SAND | 0.2     | 95.9             | 57.4                          |
| 1                                                           | AB-2   | 15.5 to 9                     | Light brown, white SAND | 0.4     | 97.8             | 28.4                          |

### 3.0 EVALUATION AND RECOMMENDATIONS

#### 3.1 General Comments

Based on our understanding of the proposed facility, the exploration encountered subsurface conditions that will provide adequate support for the proposed structure provided the recommendations presented in this report are followed.

The subsurface conditions encountered in the treatment swale borings are suitable for conventional dry treatment. Stormwater design parameters are presented in Section 3.5 below.

#### 3.2 Timber Pile Foundation Recommendations

We have evaluated compression and tension pile capacities for 6-inch, 8-inch, and 10-inch tip diameter timber piles to support the proposed restroom facility. Table 2 below shows allowable compression and tension capacities for driven timber piles with a tip elevation of -6 feet NAVD 88 (note – all elevations referenced to NAVD 88). The capacities presented in Table 2 assume a pile butt elevation of +24 feet, a ground surface elevation of +19 feet (no scour), include a Factor of Safety of 2, and assume jetting or predrilling the piles to elevation +6 feet to aide in standing the piles prior to driving.

| <b>TABLE 2</b><br><b>ALLOWABLE TIMBER PILE COMPRESSION &amp; TENSION CAPACITIES</b> |                                       |                                   |
|-------------------------------------------------------------------------------------|---------------------------------------|-----------------------------------|
| <b>Pile Size</b>                                                                    | <b>Allowable Compression Capacity</b> | <b>Allowable Tension Capacity</b> |
| 6-inch Diameter Timber Pile                                                         | 5 tons                                | 2 tons                            |
| 8-inch Diameter Timber Pile                                                         | 10 tons                               | 3 tons                            |
| 10-inch Diameter Timber Pile                                                        | 15 tons                               | 4 tons                            |

### 3.3 Pile Group Action

No reductions of the individual pile capacities will be required if piles are spaced center-to-center a minimum of 3 times their width/diameter. If piles are spaced closer, our office should be notified so that pile capacity reductions can be evaluated.

### 3.4 Settlement

Settlements of driven pile foundations are typically small and should not be a concern on this project provided the piles are embedded as recommended herein. Pile head settlements should be on the order of ½ inch or less. Group settlements are estimated to be on the same order of magnitude for the expected lightly loaded structure.

### 3.5 Stormwater Management Facility Recommendations

The subsurface conditions encountered in the treatment swale auger borings are suitable for conventional dry treatment of stormwater runoff. Geotechnical parameters for analysis/design are presented below:

- **Effective Aquifer Thickness:** A confining unit, which would hydrogeologically define the thickness of the surficial aquifer, was not encountered to a depth of 35 feet below existing grade (the deepest boring drilled on the site). For the purposes of modeling, we recommend setting the bottom of the aquifer no deeper than the bottom of the boring elevation (elevation -16 feet). Note that a shallower effective aquifer thickness for modeling a shallow swale may be more appropriate, and a sensitivity analysis using this parameter is warranted.
- **Seasonal High Groundwater Level:** Groundwater was encountered at approximately EL +4 feet at the time of drilling. Given that the boring was drilled during a period of below-normal rainfall and when tides are typically at their lowest, we have estimated the “normal” SHWT to be at/near elevation +6 feet.
- **Vertical Permeability:** Vertical flow from the bottom of the treatment swales will be controlled by the vertical permeability of the soil immediately beneath the bottom of the swale. Based on the results of the falling head permeability tests (Table 1), an average vertical permeability of 42.9 ft/day for Stratum 1 would be reasonable for modeling.

- **Horizontal Permeability:** Horizontal flow from the pond will be through the Stratum 1 soils. The horizontal permeability of Stratum 1 has been estimated based on the results of the vertical permeability tests and extensive experience with similar soils from field permeability tests. While horizontal permeabilities have generally been found to range from 3 to 10 times higher than vertical permeabilities of regional deposits, we recommend that a multiplier of 3 with a factor of safety of 2 be used for design (effectively, a 1.5 multiplier). Therefore, a  $K_h$  value of 64.4 ft/day would be reasonable for modeling the Stratum 1 materials (42.9 ft/day x 1.5).
- **Effective Porosity:** Based on the fines contents of the soils encountered in the test borings, an effective porosity of 0.30 would be appropriate for modeling the Stratum 1 soils.

#### 4.0 REPORT LIMITATIONS

The recommendations submitted are based on the available soil information obtained by Tierra, Inc. and design details furnished by Baskerville-Donovan for the subject project. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, Tierra should be notified immediately to determine if changes in the foundation, or other, recommendations are required. If Tierra is not retained to perform these functions, we cannot be responsible for the impact of such conditions on the performance of the project.

The findings, recommendations, specifications, and professional advice contained herein have been made in accordance with generally accepted professional Geotechnical engineering practices in the local area.

After the plans and specifications are more complete, the Geotechnical engineer should be provided the opportunity to review the final design plans and specifications to assure our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of Baskerville-Donovan for the specific application to the subject project.

# **APPENDIX A**

**Boring Location Plan and Soil Profiles**

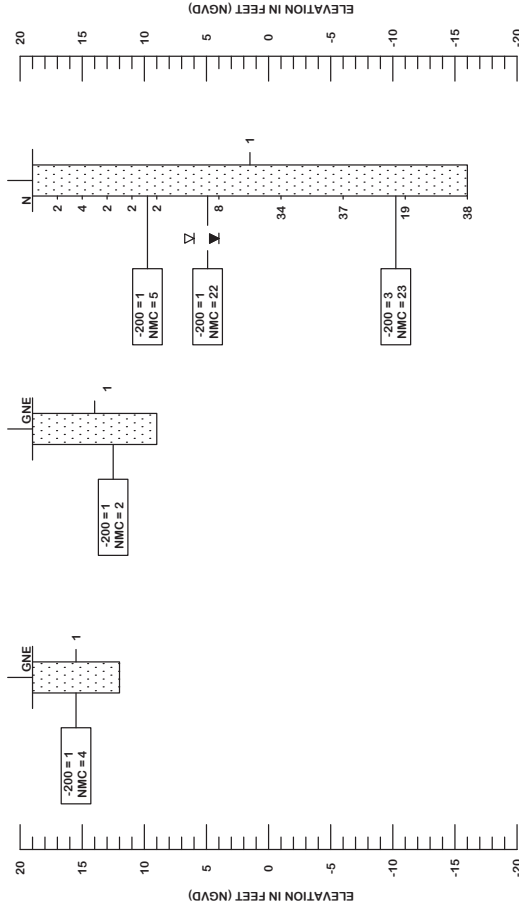
**Falling Head Permeability Test Results**



## LEGEND

|          |                                                                                                                                                                                                                                           |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EASTING  | EASTING COORDINATE REFERENCED TO THE FLORIDA STATE PLANE COORDINATE SYSTEM, FLORIDA NORTH ZONE, N.A.D. 83 DETERMINED USING HAND-HELD GARMIN GPS MAP 64 ST GPS GLOBAL POSITIONING SYSTEM WITH A REPORTED ACCURACY OF +/- 1 METER.          |
| NORTHING | NORTHING COORDINATE REFERENCED TO THE FLORIDA STATE PLANE COORDINATE SYSTEM, FLORIDA NORTH ZONE, N.A.D. 83 DETERMINED USING HAND-HELD GARMIN EGARMIN GPS MAP 64 ST GPS GLOBAL POSITIONING SYSTEM WITH A REPORTED ACCURACY OF +/- 1 METER. |

| BOR #   | AB-1      | BOR #   | AB-2      | BOR #   | B-1       |
|---------|-----------|---------|-----------|---------|-----------|
| EASTING | 1367202   | EASTING | 13671331  | EASTING | 13671235  |
| NOTHING | 59686     | NOTHING | 59686     | NOTHING | 59616     |
| ELEV.   | 19        | ELEV.   | 19        | ELEV.   | 19        |
| DATE    | 11/3/2022 | DATE    | 11/3/2022 | DATE    | 28/2/2022 |
| DRILLER | M. DAVIS  | DRILLER | M. DAVIS  | DRILLER | R. SHUEY  |
|         |           |         |           | HAMMER  | AUTOMATIC |
|         |           |         |           | RIG     | D-25      |



| AUTOMATIC HAMMER    |                  |                    |
|---------------------|------------------|--------------------|
| GRANULAR MATERIALS: | RELATIVE DENSITY | SPT<br>(BLOWS/FT.) |
| VERY LOOSE          |                  | LESS THAN 3        |
| LOOSE               |                  | 3 TO 8             |
| MEDIUM              |                  | 8 TO 24            |
| DENSE               |                  | 24 TO 40           |
| VERY DENSE          |                  | GREATER THAN 40    |
| SILTS AND CLAYS     | CONSISTENCY      | SPT<br>(BLOWS/FT.) |
| VERY SOFT           |                  | LESS THAN 1        |
| SOFT                |                  | 1 TO 3             |
| FIRM                |                  | 3 TO 6             |
| STIFF               |                  | 6 TO 12            |
| VERY STIFF          |                  | 12 TO 24           |
| HARD                |                  | GREATER THAN 24    |

FALLING HEAD PERMEABILITY TEST



Project Name:

Crystal Beach Park

Project Number:

4511-22-002

Sample Location:

AB-1, EL +18.5 to +12.0 feet

Date:

1/21/2022

Sample Description:

Light brown, white SAND (Stratum 1)

Technician:

DH

Remolded Compactive Effort:

Standard Proctor

Soil Classification:

SP

No. of Layers:

3

Blows Per Layer:

25

- Assumes:
- 1. Standard Proctor Mold (L = 4.5 in.)
  - 2. 1/2 Inch Diameter Tubing

$$K_v = \frac{(2.3 * a * L) \log (h_1/h_2)}{(A) (\Delta t)}$$

where

a = 1.267 cm (area of tube)

L = 4.5 in. (height of soil sample)

= 11.43 cm (L = 4.5 in. for full mold)

A = 12.57 sq. in. (area of Proctor mold)

= 81.1 sq. cm

| Head<br>(ft) | Time (sec) |        | Avg. Time<br>(sec) |
|--------------|------------|--------|--------------------|
|              | Run #1     | Run #2 |                    |
| 7            | 0          | 0      | 0                  |
| 6            | 1          | 1      | 1.0                |
| 5            | 3          | 3      | 3.0                |
| 4            | 5          | 5      | 5.0                |
| 3            | 8          | 8      | 8.0                |
| 2            | 11         | 11     | 11.0               |
| 1            | 17         | 17     | 17.0               |

| h1 | h2 | Delta t (sec) | K <sub>v</sub> (cm/sec) |
|----|----|---------------|-------------------------|
| 7  | 1  | 17            | 2.0E-02                 |
| 6  | 1  | 16            | 2.0E-02                 |
| 7  | 2  | 11            | 2.0E-02                 |

|                          |                |
|--------------------------|----------------|
| Average K <sub>v</sub> = | 2.0E-02 cm/sec |
|                          | 57.4 ft/day    |

| Remolded Test Sample Density |       |
|------------------------------|-------|
| Can #                        | 1     |
| Wt. Can + Wet Soil, g        | 388.6 |
| Wt. Can + Dry Soil, g        | 369.7 |
| Wt. of Water, g              | 18.9  |
| Wt. of Can, g                | 260.1 |
| Wt. of Dry Soil, g           | 109.6 |
| Moisture Content, %          | 17.2% |
| Wt. Wet Soil + Mold, lbs.    | 8.2   |
| Wt. of Mold, lbs.            | 4.5   |
| Wt. of Wet Soil, lbs.        | 3.7   |
| Wet Density, pcf             | 112.4 |
| Dry Density, pcf             | 95.9  |

| Fines Content of Test Sample             |       |
|------------------------------------------|-------|
| Can #                                    | 1     |
| Wt. Can + Wet Soil, g                    | 249.6 |
| Wt. Can + Dry Soil, g                    | 245.4 |
| Wt. of Water, g                          | 4.2   |
| Wt. of Can, g                            | 127.1 |
| Wt. of Dry Soil, g                       | 118.3 |
| Wt. of Dry Sample After Washing + Can, g | 245.2 |
| Wt. of Soil Lost During Washing, g       | 0.2   |
| Moisture Content, %                      | 3.6%  |
| Percent Fines, %                         | 0.2%  |

FALLING HEAD PERMEABILITY TEST



Project Name:

Crystal Beach Park

Project Number:

4511-22-002

Sample Location:

AB-2, EL +15.5 to +9.0 feet

Date:

1/21/2022

Sample Description:

Light brown, white SAND (Stratum 1)

Technician:

DH

Remolded Compactive Effort:

Standard Proctor

Soil Classification:

SP

No. of Layers:

3

Blows Per Layer:

25

- Assumes:
- 1. Standard Proctor Mold (L = 4.5 in.)
  - 2. 1/2 Inch Diameter Tubing

$$K_v = \frac{(2.3 \cdot a \cdot L) \log(h_1/h_2)}{(A) (\Delta t)}$$

where

a = 1.267 cm (area of tube)

L = 4.5 in. (height of soil sample)

= 11.43 cm (L = 4.5 in. for full mold)

A = 12.57 sq. in. (area of Proctor mold)

= 81.1 sq. cm

| Head<br>(ft) | Time (sec) |        | Avg. Time<br>(sec) |
|--------------|------------|--------|--------------------|
|              | Run #1     | Run #2 |                    |
| 7            | 0          | 0      | 0                  |
| 6            | 3          | 3      | 3.0                |
| 5            | 6          | 6      | 6.0                |
| 4            | 10         | 10     | 10.0               |
| 3            | 15         | 15     | 15.0               |
| 2            | 22         | 22     | 22.0               |
| 1            | 35         | 35     | 35.0               |

| h1 | h2 | Delta t (sec) | K <sub>v</sub> (cm/sec) |
|----|----|---------------|-------------------------|
| 7  | 1  | 35            | 9.9E-03                 |
| 6  | 1  | 32            | 1.0E-02                 |
| 7  | 2  | 22            | 1.0E-02                 |

|                          |                |
|--------------------------|----------------|
| Average K <sub>v</sub> = | 1.0E-02 cm/sec |
|                          | 28.4 ft/day    |

| Remolded Test Sample Density |       |
|------------------------------|-------|
| Can #                        | 1     |
| Wt. Can + Wet Soil, g        | 370.8 |
| Wt. Can + Dry Soil, g        | 354.3 |
| Wt. of Water, g              | 16.5  |
| Wt. of Can, g                | 260.1 |
| Wt. of Dry Soil, g           | 94.2  |
| Moisture Content, %          | 17.5% |
| Wt. Wet Soil + Mold, lbs.    | 8.3   |
| Wt. of Mold, lbs.            | 4.5   |
| Wt. of Wet Soil, lbs.        | 3.8   |
| Wet Density, pcf             | 115.0 |
| Dry Density, pcf             | 97.8  |

| Fines Content of Test Sample             |       |
|------------------------------------------|-------|
| Can #                                    | 2     |
| Wt. Can + Wet Soil, g                    | 276.9 |
| Wt. Can + Dry Soil, g                    | 274.2 |
| Wt. of Water, g                          | 2.7   |
| Wt. of Can, g                            | 126.1 |
| Wt. of Dry Soil, g                       | 148.1 |
| Wt. of Dry Sample After Washing + Can, g | 273.6 |
| Wt. of Soil Lost During Washing, g       | 0.6   |
| Moisture Content, %                      | 1.8%  |
| Percent Fines, %                         | 0.4%  |

## SECTION 05 60 00 – HANDRAILS

### A. General

This section is to cover the fabrication and installation of steel and aluminum hand and guardrails. This section does not pertain to grab bars used in restrooms.

### B. Quality Assurance:

1. The design of the rails shall be in accordance with the current revisions of SREF and Florida Accessibility Code for Building Construction.
2. Fabrication: Work shall be performed by experienced and qualified fabricators who have experience in aluminum rail fabrication.
3. Pipe cuts shall square and without burrs. All Welds shall be ground smooth to the surface of the pipe. Curved sections shall be bent with no crimping or flattening of the inside radius. All welded joints in rail-to-rail connections shall be internally reinforced.
4. The rails shall be anchored in such a manor as to meet the guidelines in the Florida Accessibility Code for Building Construction.
5. Prepare shop drawings for the rails at each campus after field measuring each stadium. Submit shop drawings for review.
6. Prepare a physical sample indicating all three methods of attachment for review prior to beginning fabrication. Sample shall demonstrate finish of railing, welds, bolts for connections and separation of dissimilar materials.
7. All welded connections shall be TIG welded.
8. Prepare a sample for approval of the top and bottom corners as shown on the drawings. These corners may be welded or bent.

### C. Materials:

1. All aluminum handrail pipes shall be 1-1/2" O.D.- 1 5/8" O.D., Schedule 80 extruded aluminum pipe, alloy 6063-T-6.
2. Finish: All exposed aluminum shall be mill finished aluminum. This is a finished product. Protect in the field.
3. All fasteners shall be type 300 stainless steel.
4. Wall mounting brackets shall be aluminum and fastened as indicated on drawings.

### D. Installation:

1. Railings shall be installed as shown on approved shop drawings by mechanics experienced in the installation of aluminum railing.

2. Railings shall be firmly mounted and aligned both vertically and horizontally to the structure installed on.
3. After installation, railings shall be cleaned and protected from damage until final acceptance of the project.
4. Damage to adjacent structures during installation of railing will be required like new at no cost to the owner.

END OF SECTION

06 10 00 CARPENTRY (Revised for Addendum 01)

PART 1: GENERAL

- 1.01 RELATED DOCUMENTS:  
Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- 1.02 SCOPE:  
Includes carpentry work and material necessary for a complete installation.
- 1.03 RELATED WORK:  
1. Light Steel Framing  
2. Roof and Coping Framing  
3. Roofing
- 1.04 STANDARDS:  
Each piece of lumber and plywood shall have a grade mark of an agency certified by the board of review of the American Lumber Standards Committee.
- 1.05 SUBMITTALS:  
Provide (7) seven copies of manufacturers shop drawings and installation instructions.

PART 2: MATERIALS

- 2.01 Framing and blocking shall be #2 dense SYP of sizes and dimensions shown. Members used on the exterior and in contact with concrete or masonry and where indicated on the drawings shall be pressure treated.
- 2.02 Plywood shall be 3/4" and 1/2" CDX, pressure treated in lower exterior walls. Roofing sheathing shall be 5/8" CDX.
- 2.03 Cement board material is specified under hard tile section, 09 30 00.
- 2.04 Synthetic Siding is 7 1/4" x 5/16" Cedar Mill lap siding with 6" exposure and Cedar Mill vertical sheet panel by James Hardie Building Products.
- 2.05 Corner and edge trim is to be Hardi Trim by James Hardie Building Products in widths and thicknesses shown.
- 2.06 Ceilings are to be 120"x 48" x .312" Hardie Panel Vertical siding.

- 2.07 Soffits are to be 120" x 16" x .25" Hardie Vented Smooth soffit. Similar and equal products by CertainTeed or GAF will be considered equal.
- 2.08 Steps and ramps infill material is to be McNichols 0.105 3"x 3" vinyl coated wire mesh or equal by Parco, Inc. or Josph Fazio, Inc.
- 2.09 Railing caps are to be 1 3/8"x8" composite decking similar to Wear deck, by Owens Corning. Similar and equal product will be considered provided they are submitted in accordance with specification section 012500 Substitutions.
- 2.10 Decking is to be 1" x 6" composite material by Wear Deck by Owens Corning. Similar and equal product will be considered provided they are submitted in accordance with specification section 012500 Substitutions.
- 2.10 Fasteners for exterior decking, ramps, steps and railing are to be #10 (304) stainless steel decking screws.
- 2.11 Tongue and Groove Wood Decking:
- A. Standard for Solid-Sawn Wood Roof Decking: Comply with AITC 112.
  - B. Roof Decking Species: Southern Pine.
  - C. Roof Decking Nominal Size: 2 by 6. (1-7/16" dressed thickness)
  - D. Roof Decking Grade: S.P.I.B. No. 1 Grade Timber Decking, T&G.
  - E. Grade Stamps: Factory mark each item with grade stamp of grading agency. Apply grade stamp to surfaces that are not exposed to view.
  - F. Moisture Content: Provide wood roof decking with 15 percent maximum moisture content at time of dressing.
  - G. Face Surface: Smooth.
  - H. Edge Pattern: Vee grooved.
  - I. Pressure treated wood roof decking
  - J. Preservative Chemicals: Wolman EraWood as prescribed by the manufacturer.
  - K. Penetrating Sealer: Clear sanding sealer complying with Section 09 91 23 "Painting" and compatible with topcoats specified for use over it.
  - L. Oil Stain: As selected from the manufacturer's line of stains. Factory apply.

### PART 3: INSTALLATION

- 3.01 Blocking and grounds shall be installed in a manner to eliminate cupping and warping. Members over 4" nominal width shall be kurfed on downside. Blocking shall be bolted to sub structure or otherwise securely attached to prevent movement. Nails will be double galvanized common nails of appropriate size (or galvanized screw nails). Provide solid blocking in framed partitions for support of door stops,

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other hardware items mounted to the walls and for light switches, electrical outlets and devices and recessed speakers. Provide 2X blocking in walls for base and upper cabinets.

- 3.02 Apply synthetic lap siding and trim over water resistive barrier (specified in Section 07100) over  $\frac{3}{4}$ " plywood attached to wood stud framing. Blind nail attach using stainless steel screws, No. 8-18 x.323" HD x 1  $\frac{5}{8}$ " long. Stainless steel screws must penetrate  $\frac{1}{2}$ " into material siding is to be attached to. Screw heads must be flush with the plank face and NOT countersunk. The first course of any wall should be installed over a  $\frac{1}{4}$ " lath strip to ensure a consistent plank angle. Install Hardiplank siding in compliance with local building codes for clearance between the bottom edge of plank and the finished grade. Butt ends of planks to trim. Caulk all joints with caulking (specified in Section 07100).

END OF SECTION

## 06 17 53 SHOP-FABRICATED WOOD TRUSSES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Wood roof trusses.
  - 2. Wood girder trusses.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.
- B. Shop Drawings: Show fabrication and installation details for trusses.
  - 1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
  - 2. Indicate sizes, stress grades, and species of lumber.
  - 3. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
  - 4. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
  - 5. Show splice details and bearing details.
- C. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.3 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.
  - 1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
  - 2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
- B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program, complies with quality-control procedures in TPI 1, and involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

## 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store trusses to comply with recommendations in SBCA BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer licensed in the State of Florida to design metal-plate-connected wood trusses.
- B. Structural Performance: Metal-plate-connected wood trusses shall be capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1.
- C. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.
- D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

### 2.2 DIMENSION LUMBER

- A. Lumber: DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (ALSC) Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Provide dry lumber with 19 percent maximum moisture content at time of dressing.
- B. Permanent Bracing: Provide wood bracing that complies with 15% maximum moisture content construction grade southern pine, appearance grade where exposed.

### 2.3 METAL CONNECTOR PLATES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Alpine Engineered Products, Inc.; a division of ITW Building Components Group, Inc.
  - 2. MiTek Industries, Inc.
  - 3. Truswal Systems Corporation.

- B. General: Fabricate connector plates to comply with TPI 1.
- C. Hot-Dip Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.

## 2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  - 1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
  - 2. Where trusses are exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.

## 2.5 METAL FRAMING ANCHORS AND ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Simpson Strong-Tie Co., Inc.
  - 2. MiTek Structural Connectors.
- B. Allowable design loads, as published by manufacturer, shall comply with or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

## 2.6 FABRICATION

- A. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly, with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
  - 1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- B. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.
- F. Securely connect each truss ply required for forming built-up girder trusses.
- G. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
- H. Install wood trusses within installation tolerances in TPI 1.
- I. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.
- J. Replace wood trusses that are damaged or do not comply with requirements.

END OF SECTION

SECTION 07 21 00 – SPRAY FOAM INSULATION

1. GENERAL:

- A. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS, TOOLS, EQUIPMENT, AND PERFORM ALL WORK SERVICES FURNISHING AND INSTALLATION, COMPLETE, OF ALL FOAM INSULATION AS SHOWN ON DRAWINGS AND AS SPECIFIED, IN ACCORDANCE WITH PROVISIONS OF THE CONTRACT DOCUMENTS, AND COMPLETELY COORDINATED WITH WORK OF ALL OTHER TRADES.
- B. ALTHOUGH SUCH WORK IS NOT SPECIFICALLY INDICATED, FURNISH AND INSTALL ALL SUPPLEMENTARY OR MISCELLANEOUS ITEMS, APPURTENANCES AND DEVICES INCIDENTAL TO OR NECESSARY FOR A SOUND, SECURE AND COMPLETE INSTALLATION.

2. SUBMITTALS:

- A. INSTALLATION INSTRUCTIONS AND RECOMMENDATIONS FROM MATERIALS MANUFACTURER. INCLUDE CERTIFICATION OR DATA SUBSTANTIATING THAT MATERIALS COMPLY WITH REQUIREMENTS.
- B. ACTUAL SAMPLES WHEN ARCHITECT DIRECTS.

3. SCOPE OF WORK

A. WALL FOAM INSULATION:

- 1) INSTALL 3 1/2" OF CLOSED CELL FOAM INSULATION IN EXTERIOR STUD WALL CAVITY FROM THE INTERIOR WHERE INDICATED ON FLOOR PLAN AND WALL SECTIONS.
- 2) DRILL HOLES IN STUD WALLS FROM THE INTERIOR, PRESSURE INJECT FOAM INTO OPEN CELLS. INSTALL PER MANUFACTURERS INSTALLATION INSTRUCTIONS. CLEAN AND SEAL ALL DRILLED HOLES AFTER INSULATION INSTALLATION IS COMPLETE FOR UNIFORM WALL FINISH. (SEE SECTION 07216) - FOAMED-IN-PLACE INSULATION.
- 3) COMPLETE APPROXIMATELY 20' OF INSULATION AND EXAMINE WITH ARCHITECT AND OBTAIN APPROVAL PRIOR TO PROCEEDING WITH BALANCE OF PROJECT.
- 4) SEE WALL SECTIONS FOR GENERAL INFORMATION.

A. ROOF DECK FOAM INSTALLATION

- 1) INSTALL 3 1/2" OF CLOSED CELL SPRAY FOAM INSULATION ON BOTTOM OF ROOF DECK AS INDICATED ON FLOOR PLAN AND WALL SECTIONS
- 2) INSTALL SPRAY APPLIED INTUMESCENT IGNITION BARRIER TO EXPOSED WALL AND ROOF DECK INSULATION.

- B. PROVIDE PRESCRIPTIVE THERMAL BARRIERS, PRESCRIPTIVE IGNITION BARRIERS AND INTUMESCENT COATINGS WHERE REQUIRED BY CODES OR MANUFACTURERS INSTRUCTIONS

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4. MATERIALS:

- A. SPRAY FOAM INSULATION SHALL BE: NEXSEAL 2.0 CLOSED CELL SPRAY FOAM INSULATION DEMALAC SPRAY FOAM INSULATION, THERMOSEAL 2000 MEDIUM DENSITY CLOSED CELL SPRAY FOAM OR APPROVED EQUAL.

END OF SECTION

07 41 00 - PREFORMED STANDING SEAM METAL ROOF

1. PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

1. This Section covers the , pre-finished, prefabricated Architectural standing seam roof system. All metal trim, accessories, fasteners, insulation, and sealants indicated on the drawings as part of this section.
2. Related Work Specified Elsewhere:
  1. Refer to all sections in Division 0, CONTRACT REQUIREMENTS, and Division 1, GENERAL REQUIREMENTS.

1.2 QUALITY ASSURANCE

1. **Petersen Aluminum Corporation, Acworth, GA 800-272-4482** products establish a minimum of quality required.
2. The manufacturer and erector shall demonstrate experience of a minimum of ten (10) years in this type of project.

1.3 SUBSTITUTIONS

1. The material, products and equipment specified in this section establish a standard for required function, dimension, appearance and quality to be met by any proposed substitution.

1.4 ROOF SYSTEM PERFORMANCE TESTING

1. Water Penetration: When tested per ASTM E-283/1680 and ASTM E-331/1646 there shall be no uncontrolled water penetration or air infiltration through the panel joints.
2. ***Roof System shall be designed to meet Florida Building Code wind load requirements for the specific project location. The panel shall have been tested to ASTM E-1592 Requirements and shall have a Negative Load Table in the required FBC format with a 2.0 Factor of Safety shown in this Negative Load Table.***
3. Roof System shall be designed to meet a UL Class 90 wind uplift in accordance with UL standard 580 and panel system shall be ASTM 1592 Tested and approved: U. S Army Corps of Engineer requirement. Roof system shall have current FLORIDA BUILDING CODE PRODUCT APPROVAL and shall be supported by ASCE 7 “stamped/sealed” Florida Independent Engineer Calculations from the Roofing System Manufacturer to support the applicable Zone 1, Zone 2 and Zone 3 loads for this particular project. Extrapolations will not be allowed in these calculations, only interpolations by the Engineer to illustrate the clip layout for each Zone listed above.

## 1.5 WARRANTIES

1. The Manufacturer shall warrant for twenty years (20) from the date of substantial completion of the Work related to this section, that the work is not defective in workmanship or material, and that the roof will be adequate to prevent leaks. This warranty may be provided in the short term by the Contractor/Roof Installer, however must have the backing and assurance of the roof system manufacturer.
2. **Finish Warranty on Aluminum: (Coastal Application)**  
Written 20 Year Finish Warranty shall be required for the Aluminum Standing Seam Roof System including Flashings, and related rain-carrying equipment. as supplied by the manufacturer and roofing contractor. This warranty will be for 20 Years and cover: Chalking, Fading and Integrity of the Kynar 500™ paint finish on the Aluminum. Note this is a Coastal Application with exposure to the ocean and Salt Spray. This 20 Year Finish Warranty shall cover this type of Coastal Application and must be signed and executed by the Roofing System manufacturer.

## 1.6 SUBMITTALS

1. Furnish detailed drawings showing profile and gauge of exterior sheets, location and type of fasteners, location, gauges, shape and method of attachment of all trim locations and type of sealants, and any other details as may be required for a weather-tight installation.
2. Provide finish samples of all colors specified.

## 2. PART 2 - PRODUCTS

### 2.1 PANEL DESIGN

1. Roof panels shall be standing seam in 18" widths with 2" high seam, mechanically seamed panels with Factory-supplied & calibrated Mechanical Seamers that form the completed seam to an 180° seamed panel.
2. Gauge specified herein is minimum .040" Aluminum Gauge Thickness.
3. Panels shall be factory manufactured either "with Striations" or "with pencil ribs and with striations" at the selection of the Architect.

### 2.2 ACCEPTABLE MANUFACTURERS

1. This project is detailed around the roofing product of Petersen Aluminum Corporation, Kennesaw, GA "**TITE-LOC PLUS**" **PANEL**,  
Similar products of the following manufacturers will be considered equal:  
IMETCO, Tucker, GA,  
MERCHANT & EVANS, Burlington, NJ.  
ATAS International, Inc.
2. **Color shall be: "PAC-CLAD" Kynar 500™ color: Silver.**

### 2.3 MATERIAL AND FINISHES

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1. Face Sheet Material: Aluminum Standing Seam Sheet shall be produced from ASTM B-209 quality Aluminum, 3105 H-14 Alloy and Temper material. Aluminum shall be tension leveled (temper passed and stretcher leveled) with camber a maximum of 1/4 inch in 20 feet, manufactured in the USA, and be .040" Thick Aluminum U.S. standard gauge. ***Standards and shall meet applicable Florida Building Code Wind load requirements for this project location. Additionally, Florida Professional Engineer Stamped Calculations will be required for the project to certify the roof panel assembly meets the applicable Building Code wind loads per ASCE 7 standards.***

2. FINISH

1. Finish:
  1. Finish shall be Kynar 500 or Hylar 5000 Fluorocarbon coating with a top side film thickness of 0.70 to 0.90 mil over 0.25 to 0.31 mil prime coat to provide a total dry film thickness of 0.95 to 1.25 mil. Bottom side shall be coated with a primer with a dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesion, flexibility, and longevity as specified by Kynar 500 or Hylar 5000 finish supplier.
  2. If Strippable coating shall be applied on the pre-finished panels to the top side to protect the finish during fabrication, shipping and field handling. This strippable coating shall be removed before installation.
  3. Field protection must be provided by the Contractor at the job site so material is not exposed to weather and moisture.
2. Exposed Flashing and Trim:
  1. Unless otherwise specified, all exposed adjacent flashing and trim shall be of the same material and finish as panel system.
3. Forming: Use continuous end rolling method. No end laps on panels. ***The manufacturer may elect to roll panels on the job site due to panel lengths that exceed normal transportation limitations of the trucking industry.***
4. Trim: Trim shall be fabricated of the same material and finish to match the profiled sheeting and press broken in lengths of 10 to 12 feet. Trim shall be formed only by the manufacturer or their approved dealer. Trim to be erected in overlapped condition. Use lap strips only as indicated on drawings. Miter conditions shall be factory welded material to match the sheeting.
5. Closures: Use composition or metal profiled closures at the top of each elevation to close ends of the panels. Metal closures to be made of the same material and finish as face sheet.
6. Panel Clips: Shall be Stainless Steel as required by the panel manufacturer in appropriate Gage and ***spacing of Clips to meet the job-specific Wind Load requirements by the Florida Building Code. Necessary engineering documentation of this clip spacing and attachment to be provided in the submittal stage to the Architect.***
7. Fasteners: Fasteners shall be 400 series stainless steel, dished washers stainless steel with bonded neoprene.
8. Zees: Where required by design of primary structural framing system shall be used to span between beams and/or joists. Thermally responsive base and top clips shall

- be fastened to the zees on 12" centers.
9. Insulation: See Section 07210: Building Insulation.

## **2.4 ROOFING UNDERLAYMENT**

1. On all surfaces to be covered with roofing material, furnish and install a 40 Mil "Peel & Stick Membrane" will be required as outlined by the metal panel manufacturer. Membrane to be minimum of 40 MIL Thickness, smooth, non-granular, one of the following manufacturers:
  - a) W.R. Grace "Ice & Water Shield" (High Temperature).
  - b) Carlisle: CCW WIP 300HT.
  - c) Interwrap : Titanium PSU.
  - d) MFM Corp : "Wind & Water Shield".
  - e) MID-STATES Asphalt: Quick Stick HT
  - f) Polyguard: Polyglas HT.
  - g) TAMKO: TW Tile & Metal Underlayment.
2. Underlayment shall be laid in horizontal layers with joints lapped toward the eaves a minimum of 6", and well secured along laps and at ends as necessary to properly hold the felt in place. All underlayment shall be preserved unbroken and whole.

## **2.5 SEALANTS**

1. Exterior grade silicone sealant recommended by roofing manufacturer.

## **2.6 FABRICATION**

1. Comply with dimensions, profile limitations, gauges and fabrication details shown and if not shown and, if not shown, provide manufacturer's standard product fabrication.
2. Fabricate components of the system in the factory, ready for field assembly.
3. Fabricate components and assemble units to comply with fire and performance requirements specified.
4. Apply specified finishes in conformance with manufacturer's standards, and according to manufacturer's instructions.

## **3. PART 3 - EXECUTION**

### **3.1 INSPECTION**

1. Examine alignment of structural steel and related supports prior to installation and do not proceed until the defects are corrected by the responsible contractor.

### **3.2 FASTENERS**

1. Secure units to supports.
2. Place fasteners as indicated in manufacturer's standards.

### 3.3 INSTALLATION

1. Panels shall be installed plumb and true in proper alignment and relation to the structural framing. The erector must have at least five years' successful experience with similar applications.
2. Install metal panels, fasteners, trim and related sealants in accordance with approved shop drawings and as may be required for a weather-tight installation.
3. Remove all strippable coating and provide a dry wipe-down cleaning of the panels as they are erected.

### 3.4 DAMAGED MATERIAL

1. Upon determination of responsibility, repair or replace damaged metal panels and trim to the satisfaction of the Architect and Owner.

END OF SECTION

## 07 62 00 FLASHING AND SHEET METAL

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Provide flashing and sheet metal components for building construction.
  - 1. Copings.
  - 2. Conductor heads and downspouts.
  - 3. Exposed metal trim units.
  - 4. Miscellaneous sheet metal accessories.

#### 1.02 PERFORMANCE REQUIREMENTS

- A. System Design: Provide flashing and sheet metal components that are identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE 7-98.
  - 1. Design wind velocity shall be as shown on structural Drawings.
  - 2. Design pressures are indicated on structural Drawings.

#### 1.03 SUBMITTALS

- A. Submit for approval samples, shop drawings, product data.
- B. Manufacturer Certificates: Signed by roofing manufacturer certifying that flashing and sheet metal components comply with requirements specified in "Performance Requirements" Article.

#### 1.04 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS

- A. Copings and other roof flashing, rafter end covers, etc.: Minimum .040 (unless otherwise noted on drawings) formed aluminum with hold-down clips and splice plates
- B. Finish: Kynar 500 2-coat fluoropolymer to match metal roofing.

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## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Follow recommendations of SMACNA "Sheet Metal Manual." Allow for expansion. Isolate dissimilar materials to prevent galvanic corrosion.
- B. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with a uniform appearance. Coordinate installation with roofing system and work of other sections to ensure weathertight performance. Anchor securely to structure to withstand inward and outward loads.
- C. Restore damaged components and finishes. Clean and protect work from damage.

END OF SECTION

## 07 92 00 - WATERPROOFING & SEALANTS

### PART 1      GENERAL

#### 1.01      RELATED DOCUMENTS:

Drawings and General Provisions of the Contract including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

#### 1.02      SCOPE:

This section includes waterproofing and damp proofing of retaining walls below grade, under slabs on grade, below toppings of suspended slabs, under and behind ceramic tile, thru walls and at faces of walls, masonry waterproofing, and sealant caulking, and related items.

#### 1.03      RELATED WORK:

- A.      Cast in Place Concrete
- B.      Cement Board Siding
- C.      Metal Siding / Metal Roofs
- D.      Windows and Doors

#### 1.04      SUBMITTALS

Submit technical data on proposed materials, colors if applicable and MSDS sheets. See section 013000 for submittal requirements.

### PART 2      MATERIALS

2.01      ADHESIVES: Shall be Nerva-Plast by Rubber and Plastic Compound Company and Bituthane 3000 by W.R. Grace or equal.

2.02      THRU-WALL FLASHING: See section 048000 Unit Masonry Assemblies

2.03      FLUID APPLIED AIR BARRIER: Tyvek Fluid Applied WB. Similar and equal products by Prosoco will be considered equal.

#### 2.04      SEALANT

- A.      One-part caulk shall be VLM 150 by BASF or Sherwin Williams Loxon, H1. (See Section 08 43 00 for sealant around perimeter of aluminum storefront and louvers).

2.05      BACKER ROD: Shall be closed cell polyethylene rod.

2.06      PRECOMPRESSED EXPANDING FOAM SEALANT: Emseal joint systems or equal.

### PART 3      INSTALLATION

3.01      SEALANT: Apply one-part sealant around perimeter of door frames and as indicated in recesses. Flow on smoothly for even surface. Color will be selected

by the architect from manufacturers standard color palette. Use backer rod to achieve two points of contact between materials. Review minimum sealant joint width at door perimeters of 3/8".

3.02 UNDER STANDING SEAM METAL ROOFING: See section 074113

3.03 FLUID APPLIED AIR BARRIER: Apply air and water-resistive barrier to a clean, dry substrate within temperature and weather limitations per manufacturer's written instructions.

A. FLUID-APPLIED AIR & WATER-RESISTIVE BARRIER INSTALLATION:

1. Apply to recommended thickness.
2. Allow product to cure and dry.
3. Inspect membrane before covering. Repair any punctures or damaged areas by applying additional material.
4. Back roll as necessary to ensure there are no pinholes, voids, or gaps in the membrane. Apply fluid applied air and water-resistive barrier per manufacturer's recommendations.
5. Apply additional coats per manufacturer's written instructions.

B. AT DOORS AND PENETRATIONS:

1. General: Comply with weather and air barrier manufacturer's installation instructions, temperature limitations, product data and shop drawings.
2. Apply liquid flashing membrane over surfaces to seal and waterproof rough openings per manufacturer's written instructions. Spread the wet product to create an opaque, monolithic flashing membrane which surrounds the rough opening and extends 4 to 6 inches over the face of the structural wall. Apply additional coats as needed to achieve void- and pinhole-free surface.

END OF SECTION

## 08 16 13 – FIBERGLASS REINFORCED PLASTIC (FRP) DOORS AND FRAMES

### 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 SECTION INCLUDES

- A. Fiberglass Reinforced Plastic (FRP) Doors
- B. Fiberglass Reinforced Plastic (FRP) Frames

#### 1.3 RELATED SECTIONS

- A. Section 06105 - Miscellaneous Carpentry
- B. Section 07920 - Joint Sealants
- C. Section 08710 - Finish Hardware
- D. Section 08800 - Glass and Glazing
- E. Section 09911 - Exterior Painting
- F. Section 09912 - Interior Painting

#### 1.4 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01 30 0.
- B. Shop Drawings – Include the following:
  - 1. Elevation of each door type including door size, handing and finish
  - 2. Cutout locations for lites and hardware
  - 3. Internal reinforcement
  - 4. Frame configuration, anchor types and spacing
- C. Product data including manufacturer's literature, fabrication descriptions and installation instructions.
- D. Construction and/or color samples as requested.

#### 1.5 QUALITY ASSURANCE

- A. General Qualifications:
  - 1. Manufacturer Qualifications: A company that specializes in manufacturing FRP doors and frames with a minimum of 30 years' experience.

2. Quality Assurance: Obtain all FRP doors and FRP frames from a single manufacturer to ensure consistent quality.
3. Quality Assurance: Hardware and accessories for all FRP doors and FRP frames shall exactly adhere to the Architect's specification.
4. Quality Assurance: Glass for windows in doors shall be ¼" UL Wire glass.

B. Regulatory Requirements:

1. Flame Spread: All rated FRP component parts, including the finish, shall have a flame spread classification of 25 or less per ASTM E84 and shall be self-extinguishing per ASTM D635, unless operating conditions dictate otherwise.
2. Resins and coatings to meet with USDA standards for incidental food contact, if applicable to this project.
3. Products conforming to the Florida Building Code (FBC). C. Warranty:
  1. To include ten (10) years free from defects in material and workmanship from date of shipment, and lifetime from corrosion from date of shipment, provided that the structural integrity of the doors and frames have not been violated or compromised.

1.6 DELIVERY, STORAGE, HANDLING, AND PROTECTION

- A. Doors and frames will be individually packaged in cardboard cartons. Cartons will be clearly labeled with project information and will include fasteners and installation instructions, if required. Only remove cartons upon arrival if cartons are wet or damaged.
- B. Deliver and store doors and frames at the job site in such a manner as to prevent damage; out of weather and/or extreme temperatures. The doors shall be stored in a vertical position on blocking, clear of the floor and with blocking between the doors to permit air circulation between the doors.
- C. All damaged or otherwise unsuitable doors and frames, when so ascertained, shall be immediately removed from job site.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis of Design Product: Subject to compliance with requirements, provide:
  1. Fiberglass Reinforced Plastic Doors and Frames by CORRIM Company, Oshkosh, Wisconsin 54901. Phone: 920-231-2000 Fax: 920-231-2238 [www.corrim.com](http://www.corrim.com) . Similar and equal products by Tiger Door will be accepted as an equal.

## 2.2 FRP DOORS

### A. Door Fabrication:

1. Total door thickness to be a nominal 1-3/4 inches thick.
2. Lock stiles on non-rated active leaves shall be factory beveled 1/8" in 2".
3. Provide doors with completely seamless construction on all six (6) surfaces.

### B. Face Sheets: FRP face sheets shall be manufactured using a corrosion resistant resin system with light stabilizing additives. The resin shall be reinforced with fiberglass, 50% average by weight for enhanced strength. Face sheets shall be a minimum of 0.125-inch-thick fiberglass. Face sheets will be Architect's choice of smooth, pebble or woodgrain seamless finish.

### C. Stiles and Rails: Stiles and rails shall be 1-1/2-inch square pultruded fiberglass tubes. Pultrusion is a fiberglass fabrication process that results in a much stronger, more durable product. Non-rated and 20-minute doors will have a full width horizontal 1-1/2-inch square pultruded fiberglass tube every 24 inches in height for internal reinforcement. A 1-1/2-inch square solid fiberglass block shall be used at all hardware reinforcements and corner intersections. A minimum of 1,150 pounds screw withdrawal force shall be required per screw. The bottom rail shall allow for 1-1/4 inches of height alterability without loss of the panel's integrity. Absolutely no metal or wood reinforcements, including #2 SPF (Spruce Pine Fir), will be allowed in any part of the stile and rail configuration.

### D. Core Options:

1. Polyurethane Foam Core: A 1-1/2-inch-thick rigid block of polyurethane shall be laminated to the interior of the panels. The "R" factor shall be 12. The polyurethane insulation shall be Class A and CFC free. Foam properties comply with ASTM E-84 and The International Building Code (IBC).
2. Balsa Core: 1-1/2 inches thick Balsa core of end grain construction for enhanced strength, shall be laminated to the interior of the panels. The balsa shall have a density of 8.5 – 9.0 lbs./cu. Ft. Compressive strength, perpendicular to the door panel surface shall be 1400 psi.
3. Honeycomb Core: Phenolic impregnated resin paper honeycomb.

### E. Hardware Preparations: Doors shall be reinforced and mortised for hardware with 1-1/2 inches x 1-1/2 inches of solid fiberglass to allow application of hinges and locks, in accordance with the hardware schedule, hardware manufacturer's instructions and templates.

1. Reinforcement Blocking: Non-swelling polymer or firestop blocking will be used for all lockset, surface mounted hardware and thru-bolted hardware blocking.
2. Pilot holes for full mortise butt hinges will be pre-drilled by factory.
3. All hardware shall be attached / installed by using pilot hole and stainless-steel wood screws.

F. Door Accessories

1. Louvers: Louvers shall be fabricated with pultruded FRP material of an inverted “V” design and shall be subject to the same performance guarantee as the door panel. The louver opening will be fabricated in the same method as for glazing above.
2. Fasteners: Provide countersunk stainless-steel fasteners as required for glazing openings and louvers.
3. Transoms: All transom panels will be identical to the doors in construction, materials, thickness, color, and reinforcement.
4. Astragals: Astragals for pairs of doors to be fabricated with FRP material of manufacturer’s standard flat design.

2.3 FRP FRAMES

A. Fabrication: FRP frames shall be rigid, neat in appearance, free from defects and the finish shall match the doors. Fabricate FRP doors and frames as shown on the drawings and in accordance with best shop practices. Field measurements shall be taken as required for coordinating with adjoining work.

1. Provide frames for doors, transoms, sidelights and borrowed lites, as required.
2. All frames shall be 100% pultruded fiberglass with an average 50% glass content by weight which results in an industrial fiberglass frame as strong as a 14-gauge hollow metal frame.
3. Non-rated and 20-minute UL labeled: Standard one-piece FRP profile with integral stop: 5-3/4” x 2” equal rabbet  
(Optional: 4-inch header)  
(Optional: modified depth with equal rabbet)  
(Optional: modified depth with un-equal rabbet)  
(Optional: single rabbet design)
4. Head and jamb members shall be standard 45-degree miter, providing a neatly mitered corner connection, fabricated for Knocked Down (KD) field assembly.  
(Optional: one piece frame, resin bonded and assembled at factory, available on non-rated frames only)

B. Reinforcements and Braces / Supports

1. Frames shall be reinforced and mortised for hardware in accordance with the hardware schedule, manufacturer’s instructions, and templates. Absolutely no metal reinforcements will be allowed in any part of the FRP frame configuration.
2. Corner Reinforcement: 4 inches x 4 inches x 5-3/8 inches x 1/4-inch-thick pultruded fiberglass angle. Attached to head bar at factory using stainless steel screws.

3. Mortise Hinge Reinforcement: 3 inches x 7 inches x 9/16 inch (or 3/8 inch) thick FRP material attached to frame by means of bonding and stainless-steel countersunk screws.
4. Closer Reinforcement: 1-1/2 inches x 19 inches x 3/16-inch thick FRP material attached to frame by means of bonding.
5. Strike Reinforcement: 1-1/2 inches x 9 inches x 3/4-inch thick FRP material attached to frame by means of bonding and stainless-steel countersunk screws.
6. Anchoring Systems - Furnish at least three (3) anchors in each jamb of frames up to 90 inches high and one (1) additional anchor for each 30 inches in height above 90 inches, in shapes, sizes and spacing shown or required for anchorage into adjoining wall construction.
  - a. New Masonry: T-Strap or Wire Anchor (optional: stainless steel T-Strap)
  - b. New Stud (before sheathing): New Stud Anchor
  - c. Butt Existing Wall: Existing Opening Anchor; Masonry, Steel or Wood (Optional: concealed)
  - d. Wrap Existing Wall: Compression Anchor
  - e. Consult factory for additional anchoring options.

#### 2.4 FINISH

- A. Seamless 25 mil matte gelcoat (smooth faces only), selected by Architect, from manufacturer's full range of colors.  
Prime finish for field painting; all face options. Finish on door and frame units will match.

### PART 3 - EXECUTION

#### 3.1 INSPECTION

- A. Installer shall examine the substrate and conditions under which fiberglass reinforced plastic work is to be installed and notify the General Contractor in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

#### 3.2 INSTALLATION

- A. Doors and frames will be delivered in individual cartons with the identifying mark number listed on each carton.
- B. Install FRP doors, frames, and accessories in accordance with manufacturers printed instructions, final shop drawings and standards for FBC labeled openings.

- C. Provide clearance for doors of 1/8 inch at jambs and heads; 1/4-inch clearance above threshold.

### 3.3 ADJUSTING

- A. At substantial completion, adjust all operable components to ensure proper installation. Doors shall function smoothly and swing freely without binding. Doors shall remain open at any angle without being affected by gravitational influence.

### 3.4 CLEANING

- A. Remove dirt and excess sealant from exposed surfaces. Follow the manufacturer's recommended cleaning techniques and procedures for cleaning all surfaces. Only use cleaning products that will not scratch or damage the surfaces and are recommended by the manufacturer.

## PART 4 - Material Properties of Fiber Reinforced Plastic (FRP) Profiles

### 4.1 Door Properties

|              |                                                               |
|--------------|---------------------------------------------------------------|
| ASTM D-256:  | Notched Izod Impact                                           |
| ASTM D-638:  | Tensile Strength Properties of Plastic                        |
| ASTM D-695:  | Compressive Strength                                          |
| ASTM D-732:  | Shear Strength                                                |
| ASTM D-790:  | Flexural Strength / Flexural Modulus                          |
| ASTM D-2583: | Barcol Hardness                                               |
| ASTM E-283:  | Air Infiltration Test                                         |
| ASTM E-330:  | Static Load Test                                              |
| ASTM E-331:  | Water Infiltration                                            |
| ASTM E-1886: | Impact by Missiles & Exposed to Cyclic Pressure Differentials |
| ASTM E-1996: | Impact by Wind Borne Debris                                   |
| TAS 201:     | Large Missile Impact                                          |
| TAS 202:     | Static Load Test                                              |
| TAS 203:     | Cyclic Load Test                                              |
| SFBC 3603.2: | Forced Entry                                                  |

### 4.2 Foam Core Properties

|              |                     |
|--------------|---------------------|
| ASTM C-203:  | Flexural Modulus    |
| ASTM C-272:  | Water Absorption    |
| ASTM C-273:  | Shear Strength      |
| ASTM C-518:  | K-Factor / R-Factor |
| ASTM D-1621: | Compressive Modulus |

|              |                                 |
|--------------|---------------------------------|
| ASTM D-1622: | Density                         |
| ASTM D-1623: | Tensile Strength                |
| ASTM D-2126: | Dimensional Stability           |
| ASTM D-2856: | Closed Cell Content             |
| ASTM E-84:   | Surface Burning Characteristics |
| ASTM E-96:   | Water Vapor Permeability        |

#### 4.3 Balsa Core Properties

|                  |                                        |
|------------------|----------------------------------------|
| ASTM C-271:      | Apparent Normal Density                |
| ASTM C-273:      | Shear Strength                         |
| ASTM C-297:      | Tensile Strength                       |
| ASTM C-365:      | Compressive-Strength                   |
| ASTM D-177:      | Thermal Conductivity                   |
| BSS-7238:        | Smoke Density & Toxic Gas Generation   |
| CMVSS/FMVSS 302: | Motor Vehicle Flammability Safety Test |
| MIL-STD-907B:    | Fire Resistance Test                   |

#### 4.4 Adhesive Properties: Urethane Adhesive System

|               |                              |
|---------------|------------------------------|
| ASTM D-570:   | Water Absorption             |
| ASTM D-638:   | Elongation Percent           |
| ASTM D-638:   | Tensile Strength             |
| ASTM D-638:   | Young's Modulus              |
| ASTM D-2240:  | Shore Hardness, D            |
| ASTM D-3163:  | Bond Configuration Lap Shear |
| ASTM E-132:   | Poisson Ratio                |
| ASTM E-1640:  | Glass Transition Temperature |
| ISO MAT-2208: | CLTE@ -30 to 0 deg. C        |
| ISO MAT-2208: | CLTE@ 50 to 100 deg. C       |
| SAE J-1525:   | Crosshead Speed              |

#### 4.5 Resin Properties

|              |                                            |
|--------------|--------------------------------------------|
| ASTM D-256:  | Notched Izod Impact                        |
| ASTM D-570:  | Water Absorption                           |
| ASTM D-638:  | Tensile Strength Properties of Plastics    |
| ASTM D-638:  | Tensile Modulus                            |
| ASTM D-638:  | Tensile Elongation @ Yield                 |
| ASTM D-648:  | Heat Deflection Temperature                |
| ASTM D-695:  | Compressive Strength / Compressive Modulus |
| ASTM D-790:  | Flexural Strength / Flexural Modulus       |
| ASTM D-2566: | Linear Shrinkage                           |
| ASTM D-2583: | Barcol Hardness                            |

END OF SECTION 08220

08 43 00 - ALUMINUM STOREFRONT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
  - 1. Exterior thermally broken, impact resistant aluminum storefront systems fixed framing-
- B. Related Sections:
  - 1. 08 81 00 "Glass & Glazing"
  - 2. 07 92 00 "Flashing and Sealants"

1.2 SYSTEM DESCRIPTION

- A. General: Provide aluminum storefront systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project. Failure includes the following:
  - 1. Air infiltration and water penetration exceeding specified limits.
  - 2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.
    - a. Drawings are diagrammatic and do not purport to identify nor solve problems of thermal or structural movement, glazing, anchorage, or moisture disposal.
    - b. Requirements shown by details are intended to establish basic dimension of units, sight lines and profiles of members.
    - c. Provide concealed fastening whenever possible.
    - d. Provide entrance and storefront systems, including necessary modifications, to meet specified requirements and maintaining visual design concepts.
    - e. Attachment considerations are to take into account site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening, or fracturing connection between units and building structure or between units themselves.
    - f. Anchors, fasteners and braces shall be structurally stressed not more than 50% of allowable stress when maximum loads are applied.
    - g. Provide for expansion and contraction due to structural movement without detriment to appearance or performance.
    - h. Framing systems shall accommodate expansion and contraction movement due to surface temperature differentials of 180 degrees F without causing buckling, stress on glass, failure of joint seals, excessive stress on structural elements, reduction of performance, or other detrimental effects.
- B. Glazing: Physically and thermally isolate glazing from framing members.
- C. Wind loads: provide framing systems, including anchorage, capable of withstanding wind-load design pressures of (70) lbs./sq. ft. inward and (70) lbs./sq. ft. outward calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7, "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.

1. Design wind velocity shall be 180 mph with a wind load importance factor of 1.0.
  2. Deflection of framing members in a direction normal to wall plane is limited to 1/175 of clear span or 3/4 inch (19 mm), whichever is smaller, unless otherwise indicated.
  3. Static-Pressure Test Performance: Provide storefront systems that do not evidence material failures, structural distress, failure of operating components to function normally, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E 330.
    - a. Test Pressure: 150 percent of inward and outward wind-load design pressures.
    - b. Duration: As required by design wind velocity; fastest 1 mile (1.609 km) of wind for relevant exposure category.
    - c. Design pressures for components and cladding shall be as indicated on structural drawings.
- D. Hurricane-Resistance Test Performance: Provide storefront systems that pass large and small missile-impact tests, in accordance with ASTM E 1886, information in ASTM E 1996 and TAS 201/203.
1. Large Missile Impact: All aluminum-framed systems located within 30 feet (9.1M) of grade.
- E. Dead Loads: Provide storefront-system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load.
1. Provide a minimum 1/8-inch (3.18-mm) clearance between members and top of glazing or other fixed part immediately below.
- F. Air Infiltration: Provide storefront systems with permanent resistance to air leakage through fixed glazing and frame areas of not more than 0.06 cfm/sq. ft. (0.3 L/s/sq. m) of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 1.57 lbf/sq. ft. (75.2 Pa).
- G. Water Penetration: Provide storefront systems that do not evidence water leakage through fixed glazing and frame areas when tested according to ASTM E 331 at minimum differential pressure of 20 percent of inward-acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 6.24 lbf/sq. ft. (299 Pa). Water leakage is defined as follows:
1. Uncontrolled water infiltrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.
- H. Thermal Movements: Provide storefront systems, including anchorage, that accommodate thermal movements of systems and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, and other detrimental effects.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- I. Structural-Support Movement: Provide storefront systems that accommodate structural movements including, but not limited to, sway and deflection.

- J. Condensation Resistance: Provide storefront systems with condensation resistance factor (CRF) of not less than 59 when tested according to AAMA 1503.1.
- K. Average Thermal Conductance: Provide storefront systems with average U-values of not more than 0.45 Btu/sq. ft. x h x deg F (3.57 W/sq. m x K) when tested according to AAMA 507.
- L. Dimensional Tolerances: Provide storefront systems that accommodate dimensional tolerances of building frame and other adjacent construction.

### 1.3 SUBMITTALS

- A. Product Data: For each product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop Drawings: For storefront systems. Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, and attachments to other work.
- C. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- D. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of storefront systems with requirements based on comprehensive testing of current systems.

### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing storefront systems similar to those required for this Project and who is acceptable to manufacturer.
  - 1. Engineering Responsibility: Prepare data for storefront systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Source Limitations: Obtain each type of storefront system through one source from a single manufacturer.

### 1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

### 1.6 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

- B. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of storefront systems that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
  - 1. Structural failures including, but not limited to, excessive deflection.
  - 2. Adhesive sealant failures.
  - 3. Cohesive sealant failures.
  - 4. Failure of system to meet performance requirements.
  - 5. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 6. Water leakage through fixed glazing and frame areas.
- C. Warranty Period: 2 years from date of Substantial Completion.
- D. Warranty Period for Metal Finishes: 10 years from date of Substantial Completion.
- E. Warranty Period for Insulating Glass: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design for aluminum storefront systems is based on the following products. Subject to compliance with requirements, provide the named product or an equivalent product by one of the manufacturers listed in paragraph 2.1.B below.
  - 1. Fixed Framing: IR 501 T Impact Framing manufactured by Kawneer
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. YKK AP
  - 2. OldCastle
  - 3. Coral Architectural Products

### 2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.
  - 1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
  - 2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).
  - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
  - 4. Bars, Rods, and Wire: ASTM B 211 (ASTM B 211M).
  - 5. Welding Rods and Bare Electrodes: AWS A5.10.
- B. Glazing as specified in Division 8 Section "Glazing."
- C. Glazing Gaskets: Manufacturer's standard compression types; replaceable, extruded EPDM rubber.

- D. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard elastomeric type for spacers and setting blocks. Bond Breaker Tape, manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
- E. Secondary Sealant: For use as weatherseal, compatible with structural silicone sealant and other system components with which it comes in contact, and that accommodates a 50 percent increase or decrease in joint width at the time of application when measured according to ASTM C 719.
  - 1. Color: As selected by Architect from manufacturer's full range of colors.
  - 2. Use neutral-cure silicone sealant with insulating-glass units.
- F. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.
- G. Sealants and joint fillers for joints at perimeter of storefront systems as specified in Division 7 Section "Joint Sealants."
- H. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

## 2.3 COMPONENTS

- A. Brackets and Reinforcements: Provide manufacturer's standard brackets and reinforcements that are compatible with adjacent materials. Provide non-staining, nonferrous shims for aligning system components.
- B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, nonbleeding fasteners and accessories compatible with adjacent materials.
  - 1. Reinforce members as required to retain fastener threads.
  - 2. Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.
- C. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.
- D. Concealed Flashing: Dead-soft, 0.018-inch- (0.457-mm-) thick stainless steel, complying with ASTM A 666, of type selected by manufacturer for compatibility with system.<sup>2</sup>

## 2.4 FABRICATION

- A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

- B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
- C. Prepare components to receive concealed fasteners and anchor and connection devices.
- D. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- E. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."
- F. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- G. Storefront: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.

## 2.6 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- D. Class I, Clear Anodized Finish: AA-M10C21A41/AA-M45C22A41 (Mechanical Finish: non-specular as fabricated; Chemical finish: etched, medium matte; Anodic Coating: Architectural Class I, Clear coating (0.7 mils minimum) complying with AAMA 611.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
- B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- D. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Comply with requirements of Division 7 Section "Joint Sealants."
- E. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.
- F. Install entrances plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.
  - 1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.
- G. Install glazing to comply with requirements of Division 8 Section "Glazing," unless otherwise indicated.
- H. Install secondary-sealant weatherseal according to sealant manufacturer's written instructions to provide weatherproof joints. Install joint fillers behind sealant as recommended by sealant manufacturer.
- I. Install perimeter sealant to comply with requirements of Division 7 Section "Joint Sealants," unless otherwise indicated.
- J. Erection Tolerances: Install storefront systems to comply with the following maximum tolerances:
  - 1. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.
  - 2. Alignment: Where surfaces about in line, limit offset from true alignment to 1/16 inch (1.5 mm). Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).
  - 3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).

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3.3 ADJUSTING AND CLEANING

- A. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.4 PROTECTION

- A. General Contractor shall provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, which ensure storefront systems are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

08 71 00 - HARDWARE

PART 1      GENERAL

1.01      RELATED DOCUMENTS

Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.02      WORK INCLUDES

“Finish hardware” includes items known commercially as finish hardware which are required for swing, sliding and folding doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame.

1.03      RELATED WORK

Hardware supplier shall check with other sections of this specification for related work such as aluminum entrances, metal doors and frames, wood doors, toilet partitions and accessories, or any other items that may relate to work in this section.

1.04      QUALITY ASSURANCE

- A. The finish hardware supplier shall furnish to the General Contractor all finishing hardware as hereinafter specified or as obviously required to complete the project. Items not specifically mentioned but necessary to complete the work shall be furnished, matching in quality and finish to the items hereinafter specified or described. Should an opening be omitted, this supplier shall provide finish hardware equal to that specified for similar or adjacent openings and as approved by the architect for function and quality. No extras will be allowed for omitted but required items. Clarify all questions with the architect in writing, prior to bid opening.
- B. Experience: Hardware shall be furnished by those having experience in the builder's hardware field, competent to correctly interpret the plans, specifications; to furnish appropriate technician regularly employed by them to immediately service the job as required. This technician shall operate out of a stocking builders warehouse located within 75 miles of the job site in order to insure immediate servicing of the project. This supplier shall make two scheduled visits to the job site during the application of the finish hardware. Prior to each visit, he shall notify the General Contractor and the Architect in writing of his intention to visit the job so that either or both parties may have representation on the job to discuss any hardware problems that might need to

be discussed. In addition, this supplier shall immediately service the job upon the call of the General Contractor and/or the Architect. Upon the completion of the job and prior to the final construction inspection, this supplier shall lubricate and adjust all hardware according to the manufacturer's recommendations. These service requirements shall be demanded and strictly enforced by the architects.

- C. Product Delivery: All items of finish hardware shall be received at supplier's warehouse, checked for correctness of product, strikes, brackets, screws, and miscellaneous items, etc. Hardware is to be accumulate at supplier's warehouse and as far as practical be delivered in one complete delivery by supplier's own personnel. Contractor shall refuse drop or factory shipments. Supplier is to coordinate delivery with Contractor and Contractor is to check all items of hardware at the time of delivery with personnel from supplier's office.
- D. Product Handling: Provide secure lock-up for hardware delivered to the project, but not yet installed. Control the handling and installation of hardware items which are not completely replaceable so that the completion of the work will not be delayed by hardware losses, both before and after installation.
- E. Fire Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80 and the Florida Department of Educations Code requirements. Provide only hardware that has been tested and listed by Underwriters Laboratories, Inc. for types and sizes of doors required and complies with requirements of door and doorframe labels.
- F. Adjust and Clean:
  - 1. Adjust and check each operating item of hardware and each door to insure proper operation or function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer (graphite-type if no other recommended). Replace units which cannot be adjusted and lubricated to operate freely and smoothly as intended for the application made.
  - 2. Clean adjacent surfaces soiled by hardware installation.
  - 3. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door controls devices to compensate for final operation of heating and ventilating equipment.

## PART 2      PRODUCTS

### 2.01      FASTENINGS

- A. Furnish all finish hardware with all necessary screws, bolts, and other

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fasteners of suitable size and type to anchor the hardware in position for long life under hard use.

- B. Furnish sex bolts for all panic or exit devices and closers.
- C. All fastenings shall harmonize with the hardware as to material and finish.

## 2.02 ACCEPTABLE MANUFACTURERS

Products Approved: (Subject to the series and design approved by Architect)

Products for Exterior Doors must meet Florida Building Code requirements.

|            |                                         |
|------------|-----------------------------------------|
| Hinges     | McKinney, Hager, and Ives               |
| Locks      | Sargent, Corbin and Schlage, Alarm Lock |
| Thresholds | Hager, NGP and Pemko                    |
| Misc.      | Rockwood, Hager, and Ives               |

## 2.03

Hardware sets below are for design. Supply locks & seals per manufacturers valid Florida Product Approval for Impact Rating.

### HARDWARE SET #1

Doors 1 (2 Each)

|                     |                         |      |
|---------------------|-------------------------|------|
| 3 ea. Hinges        | TA2314 4.5 x 4.5 NRP    | 626  |
| 1 ea. Digital Lock  | DL2800 (Cylindrical)    | 626  |
| 1 ea. Closer        | 1431 – UO               | 689  |
| 1 ea. Threshold     | 520S x DW               | Alum |
| 1 set Weather-strip | 891S x LR               | Alum |
| 1 ea. Door Sweep    | 770S x DW (Nylon Brush) | Alum |
| 1 ea. Kick Down     | FS452284                | Alum |

### HARDWARE SET #2

Door 2

|                     |                         |      |
|---------------------|-------------------------|------|
| 3 ea. Hinges        | TA2314 4.5 x 4.5 NRP    | 626  |
| 1 ea. Storeroom Lk  | L9480-06A               | 626  |
| 1 ea. OH Holder     | GJ90H x DW              | 689  |
| 1 ea. Threshold     | 520S x DW               | Alum |
| 1 set Weather-strip | 891S x LR               | Alum |
| 1 ea. Door Sweep    | 770S x DW (Nylon Brush) | Alum |
| 1 ea. Kick Down     | FS452284                | Alum |

END OF SECTION

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## SECTION 08 81 00 - GLASS AND GLAZING

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Provide glass and glazing for all applications, including without limitation, entrances and storefront, windows, glazed doors, transoms, and sidelights.
- B. Glass Schedule:
  - 1. Exterior Windows: 1-5/16" thick insulating unit; tinted 1/4" tempered exterior pane, clear laminated impact-resistant interior unit.

#### 1.02 SUBMITTALS

- A. Submit for approval samples, product data, warranty, and test reports.

#### 1.03 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Glazing sheets:
  - 1. Primary glass, Fed. Spec DD-G-451:
    - a. Clear and tinted float glass.
  - 2. Heat treated glass products, Fed. Spec DD-G-1403:
    - a. Heat-strengthened glass.
    - b. Tempered glass.
    - c. Spandrel glass.
  - 2. Impact-resistant Glass – Provide at all exterior windows.
- B. Insulating impact glass units. Insulating glass warranty: 10 years.  
**Note: These are to be obscure glass units**
  - 1. Overall Thickness approximately 1 5/16"
  - 2. Exterior Lite: 1/4" Bronze Tempered Substrate
  - 3. Air Space Content: Air, 1/2" thickness
  - 4. Interior Lite: 19/32" Heat Strengthened Impact-Resistant Laminated Glass. Class 1, (clear)
  - 5. Exterior Lite: Solarban 70 Low E on the #2 Surface

- a. Kind FT, (fully tempered)
- 6. Interior Lite: Type I (transparent glass, Laminated).
  - c. (Class 1, (clear both lites)
  - d. Laminate Interlayer .090" DuPont Sentry Glass for windows
  - e. Kind HS, (Heat strengthened)

## 2.2 ELASTOMERIC GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
  - 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
  - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  - 3. Colors of Exposed Glazing Sealants: As selected by Architect from the manufacturer's full range for this characteristic.
- B. Elastomeric Glazing Sealant Standard: Comply with ASTM C 920-05 and other requirements indicated for each liquid-applied, chemically curing sealant in the Glazing Sealant Schedule at the end of Part 3, including those referencing ASTM C 920-05 classifications for type, grade, class, and uses.

## 2.3 GLAZING TAPES

- A. Black-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with and AAMA 800 for products indicated below:
  - 1. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tape: Closed-cell, PVC foam tape; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
  - 1. Type 1, for glazing applications in which tape acts as the primary sealant.
  - 2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.4 MISCELLANEOUS GLAZING MATERIALS

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- A. Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  - 2. Presence and functioning of weep system.
  - 3. Minimum required face or edge clearances.
  - 4. Effective sealing between joints of glass-framing members.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement; weeps are clear, and ready to receive glazing.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
  - 1. Clean contact surfaces with solvent and wipe dry.
  - 2. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
  - 3. Prime surfaces scheduled to receive sealant.
  - 4. Install sealants in accordance with ASTM C 1193 and FGMA Sealant Manual and in accordance with the manufacturer's instructions.

### 3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Product site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

#### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

#### 3.5 SEALANT GLAZING

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing,

between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### 3.6 PROTECTION AND CLEANING

- A. General Contractor shall provide final protection and maintain conditions in a manner acceptable to manufacturer/fabricator and Installer that ensure glass is without damage or deterioration at the time of Substantial Completion. Protect glass from damage from welding, grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants. General Contractor shall clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.
- B. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- C. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do meet glass, remove them immediately as recommended by glass manufacturer.
- D. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent interval during construction, but not less than once a month, for build-up of dirt, scum alkaline deposits, or stains; remove as recommended by glass manufacturer.
- E. Remove and provide new glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
- F. Clean glass and adjacent surfaces.

END OF SECTION 08800

09 27 00 – CEMENT BACKER BOARDS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide cement backer boards including metal support systems:
  - 1. Interior walls and partitions to receive thin-set wall tile.

1.02 SUBMITTALS

- A. Submit for approval product data.

1.03 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Tolerances: Not more than 1/16" difference in true plane at joints between adjacent boards before finishing. No gaps or voids between gypsum board units or between drywall and adjacent work, unless detailed otherwise. Not more than 1/8" in 10' deviation from true plane, plumb and level in finished work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Backer boards: 5/8" thickness, glass mesh reinforced portland cement backer board; DUROCK Cement Board, U.S. Gypsum or approved equal.
- B. Steel studs: ASTM C 645, 20 gage screw-type steel studs, 16 inches o.c., ASTM A 653 G40, hot-dip galvanized.
- D. Joint tape: DUROCK alkali-resistant glass-fiber tape.
- E. Accessories: DUROCK screws, corrosion-resistant, 8-gage, wafer heads with countersinking ribs.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with ASTM C840 and GA 216; except as otherwise indicated, extend fire-rated partitions to underside of deck above ceiling and extend other partitions at least 6" above ceilings.

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- B. Install framing system at 16" o.c., include blocking for grab bars, accessories and similar items.
- C. Provide fire-rated systems where indicated and where required by authorities having jurisdiction.
- D. Install boards vertically (parallel to framing). Do not allow butt-to-butt joints and joints that do not fall over framing members.
- E. Install cement backer board panels with ¼" open space where panels abut other construction or penetrations.
- F. Install trim and joint treatment in strict compliance with manufacturer's instructions and recommendations.

END OF SECTION

09 30 13 - CERAMIC TILE

PART 1      GENERAL

1.01      RELATED DOCUMENTS:

Drawings and General Provision of the Contract, including General and Supplementary Condition and Division 1 Specification sections, apply to work of this section.

1.02      SCOPE:

This section includes ceramic tile surfaces, marble and limestone tiles, covering all labor, material and equipment required for the proper execution of the work.

1.03      STANDARDS: Tile Council of America Quality Standards and Handbook for Tile Installation.

1.04      SUBSTITUTIONS: Ceramic tile specified is as made by American Olean but similar and equal material by United States Tile Company or Dal-Tile Corp. will be considered.

PART 2      MATERIALS

2.01      PORTLAND CEMENT: Shall conform to the requirements for such materials as specified under concrete work.

2.02      SAND: Shall be clean and free from organic matter. All sand shall pass Number 5 sieve; 90% shall pass Number 8 sieve; 30% shall pass Number 50 sieve; 5% permitted to pass Number 100 sieve. Percentages are by weight.

2.03      LATH: Shall be 3.4# galvanized key lath, self furring.

2.04      WALL TILE FOR INTERIOR SPACES: Shall be 4"x 4" Daltile or equal porcelain ceramic mosaic with gloss glazed finish. Provide with coves caps and round outs. Color will be selected by Architect from price group 1 & 2 tile.

2.05      MARBLE THRESHOLDS: Shall be cut to profile from Alabama Cream "A" Marble.

2.06      Cement board ½" thick Durock by USG.

2.07      GROUT: Shall be Laticrete 3701 Joint & Grout Filler mixed to proper consistency. Colors shall be selected by Architect.

2.08      THIN SET GROUT: Laticrete #4237 & 3030 for Porcelain Tile or Mapei, Karabond/Keralastic.

2.09      LEVELING COAT: Laticrete #3701

2.10 SILICONIZED CAULK: Mapei Keracaulk U un-sanded siliconized Acrylic caulk.

2.11 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer. Waterproof membrane required at all floor tile in toilet rooms .
- B. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. C-Cure; Pro-Red Waterproofing Membrane 63.
    - b. Custom Building Products; RedGard Waterproofing and Crack Prevention Membrane.
    - c. Jamo Inc.; Waterproof Membrane.

2.12 CRACK ISOLATION MEMBRANE

- C. General: Manufacturer's standard product that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- D. Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, modified-bituminous sheet with fabric reinforcement facing; 0.040-inch nominal thickness.
  - 1. Products: Subject to compliance with requirements, Basis of Design:
    - a. Custom Building Products Crack Buster Pro Crack Isolation Membrane.
    - b. C-Cure Crack Isolation Membrane
    - c. Jamo Crack Isolation Membrane

PART 3      INSTALLATION

3.01 WALL TILE: Tile shall be set on cement mortar and metal lath over waterproof membrane applied to metal studs in accordance with ATC specification W231-84 GR applied with thin set grout to ½" cement board and against masonry in accordance with ATC specification W251-84 & on cement backer board or WP Gypsum with Laticrete 3030.

3.02 BACKER BOARD: ½" thick cement board shall be screwed to framing with 1 ¼" screws @ 8"o.c.

3.03 TILE GROUT: Grout shall be with Laticrete #3701; joint and grout filler admix. Installation shall be in accordance with ATC Specifications and Directions of the

manufacturer. Use 3/8" grout joint for floors and Color shall be selected by Architect. Use 1/16" grout joint for wall tiles.

3.04 MEMBRANE WATERPROOFING: Below suspended concrete floor and behind wall tile shall extend up wall 8" and secured.

3.05 GROUT JOINTS WITH LATICRETE: Grout with grout admixture.

3.06 CAULK JOINTS: Install caulk at all inside corners and expansion joints.

END OF SECTION

## 1. Scope of Work

1.1 Furnish all necessary materials, labor and equipment required to prepare substrate and install Epoxy High-Build Coating System.

## 2. Related Work Specified Elsewhere

2.1 Resinous flooring material provides an impermeable barrier against rising moisture. All Substrates must therefore be free of ground water effects and verified as such prior to installation of system.

### 2.2 Concrete.

2.2.1 The concrete on which resinous flooring is to be installed shall have a minimum compressive strength of 3000 p.s.i and shall have cured at least 4 weeks before installation begins. New concrete shall be straight properly sloped, and finished with a fine broom, or wooden float. Extra care shall be taken not to raise any unnecessary "cream" to the surface. Concrete in these areas shall be moist cured with burlap or polyethylene. No chemical curing agents shall be used. Use no methods or materials that would prevent the proper bonding of a Polymeric material.

2.2.2 All concrete areas shall be abrasive cleaned. This abrasive cleaning shall be Dust Free Shot-blasting, or Dust Free Grinding (or other method approved by the ENGINEER) as necessary to insure that the concrete is free of all paint, sealers, curing agents, oil, grease, moisture, dirt, and other contaminants.

2.3 Wood. Plywood is acceptable as a substrate if proper care is taken to ensure that the panels are securely anchored and properly jointed.

2.4 Facilities. The resinous flooring contractor shall be provided with dry storage space for materials and equipment and with suitable electric current at no charge for the processing tools and mixing devices running on electricity.

## 3. Materials

3.1 Polymeric flooring material shall be Epoxy.com™ [Product #315](#), as distributed by Epoxy.com a Division of Epoxy Systems, Inc., a Vermont Corporation, with Technical Support Offices in Dunnellon, Florida - Phone 321-206-1833. Material shall also include Epoxy.com Flooring chips. Primer (as needed) and Polymeric flooring material to be in accordance with manufacturer's recommendations. Epoxy.com™ Product #315BC is a 100% solid, pigmented Polymeric resin. Epoxy.com™ Product #315BC is a 100% solid, clear, yellowing resistant Polymeric resin. Similar and equal products by Dur A Flex and Laticrete will be considered equal to the specified system.

### 3.1.1 Application Properties:

PART 1 - Mix ratio 2:1 by Volume.

PART 2 - Viscosity (mixed) 450 cps

PART 3 - Pot life 30 minutes

PART 4 - Tack free to touch 24 hours.

PART 5 - Initial cure 48 hours

PART 6 - Final cure 7 days

3.1.2 Physical Properties (neat)

PART 7 - Bond strength (ASTM C-882) 2110 p.s.i

PART 8 - Flexural Strength (ASTM C-580-68) 6100 (7 days)

PART 9 - Compressive Strength (ASTM D-695) 9900

PART 10 - Absorption (ASTM D-570) 0.7%

PART 11 - Thermal shock 40 hrs. @ 10 Degrees F., 3 Min. @ 212 Degrees F. Shock Water 33 Degrees F.

PART 12 - Hardness (Shore D) 65 @ 24 hours, 75 @7 days.

3.1.3 Flammability. Finished Polymeric flooring shall not support combustion and shall be self-extinguishing.

3.2 Type and gradation of fillers used shall be those recommended by Epoxy.com.

#### 4. Acceptance of Substrate

4.1 Before installing any Polymeric flooring system, the applicator shall inspect the substrate and immediately report to the general contractor, architect, or owner any unsatisfactory conditions.

#### 5. Preparation of Substrate

5.1 Wood. The plywood panels used shall be 3/4-inch (19 mm) exterior grade, securely anchored (glued and screwed) to the subsurface (e.g., studs 10-12" (4-5 cm) centers). They shall be free of excessive tool marks, gouges, and indentations. The edges of the panels shall be smooth, un-chipped, flush to a line, and free of contamination (E.G., glue used to secure panels to subsurface). Prior to the installation of the Polymeric resurfacing system, the joints shall be filled with an elastic jointing compound compatible with the Polymeric flooring system used.

5.2 Bond tests as recommended by the manufacturer of the Polymeric flooring system shall be conducted in order to assess the condition of the prepared substrate. No materials shall be applied without the consent of the resident Engineer.

#### 6. Installation:

6.1 Polymeric flooring system shall be installed in strict accordance with the manufacturer's installation instructions.

6.2 Primer: Apply a coat of primer if recommended by the manufacturer for the specific application at a rate recommended by the manufacturer. Any cracks in the concrete that exist at this time shall be evaluated by the ENGINEER.

6.3 Base Cove: A base cove of 4 inches high will be applied to all wall surfaces where noted in this section or on the drawings. The base cove (if any are required) shall be installed so as to have a 1/4 inch radius at the bottom of it.

6.4 Basecoat: Apply a coat of resin at a thickness so as to insure a total nominal thickness of the system of not less than 1/16 inch.

6.5 Broadcast coat: Broadcast surface to saturation with a vinyl chip that is approved by the flooring manufacturer.

6.6 TopCoat: A clear top coating of Epoxy.com Product #315 shall be applied as a top-coating.

### 3.03 CURING AND PROTECTION

A. Cure High-Build Epoxy/Urethane Coating System materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of the application and prior to completion of the curing process.

B. Apply temporary protection until the floor is fully cured. The General Contractor shall protect the finished floor from the time that the sub-contractor completes the work.

END OF SECTION

09 91 00 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
  - 1. Fiber Cement siding and trim
  - 2. Steel and iron.
  - 3. Galvanized metal.
  - 4. Cotton or canvas insulation covering.
  - 5. ASJ insulation covering.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
  - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
  - 2. Indicate VOC content.
- B. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint: [5] percent, but not less than 1 gal. Of each material and color applied.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

## 1.6 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

## PART 2 - PRODUCTS

### MANUFACTURERS

Use first-line standard products for all systems by Sherwin Williams are the basis of design. Similar and equal products be Coronado and PPG will be accepted as equals.

- A. Products: Subject to compliance with requirements, provide products listed in the Exterior Painting Schedule for the paint category indicated.

## 2.2 PAINT, GENERAL

### A. Material Compatibility:

- 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
- 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

### B. Colors: As selected by Architect from manufacturer's full range

### C. Paint schedule:

#### 1. EXTERIOR FIBER CEMENT SIDING AND TRIM

Primer LX02W0050 - Sherwin Williams Loxon Primer  
Intermediate Coat: A89W02151 - Super Paint Exterior Satin  
Topcoat: A89W02151 - Super Paint Exterior Satin

#### 2. INTERIOR FIBER CEMENT SIDING AND TRIM

Primer: LX02W0050 - Loxon Primer  
Intermediate Coat: K46W01151 - PI Precat Semigloss  
Topcoat: K46W01151 - PI Precat Semigloss

#### 3. EXTERIOR GALVANIZED METAL

Primer: B66A00310 - Pro Industrial Pro-Cryl® Universal Acrylic Primer Intermediate Coat:  
B66W00611 - Pro Industrial High-Performance Acrylic - Gloss  
Topcoat: B66W00611 - Pro Industrial High-Performance Acrylic – Gloss

#### 4. INTERIOR CANVAS INSULATION COVERS

Primer LX02W0050 - Sherwin Williams Loxon Primer

Intermediate Coat: A89W02151 - Super Paint Exterior Satin

Topcoat: A89W02151 - Super Paint Exterior Satin

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Concrete: 12 percent.
  - 2. Masonry (Clay and CMUs): 12 percent.
  - 3. Portland cement Plaster: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Application of coating indicates acceptance of surfaces and conditions.

#### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and comparable items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Pressure wash exterior of existing buildings prior to painting
- J. Within 48 hours of painting rinse all exterior surfaces with clean fresh water to remove salt.

### 3.1 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
  - 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
  - 4. Paint entire exposed surface of window frames and sashes.
  - 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  - 6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view:
  - a. Equipment, including panel boards.
  - b. Uninsulated metal piping.
  - c. Uninsulated plastic piping.
  - d. Pipe hangers and supports.
  - e. Metal conduit.
  - f. Plastic conduit.
  - g. Tanks that do not have factory-applied final finishes.

### 3.2 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and evaluate paint for dry film thickness.
  1. Contractor shall touch up and restore painted surfaces damaged by testing.
  2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

### 3.3 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.7 MILDEWCIDE

Provide mildewcide additive to all exterior paint. Mildewcide additive shall be chemically compatible with paint formulation and shall not adversely affect the color, texture, or durability of the coating.

2. Mildewcide additive shall be EPA registered, non-toxic, low VOC composition, and shall provide complete protection against microbial defacement of painted surfaces.
3. Provide M-1 Advanced Mildewcide as manufactured by The Jomaps Company or approved equal.

END OF SECTION 09 91 00

## 10 14 00 INTERIOR AND EXTERIOR SIGNS

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Provide specialty building signage. Note: Exterior building signage is shown on A200. See Allowance Section 012100.

#### 1.02 SUBMITTALS

- A. Submit for approval samples, shop drawings, product data.

#### 1.03 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. All signs shall comply with Florida Accessibility Code for Building Construction. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS

- A. Panel signs; as manufactured by Mohawk signs or approved equal. Provide one for each room and room number shown on floor plans. Provide exterior grade signs for doors entered from outside. Provide one for each room on the floor plan.
  - 1. Material: Sand carved MP plastic, 1/32" H. raised graphics
  - 2. Size: Minimum 6 inches square, radiused corners
  - 3. Face Finish/Color: Matte finish/Color selected by Architect
  - 4. Number Style: Helvetica Medium
  - 5. Number Size: 1 inch
  - 6. Number Copy Position: Top left
  - 7. Letter Style: Helvetica Medium
  - 8. Letter Size: 3/4" uppercase
  - 9. Letter Copy Position: Bottom left
  - 10. Braille: Grade 2, left justified below number/letter
  - 11. Number/Letter Color: White
  - 12. Mounting: Non-corrosive fasteners and anchors

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Panel signs shall be wall mounted at sixty (60) inches above finished floor to center of sign on latch side of doors. Exact location shall be as directed by Owner.
- B. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance.
- C. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
- D. Restore damaged finishes. Clean and protect work from damage.

### 3.02 SIGN SCHEDULE

- A. Space Identification: Provide sign indicating room name and number for each space identified on floor plan.
- B. Accessibility Signage: In addition to room name and number, provide sign with international symbol of accessibility at all toilet rooms.
- C. Provide sign stating "FIRE EXTINGUISHER INSIDE"

END OF SECTION

## 10 22 00 TOILET PARTITIONS

### PART 1      GENERAL

#### 1.01            RELATED DOCUMENTS:

Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.02    The Contractor shall furnish all labor, materials, tools, equipment and perform all work and services for toilet partitions as shown on drawings and as specified, in accordance with provisions of the contract documents, and completely coordinate with work of all other trades.

1.03    Verify dimensions by field measurements before fabrication, wherever possible without delaying project.

### PART 2      SUBSTITUTIONS

2.01            Toilet partitions specified are by Comtec, but equal and similar products by Santana Products and Sanymetal will be considered.

### PART 3      SUBMITTALS

3.01            Shop drawings (7 copies) for fabrication and erection; include plans and elevations. Show all anchorage and accessory items, hardware, and finishes.

### PART 4      MATERIALS

4.01            All partitions shall be equal to overhead braced, solid polymer HD by Santana in colors that extend through the entire thickness of the panels. Colors to be selected by the Architect.

4.02            Doors and panels shall be 55" high and mounted at 14" above finished floor.

4.03            Pilasters shall be 82" high and fastened to non-corrosive polymer resin shoes.

4.04            All hardware shall be fabricated from heavy aluminum extrusion (6463-T5 alloy) with clear anodized finish.

4.05            Bumper Coat Hook: Provide rubber tipped combination bumper and coat hook for each compartment.

4.06            Floor shoes shall be non-metallic.

4.06            Paper holders are provided under Section 10 28 00.

PART 5      INSTALLATION

5.01            Install in a rigid, straight, plumb and level manner with layout as indicated. Provide not more than ½" clearance between pilasters and panels, and not more than 1" clearance between panels and walls.

5.02            No evidence of drilling, cutting or patching shall be visible in the finished work.

END OF SECTION

Mike Marshall, 09/2026

## SECTION 10 28 00 – TOILET ACCESSORIES

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Provide toilet accessories at toilet rooms.

#### 1.02 SUBMITTALS

- A. Submit for approval product data, accessory schedule.

#### 1.03 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

### PART 2 - PRODUCTS

- 2.01 Furnish and install the following items by Bobrick, ASI or equal:

| <u>ITEM</u>          | <u>DESCRIPTION</u>                                             |
|----------------------|----------------------------------------------------------------|
| A. Toilet paper roll | B-2892 Double Roll                                             |
| B. Grab Bars         | B-6806.99 x 42 peened 1 ½” (2 at each toilet)                  |
| C. Mirror            | B-2908 2436                                                    |
| D. Hand Dryer        | See Electrical drawings                                        |
| E. Napkin Disposal   | B-5270 Matrix series surface mounted napkin disposal           |
| F. Changing Station  | Koala Kare B-KB310 Surface mounted horizontal Changing station |
| G. Soap Dispenser    | B-5050 Matrix series surface mounted soap dispenser            |

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- B. Install grab bars to withstand a downward load of at least 250 lbs, when tested according to method in ASTM F 446.
- C. Restore damaged finishes and test for proper operation. Clean and protect work from damage.
- D. Install wood blocking in walls at grab bars and changing station.

END OF SECTION

## SECTION 22 00 00 – PLUMBING 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.
- A. This is a basic plumbing requirements section. The provisions of this section apply to work of all Division 22 sections.
- B. Review all other contract documents to be aware of conditions affecting work herein.
- C. All work under Division 22 shall be constructed in accordance with the codes listed herein. The design has been based on the requirements of these codes; and while it is not the responsibility of the contractor to verify that all work called for complies with these codes, he shall be responsible for calling to the architect/engineer's attention any details or specifications that are not in conformance with these or other codes.
- D. Where code conflict exists, generally the most restrictive requirement applies. Comply with current code edition, unless noted.
  - 1. 2020 Florida Building Code.
  - 2. 2020 Florida Plumbing Code.
  - 3. 2020 Fuel Gas Code.
  - 4. National Electric Code (NFPA 70).
  - 5. Life Safety Code (NFPA 101).
  - 6. Air Conditioning and Ventilating Systems (NFPA 90a).
  - 7. Handicapped Accessibility, ANSI A117.1 And Florida Statute Chapter 553, Part V.
- E. All plumbing materials, installation and systems shall meet the requirements of the following standards, including the latest addenda and amendments, to the extent referenced:
  - 1. Underwriters' Laboratories (UL)
  - 2. American National Standards Institution (ANSI)
  - 3. American Society of Testing Materials (ASTM)
  - 4. Air Conditioning and Refrigeration Institute (ARI)
  - 5. National Fire Protection Association (NFPA)
  - 6. National Electrical Manufacturers Association (NEMA)
  - 7. American Society of Plumbing Engineers (ASPE)
- F. Codes or standards applying to a specific part of the work may be included in that section.
- G. Comply with regulations and codes of suppliers of utilities.

- H. Where no specific method or form of construction is called for in the contract documents, the contractor shall comply with code requirements when carrying out such work.

## 1.2 SUMMARY

### A. Related Sections:

#### 1. SECTION 23 00 00 MECHANICAL GENERAL

- a. Contractor shall adhere to all requirements provided by above referenced specification sections (e.g., Summary, Definitions, Field measurements and Coordination, Submittals, Quality Assurance, Coordination with multi-discipline trades, Products and Project execution)

## 1.3 GENERAL INFORMATION

- A. This section is a Division-22 Basic Plumbing Materials and Methods Section and is part of each Division-22 Section referring to testing and other procedures specified herein.
- B. Notify the Architect/Engineer when system tests are ready to be witnessed at least 24 hours prior to the test.
- C. All materials, test equipment, and devices required for cleaning, testing, sterilizing, or purging shall be provided by the contractor.

## 1.4 DIVISION 1 GENERAL COORDINATION

- A. Coordinate with the general contractor for all cutting and patching. Contractors performing Division 22 work shall inform the general contractor of all cutting and patching required prior to bidding and shall coordinate installation.

## 1.5 COORDINATION

- A. Coordinate mechanical equipment installation with other building components.
- B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

- E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- F. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.
- G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.
- H. Refer to other Division 22 sections and/or drawings for specific requirements of the particular piping system being installed. Where another Division 22 sections or the drawings conflict with requirements of this section, the other Division 22 sections or the drawings shall take precedence over the general requirements herein.
- I. OSHA: Contractor employee worker protection for all trenching and excavation operations shall comply with 29 CFR 1926.650 Subpart P and all current OSHA requirements.

#### 1.6 MULTI-DISCIPLINE COORDINATION

##### A. DIVISION SITE WORK

- 1. Refer to Division 31, 32 and 33, Sitework for:
  - a. All water, sewer, and storm water piping greater than five feet from the building.
  - b. Manholes and catch-basins.
  - c. Underground tanks and enclosures.
  - d. Site fire protection work.
- 2. The following work is part of Division 22:
  - a. Grease trap.
  - b. All site gas piping.
  - c. All site acid waste piping and neutralization tank.

##### B. DIVISION 3 CONCRETE

- 1. Refer to Division 3, Concrete for:
  - a. Rough grouting in and around plumbing work.
  - b. Patching concrete cut to accommodate plumbing work.
- 2. The following is part of Division 22 work, complying with the requirements of Division 3
  - a. Curbs, foundations and pads for plumbing equipment.
  - b. Basins, sumps, and vaults of plumbing work.
  - c. Underground structural concrete to accommodate plumbing work.
  - d. Inertia bases.

C. DIVISION 5 METALS

1. Refer to Division 5, Metals for:
  - a. Framing openings for plumbing equipment.
2. The following is part of Division 22 work.
  - a. Supports for plumbing work.

D. DIVISION 6 WOOD AND PLASTIC

1. Refer to Division 6, Wood for:
  - a. Framing openings for plumbing equipment

E. DIVISION 7 THERMAL AND MOISTURE PROTECTION

1. Refer to Division 7, Thermal and Moisture Protection for:
  - a. Installation of all roof curbs and roof supports for plumbing work.
  - b. Caulking and waterproofing of all wall and roof mounted plumbing work.
  - c. Providing all roof curbs and all vent flashing for metal roofs.
2. The following is part of Division 22 work, complying with the requirements of Division 7.
  - a. Fire barrier penetration seals.

F. DIVISION 9 FINISHES

1. Refer to Division 9, Finishes for:
  - a. Painting exposed ductwork, piping, and equipment.
  - b. Painting structural metal and concrete for plumbing work.
  - c. Painting door grilles and access panels.
  - d. Painting color-coded plumbing work indicated for continuous painting. See color schedule in Division 22 section, "Plumbing Identification".
  - e. Installation of access doors in gypsum drywall.
  - f. Colors shall be selected by the Architect for all painting of exposed plumbing work in occupied spaces, unless specified herein. Do not paint insulated or jacketed surfaces.
2. Perform the following as part of Division 22 work:
  - a. Touch up painting of factory finishes.

- b. Painting of all hangers.

#### G. DIVISION 10 SPECIALTIES

- 1. Refer to Division 10, Specialties for:
  - a. Fire extinguishers and fire extinguisher cabinets and accessories.

#### H. DIVISION 11 EQUIPMENT

- 1. Refer to Division 11, Equipment for:
  - a. Equipment for all food service equipment to be provided. Unless noted otherwise, this includes the cooking hoods with fire suppression, dishwasher hoods, dishwasher booster heaters, and food preparation/cleanup equipment.
  - b. Equipment for all laboratory equipment including cabinets, casework, student stations, demonstration desks, safety stations, eyewashes, and all related fixtures, fittings, and trim.
- 2. Provide the following as part of Division 22 work:
  - a. All trim including faucets, waste connections, drain traps, vents, valves, piping, flashing, fittings, strainers, and other materials necessary to make equipment operational. Provide rough-in for all equipment. Provide final connections for all equipment.
  - b. All fixtures specified in Contract Documents. See plumbing schedule.
  - c. All automatic gas valves for shutoff of gas to cooking appliances when fire suppression system activates. Div 23 to provide valve. Coordinate type of valve with fire suppression system supplier. Div. 22 to install gas valve. Coordinate power requirements with Div. 26.
  - d. All trim not furnished by Division 11 includes drains, wastes, continuous wastes, tailpieces, traps and similar devices necessary to make fixtures operational. Provide rough-in for all fixtures. Provide final connections for all fixtures. Provide all fixtures specified in Contract Documents.

#### I. DIVISION 26 ELECTRICAL

- a. The plumbing contractor shall coordinate the exact electrical requirements of all plumbing equipment being provided with the electrical contractor. Where approval submittals are required, this coordination shall be accomplished prior to making the submittals. The electrical design shown on the drawings supports the plumbing equipment basis of design. If plumbing equipment is submitted with different electrical requirements, it is the responsibility of the plumbing contractor to resolve all required electrical design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, etc.) and clearly show the new electrical design on the plumbing submittal with a written statement that this design will be provided at no additional cost. Plumbing submittals made with no written reference

to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

- b. Electrical contractors shall provide disconnect switches, starters, and contactors for plumbing equipment unless specifically noted as being furnished as part of plumbing equipment.
- c. Electrical contractors shall provide all power wiring, raceway and devices, and make final electrical connections to all plumbing equipment, switches, starters, contactors, controllers, and similar equipment.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT AND MATERIALS

- A. See SECTION 23 00 00.

### 2.2 REQUEST FOR SUBSTITUTION

- A. See SECTION 23 00 00

### 2.3 EXCAVATION AND BACKFILL MATERIALS

- A. See Section 23 00 00

## PART 3 - EXECUTION

### 3.1 WORKMANSHIP

- A. See Section 23 00 00

### 3.2 COORDINATION

- A. See Section 23 00 00

### 3.3 RECORD DRAWINGS

- A. See Section 23 00 00

### 3.4 ACCEPTANCE

- A. See Section 23 00 00

### 3.5 PLUMBING DEMOLITION

- A. Refer to Division 1 Sections and Contract Drawings for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.
- C. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
- D. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
- E. Equipment to Be Removed: Disconnect and cap services and remove equipment.
- F. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
- G. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

### 3.6 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems. Individual Division 22 piping Sections specify unique piping installation requirements.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping such that no piping passes over electrical panels.
- F. Refer to fire protection, plumbing and HVAC specifications for sleeve, sleeve seal system and escutcheon requirements.
- G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- H. Install piping to permit valve servicing.

- I. Install piping at indicated slopes.
- J. Install piping free of sags and bends.
- K. Install fittings for changes in direction and branch connections.
- L. Install piping to allow application of insulation.
- M. Select system components with pressure rating equal to or greater than system operating pressure.
- N. Verify final equipment locations for roughing-in.
- O. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### 3.7 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. See Section 23 00 00

### 3.8 PAINTING

- A. See Section 23 00 00

### 3.9 CONCRETE BASES

- A. See Section 23 00 00

### 3.10 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. See Section 23 00 00

### 3.11 CUTTING AND PATCHING

- A. See Section 23 00 00

### 3.12 GROUTING

- A. See Section 23 00 00

### 3.13 EXCAVATION AND BACKFILL

- A. See Section 23 00 00

### 3.14 PRESSURE TESTS

- A. General: provide temporary equipment for testing, including pump and gages. Test piping systems before insulation is installed wherever feasible and remove control devices before testing. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with the indicated medium and pressurize for indicated pressure and time.
- B. The required test period is two hours.
- C. No piping, fixtures, or equipment shall be concealed or covered until they have been tested. The contractor shall apply each test and ensure that it is satisfactory for the period specified before calling the architect/engineer to observe the test. Test shall be repeated upon request to the satisfaction of those making the inspection.
- D. Observe each test section for leakage at the end of the test period. Test fails if leakage is observed or if pressure drop exceeds 5% of the test pressure.
- E. Check of systems during application of test pressures should include visual check for water leakage and soap bubble or similar for air and nitrogen leakage.
- F. Repair piping systems sections which fail required piping test, by disassembly and re-installation, using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.
- G. Pressure test requirements
  - 1. Soil, waste, vent and acid waste and vent: Test all piping within the building with a 10-foot head of water. Test piping in sections so that all joints are tested. Provide test tees as required.
  - 2. Domestic water: Perform hydrostatic test on all piping within the building at twice the normal static pressure at service point, but not less than 100 psig. Once tested, flush out piping and leave under pressure of the supply main or 40 psig for the balance of the construction period.

### 3.15 CLEANING AND STERILIZATION

- A. Sleeve-seal systems in this article are used, in slabs-on-grade and below grade in exterior concrete walls, for a watertight seal around service piping entries into the building. These systems typically require installation in a sleeve for proper operation.
- B. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- C. General: clean exterior surfaces of installed piping systems of superfluous materials and prepare for application of specified coatings (if any). Flush out piping systems with clean water before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items.

- D. Flush and drain all water systems at least three times. Replace startup strainers with operating strainers.
- E. Sterilization of domestic water systems
  - 1. Prerequisites: all hot and cold-water piping installed (complete), all fixtures connected, system flushed out, and system filled with water.
  - 2. The shut off valve at the water main shall be closed, all fixture outlets opened slightly, and a sterilizing solution shall be introduced at a manifold connection installed by the contractor at the meter.
  - 3. The solution shall contain 50 parts per million of available chlorine. The chlorinating material shall be either liquid chlorine or calcium hypochlorite. The solution shall be allowed to stand in the system for at least eight hours after which the entire system shall be flushed.
  - 4. After final flushing, all aerators shall be removed, cleaned, and reinstalled. After final flush the residual chlorine shall not exceed 0.2 parts per million.
  - 5. The architect/engineer shall be notified 24 hours prior to the procedure so that it can be witnessed.
  - 6. Provide sampling and certified reports by an independent testing lab. Provide written health department approval of disinfection samples.

END OF SECTION 22 00 00

## SECTION 22 05 17 - SLEEVES AND SLEEVE SEALS FOR PLUMBING 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.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Sleeves.
  - 2. Sleeve-seal systems.
  - 3. Grout.

#### 1.3 ACTION SUBMITTALS

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

### PART 2 - PRODUCTS

#### 2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral water stop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

#### 2.2 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

## 2.3 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Non-shrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

## PART 3 - EXECUTION

### 3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
  1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
  1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
  2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
  2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
  3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Division 07.
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07.

### 3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

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

### 3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
1. Exterior Concrete Walls below Grade:
    - a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.
      - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
  2. Concrete Slabs-on-Grade:
    - a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.
      - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
  3. Concrete Slabs above Grade:
    - a. Piping Smaller Than NPS 6: PVC-pipe sleeves.
  4. Interior Partitions:
    - a. Piping Smaller Than NPS 6: PVC-pipe sleeves.

END OF SECTION 22 05 17

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## SECTION 22 05 18 - ESCUTCHEONS FOR PLUMBING 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.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Escutcheons.
  - 2. Floor plates.

#### 1.3 ACTION SUBMITTALS

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

### PART 2 - PRODUCTS

#### 2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

#### 2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
  - 1. Escutcheons for New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
    - c. Insulated Piping: One-piece, stamped-steel type.
    - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
    - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
    - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
    - g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
    - h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
    - i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
    - j. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.
    - k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.
- C. Install floor plates for piping penetrations of equipment-room floors.
- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
  - 1. New Piping: One-piece, floor-plate type.

### 3.2 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 22 05 18

## SECTION 22 05 23 - GENERAL-DUTY VALVES FOR PLUMBING 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.

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Brass ball valves.
  - 2. Bronze ball valves.
  - 3. Bronze swing check valves.
  - 4. Bronze gate valves.
  - 5. Bronze globe valves.

- B. Related Sections:

- 1. Section 22 05 53 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
  - 2. Section 22 11 16 "Domestic Water Piping" for valves applicable only to this piping.
  - 3. Section 22 13 19 "Sanitary Waste Piping Specialties" for valves applicable only to this piping.
  - 4. Section 22 14 23 "Storm Drainage Piping Specialties" for valves applicable only to this piping.

#### 1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Non rising stem.
- E. RS: Rising stem.

#### 1.4 ACTION SUBMITTALS

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

## 1.5 QUALITY ASSURANCE

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
  - 1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
  - 2. ASME B31.1 for power piping valves.
  - 3. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 for valve materials for potable-water service.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, grooves, and weld ends.
  - 3. Set angle, gate, and globe valves closed to prevent rattling.
  - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
  - 5. Set butterfly valves closed or slightly open.
  - 6. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valve Actuator Types:
  - 1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
  - 2. Handwheel: For valves other than quarter-turn types.
  - 3. Hand lever: For quarter-turn valves NPS 6 and smaller.
- E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

F. Valve-End Connections:

1. Grooved: With grooves according to AWWA C606.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

## 2.2 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Milwaukee Valve Company.
  - b. NIBCO INC.
  - c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
  - a. Standard: MSS SP-110.
  - b. SWP Rating: 150 psig.
  - c. CWP Rating: 600 psig.
  - d. Body Design: Two pieces.
  - e. Body Material: Forged brass.
  - f. Ends: Threaded.
  - g. Seats: PTFE or TFE.
  - h. Stem: Stainless steel.
  - i. Ball: Stainless steel, vented.
  - j. Port: Full.

## 2.3 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Milwaukee Valve Company.
  - b. NIBCO INC.
  - c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:

- a. Standard: MSS SP-110.
- b. SWP Rating: 150 psig.
- c. CWP Rating: 600 psig.
- d. Body Design: Two pieces.
- e. Body Material: Bronze.
- f. Ends: Threaded.
- g. Seats: PTFE or TFE.
- h. Stem: Stainless steel.
- i. Ball: Stainless steel, vented.
- j. Port: Full.

## 2.4 BRONZE SWING CHECK VALVES

### A. Class 150, Bronze Swing Check Valves with Bronze Disc:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Milwaukee Valve Company.
  - b. NIBCO INC.
- 2. Description:
  - a. Standard: MSS SP-80, Type 3.
  - b. CWP Rating: 300 psig.
  - c. Body Design: Horizontal flow.
  - d. Body Material: ASTM B 62, bronze.
  - e. Ends: Threaded.
  - f. Disc: Bronze.

## 2.5 BRONZE GATE VALVES

### A. Class 150, NRS Bronze Gate Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Milwaukee Valve Company.
  - b. NIBCO INC.
  - c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- 2. Description:
  - a. Standard: MSS SP-80, Type 1.
  - b. CWP Rating: 300 psig.
  - c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
  - d. Ends: Threaded.
  - e. Stem: Bronze.
  - f. Disc: Solid wedge; bronze.

- g. Packing: Asbestos free.
- h. Handwheel: Malleable iron, bronze, or aluminum.

## 2.6 BRONZE GLOBE VALVES

### A. Class 150, Bronze Globe Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Milwaukee Valve Company.
  - b. NIBCO INC.
  - c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
  - a. Standard: MSS SP-80, Type 2.
  - b. CWP Rating: 300 psig.
  - c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
  - d. Ends: Threaded.
  - e. Stem: Bronze.
  - f. Disc: PTFE or TFE.
  - g. Packing: Asbestos free.
  - h. Handwheel: Malleable iron, bronze, or aluminum.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

### 3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install check valves for proper direction of flow and as follows:
  - 1. Swing Check Valves: In horizontal position with hinge pin level.
  - 2. Check Valves: In horizontal or vertical position, between flanges.

### 3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

### 3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
  - 1. Shutoff Service: Ball or globe valves.
  - 2. Throttling Service: Ball or globe valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
  - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
  - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
  - 3. For Grooved-End Copper Tubing: Valve ends may be grooved.

### 3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 3/4 and Larger:
  - 1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
  - 2. Ball Valves: Two-piece, full port, brass, or bronze with stainless-steel trim.
  - 3. Bronze Swing Check Valves: Class 150, bronze disc.
  - 4. Bronze Gate Valves: Class 150, NRS.
  - 5. Bronze Globe Valves: Class 150, bronze disc.

END OF SECTION 22 05 23

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

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Metal pipe hangers and supports.
  - 2. Trapeze pipe hangers.
  - 3. Thermal-hanger shield inserts.
  - 4. Fastener systems.
  - 5. Pipe stands.
  - 6. Equipment supports.
- B. Related Sections:
  - 1. Section 05 50 00 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
  - 2. Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for vibration isolation devices.

#### 1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
  - 1. Trapeze pipe hangers.
  - 2. Metal framing systems.
  - 3. Pipe stands.
  - 4. Equipment supports.
- C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Detailed fabrication and assembly of trapeze hangers.
  - 2. Design Calculations: Calculate requirements for designing trapeze hangers.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

## 1.6 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

## PART 2 - PRODUCTS

### 2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
  - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
  - 2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
  - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
  - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
  - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Copper Pipe Hangers:
  - 1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
  - 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

### 2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

### 2.3 THERMAL-HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Carpenter & Paterson, Inc.
  - 2. Clement Support Services.
  - 3. ERICO International Corporation.
  - 4. National Pipe Hanger Corporation.
  - 5. PHS Industries, Inc.
  - 6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
  - 7. Piping Technology & Products, Inc.

8. Rilco Manufacturing Co., Inc.
  9. Value Engineered Products, Inc.
- 
- B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.
  - C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.
  - D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
  - E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
  - F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

## 2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened Portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

## 2.5 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.
- C. High-Type, Single-Pipe Stand:
  1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
  2. Base: Stainless steel.
  3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
  4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.
- D. High-Type, Multiple-Pipe Stand:
  1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
  2. Bases: One or more; plastic.

3. Vertical Members: Two or more protective-coated-steel channels.
  4. Horizontal Member: Protective-coated-steel channel.
  5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.
- E. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

## 2.6 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

## 2.7 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

## 2.8 MISCELLANEOUS MATERIALS

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

# PART 3 - EXECUTION

## 3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
  2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

- C. Thermal-Hanger Shield Installation: Install in pipe hangers or shield for insulated piping.
- D. Fastener System Installation:
  - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturers. Install fasteners according to powder-actuated tool manufacturer's operating manual.
  - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to the manufacturer's written instructions.
- E. Pipe Stand Installation:
  - 1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
- F. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- J. Install lateral bracing with pipe hangers and supports to prevent swaying.
- K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- N. Insulated Piping:
  - 1. Attach clamps and spacers to piping.
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
  - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
  - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
  - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
  - b. NPS 4: 12 inches long and 0.06 inch thick.
5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### 3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment support.

### 3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

### 3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

### 3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

### 3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.
- F. Use copper-plated pipe hangers and stainless-steel attachments for copper piping and tubing.
- G. Use padded hangers for piping that is subject to scratching.
- H. Use thermal-hanger shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
  - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
  - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.

4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
  5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
  6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
  7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
  8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
  9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
  10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
  11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
  12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
  13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
  14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
  15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
  16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
  2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
  2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
  3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
  4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
  5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.

2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
  3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
  6. C-Clamps (MSS Type 23): For structural shapes.
  7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
  8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
  9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
  10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
  11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
  12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    - a. Light (MSS Type 31): 750 lb.
    - b. Medium (MSS Type 32): 1500 lb.
    - c. Heavy (MSS Type 33): 3000 lb.
  13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
  14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
  15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
  2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
  3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- O. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- P. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
- Q. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 22 05 29

## SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Equipment labels.
  - 2. Warning signs and labels.
  - 3. Pipe labels.

#### 1.3 ACTION SUBMITTALS

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

#### 1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

### PART 2 - PRODUCTS

#### 2.1 EQUIPMENT LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic phenolic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Black.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- I. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

## 2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Red.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Label Content: Include caution and warning information, plus emergency notification instructions.

## 2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

- C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
  - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
  - 2. Lettering Size: At least 1-1/2 inches high.
  - 3. Designation abbreviations:
    - a. DOMESTIC COLD WATER
    - b. DOMESTIC HOT WATER

### PART 3 - EXECUTION

#### 3.1 PREPARATION

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

#### 3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of plumbing equipment.
- B. Locate equipment labels where accessible and visible.

#### 3.3 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in Division 9.
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
  - 1. Near each valve and control device.
  - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
  - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
  - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
  - 5. Near major equipment items and other points of origination and termination.
  - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment or in concealed spaces.
  - 7. Pipe stenciling or painting of piping identification is not permitted.
- C. Pipe Label Color Schedule:
  - 1. Low-Pressure, Compressed-Air Piping:
    - a. Background Color: Blue.

- b. Letter Color: White.
- 2. Domestic Cold-Water Piping:
  - a. Background Color: Green.
  - b. Letter Color: White.
- 3. Domestic Hot-Water Piping:
  - a. Background Color: Yellow.
  - b. Letter Color: Black.
- 4. Sanitary Waste, Vent, and Storm Piping:
  - a. Background Color: Black.
  - b. Letter Color: White.
- 5. Natural Gas Piping:
  - a. Background Color: Yellow.
  - b. Letter Color: Black.

END OF SECTION 22 05 53

## SECTION 22 07 19 - PLUMBING PIPING INSULATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes insulating the following plumbing piping services:
  - 1. Domestic cold-water piping.
  - 2. Domestic hot-water piping.
  - 3. Domestic recirculating hot-water piping.
  - 4. Sanitary waste piping exposed to freezing conditions.
  - 5. Supplies and drains for handicap-accessible lavatories and sinks.
- B. Related Sections:
  - 1. Section 22 07 16 "Plumbing Equipment Insulation."

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
  - 2. Detail attachment and covering of heat tracing inside insulation.
  - 3. Detail insulation application at pipe expansion joints for each type of insulation.
  - 4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
  - 5. Detail removable insulation at piping specialties, equipment connections, and access panels.
  - 6. Detail application of field-applied jackets.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

## 1.5 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
  - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

## 1.6 COORDINATION

- A. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- B. Coordinate installation and testing of heat tracing. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

## PART 2 - PRODUCTS

### 2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

- F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Pittsburgh Corning Corporation; Foamglas.
    - b. Engineer approved equal.
  2. Special-Shaped Insulation: ASTM C 552, Type III.
  3. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
  4. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
  5. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Aeroflex USA, Inc.; Aerocel.
    - b. Armacell LLC; AP Armaflex.
    - c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.
- H. Mineral-Fiber, Preformed Pipe Insulation:
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Johns Manville; Micro-Lok.
    - b. Knauf Insulation; 1000-Degree Pipe Insulation.
    - c. Owens Corning; Fiberglas Pipe Insulation.
  2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

## 2.2 INSULATING CEMENTS

- A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.
    - b. Engineer approved equal.

## 2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

- B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 81-84.
    - b. Engineer approved equal.
  2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Aeroflex USA, Inc.; Aeroseal.
    - b. Armacell LLC; Armaflex 520 Adhesive.
    - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
    - d. K-Flex USA; R-373 Contact Adhesive.
  2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
1. Products: Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
    - b. Eagle Bridges - Marathon Industries; 225.
    - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
    - d. Mon-Eco Industries, Inc.; 22-25.
  2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
    - b. Eagle Bridges - Marathon Industries; 225.

- c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.
  - d. Mon-Eco Industries, Inc.; 22-25.
- 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. PVC Jacket Adhesive: Compatible with PVC jacket.

- 1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Dow Corning Corporation; 739, Dow Silicone.
  - b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
  - c. P.I.C. Plastics, Inc.; Welding Adhesive.
  - d. Speedline Corporation; Polyco VP Adhesive.
- 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

- 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

- 1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
  - b. Vimasco Corporation; 749.
- 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
- 3. Service Temperature Range: Minus 20 to plus 180 deg F.
- 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
- 5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.

- 1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Encacel.
  - b. Eagle Bridges - Marathon Industries; 570.

- c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 60-95/60-96.
  2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
  3. Service Temperature Range: Minus 50 to plus 220 deg F.
  4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
  5. Color: White.
- D. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
    - b. Eagle Bridges - Marathon Industries; 550.
    - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
    - d. Mon-Eco Industries, Inc.; 55-50.
    - e. Vimasco Corporation; WC-1/WC-5.
  2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
  3. Service Temperature Range: Minus 20 to plus 180 deg F.
  4. Solids Content: 60 percent by volume and 66 percent by weight.
  5. Color: White.

## 2.5 SEALANTS

### A. Joint Sealants:

1. Joint Sealants for Cellular-Glass Products: Subject to compliance with requirements, provide one of the following:
  - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
  - b. Eagle Bridges - Marathon Industries; 405.
  - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
  - d. Mon-Eco Industries, Inc.; 44-05.
  - e. Pittsburgh Corning Corporation; Pittseal 444.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

### B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
    - b. Eagle Bridges - Marathon Industries; 405.
    - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
    - d. Mon-Eco Industries, Inc.; 44-05.
  2. Materials shall be compatible with insulation materials, jackets, and substrates.
  3. Fire- and water-resistant, flexible, elastomeric sealant.
  4. Service Temperature Range: Minus 40 to plus 250 deg F.
  5. Color: Aluminum.
  6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
    - b. Engineer approved equal.
  2. Materials shall be compatible with insulation materials, jackets, and substrates.
  3. Fire- and water-resistant, flexible, elastomeric sealant.
  4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
  5. Color: White.
  6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## 2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
  2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
  3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

## 2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.
1. Products: Subject to compliance with requirements, provide one of the following:

- a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Mast-A-Fab.
- b. Vimasco Corporation; Elastafab 894.

## 2.8 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Johns Manville; Zeston.
    - b. P.I.C. Plastics, Inc.; FG Series.
    - c. Proto Corporation; LoSmoke.
    - d. Speedline Corporation; SmokeSafe.
  2. Adhesive: As recommended by jacket material manufacturer.
  3. Color: White.
  4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
    - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
- C. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
    - b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
    - c. RPR Products, Inc.; Insul-Mate.
  2. Sheet and roll stock ready for shop or field sizing.
  3. Finish and thickness are indicated in field-applied jacket schedules.
  4. Moisture Barrier for Indoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
  5. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
  6. Factory-Fabricated Fitting Covers:
    - a. Same material, finish, and thickness as jacket.
    - b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    - c. Tee covers.
    - d. Flange and union covers.
    - e. End caps.

- f. Beveled collars.
- g. Valve covers.
- h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

## 2.9 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. ABI, Ideal Tape Division; 428 AWF ASJ.
- b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
- c. Compac Corporation; 104 and 105.
- d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

- 2. Width: 3 inches.
- 3. Thickness: 11.5 mils.
- 4. Adhesion: 90 ounces force/inch in width.
- 5. Elongation: 2 percent.
- 6. Tensile Strength: 40 lbf/inch in width.
- 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. ABI, Ideal Tape Division; 491 AWF FSK.
- b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
- c. Compac Corporation; 110 and 111.
- d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.

- 2. Width: 3 inches.
- 3. Thickness: 6.5 mils.
- 4. Adhesion: 90 ounces force/inch in width.
- 5. Elongation: 2 percent.
- 6. Tensile Strength: 40 lbf/inch in width.
- 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. ABI, Ideal Tape Division; 370 White PVC tape.
- b. Compac Corporation; 130.
- c. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. ABI, Ideal Tape Division; 488 AWF.
  - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
  - c. Compac Corporation; 120.
  - d. Venture Tape; 3520 CW.
2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

## 2.10 SECUREMENTS

- A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. ITW Insulation Systems; Gerrard Strapping and Seals.
    - b. RPR Products, Inc.; Insul-Mate Strapping and Seals.

## 2.11 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Engineered Brass Company.
  - b. Insul-Tect Products Co.; a subsidiary of MVG Molded Products.
  - c. McGuire Manufacturing.
  - d. Plumberex.
  - e. Truebro; a brand of IPS Corporation.
  - f. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Truebro; a brand of IPS Corporation.
  - b. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

#### 3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Coordinate with heat trace installation.**
- C. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- D. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- E. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- F. Install multiple layers of insulation with longitudinal and end seams staggered.
- G. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- H. Keep insulation materials dry during application and finishing.
- I. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- J. Install insulation with least number of joints practical.

- K. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- L. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- M. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.
  - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
  - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
    - a. For below-ambient services, apply vapor-barrier mastic over staples.
  - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
  - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- N. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- O. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- P. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- Q. For above-ambient services, do not install insulation to the following:
  - 1. Vibration-control devices.
  - 2. Testing agency labels and stamps.
  - 3. Nameplates and data plates.
  - 4. Cleanouts.

### 3.3 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
  - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
  - 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
  - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
  - 1. Pipe: Install insulation continuously through floor penetrations.
  - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

### 3.4 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
  2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
  4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
  5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
  6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
  7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
  8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
  9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.

2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

### 3.5 INSTALLATION OF CELLULAR-GLASS INSULATION

#### A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

#### B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

#### C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

#### D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.

2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

### 3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
  1. Install pipe insulation to outer diameter of pipe flange.
  2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
  3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
  4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
  1. Install mitered sections of pipe insulation.
  2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
  1. Install preformed valve covers manufactured of same material as pipe insulation when available.
  2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
  3. Install insulation to flanges as specified for flange insulation application.
  4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

### 3.7 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
  1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
  2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
  3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.

4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

### 3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

- C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

### 3.9 FINISHES

- A. Do not field paint aluminum or stainless-steel jackets.

### 3.10 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
  - 1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

### 3.11 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
  - 1. Drainage piping located in crawl spaces.
  - 2. Underground piping.
  - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

### 3.12 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Cold Water: Insulation shall be one of the following:
  - 1. Flexible Elastomeric: 1 inch thick.
  - 2. Cellular Glass: 1 inch thick.
- B. Domestic Hot and Recirculated Hot Water: Insulation shall be one of the following:
  - 1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.

2. Cellular Glass: 1-1/2 inch thick.

C. Stormwater and Overflow: Insulation shall be one of the following:

1. Flexible Elastomeric: 1/2 inch thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

D. Roof Drain and Overflow Drain Bodies: Insulation shall be one of the following:

1. Flexible Elastomeric: 1/2 inch thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

### 3.13 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. None.

D. Piping, Exposed:

1. PVC: 20 mils thick.

### 3.14 OUTDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water: Insulation shall be one of the following:

1. Flexible Elastomeric: 1-1/2 inch thick.
2. Cellular Glass: 1-1/2 inch thick.

B. Domestic Hot and Recirculated Hot Water: Insulation shall be one of the following:

1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.
2. Cellular Glass: 1-1/2 inch thick.

C. Stormwater and Overflow: Insulation shall be one of the following:

1. Flexible Elastomeric: 1/2 inch thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

D. Roof Drain and Overflow Drain Bodies: Insulation shall be one of the following:

1. Flexible Elastomeric: 1/2 inch thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

3.15 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket. Coordinate with heat trace installation. Insulate pipe until 12" below grade.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Exposed:
  - 1. Aluminum Jacket, Stucco Embossed: 0.02 inch thick.

END OF SECTION 22 07 19

## SECTION 22 11 16 - 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.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

### PART 2 - PRODUCTS

#### 2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."

#### 2.2 CPVC PIPING

- A. CPVC Pipe: ASTM F 441/F 441M, **Schedule 40.**

- 1. CPVC Socket Fittings: **ASTM F 438 for Schedule 40.**
  - 2. CPVC Threaded Fittings: ASTM F 437, Schedule 80.

B. CPVC Piping System: ASTM D 2846/D 2846M, SDR 11, pipe and socket fittings.

C. CPVC Tubing System: ASTM D 2846/D 2846M, SDR 11, tube and socket fittings.

## 2.3 PEX TUBE AND FITTINGS

A. PEX Distribution System: ASTM F 877, SDR 9 tubing.

B. Fittings for PEX Tube: ASTM F 1807, metal-insert type with copper or stainless-steel crimp rings and matching PEX tube dimensions.

C. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 877; with plastic or corrosion-resistant-metal valve for each outlet.

## 2.4 PVC PIPE AND FITTINGS

A. PVC Pipe: ASTM D 1785, **Schedule 40.**

B. PVC Socket Fittings: **ASTM D 2466 for Schedule 40.**

C. PVC Schedule 80 Threaded Fittings: ASTM D 2464.

## 2.5 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch (3.2 mm) thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solvent Cements for Joining CPVC Piping and Tubing: ASTM F 493.

1. CPVC solvent cement shall have a VOC content of 490 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

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

2. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

## 2.6 TRANSITION FITTINGS

### A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

### B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

### C. Plastic-to-Metal Transition Fittings:

1. Manufacturer: Subject to compliance with requirements, provide comparable product by one of the following:
  - a. Charlotte Pipe and Foundry Company.
  - b. Harvel Plastics, Inc.
  - c. Spears Manufacturing Company.
2. Description:
  - a. **CPVC or PVC** one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.

### D. Plastic-to-Metal Transition Unions:

1. Manufacturers: Subject to compliance with requirements, provide comparable product by one of the following:
  - a. Colonial Engineering, Inc.
  - b. NIBCO Inc.
  - c. Spears Manufacturing Company.
2. Description:
  - a. **CPVC or PVC** four-part union.
  - b. Solvent-cement-joint **or threaded** plastic end.
  - c. Rubber O-ring.
  - d. Union nut.

## PART 3 - EXECUTION

### 3.1 EARTHWORK

- A. Comply with requirements in Section 31 20 00 "Earth Moving" for excavating, trenching, and backfilling.

### 3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 22 05 19 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 22 11 19 "Domestic Water Piping Specialties."
- C. Install shutoff valve immediately upstream of each dielectric fitting.
- D. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 22 11 19 "Domestic Water Piping Specialties."
- E. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.
- F. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- G. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- H. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- I. Install piping to permit valve servicing.
- J. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- K. Install piping free of sags and bends.
- L. Install fittings for changes in direction and branch connections.
- M. Install thermometers on outlet piping from each water heater. Comply with requirements for thermometers in Section 22 05 19 "Meters and Gages for Plumbing Piping."

- N. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- O. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- P. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

### 3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- E. Joint Construction for Solvent-Cemented Plastic Piping: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
  - 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
  - 3. PVC Piping: Join according to ASTM D 2855.
- F. Joints for PEX Piping: Join according to ASTM F 1807.
- G. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

### 3.4 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
  - 1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
  - 2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

- C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

### 3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger, support products, and installation in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

- 1. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.

- 2. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.

- 3. Vertical Piping: MSS Type 8 or 42, clamps.

- 4. Individual, Straight, Horizontal Piping Runs:

- a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

- b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

- c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

- 5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

- 6. Base of Vertical Piping: MSS Type 52, spring hangers.

- B. Support vertical piping and tubing at base and at each floor.

- C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

- D. Install vinyl-coated hangers for CPVC piping with the following maximum horizontal spacing and minimum rod diameters:

- 1. NPS 1 and Smaller: 36 inches with 3/8-inch rod.

- 2. NPS 1-1/4 to NPS 2 : 48 inches with 3/8-inch rod.

- 3. NPS 2-1/2 to NPS 3-1/2: 48 inches with 1/2-inch rod.

- 4. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.

- E. Install supports for vertical CPVC piping every 60 inches for NPS 1 and smaller, and every 72 inches for NPS 1-1/4 and larger.

- F. Install vinyl-coated hangers for PEX piping with the following maximum horizontal spacing and minimum rod diameters:

- 1. NPS 1 and Smaller: 32 inches with 3/8-inch rod.

- G. Install hangers for vertical PEX piping every 48 inches.

- H. Install vinyl-coated hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

- 1. NPS 2 and Smaller: 48 inches with 3/8-inch rod.

- 2. NPS 2-1/2 to NPS 3-1/2: 48 inches with 1/2-inch rod.

- 3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.

- I. Install supports for vertical PVC piping every 48 inches.
- J. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

### 3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
  - 1. Water Heaters: Cold-water inlet 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 that required by plumbing code.
  - 3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

### 3.7 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 22 05 53 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

### 3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Piping Inspections:
    - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
    - b. During installation, notify authorities having jurisdiction at least one day 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 authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
  - c. Re-inspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for re-inspection.
  - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
2. Piping Tests:
  - a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
  - b. 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 a separate report for each test, complete with diagram of portion of piping tested.
  - c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  - d. 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 it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
  - e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
  - f. Prepare reports for tests and for corrective action required.
- B. Domestic water piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.9 ADJUSTING

- A. Perform the following adjustments before operation:
  1. Close drain valves, hydrants, and hose bibbs.
  2. Open shutoff valves to fully open position.
  3. Open throttling valves to proper setting.
  4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch. Adjust calibrated balancing valves to flows indicated.
  5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
  6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
  7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
  8. Check plumbing specialties and verify proper settings, adjustments, and operation.

### 3.10 CLEANING

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

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures 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. Repeat procedures if biological examination shows contamination.
  - e. Submit water samples in sterile bottles to authorities having jurisdiction.

### 3.11 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be one of the following:

1. PVC, Schedule 40; socket fittings; and solvent-cemented joints.

- E. Aboveground domestic water piping, NPS 2 and smaller, shall be the following:

1. CPVC, Schedule 40; socket fittings; and solvent-cemented joints.

2. CPVC Tubing System: CPVC tube; CPVC socket fittings; and solvent-cemented joints. NPS 1-1/2 and NPS 2 CPVC pipe with CPVC socket fittings may be used instead of tubing.

3. PEX tube, NPS 1 and smaller; fittings for PEX tube; and crimped joints.

4. PVC, Schedule 40; socket fittings; and solvent-cemented joints.

- F. Aboveground domestic water piping, NPS 2-1/2 to NPS 4 shall be the following:

1. CPVC, Schedule 40; socket fittings; and solvent-cemented joints.

**2. PVC, Schedule 40; socket fittings; and solvent-cemented joints.**

3.12 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  - 1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 and larger.
  - 2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
  - 3. Hot-Water Circulation Piping, Balancing Duty: Memory-stop balancing valves.
  - 4. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 22 11 16

## SECTION 22 11 19 - DOMESTIC WATER PIPING SPECIALTIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Vacuum breakers.
  - 2. Backflow preventers
  - 3. Balancing valves.
  - 4. Temperature-actuated, water mixing valves.
  - 5. Hose bibbs.
  - 6. Wall hydrants.
  - 7. Water-hammer arresters.
  - 8. Trap-seal primer valves.
  - 9. Trap-seal primer systems.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For domestic water piping specialties.
  - 1. Include diagrams for power, signal, and control wiring.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

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

### 2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig (860 kPa) unless otherwise indicated.

### 2.3 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
  - b. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.
2. Standard: ASSE 1001.
3. Size: NPS 1/4 to NPS 3 (DN 8 to DN 80), as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Rough bronze.

- B. Hose-Connection Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. MIFAB, Inc.
  - b. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
  - c. Woodford Manufacturing Company; a division of WCM Industries, Inc.
  - d. Zurn Industries, LLC; Plumbing Products Group; Light Commercial Products.
  - e. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.
2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Rough bronze.

### 2.4 BACKFLOW PREVENTERS

- A. Reduced-Pressure-Principle Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
  - b. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.
2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 7 psig maximum, through middle third of flow range.
5. Body: Bronze for NPS 2 and smaller; steel with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
7. Accessories:
  - a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
  - b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
  - c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Backflow-Preventer Test Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
  - b. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.
2. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

## 2.5 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Armstrong International, Inc.
  - b. Flo Fab Inc.
  - c. ITT Corporation; Bell & Gossett Div.
  - d. NIBCO Inc.
  - e. TAC.
  - f. TACO Incorporated.
  - g. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
2. Type: Ball valve with two readout ports and memory-setting indicator.
3. Body: Brass.
4. Size: Same as connected piping, but not larger than NPS 2.
5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

- B. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.
- C. Memory-Stop Balancing Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Milwaukee Valve Company.
    - b. NIBCO Inc.
  - 2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
  - 3. Pressure Rating: 400-psig minimum CWP.
  - 4. Size: NPS 2 or smaller.
  - 5. Body: Copper alloy.
  - 6. Port: Standard or full port.
  - 7. Ball: Chrome-plated brass.
  - 8. Seats and Seals: Replaceable.
  - 9. End Connections: Solder joint or threaded.
  - 10. Handle: Vinyl-covered steel with memory-setting device.

## 2.6 TEMPERATURE-ACTUATED, WATER MIXING VALVES

- A. Primary, Thermostatic, Water Mixing Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Lawler Manufacturing Company, Inc.
    - b. Leonard Valve Company.
    - c. Powers; a division of Watts Water Technologies, Inc.
    - d. Symmons Industries, Inc.
  - 2. Standard: ASSE 1017.
  - 3. Pressure Rating: 125 psig minimum unless otherwise indicated.
  - 4. Type: Exposed-mounted, thermostatically controlled, water mixing valve.
  - 5. Material: Bronze body with corrosion-resistant interior components.
  - 6. Connections: Threaded inlets and outlet.
  - 7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
  - 8. Tempered-Water Setting: 110 deg F.
  - 9. Valve Finish: Rough bronze.
  - 10. Piping Finish: Copper.

## 2.7 OUTLET BOXES

- A. Clothes Washer Outlet Boxes:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Acorn Engineering Company.
  - b. Guy Gray Manufacturing Co., Inc.
  - c. IPS Corporation.
  - d. Oatey.
  - e. Symmons Industries, Inc.
  - f. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
  - g. Zurn Industries, LLC; Plumbing Products Group; Light Commercial Products.
2. Mounting: Recessed.
3. Material and Finish: Plastic box and faceplate.
4. Faucet: Combination valved fitting or separate hot- and cold-water valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.
5. Supply Shutoff Fittings: NPS 1/2 gate, globe, or ball valves and NPS 1/2 copper, water tubing.
6. Drain: NPS 2 standpipe and P-trap for direct waste connection to drainage piping.
7. Inlet Hoses: Two 60-inch- long, rubber household clothes washer inlet hoses with female, garden-hose-thread couplings. Include rubber washers.
8. Drain Hose: One 48-inch- long, rubber household clothes washer drain hose with hooked end.

B. Icemaker Outlet Boxes:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Acorn Engineering Company.
  - b. IPS Corporation.
  - c. Oatey.
2. Mounting: Recessed.
3. Material and Finish: Plastic box and faceplate.
4. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 or smaller copper tube outlet.
5. Supply Shutoff Fitting: NPS 1/2 gate, globe, or ball valve and NPS 1/2 copper, water tubing.

2.8 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.

9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include wall flange with each chrome- or nickel-plated hose bibb.

## 2.9 WALL HYDRANTS

### A. Nonfreeze Wall Hydrants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Josam Company.
  - b. MIFAB, Inc.
  - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - d. Watts Drainage Products.
  - e. Woodford Manufacturing Company; a division of WCM Industries, Inc.
  - f. Zurn Industries, LLC; Plumbing Products Group; Light Commercial Products.
2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4 or NPS 1.
7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounted with cover.
9. Box and Cover Finish: Polished nickel bronze.
10. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
11. Nozzle and Wall-Plate Finish: Polished nickel bronze.
12. Operating Keys(s): Two with each wall hydrant.

## 2.10 WATER-HAMMER ARRESTERS

### A. Water-Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. AMTROL, Inc.
  - b. Josam Company.
  - c. MIFAB, Inc.
  - d. Sioux Chief Manufacturing Company, Inc.
  - e. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.

- f. Watts Drainage Products.
  - g. Zurn Industries, LLC; Plumbing Products Group; Specification Drainage Products.
- 2. Standard: ASSE 1010 or PDI-WH 201.
  - 3. Type: Metal bellows.
  - 4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

## 2.11 TRAP-SEAL PRIMER DEVICE

### A. Supply-Type, Trap-Seal Primer Device:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. MIFAB, Inc.
  - b. Precision Plumbing Products, Inc.
  - c. Sioux Chief Manufacturing Company, Inc.
  - d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - e. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
- 2. Standard: ASSE 1018.
- 3. Pressure Rating: 125 psig minimum.
- 4. Body: Bronze.
- 5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
- 6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
- 7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install backflow preventers 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.
  - 1. Locate backflow preventers in same room as connected equipment or system.
  - 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
  - 3. Do not install bypass piping around backflow preventers.
- B. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.
- C. Install balancing valves in locations where they can easily be adjusted.

- D. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
  - 1. Install cabinet-type units recessed in or surface mounted on wall as specified.
- E. Install outlet boxes recessed in wall or surface mounted on wall. Install 2-by-4-inch fire-retardant-treated-wood blocking, wall reinforcement between studs. Comply with requirements for fire-retardant-treated-wood blocking in Section 06 10 00 "Rough Carpentry."
- F. Install water-hammer arresters in water piping according to PDI-WH 201.
- G. Install supply-type, 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.
- H. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

### 3.2 CONNECTIONS

- A. Comply with requirements for ground equipment in Section 26 05 26 "Grounding and Bonding for Electrical Systems."
- B. Fire-retardant-treated-wood blocking is specified in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

### 3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Test each pressure vacuum breaker, reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.4 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 22 11 19

## SECTION 22 13 16 - 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 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Pipe, tube, and fittings.
  - 2. Specialty pipe fittings.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
  - 1. Soil, Waste, and Vent Piping: 10-foot head of water.

#### 1.4 ACTION SUBMITTALS

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

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

#### 1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

## PART 2 - PRODUCTS

### 2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

### 2.2 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: Schedule 40, ASTM D 2665, drain, waste, and vent.
- B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- C. Adhesive Primer: ASTM F 656.
  - 1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Solvent Cement: ASTM D 2564.
  - 1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

### 2.3 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
  - 1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
  - 2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
  - 3. Shielded, Nonpressure Transition Couplings:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Cascade Waterworks Mfg. Co.
      - 2) Mission Rubber Company; a division of MCP Industries, Inc.
    - b. Standard: ASTM C 1460.

- c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
- 4. Pressure Transition Couplings:
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Cascade Waterworks Mfg. Co.
    - 2) Dresser, Inc.
    - 3) EBAA Iron, Inc.
    - 4) JCM Industries, Inc.
    - 5) Romac Industries, Inc.
    - 6) Smith-Blair, Inc.; a Sensus company.
    - 7) The Ford Meter Box Company, Inc.
    - 8) Viking Johnson.
  - b. Standard: AWWA C219.
  - c. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
  - d. Center-Sleeve Material: Manufacturer's standard.
  - e. Gasket Material: Natural or synthetic rubber.
  - f. Metal Component Finish: Corrosion-resistant coating or material.

B. Dielectric Fittings:

- 1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- 2. Dielectric Unions:
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Capitol Manufacturing Company.
    - 2) Central Plastics Company.
    - 3) Hart Industries International, Inc.
    - 4) Jomar International Ltd.
    - 5) Matco-Norca, Inc.
    - 6) McDonald, A. Y. Mfg. Co.
    - 7) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    - 8) Wilkins; a Zurn company.
  - b. Description:
    - 1) Standard: ASSE 1079.
    - 2) Pressure Rating: [125 psig (860 kPa) minimum at 180 deg F (82 deg C)] [150 psig (1035 kPa)] [250 psig (1725 kPa)].
    - 3) End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Flanges:

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

- 1) Capitol Manufacturing Company.
- 2) Central Plastics Company.
- 3) Matco-Norca, Inc.
- 4) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- 5) Wilkins; a Zurn company.

- b. Description:

- 1) Standard: ASSE 1079.
- 2) Factory-fabricated, bolted, companion-flange assembly.
- 3) Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C).
- 4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

4. Dielectric-Flange Insulating Kits:

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

- 1) Advance Products & Systems, Inc.
- 2) Calpico, Inc.
- 3) Central Plastics Company.
- 4) Pipeline Seal and Insulator, Inc.

- b. Description:

- 1) Nonconducting materials for field assembly of companion flanges.
- 2) Pressure Rating: [150 psig (1035 kPa)] <Insert pressure>.
- 3) Gasket: Neoprene or phenolic.
- 4) Bolt Sleeves: Phenolic or polyethylene.
- 5) Washers: Phenolic with steel backing washers.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Install piping to allow application of insulation.
- I. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- J. 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.
- K. 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; 2 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.
- L. Install aboveground PVC piping according to ASTM D 2665 and Section 3.1(B) of this Specification.
- M. Install underground PVC piping according to ASTM D 2321.
- N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

- Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 23 00 00 "Mechanical General."

### 3.2 JOINT CONSTRUCTION

- A. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

### 3.3 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
1. Install transition couplings at joints of piping with small differences in OD's.
  2. In Drainage Piping: Shielded, nonpressure transition couplings.
  3. In Aboveground Force Main Piping: Fitting-type transition couplings.
  4. In Underground Force Main Piping:
    - a. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
    - b. NPS 2 and Larger: Pressure transition couplings.
- B. Dielectric Fittings:
1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
  2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
  3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

### 3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
1. Install galvanized-steel pipe hangers for horizontal piping.
  2. Install galvanized-steel pipe support clamps for vertical piping.
  3. Vertical Piping: MSS Type 8 or Type 42, clamps.
  4. Install individual, straight, horizontal piping runs:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
  5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

- 6. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
  - 2. NPS 3: 48 inches with 1/2-inch rod.
  - 3. NPS 4: 48 inches with 5/8-inch rod.
  - 4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
- G. Install supports for vertical PVC piping every 48 inches.
- H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.5 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. Coordinate with civil site plans.
- 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.
  - 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.
  - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
  - 5. Comply with requirements for backwater valves, cleanouts and drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
  - 6. 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.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections according to the following unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

### 3.6 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

### 3.7 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. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.
- 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.

### 3.8 CLEANING AND PROTECTION

- 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.
- D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

### 3.9 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 and smaller shall be the following:
  - 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
  - 2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- C. Aboveground, vent piping NPS 4 and smaller shall be the following:
  - 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
  - 2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- D. Underground, soil, waste, and vent piping NPS 4 and smaller shall be the following:
  - 1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
  - 2. Hubless, cast-iron soil pipe and fittings; cast-iron hubless-piping couplings; and coupled joints.
  - 3. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
  - 4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 22 13 16

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## SECTION 22 13 19 - SANITARY WASTE PIPING SPECIALTIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

1. Cleanouts.
2. Floor drains.
3. Trench drains.
4. Air-admittance valves.
5. Roof flashing assemblies.
6. Through-penetration firestop assemblies.
7. Miscellaneous sanitary drainage piping specialties.
8. Flashing materials.

#### 1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. FRP: Fiberglass-reinforced plastic.
- C. HDPE: High-density polyethylene plastic.
- D. PE: Polyethylene plastic.
- E. PP: Polypropylene plastic.
- F. PVC: Polyvinyl chloride plastic.

#### 1.4 ACTION SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details for frost-resistant vent terminals.
  1. Wiring Diagrams: Power, signal, and control wiring.
- B. Field quality-control test reports.

## 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

## 1.6 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.
- B. 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.
- C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

## 1.7 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 03 30 00 "Cast-in-Place Concrete."
- B. Coordinate size and location of roof penetrations.

## 1.8 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.

# PART 2 - PRODUCTS

## 2.1 CLEANOUTS

- A. Exposed Metal Cleanouts:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Josam Company; Josam Div.
    - b. MIFAB, Inc.
    - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    - d. Watts Drainage Products Inc.
    - e. Zurn Plumbing Products Group; Specification Drainage Operation.
    - f. Josam Company; Blucher-Josam Div.
  - 2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.

3. Size: Same as connected drainage piping
4. Body Material: As required to match connected piping.
5. Closure: Countersunk brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Closure: Stainless-steel plug with seal.

B. Metal Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Josam Company; Josam Div.
  - b. Sioux Chief Manufacturing Company, Inc.
  - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - d. Watts Drainage Products Inc.
  - e. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.36.2M for threaded, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Heavy-duty, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Closure: Brass plug with straight threads and gasket.
7. Adjustable Housing Material: Cast iron with threads.
8. Frame and Cover Material and Finish: Polished bronze.
9. Frame and Cover Shape: Round.
10. Top Loading Classification: Heavy Duty.
11. Riser: ASTM A 74, Cast-iron drainage pipe fitting and riser to cleanout.
12. Standard: ASME A112.3.1.
13. Size: Same as connected branch.
14. Housing: Stainless steel.
15. Closure: Stainless steel with seal.
16. Riser: Stainless-steel drainage pipe fitting to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Josam Company; Josam Div.
  - b. MIFAB, Inc.
  - c. Smith, Jay R. Mfg. Co.; d of Smith Industries, Inc.
  - d. Watts Drainage Products Inc.
  - e. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: As required to match connected piping.
5. Closure: Countersunk brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

8. Wall Access: Round, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

## 2.2 FLOOR DRAINS

### A. Cast-Iron Floor Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Josam Company; Josam Div.
  - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - c. Watts Drainage Products Inc.
  - d. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.6.3.
3. Pattern: Sanitary drain.
4. Body Material: Gray iron.
5. Outlet: Bottom.
6. Top Loading Classification: Heavy Duty.
7. Trap Features: Trap-seal primer valve drain connection.

## 2.3 TRENCH DRAINS

### A. Trench Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Josam Company; Josam Div.
  - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - c. Watts Drainage Products Inc.
  - d. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.6.3 for trench drains.
3. Material: Ductile or gray iron.
4. Flange: Anchor.
5. Outlet: End.
6. Grate Material: Stainless steel.
7. Top Loading Classification: Extra Heavy-Duty.

## 2.4 AIR-ADMITTANCE VALVES

### A. Fixture Air-Admittance Valves:

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

- a. Oatey.
  - b. Studor, Inc.
2. Standard: ASSE 1051, Type A for single fixture or Type B for branch piping.
3. Housing: Plastic.
4. Operation: Mechanical sealing diaphragm.
5. Size: Same as connected fixture or branch vent piping.

## 2.5 ROOF FLASHING ASSEMBLIES

### A. Roof Flashing Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Acorn Engineering Company; Elmdor/Stoneman Div.
  - b. Thaler Metal Industries Ltd.
- B. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch- thick, lead flashing collar and skirt extending at least 6 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
  1. Open-Top Vent Cap: Without cap.
  2. Low-Silhouette Vent Cap: With vandal-proof vent cap.
  3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

## 2.6 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

### A. Through-Penetration Firestop Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. ProSet Systems Inc.
  - b. Engineer approved equal.
2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
3. Size: Same as connected soil, waste, or vent stack.
4. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
5. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
6. Special Coating: Corrosion resistant on interior of fittings.

## 2.7 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

### A. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
  2. Size: Same as connected waste piping.
    - a. NPS 2 (DN 50): 4-inch- minimum water seal.
    - b. NPS 2-1/2 (DN 65) and Larger: 5-inch- minimum water seal.
- B. Floor-Drain, Trap-Seal Primer Fittings:
1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
  2. Size: Same as floor drain outlet with NPS 1/2 side inlet.
- C. Air-Gap Fittings:
1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
  2. Body: Bronze or cast iron.
  3. Inlet: Opening in top of body.
  4. Outlet: Larger than inlet.
  5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.
- D. Sleeve Flashing Device:
1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch (25 mm) above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
  2. Size: As required for close fit to riser or stack piping.
- E. Stack Flashing Fittings:
1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
  2. Size: Same as connected stack vent or vent stack.
- F. Vent Caps:
1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
  2. Size: Same as connected stack vent or vent stack.
- G. Frost-Resistant Vent Terminals:
1. Description: Manufactured or shop-fabricated assembly constructed of copper, lead-coated copper, or galvanized steel.
  2. Design: To provide 1-inch enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.
- H. Expansion Joints:

1. Standard: ASME A112.21.2M.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

## 2.8 FLASHING MATERIALS

- A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
  1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
  2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
  3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.
- B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:
  1. General Applications: 12 oz./sq. ft.
  2. Vent Pipe Flashing: 8 oz./sq. ft.
- C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.
- D. Fasteners: Metal compatible with material and substrate being fastened.
- E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- F. Solder: ASTM B 32, lead-free alloy.
- G. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. 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.
- B. 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.
- C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- E. 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.
- F. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface, unless otherwise indicated.
- G. Install fixture air-admittance valves on fixture drain piping.
- H. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
- I. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- J. Install deep-seal traps on all floor drains and other waste outlets.
- K. Install floor-drain, trap-seal primer fittings on inlet to all floor drains.
  1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
  2. Size: Same as floor drain inlet.
- L. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- M. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- N. Install vent caps on each vent pipe passing through roof.
- O. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

- P. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.
- Q. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.
- R. Install wood-blocking reinforcement for wall-mounting-type specialties.
- S. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

### 3.2 CONNECTIONS

- A. Comply with requirements in Section 22 13 16 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

### 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 6.0-lb/sq. ft, 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
  - 2. Copper Sheets: Solder joints of copper sheets.
- 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.
- D. Secure flashing into sleeve and specialty clamping ring or device.
- E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 07 62 00 "Sheet Metal Flashing and Trim."

- F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.
- G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

### 3.4 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

### 3.5 PROTECTION

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

END OF SECTION 22 13 19

## SECTION 23 00 00 – MECHANICAL GENERAL

### 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.
- B. This is a Basic Mechanical Requirements Section. Provisions of this section apply to work of all Division 21, 22, and 23 sections (HVAC, Plumbing and Fire Protection).
- C. Review all other contract documents to be aware of conditions affecting work herein.
- D. All work under Division 23 shall be constructed in accordance with the codes listed herein. The design has been based on the requirements of these codes; and while it is not the responsibility of the Contractor to verify that all work called for complies with these codes, he shall be responsible for calling to the Architect/Engineer's attention any details or specifications that are not in conformance with these or other codes.
- E. Where code conflict exists, generally the most restrictive requirement applies. Comply with current code edition, unless noted.
  - 1. 2020 Florida Building Code.
  - 2. National Electric Code (NFPA 70).
  - 3. Life Safety Code (NFPA 101).
  - 4. Air Conditioning and Ventilating Systems (NFPA 90A).
  - 5. Standard for the Installation of Sprinkler Systems (NFPA 13).
  - 6. Handicapped Accessibility, ANSI A117.1 and Florida Statute Chapter 553, Part V.
- F. All mechanical materials, installation and systems shall meet the requirements of the following standards, including the latest addenda and amendments, to the extent referenced:
  - 1. Underwriters' Laboratories (UL)
  - 2. American National Standards Institution (ANSI)
  - 3. American Society of Testing Materials (ASTM)
  - 4. Air Conditioning and Refrigeration Institute (ARI)
  - 5. National Fire Protection Association (NFPA)
  - 6. National Electrical Manufacturers Association (NEMA)
  - 7. Sheet Metal and Air Conditioning Contractors' National Association SMACNA)
  - 8. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
  - 9. Air Movement and Control Association (AMCA)
- G. Codes or standards applying to a specific part of the work may be included in that section.
- H. Comply with regulations and codes of suppliers of utilities.

- I. Where no specific method or form of construction is called for in the contract documents, the Contractor shall comply with code requirements when carrying out such work.

## 1.2 CONTRACTORS QUALIFICATIONS

- A. General: Wherever the word "mechanical contractor", "sub-contractor" or "firm" is used in these sub-paragraphs, it shall mean the contractor/sub-contractor of record for the installations used for proficiency qualification.
- B. Location: The firm which performs the installation of the work under this section shall be one who maintains an established, experienced organization with a permanent, manned office within 50 miles from the project site location.
- C. HVAC Experience: The firm's proficiency in the installation, start-up, adjustment, and maintenance of air conditioning systems shall have been demonstrated by the successful performance of work as specified herein on at least three systems each with ducted air distribution, and hydronic and refrigerant piping of 25 tons capacity or greater with the school district of Santa Rosa County. The firm shall have been in business performing services as specified herein, for at least 5 years.
- D. Plumbing Experience: The firm's proficiency in the installation and adjustment of plumbing systems shall have been demonstrated by the successful performance of work as specified herein on at least three commercial or institutional buildings, each containing a minimum of 10 plumbing fixtures. The firm shall have been in business performing services as specified herein, for at least 5 years.

## 1.3 SUMMARY

- A. This Section includes the following:
  1. Piping materials and installation instructions common to most piping systems.
  2. Joining Materials.
  3. Transition fittings.
  4. Dielectric fittings.
  5. Flexible Connectors.
  6. Excavation and backfill.
  7. Mechanical demolition.
  8. Equipment installation requirements common to equipment sections.
  9. Painting and finishing.
  10. Concrete bases.
  11. Supports and anchorages.

## 1.4 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, and tunnels.

- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
  - 1. CPVC: Chlorinated polyvinyl chloride plastic.
  - 2. PE: Polyethylene plastic.
  - 3. PVC: Polyvinyl chloride plastic.
- G. The following are industry abbreviations for rubber materials:
  - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
  - 2. NBR: Acrylonitrile-butadiene rubber.
- H. Provide: Furnish and install, complete and ready for intended use.
- I. Furnish: Supply and deliver to project site, ready for subsequent requirements.
- J. Install: Operations at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar requirements.
- K. Permits and Fees: Contractor shall purchase all necessary permits, meters, and pay for any inspections required for his work and pay all fees and charges incidental thereto.
- L. Verification of Owner's Data: Prior to commencing any work the Contractor shall satisfy himself as to the accuracy of all data as indicated in these plans and specifications and/or as provided by the Owner. Should the Contractor discover any inaccuracies, errors, or omissions in the data, he shall immediately notify the Architect/Engineer in order that proper adjustments can be anticipated and ordered. Commencement by the Contractor of any work shall be held as an acceptance of the data by him after which time the Contractor has no claim against the Owner resulting from alleged errors, omissions or inaccuracies of the said data.
- M. Delivery and Storage of Materials: Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. All material shall be stored to provide protection from the weather and accidental damage.
- N. Extent of work is indicated by the drawings, schedules, and the requirements of the specifications. Singular references shall not be constructed as requiring only one device if multiple devices are shown on the drawings or are required for proper system operation.

#### 1.5 FIELD MEASUREMENTS AND COORDINATION:

- A. The intent of the drawings and specifications is to obtain a complete and satisfactory installation. Separate divisional drawings and specifications shall not relieve the Contractor or subcontractors from full compliance of work of his trade indicated on any of the drawings or in any section of the specifications.
- B. Verify all field dimensions and locations of equipment to insure close, neat fit with other trades' work. Make use of all contract documents and approved shop drawings to verify exact dimension and locations.
- C. Coordinate work in this division with all other trades in proper sequence to insure that the total work is completed within contract time schedule and with a minimum cutting and patching.
- D. Locate all apparatus symmetrical with architectural elements. Install to exact height and locations when shown on architectural drawings. When locations are shown only on mechanical drawings, be guided by architectural details and conditions existing at job and correlate this work with that of others.
- E. Install work as required to fit structure, avoid obstructions, and retain clearance, headroom, openings and passageways. Cut no structural members without written approval.
- F. Carefully examine any existing conditions, piping, and premises. Compare drawings with existing conditions. Report any observed discrepancies. It shall be the Contractor's responsibility to properly coordinate the work and to identify problems in a timely manner. Written instructions will be issued to resolve discrepancies.
- G. Because of the small scale of the drawings, it is not possible to indicate all offsets and fittings or to locate every accessory. Drawings are essentially diagrammatic. Study carefully the sizes and locations of structural members, wall and partition locations, trusses, and room dimensions and take actual measurements on the job. Locate piping, ductwork, equipment and accessories with sufficient space for installing and servicing. Contractor is responsible for accuracy of his measurements and for coordination with all trades. Contractor shall not order materials or perform work without such verification. No extra compensation will be allowed because field measurements vary from the dimensions on the drawings. If field measurements show that equipment or piping cannot be fitted, the Architect/Engineer shall be consulted. Remove and relocate, without additional compensation, any item that is installed and is later found to encroach on space assigned to another use.
- H. Coordinate with the General Contractor for all cutting and patching. Contractors performing Division 23 work shall inform the General Contractor of all cutting and patching required prior to bidding and shall coordinate installation.

#### 1.6 SUBMITTALS

- A. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Drawings shall be prepared by the contractor using AutoCAD 2007 or higher. The Engineer will supply base floor plans only. All other work shall be by the contractor. Show space

requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:

1. Planned piping layout, including valve and specialty locations and valve-stem movement.
  2. Planned ductwork layout, including dampers, elbows, etc.
  3. Clearances for installing and maintaining insulation.
  4. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
  5. Equipment and accessory service connections and support details.
  6. Exterior wall and foundation penetrations.
  7. Fire-rated wall and floor penetrations.
  8. Access panel and door locations.
  9. Sizes and location of required concrete pads and bases.
  10. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
  11. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
  12. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.
- B. Samples: Of color, lettering style and other graphic representation required for each identification material and device.
- C. When approved, the submittal control log and submittals shall be an addition to the specifications herewith, and shall be of equal force in that no deviation will be permitted except with the approval of the Architect/Engineer.
- D. Shop drawings, product literature, and other approval submittals will only be reviewed if they are submitted in full accordance with the General and Supplementary Conditions and Division 1 Specification sections and the following:
1. Submittals shall be properly organized in accordance with the approved submittal control log.
  2. Submittals shall not include items from more than one specification section in the same submittal package unless approved in the submittal control log.
  3. Submittals shall be properly identified by a cover sheet showing the project name, Architect and Engineer names, submittal control number, specification section, a list of products or item names with model numbers in the order they appear in the package, and spaces for approval stamps. A sample cover sheet is included at the end of this section.
  4. Submittals shall have been reviewed and approved by the General Contractor (or Prime Contractor). Evidence of this review and approval shall be an "Approved" stamp with a signature and date on the cover sheet.
  5. Submittals that include a series of fixtures or devices (such as plumbing fixtures or valves) shall be organized by the fixture number or valve type and be marked accordingly. Each fixture must include all items associated with that fixture regardless of whether or not those items are used on other fixtures.
  6. The design shown on the drawings supports the mechanical equipment basis of design specifications at the time of design. If mechanical equipment is submitted with different electrical, physical, capacity, etc. requirements, it shall be the responsibility of the mechanical contractor to resolve all required design changes (wire and conduit size, type

of disconnect or overload protection, point(s) of connection, ductwork modifications, etc.) and clearly show the new design on the mechanical submittal with a written statement that this change will be provided at no additional cost. Mechanical submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

- E. If the shop drawings show variation from the requirements of contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variation in writing in his letter of transmittal and on the submittal cover sheet in order that, if acceptable, Contractor will not be relieved of the responsibility for executing the work in accordance with the contract.
- F. Review of shop drawings, product literature, catalog data, or schedules shall not relieve the Contractor from responsibility for deviations from contract drawings or specifications, unless he has in writing called to the attention of the Architect/Engineer each such deviation in writing at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings, product literature, catalog data, or schedules. Any feature or function specified but not mentioned in the submittal shall be assumed to be included per the specification.
- G. Submit shop drawings as called for in other sections after award of the contract and before any material is ordered or fabricated. Shop drawings shall consist of plans, sections, elevations and details to scale (not smaller than 1/4" per foot), with dimensions clearly showing the installation. Direct copies of small scale project drawings issued to the Contractor are not acceptable. Drawings shall take into account equipment furnished under other sections and shall show space allotted for it. Include construction details and materials. NOTE: Failure of the Contractor to provide this information during the shop drawings phase shall make the Contractor responsible for all changes to achieve compliance with the Contract Documents without additional compensation.
- H. Test Reports and Verification Submittals: Submit test reports, certifications and verification letters as called for in other sections. Contractor shall coordinate the required testing and documentation of system performance such that sufficient time exists to prepare the reports, submit the reports, review the reports and take corrective action within the scheduled contract time.
- I. O&M Data Submittals: Submit Operation and Maintenance data as called for in other sections. When a copy of approval submittals is included in the O&M Manual, only the final Approved or Approved as Noted copy shall be used. Contractor shall organize these data in the O&M Manuals tabbed by specification number. Prepare O&M Manuals as required by Division 1 and as described herein. Submit manuals at the Substantial Completion inspection.

## 1.6 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code-Steel."
- B. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

- C. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- D. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
- E. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- F. The design and layout shown on the drawings are based on the Manufacturers listed in the Division 23 specifications. If equipment other than that of the Manufacturers indicated is submitted to the Engineer for consideration as an equal, it shall be the responsibility of the Manufacturer requesting approval to submit with the request a revised drawing(s) of the mechanical equipment layouts acceptable to the Engineer. These revised drawings shall show the proposed location(s) of the alternate unit(s) and the area required for withdrawal space of replacement or serviceable components. These drawings shall also show clearances of adjacent equipment and the service area required by that equipment.
- G. Equipment Selection: Equipment of differing electrical characteristics, physical dimensions and/or weights, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical, electrical, structural, and architectural services (such as circuit breakers, conduit, motors, bases, equipment pads, and equipment spaces) are adjusted by the contractor accordingly. The additional costs resulting from these modifications shall be the responsibility of the Contractor and no costs resulting from these modifications shall be passed to the Owner. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

#### 1.7 COORDINATION

- A. Coordinate mechanical equipment installation with other building components.
- B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
- E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- F. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.
- G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

- H. Refer to other Division 23 sections and/or drawings for specific requirements of the particular piping system being installed. Where another Division 23 section or the drawings conflict with requirements of this section, the other Division 23 section or the drawings shall take precedence over the general requirements herein.
- I. OSHA: Contractor employee worker protection for all trenching and excavation operations shall comply with 29 CFR 1926.650 Subpart P and all current OSHA requirements.

## 1.8 MULTI-DISCIPLINE COORDINATION

### A. DIVISION 31, 32, AND 33 SITE WORK

- 1. Refer to Division Sitework for:
  - a. All water, sewer, and storm water piping greater than five feet from the building
  - b. Manholes and catch-basins.
  - c. Underground tanks and enclosures.
  - d. Site fire protection work.
- 2. The following work is part of Division 23:
  - a. All site heating hot water and chilled water piping.
  - b. Grease trap.

### B. DIVISION 3 CONCRETE

- 1. Refer to Division 3, Concrete for:
  - a. Rough grouting in and around mechanical work.
  - b. Patching concrete cut to accommodate mechanical work.
- 2. The following is part of Division 23 work, complying with the requirements of Division 3
  - a. Curbs, foundations and pads for mechanical equipment.
  - b. Basins, sumps, and vaults of mechanical work.
  - c. Underground structural concrete to accommodate mechanical work.
  - d. Inertia bases.

### C. DIVISION 4 MASONRY

- 1. Refer to Division 4, Masonry for:
  - a. Installation of access doors in walls.

### D. DIVISION 5 METALS

- 1. Refer to Division 5, Metals for:

- a. Framing openings for mechanical equipment.
- 2. The following is part of Division 23 work.
  - a. Supports for mechanical work.

E. DIVISION 6 WOOD AND PLASTIC

- 1. Refer to Division 6, Wood for:
  - a. Framing openings for mechanical equipment

F. DIVISION 7 THERMAL AND MOISTURE PROTECTION

- 1. Refer to Division 7, Thermal and Moisture Protection for:
  - a. Installation of all roof curbs and roof supports for mechanical work.
  - b. Caulking and waterproofing of all wall and roof mounted mechanical work.
  - c. Providing all roof curbs and all vent flashing for metal roofs.
- 2. The following is part of Division 23 work, complying with the requirements of Division 7.
  - a. Fire barrier penetration seals.
  - b. Installation of louver and water proofing. Coordinate with architectural.

G. DIVISION 8 DOORS AND WINDOWS

- 1. Refer to Division 8, Doors & Windows for:
  - a. Installation of all door grilles.
  - b. Providing all undercuts

H. DIVISION 9 FINISHES

- 1. Refer to Division 9, Finishes for:
  - a. Painting exposed ductwork, piping, and equipment.
  - b. Painting structural metal and concrete for mechanical work.
  - c. Painting door grilles and access panels.
  - d. Painting color-coded mechanical work indicated for continuous painting. See color schedule in Division 23 section, "Mechanical Identification".
  - e. Installation of access doors in gypsum drywall.
  - f. Colors shall be selected by the Architect for all painting of exposed mechanical work in occupied spaces, unless specified herein. Do not paint insulated or jacketed surfaces.

2. Perform the following as part of Division 23 work:

- a. Touch up painting of factory finishes.
- b. Painting of all hangers.

I. DIVISION 10 SPECIALTIES

1. Refer to Division 10, Specialties for:

- a. Fire extinguishers and fire extinguisher cabinets and accessories.

J. DIVISION 11 EQUIPMENT

1. Refer to Division 11, Equipment for:

- a. Equipment for all food service equipment to be provided. This includes the cooking hoods with fire suppression, dishwasher hoods, dishwasher booster heaters, and food preparation/cleanup equipment.
- b. Equipment for all laboratory equipment including cabinets, casework, student stations, demonstration desks, safety stations, eyewashes, and all related fixtures, fittings, and trim.

2. Provide the following as part of Division 23 work:

- a. All ducts, connections, and related devices to make kitchen hoods operational.
- b. All trim including faucets, waste connections, drain traps, vents, valves, piping, flashing, fittings, strainers, and other materials necessary to make equipment operational. Provide rough-in for all equipment. Provide final connections for all equipment.
- c. All fixtures specified in Contract Documents.
- d. All automatic gas valves for shutoff of gas to cooking appliances when fire suppression system activates. Coordinate type of valve with fire suppression system supplier.
- e. All trim not furnished by Division 11 including drains, wastes, continuous wastes, tailpieces, traps and similar devices necessary to make fixtures operational. Provide rough-in for all fixtures. Provide final connections for all fixtures. Provide all fixtures specified in Contract Documents.

K. DIVISION 26 ELECTRICAL

- 1. Mechanical contractor shall coordinate the exact electrical requirements of all mechanical equipment being provided with the electrical contractor. Where approval submittals are required, this coordination shall be accomplished prior to making the submittals. The electrical design shown on the drawings supports the mechanical equipment basis of design. If mechanical equipment is submitted with different electrical requirements, it is the responsibility of the mechanical contractor to resolve all required electrical design

changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, etc.) and clearly show the new electrical design on the mechanical submittal with a written statement that this design will be provided at no additional cost. Mechanical submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

2. Mechanical contractor shall provide all HVAC control wiring including the Energy Management Control system sensors, alarms, and input/output signals and all relays, interlocks, warning lights, and control devices, complying with the requirements of Division 26. The intent is for the mechanical contractor to be responsible for the entire HVAC control system, including point-to-point wiring and connections.
3. Electrical contractor shall provide disconnect switches, starters, and contactors for mechanical equipment unless specifically noted as being furnished as part of mechanical equipment.
4. Electrical contractor shall provide all power wiring, raceway and devices, and make final electrical connections to all mechanical equipment, switches, starters, contactors, controllers, and similar equipment.
5. All duct-mounted smoke detectors shall be furnished and wired by the electrical contractor and installed by the mechanical contractor.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT AND MATERIALS

- A. All materials shall be new or Owner-supplied reused as shown on the drawings, the best of their respective kinds, suitable for the conditions and duties imposed on them at the building and shall be of reputable manufacturers. The description, characteristics, and requirements of materials to be used shall be in accordance with qualifying conditions established in the following sections.
- B. All equipment and materials shall be new and the most suitable grade for the purpose intended. Equipment furnished under this division shall be the product of a manufacturer regularly engaged in the manufacture of such items for a period of three years. Where practical, all of the components shall be products of a single manufacturer in order to provide proper coordination and responsibility. Where required, Contractor shall furnish proof of installation of similar units or equipment.
- C. Each item of equipment shall bear a name plate showing the manufacturer's name, trade name, model number, serial number, ratings and other information necessary to fully identify it. This plate shall be permanently mounted in a prominent location and shall not be concealed, insulated or painted.
- D. The label of the approving agency, such as UL, IBR, ASME, ARI, AMCA, by which a standard has been established for the particular item shall be in full view.

- E. The equipment shall be essentially the standard product of a manufacturer regularly engaged in the production of such equipment and shall be a product of the manufacturer's latest design.
- F. A service organization with personnel and spare parts shall be available within two hours for each type of equipment furnished.
- G. Install in accordance with manufacturer's recommendations. Place in service by a factory trained representative where required.
- H. Materials and equipment are specified herein by a single or by multiple manufacturers to indicate quality, material and type of construction desired. Manufacturer's products shown on the drawings have been used as basis for design; it shall be the Contractor's responsibility to ascertain that alternate manufacturer's products, or the particular products of named manufacturers, meet the detailed specifications and that size and arrangement of equipment are suitable for installation.
- I. Model Numbers: Catalog numbers and model numbers indicated in the drawings and specifications are used as a guide in the selection of the equipment and are only listed for the contractor's convenience. The contractor shall determine the actual model numbers for ordering materials in accordance with the written description of each item and with the intent of the drawings and specifications.

## 2.2 REQUESTS FOR SUBSTITUTION

- A. Where a particular system, product or material is specified by name, consider it as standard basis for bidding, and base proposal on the particular system, product or material specified.
- B. Requests by Contractor for substitution will be considered only when reasonable, timely, fully documented, and qualifying under one or more of the following circumstances.
  - 1. Required product cannot be supplied in time for compliance with Contract time requirements.
  - 2. Required product is not acceptable to governing authority, or determined to be non-compatible, or cannot be properly coordinated, warranted or insured, or has other recognized disability as certified by Contractor.
  - 3. Substantial cost advantage is offered Owner after deducting offsetting disadvantages including delays, additional compensation for redesign, investigation, evaluation and other necessary services and similar considerations.
- C. All requests for substitution shall contain a "Comparison Schedule" and clearly and specifically indicate any and all differences or omissions between the product specified as the basis of design and the product proposed for substitution. Differences shall include but shall not be limited to data as follows for both the specified and substituted products:
  - 1. Principal of operation.
  - 2. Materials of construction or finishes.
  - 3. Thickness of gauge of materials.
  - 4. Weight of item.
  - 5. Deleted features or items.
  - 6. Added features or items.

7. Changes in other work caused by the substitution.
8. Performance curves.

If the approved substitution contains differences or omissions not specifically called to the attention of the Architect/Engineer, the Owner reserves the right to require equal or similar features to be added to the substituted products (or to have the substituted products replaced) at the Contractor's expense.

## 2.3 EXCAVATION AND BACKFILL MATERIALS

- A. Sand: Clean, hard, uncoated grains free from organic matter or other deleterious substances. Sand for backfill shall be of a grade equal to mortar sand.
- B. Gravel: Clean, well graded hard stone or gravel, free from organic material. Size range to be from No. 4 screen retentions to 1".
- C. Earth: Fill free of clay, muck, stones, wood, roots or rubbish.
- D. Identification Tape: Polyethylene 6 inches wide, 0.004 inches thick, continuously printed with "CAUTION" in large letters and type of pipe below.
- E. Copper Identification Wire: 12-gauge.

## PART 3 - EXECUTION

### 3.1 WORKMANSHIP

- A. All materials and equipment shall be installed and completed in a first-class workmanlike manner and in accordance with the best modern methods and practice. Any materials installed which do not present an orderly and reasonably neat and/or workmanlike appearance, or do not allow adequate space for maintenance, shall be removed and replaced when so directed by the Architect/Engineer.

### 3.2 COORDINATION

- A. The Contractor shall be responsible for full coordination of the mechanical systems with shop drawings of the building construction so the proper openings and sleeves or supports are provided for piping, ductwork, or other equipment passing through slabs or walls.
- B. Any additional steel supports required for the installation of any mechanical equipment, piping, or ductwork shall be furnished and installed under the section of the specifications requiring the additional supports.
- C. It shall be the Contractor's responsibility to see that all equipment such as valves, dampers, filters and such other apparatus or equipment that may require maintenance and operation are made easily accessible, regardless of the diagrammatic location shown on the drawings.
- D. All connections to fixtures and equipment shown on the drawings shall be considered diagrammatic unless otherwise indicated by detail. The actual connections shall be made to fully suit the requirements of each case and adequately provide for expansion and servicing.

- E. The contractor shall protect equipment, material, and fixtures at all times. He shall replace all equipment, material, and fixtures which are damaged as a result of inadequate protection.
- F. Prior to starting and during progress of work, examine work and materials installed by others as they apply to work in this division. Report conditions which will prevent satisfactory installation.
- G. Start of work will be construed as acceptance of suitability of work of others.
- H. Before any equipment is shut down for disconnecting or tie-ins, arrangements shall be made with the Architect/Engineer and this work shall be done at the time best suited to the Owner. This will typically be on weekends and/or holidays and/or after normal working hours. Services shall be restored the same day unless prior arrangements are made. All overtime or premium costs associated with this work shall be included in the base bid.
- I. Provide all required temporary valves, piping, ductwork, equipment and devices as required. Maintain temporary services to areas as required. Remove all temporary material and equipment on completion of work unless Engineer concurs that such material and equipment would be beneficial to the Owner on a permanent basis.
- J. Notify General Contractor to do all cutting and patching of all holes, chases, sleeves, and other openings required for installation of equipment furnished and installed under this section. Utilize experienced trades for cutting and patching. Obtain permission from Architect/Engineer before cutting any structural items.
- K. Bolt equipment directly to concrete pads or vibration isolators as required, using hot-dipped galvanized anchor bolts, nuts and washers. Level equipment.
- L. Touch-up factory finishes on equipment located inside and outside shall be done under Division 23. Obtain matched color coatings from the manufacturer and apply as directed. If corrosion is found during inspection on the surface of any equipment, clean, prime, and paint, as required.
- M. Thoroughly clean all exposed parts of apparatus and equipment of cement, plaster, and other materials and remove all oil and grease spots. Repaint or touch up as required to look like new. During progress of work, contractor is to carefully clean up and leave premises and all portions of building free from debris and in a clean and safe condition.
- N. Start each item of equipment in strict accordance with the manufacturer's instructions; or where noted under equipment specification, start-up shall be done by a qualified representative of the manufacturer. Alignment, lubrication, safety, and operating control shall be included in start-up check.
- O. Operate heating and cooling systems as required after initial startup to maintain temperature and humidity conditions to avoid freeze damage and warping or sagging of ceilings and carpet.

### 3.3 RECORD DRAWINGS

1. During the progress of the work the Contractor shall record on their field set of drawings the exact location, as installed, of all piping, ductwork, equipment, and other systems which are not installed exactly as shown on the contract drawings.
2. Upon completion of the work, record drawings shall be prepared as described in the General Conditions, Supplementary Conditions, and Division 1 sections.

### 3.4 ACCEPTANCE

1. Punch List: Submit written confirmation that all punch lists have been checked and the required work completed.
2. Instructions: At completion of the work, provide a competent and experienced person who is thoroughly familiar with project, for one day to instruct permanent operating personnel in operation of equipment and control systems. This is in addition to any specific equipment operation and maintenance training.
3. Operation and Maintenance Manuals: Furnish three complete manuals bound in ring binders with Table of Contents, organized, and tabbed by specification section. Manuals shall contain:
  - a. Detailed operating instructions and instructions for making minor adjustments.
  - b. Complete wiring and control diagrams.
  - c. Routine maintenance operations.
  - d. Manufacturer's catalog data, service instructions, and parts lists for each piece of operating equipment.
  - e. Copies of approved submittals.
  - f. Copies of all manufacturer's warranties.
  - g. Copies of test reports and verification submittals.
4. Record Drawings: Submit record drawings.
5. Control Diagrams: Frame under plastic and mount on equipment room wall.

### 3.5 MECHANICAL DEMOLITION

- A. Refer to Division 1 Sections and Contract Drawings for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.
- C. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
- D. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.

- E. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
- F. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
- G. Equipment to Be Removed: Disconnect and cap services and remove equipment.
- H. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
- I. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

### 3.6 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 23 Sections specifying piping systems. Individual Division 23 piping Sections specify unique piping installation requirements
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping such that no piping passes over electrical panels.
- F. Refer to fire protection, plumbing and HVAC specifications for sleeve, sleeve seal system and escutcheon requirements.
- G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- H. Install piping to permit valve servicing.
- I. Install piping at indicated slopes.
- J. Install piping free of sags and bends.
- K. Install fittings for changes in direction and branch connections.
- L. Install piping to allow application of insulation.

- M. Select system components with pressure rating equal to or greater than system operating pressure.
- N. Verify final equipment locations for roughing-in.
- O. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### 3.7 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

### 3.8 PAINTING

- A. Apply paint to exposed uninsulated piping according to the following:
  - 1. Interior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
  - 2. Interior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
  - 3. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
  - 4. Exterior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
  - 5. Exterior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
  - 6. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
- B. Do not paint piping specialties with factory-applied finish.
- C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### 3.9 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for

anchor bolt and tie locations. Use 3,000-psig, 28-day compressive-strength concrete and reinforcement.

### 3.10 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment
- B. Field Welding: Comply with AWS D1.1.

### 3.11 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

### 3.12 GROUTING

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

### 3.13 EXCAVATION AND BACKFILL

- A. Ditching and Excavation: Shall be performed by hand wherever there is a possibility of encountering obstacles or any existing utility lines of any nature whatsoever. Where clear and unobstructed areas are to be excavated, appropriate machine excavation methods may be employed. Avoid use of machine excavators within the limits of the building lines.
- B. Bedding: Excavate to bottom grade of pipe to be installed, and shape bed of undisturbed earth to contour of pipe for a width of at least 50% of pipe diameter. If earth conditions necessitate excavation below grade of the pipe, such as due to the presence of clay, muck, or roots, subcut and bring bed up to proper elevation with clean, new sand (as described in paragraph 2.3), de-

posited in 6" layers and tamped. Notify Architect/Engineer if subcut exceeds 12", or if bed is of an unstable nature. In this case a 6" minimum layer of gravel will be required before sand bedding begins. Submit cost proposal if the earth conditions require subcut in excess of 12" or if gravel is required to achieve proper bedding.

- C. Placing: Pipe shall be carefully handled into place. Avoid knocking loose soil from the banks of the trench into the pipe bed. Rig heavier sections with nylon slings in lieu of wire rope to avoid crushing or chipping. Pipe which is handled with insulation in place, coated pipe, and jacketed pipe shall have special handling slings as required to prevent damage to the material.
- D. Backfilling: Deposit clean new sand (as described in paragraph 2.3) to 6" above the pipe and tamp. Then deposit sand or earth carefully in 6" layers, maintaining adequate side support, especially on nonferrous piping materials. Compact fill in 6" layers, using mechanical means, up to the top elevation of the pipe, and in 12" layers to rough or finish grade as required. Fine grade and restore surface to original condition.
- E. Special: Excavations shall be installed and maintained in satisfactory condition during the progress of the work. Subsurface structures are to be constructed in adequately sized excavations. De-watering equipment shall be installed and properly maintained where required. Shoring shall be employed in the event of unstable soil condition, and in all cases where required by OSHA regulations and necessary to protect materials and personnel from injury.
- F. Identification: Install identification tape directly above all underground piping, one tape for each pipe where multiple pipes are installed. Depth of tape shall be at least 6 inches below finished grade and 24" above buried pipe. Install copper wire above non-metallic pipes.
- G. Depth of Cover: Minimum cover for underground piping is two feet unless indicated otherwise.

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**SECTION 312200  
GRADING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Removal of topsoil.
- B. Rough grading the site for site structures.
- C. Finish grading.

**1.02 RELATED REQUIREMENTS**

- A. Section 312323 - Fill: Filling and compaction.
- B. Section 329223 - Sodding: Finish ground cover.
- C. Section 329300 - Plants: Topsoil in beds and pits.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Topsoil: See Section 312323.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.
- B. Verify the absence of standing or ponding water.

**3.02 PREPARATION**

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect from damage above- and below-grade utilities to remain.
- D. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.
- E. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.
- F. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.
- G. Protect plants, lawns, and other features to remain as a portion of final landscaping.

**3.03 ROUGH GRADING**

- A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
- B. Do not remove topsoil when wet.
- C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
- D. Do not remove wet subsoil , unless it is subsequently processed to obtain optimum moisture content.
- E. When excavating through roots, perform work by hand and cut roots with sharp axe.
- F. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.
- G. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

**3.04 FINISH GRADING**

- A. Before Finish Grading:

1. Verify building and trench backfilling have been inspected.
2. Verify subgrade has been contoured and compacted.
  - a. Finish grading contractor shall receive rough grade within +/-1" of finish grade.
- B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.
- C. Where topsoil is to be placed, scarify surface to depth of 3 inches.
- D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.
- E. Place topsoil in areas where sodding and planting are indicated.
- F. Place topsoil where required to level finish grade.
- G. Place topsoil to the following compacted thicknesses:
  1. Areas to be Sodded: 3 inches.
  2. Planting Areas: 4 inches.
- H. Place topsoil during dry weather.
- I. Remove roots, weeds, rocks, and foreign material while spreading.
- J. Near plants and buildings spread topsoil manually to prevent damage.
- K. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- L. Lightly compact placed topsoil.
- M. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

### **3.05 TOLERANCES**

- A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.
- B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

### **3.06 REPAIR AND RESTORATION**

- A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.
- B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Landscape Architect as to remedy.
- C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

### **3.07 FIELD QUALITY CONTROL**

- A. See Section 312323 for compaction density testing.

### **3.08 CLEANING**

- A. Leave site clean and raked, ready to receive landscaping.

**END OF SECTION**

**SECTION 312323**  
**FILL**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Filling, backfilling, and compacting for building volume below grade and landscaped areas.
- B. Backfilling and compacting for utilities outside the building to utility main connections.
- C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

**1.02 RELATED REQUIREMENTS**

- A. Section 312200 - Grading: Site grading.

**1.03 DEFINITIONS**

- A. Finish Grade Elevations: Indicated on drawings.

**1.04 REFERENCE STANDARDS**

- A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base, and Surface Courses; 2017 (Reapproved 2021).
- B. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop; 2022, with Errata .
- C. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2019.
- D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)); 2012 (Reapproved 2021).
- E. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2015, with Editorial Revision (2016).
- F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)); 2012 (Reapproved 2021).
- G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.
- H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017, with Editorial Revision (2020).
- I. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2017, with Editorial Revision (2018).
- J. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2023.

**1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Soil Samples: 10 pounds sample of each type of fill; submit in air-tight containers to testing laboratory.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.
- D. Compaction Density Test Reports.
- E. Testing Agency Qualification Statement.

**1.06 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where indicated.
  - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
  - 2. Prevent contamination.
  - 3. Protect stockpiles from erosion and deterioration of materials.

## **PART 2 PRODUCTS**

### **2.01 FILL MATERIALS**

- A. General Fill: Subsoil excavated on-site.
  - 1. Graded.
  - 2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
  - 3. Complying with ASTM D2487 Group Symbol CL.
- B. Topsoil: Topsoil excavated on-site.
  - 1. Unclassified.
  - 2. Graded.
  - 3. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
  - 4. Acidity range (pH) of 5.5 to 7.5.
  - 5. Containing a minimum of 4 percent and a maximum of 25 percent inorganic matter.
  - 6. Complying with ASTM D2487 Group Symbol OH.

### **2.02 SOURCE QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements or ALDOT specifications, for general requirements for testing and analysis of soil material.
- B. Where fill materials are specified by reference to a specific standard, testing of samples for compliance will be provided before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Identify required lines, levels, contours, and datum locations.
- B. Verify areas to be filled are not compromised with surface or ground water.

### **3.02 PREPARATION**

- A. Scarify subgrade surface to a depth of 6 inches to identify soft spots.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

### **3.03 FILLING**

- A. Fill to contours and elevations indicated using unfrozen materials.
- B. Employ a placement method that does not disturb or damage other work.
- C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- D. Maintain optimum moisture content of fill materials to attain required compaction density.
- E. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.
- F. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- G. Correct areas that are over-excavated.

1. Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.
- H. Compaction Density Unless Otherwise Specified or Indicated:
  1. Under paving, slabs-on-grade, and similar construction: 97 percent of maximum dry density unless otherwise directed by Geotechnical Report.
  2. Landscape areas: 80 percent of maximum dry density unless otherwise directed by Geotechnical Report.
- I. Reshape and re-compact fills subjected to vehicular traffic.
- J. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Landscape Architect or other Owner's Representative. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

### **3.04 FILL AT SPECIFIC LOCATIONS**

### **3.05 TOLERANCES**

- A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.
- B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch from required elevations.

### **3.06 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.
- B. Soil Fill Materials:
  1. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.
  2. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.
  3. If tests indicate work does not meet specified requirements, remove work, replace and retest.
  4. Frequency of Tests: Per Geotechnical report.

### **3.07 CLEANING**

- A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

**END OF SECTION**

## 31 62 19 TIMBER PILES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes round timber piles.

#### 1.2 UNIT PRICES

- A. Contract Sum: Base Contract Sum on number and dimensions of piles indicated from tip to cutoff, plus not less than 12 inches of overlength for cutting piles at cutoff elevations.
- B. Work of this Section is affected as follows:
  - 1. Additional payment for pile lengths in excess of that indicated, and credit for pile lengths less than that indicated, is calculated at unit prices stated in the Contract, based on net addition or deduction to total pile length as determined by Architect and measured to nearest 12 inches.
    - a. Additional payment for splices required to extend pile lengths in excess of that indicated is calculated at unit prices stated in the Contract.
  - 2. Unit prices include labor, materials, tools, equipment, and incidentals for furnishing, driving, cutting off, capping, and disposing of cutoffs.
  - 3. Test piles that become part of permanent foundation system are considered as an integral part of the Work.
  - 4. No payment is made for rejected piles, including piles driven out of tolerance, defective piles, or piles damaged during handling or driving.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For timber piles. Show fabrication and installation details for piles, including details of driving shoes, tips or boots, and pile butt protection.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Round timber pile treatment data.
- B. Pile-Driving Equipment Data: Include type, make, and rated energy range; weight of striking part of hammer; weight of drive cap; and, type, size, and properties of hammer cushion.
- C. Pile-driving records.
- D. Field quality-control reports.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store piles at Project site to prevent breaks, cuts, abrasions, or other physical damage and as required by AWWA M4. Do not drill holes or drive spikes or nails into pile below cutoff elevation.

## PART 2 - PRODUCTS

### 2.1 TIMBER PILES

- A. Round Timber Piles: ASTM D 25, unused, clean peeled, one piece from butt to tip; of the following species and size basis:
  - 1. Species: Southern yellow pine.
  - 2. Size Basis: 8-inch tip and 6-inch tip as indicated and natural taper
- B. Pressure-treat round timber piles according to AWWA U1 as follows:
  - 1. Service Condition: UC4C Ground Contact, Extreme Duty
  - 2. Treatment: Waterborne preservative Chromated Copper Arsenate (CCA) must be used. No exceptions taken.

### 2.2 PILE ACCESSORIES

- A. Driving Shoes: Fabricate from ASTM A 1011/A 1011M, hot-rolled carbon-steel strip to suit pile-tip diameter.

### 2.3 FABRICATION

- A. Pile Tips: Cut and shape pile tips to accept driving shoes. Fit and fasten driving shoes to pile tips according to manufacturer's written instructions.

- B. Pile Butt: Trim pile butt and cut perpendicular to longitudinal axis of pile. Chamfer and shape butt to fit tightly to driving cap of hammer.
- C. Field-Applied Wood Preservative: Treat field cuts, holes, and other penetrations according to AWWPA M4.
- D. Pile-Length Markings: Mark each pile with horizontal lines at 12-inch intervals; label the distance from pile tip at 60-inch intervals. Maintain markings on piles until driven.

## PART 3 - EXECUTION

### 3.1 DRIVING PILES

- A. General: Continuously drive piles to elevations or penetration resistance indicated. Establish and maintain axial alignment of leads and piles before and during driving.
- B. Heaved Piles: Redrive heaved piles to tip elevation at least as deep as original tip elevation with a driving resistance at least as great as original driving resistance.
- C. Driving Tolerances: Drive piles without exceeding the following tolerances, measured at pile heads:
  - 1. Location: 4 inches from location indicated after initial driving, and 6 inches after pile driving is completed.
  - 2. Plumb: Maintain 1 inch in 48 inches from vertical, or a maximum of 4 inches, measured when pile is aboveground in leads.
  - 3. Batter Angle: Maximum 1 inch in 48 inches from required angle, measured when pile is aboveground in leads.
- D. Withdraw damaged or defective piles and piles that exceed driving tolerances, and install new piles within driving tolerances. Fill holes left by withdrawn piles as directed by Architect.
- E. Cut off butts of driven piles square with pile axis except as indicated and at elevations indicated.
  - 1. Cover cut-off piling surfaces with minimum three coats of preservative treatment according to AWWPA M4.
- F. Pile-Driving Records: Maintain accurate driving records for each pile, compiled and attested to by a qualified professional engineer.

### 3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Dynamic Pile Testing: High-strain dynamic monitoring shall be performed and reported according to ASTM D 4945 during initial driving and during restriking on five single piles of each diameter.

END OF SECTION

**SECTION 312200  
GRADING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Removal of topsoil.
- B. Rough grading the site for site structures.
- C. Finish grading.

**1.02 RELATED REQUIREMENTS**

- A. Section 312323 - Fill: Filling and compaction.
- B. Section 329223 - Sodding: Finish ground cover.
- C. Section 329300 - Plants: Topsoil in beds and pits.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Topsoil: See Section 312323.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.
- B. Verify the absence of standing or ponding water.

**3.02 PREPARATION**

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect from damage above- and below-grade utilities to remain.
- D. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.
- E. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.
- F. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.
- G. Protect plants, lawns, and other features to remain as a portion of final landscaping.

**3.03 ROUGH GRADING**

- A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
- B. Do not remove topsoil when wet.
- C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
- D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.
- E. When excavating through roots, perform work by hand and cut roots with sharp axe.
- F. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.
- G. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

**3.04 FINISH GRADING**

- A. Before Finish Grading:

1. Verify building and trench backfilling have been inspected.
2. Verify subgrade has been contoured and compacted.
  - a. Finish grading contractor shall receive rough grade within +/-1" of finish grade.
- B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.
- C. Where topsoil is to be placed, scarify surface to depth of 3 inches.
- D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.
- E. Place topsoil in areas where sodding and planting are indicated.
- F. Place topsoil where required to level finish grade.
- G. Place topsoil to the following compacted thicknesses:
  1. Areas to be Sodded: 3 inches.
  2. Planting Areas: 4 inches.
- H. Place topsoil during dry weather.
- I. Remove roots, weeds, rocks, and foreign material while spreading.
- J. Near plants and buildings spread topsoil manually to prevent damage.
- K. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- L. Lightly compact placed topsoil.
- M. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

### **3.05 TOLERANCES**

- A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.
- B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

### **3.06 REPAIR AND RESTORATION**

- A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.
- B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Landscape Architect as to remedy.
- C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

### **3.07 FIELD QUALITY CONTROL**

- A. See Section 312323 for compaction density testing.

### **3.08 CLEANING**

- A. Leave site clean and raked, ready to receive landscaping.

**END OF SECTION**

**SECTION 312323**  
**FILL**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Filling, backfilling, and compacting for building volume below grade and landscaped areas.
- B. Backfilling and compacting for utilities outside the building to utility main connections.
- C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

**1.02 RELATED REQUIREMENTS**

- A. Section 312200 - Grading: Site grading.

**1.03 DEFINITIONS**

- A. Finish Grade Elevations: Indicated on drawings.

**1.04 REFERENCE STANDARDS**

- A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base, and Surface Courses; 2017 (Reapproved 2021).
- B. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop; 2022, with Errata .
- C. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2019.
- D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)); 2012 (Reapproved 2021).
- E. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2015, with Editorial Revision (2016).
- F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)); 2012 (Reapproved 2021).
- G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.
- H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017, with Editorial Revision (2020).
- I. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2017, with Editorial Revision (2018).
- J. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2023.

**1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Soil Samples: 10 pounds sample of each type of fill; submit in air-tight containers to testing laboratory.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.
- D. Compaction Density Test Reports.
- E. Testing Agency Qualification Statement.

**1.06 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where indicated.
  - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
  - 2. Prevent contamination.
  - 3. Protect stockpiles from erosion and deterioration of materials.

## **PART 2 PRODUCTS**

### **2.01 FILL MATERIALS**

- A. General Fill: Subsoil excavated on-site.
  - 1. Graded.
  - 2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
  - 3. Complying with ASTM D2487 Group Symbol CL.
- B. Topsoil: Topsoil excavated on-site.
  - 1. Unclassified.
  - 2. Graded.
  - 3. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
  - 4. Acidity range (pH) of 5.5 to 7.5.
  - 5. Containing a minimum of 4 percent and a maximum of 25 percent inorganic matter.
  - 6. Complying with ASTM D2487 Group Symbol OH.

### **2.02 SOURCE QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements or ALDOT specifications, for general requirements for testing and analysis of soil material.
- B. Where fill materials are specified by reference to a specific standard, testing of samples for compliance will be provided before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Identify required lines, levels, contours, and datum locations.
- B. Verify areas to be filled are not compromised with surface or ground water.

### **3.02 PREPARATION**

- A. Scarify subgrade surface to a depth of 6 inches to identify soft spots.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

### **3.03 FILLING**

- A. Fill to contours and elevations indicated using unfrozen materials.
- B. Employ a placement method that does not disturb or damage other work.
- C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- D. Maintain optimum moisture content of fill materials to attain required compaction density.
- E. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.
- F. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- G. Correct areas that are over-excavated.

1. Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.
- H. Compaction Density Unless Otherwise Specified or Indicated:
  1. Under paving, slabs-on-grade, and similar construction: 97 percent of maximum dry density unless otherwise directed by Geotechnical Report.
  2. Landscape areas: 80 percent of maximum dry density unless otherwise directed by Geotechnical Report.
- I. Reshape and re-compact fills subjected to vehicular traffic.
- J. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Landscape Architect or other Owner's Representative. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

### **3.04 FILL AT SPECIFIC LOCATIONS**

### **3.05 TOLERANCES**

- A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.
- B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch from required elevations.

### **3.06 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.
- B. Soil Fill Materials:
  1. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.
  2. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.
  3. If tests indicate work does not meet specified requirements, remove work, replace and retest.
  4. Frequency of Tests: Per Geotechnical report.

### **3.07 CLEANING**

- A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

**END OF SECTION**

**SECTION 328423  
UNDERGROUND SPRINKLERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pipe and fittings, valves, sprinkler heads, drip irrigation specialties, emitters, and accessories.
- B. Control system.

**1.02 RELATED REQUIREMENTS**

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 312316 - Excavation: Excavating for irrigation piping.
- C. Section 312323 - Fill: Backfilling for irrigation piping.

**1.03 REFERENCE STANDARDS**

- A. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2020.
- B. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate the work with site backfilling, landscape grading and delivery of plant life.
- B. Preinstallation Meeting: Convene one week prior to commencing work of this Section.

**1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component and control system and wiring diagrams. Include specific model numbers to be provided.
- C. Operation and Maintenance Data:
  - 1. Provide instructions for operation and maintenance of system and controls, seasonal activation and shutdown, and manufacturer's parts catalog.
  - 2. Provide schedule indicating length of time each valve is required to be open to provide a determined amount of water.
- D. Record Documents: Record actual locations of all concealed components piping system.

**1.06 QUALITY ASSURANCE**

- A. A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience.

**PART 2 PRODUCTS**

**2.01 REGULATORY REQUIREMENTS**

- A. Comply with applicable code for piping and component requirements.

**2.02 IRRIGATION SYSTEM**

- A. Electric solenoid controlled underground irrigation system, with low point self drain.
  - 1. Source Power: 120 volt, minimum 15 A., single phase.
- B. Manufacturers:
  - 1. Rain Bird Sales, Inc: [www.rainbird.com/#sl](http://www.rainbird.com/#sl) per Owner maintenance requirements.
  - 2. Substitutions: See Section 016000 - Product Requirements.

### 2.03 PIPE MATERIALS

- A. PVC Pipe 2 inch & smaller: ASTM D2241; 200 psi pressure rated upstream from controls, 200 psi downstream; solvent welded sockets.
- B. PVC Pipe 2.5 inch & larger: ASTM D2241; 200 psi pressure rated upstream from controls, [200] psi downstream; rubber gasketed joints.
- C. Fittings: Type and style of connection to match pipe.
- D. Pipe Risers at Valves: 160 psi PVC pipe.
- E. Solvent Cement: ASTM D2564 for PVC pipe and fittings.
- F. Sleeve Material: PVC Class 200.

### 2.04 SPRINKLERS

- A. Manufacturers:
  - 1. Rainbird.
  - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Spray Type Sprinkler Head: Fixed surface head.
- C. Quick Coupler: Rainbird..

### 2.05 MANUAL VALVES

- A. Plastic Ball Valves:
  - 1. Description:
    - a. Standard: MSS SP-122.
    - b. Pressure Rating: 150 psig.
    - c. Body Material: PVC.
    - d. Type: Union.
    - e. End Connections: Socket or threaded.
    - f. Port: Full.

### 2.06 AUTOMATIC CONTROL VALVES

- A. Manufacturers:
  - 1. Rainbird, as Indicated on Drawings.
  - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Valve Box and Cover:
  - 1. Plastic Boxes:
    - a. Description: Box and cover, with open bottom and openings for piping; designed for installing flush with grade.
      - 1) Size: As required for valves and service.
      - 2) Shape: Rectangular.
      - 3) Sidewall Material: PE, ABS, or FRP.
      - 4) Cover Material: PE, ABS, or FRP.
        - (a) Lettering: " IRRIGATION".
        - (b) Must be sized to allow for 2" clearance in any direction of operable, movable parts or parts requiring maintenance within the box, such as a solenoid or valve top replacement.

### 2.07 CONTROLS

- A. Controller: As Indicated on Drawings.
- B. Controller Housing: NEMA 250 Type 3; weatherproof, watertight, with lockable access door.
- C. Valves: Electric Solenoid; normally closed; hydraulic tubing, including required fittings and accessories.
- D. Wire Conductors: Color coded.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify location of existing utilities.
- B. Verify that required utilities are available, in proper location, and ready for use.

#### **3.02 PREPARATION**

- A. Piping layout indicated is diagrammatic only. Route piping to avoid plants, ground cover, and structures.
- B. Layout and stake locations of system components.
- C. Review layout requirements with other affected work. Coordinate locations of sleeves under paving to accommodate system.

#### **3.03 TRENCHING**

- A. Trench Size:
  - 1. Minimum Cover Over Installed Main Piping: 24 inches or not less than 18 inches below average local frost depth, whichever is deeper.
  - 2. Minimum Cover Over Installed Circuit Piping: 18 inches.
  - 3. Minimum Cover Over Installed Drain Piping: 18 inches.
  - 4. Minimum Cover Over Installed Sleeve Piping: 24 inches
- B. Trench to accommodate grade changes and slope to drains.
- C. Maintain trenches free of debris, material, or obstructions that may damage pipe.
- D. Install warning tape directly above pressure piping, 12 inches below finished grades, except 6 inches below subgrade under pavement and slabs.

#### **3.04 INSTALLATION**

- A. Connect to utilities.
- B. Set outlets and box covers at finish grade elevations.
- C. Provide for thermal movement of components in system.
- D. Slope piping for self drainage to drain valves at a minimum uniform slope of 0.5 percent.
- E. Use threaded nipples for risers to each outlet.
- F. Install piping free of sags and bends.
- G. Install groups of pipes parallel to each other, spaced to permit valve servicing.
- H. Install fittings for changes in direction and branch connections.
- I. Install underground thermoplastic piping according to ASTM D 2774 and ASTM F 690.
- J. Install expansion loops in control-valve boxes for plastic piping.
- K. Lay piping on solid subbase, uniformly sloped without humps or depressions.
- L. Install PVC piping in dry weather when temperature is above 40 deg F. Allow joints to cure at least 24 hours at temperatures above 40 deg F before testing.
- M. Install control wiring in accordance with Section 260519. Provide 10 inch expansion coil at each valve to which controls are connected, and at 100 ft intervals. Bury wiring beside pipe.
- N. After piping is installed, but before outlets are installed and backfilling commences, open valves and flush system with full head of water.

#### **3.05 JOINT CONSTRUCTION**

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Flanged Joints: Select rubber gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- E. PVC Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. PVC Pressure Piping: Join schedule number, ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
  - 3. PVC Nonpressure Piping: Join according to ASTM D 2855.

### **3.06 VALVE INSTALLATION**

- A. Drain Valves: Install in underground piping in boxes for automatic control valves.

### **3.07 SPRINKLER INSTALLATION**

- A. Install sprinklers after hydrostatic test is completed.
- B. Install sprinklers at manufacturer's recommended heights.
- C. Locate part-circle sprinklers to maintain a minimum distance of 4 inches from walls and 2 inches from other boundaries unless otherwise indicated.

### **3.08 DRIP IRRIGATION SPECIALTY INSTALLATION**

- A. Install freestanding emitters on pipe riser to mounting height indicated.
- B. Install drip tubes with direct-attached emitters on ground.
- C. Install application pressure regulators and filter units in piping near device being protected, and in control-valve boxes.
- D. Install air relief valves and vacuum relief valves in piping, and in control-valve boxes.

### **3.09 AUTOMATIC IRRIGATION-CONTROL SYSTEM INSTALLATION**

- A. Equipment Mounting: Install exterior freestanding controllers on precast concrete bases.
  - 1. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
- B. Install control cable in same trench as irrigation piping and at least 2 inches below or beside piping. Provide conductors of size not smaller than recommended by controller manufacturer. Install cable in separate sleeve under paved areas.

### **3.10 IDENTIFICATION**

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."
- B. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplates and signs on each automatic controller.
  - 1. Text: In addition to identifying unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- C. Valve Tags: Valves should be labeled with printed plastic tags.

- D. Warning Tapes: Arrange for installation of continuous, underground, detectable warning tapes over underground piping during backfilling of trenches.

### **3.11 FIELD QUALITY CONTROL**

- A. Perform test and inspections.
- B. Prior to backfilling, test system for leakage at main piping to maintain 100 psi pressure for one hour.
- C. Test and inspections:
  - 1. System is acceptable if no leakage or loss of pressure occurs during test period.
  - 2. Sprinkler coverage Test: After installation, the system will be observed to meet the following criteria. Adjustments to system shall be made until criteria are met to satisfy either Landscape Architect or Owner's Representative.
    - a. All sprinklers must be adjusted to minimize overspray onto buildings and paved areas.
    - b. All sprinkler controls must be adjusted to minimize runoff of irrigated water.
    - c. All sprinklers must operate at their design radius of throw. Nozzle sizes and types called for in the system design must have been used.
    - d. Spray patterns must overlap as designed.
    - e. Sprinklers must be connected, as designed, to the appropriate zone.
  - 3. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.
  - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Any irrigation product will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

### **3.12 SYSTEM STARTUP**

- A. Perform startup service.
  - 1. Prepare and start system in accordance with manufacturer's instructions.
  - 2. Verify that controllers are installed and connected according to the Contract Documents.
  - 3. Verify that electrical wiring installation complies with manufacturer's submittal.

### **3.13 ADJUSTING**

- A. Adjust control system to achieve time cycles required.
- B. Adjust head types for full water coverage as directed.
- C. Adjust settings of controllers.
- D. Adjust automatic control valves to provide flow rate at rated operating pressure required for each sprinkler circuit.
- E. Adjust sprinklers and devices, except those intended to be mounted aboveground, so they will be flush with, or not more than 1/2 inch above, finish grade.

### **3.14 CLEANING**

- A. Flush dirt and debris from piping before installing sprinklers and other devices.

### **3.15 PIPING SCHEDULE**

- A. Install components having pressure rating equal to or greater than system operating pressure.
- B. Piping in control-valve boxes and aboveground may be joined with flanges or unions instead of joints indicated.
- C. Underground irrigation main piping, NPS 2 and smaller , shall be the following:
  - 1. Class 200 SDR 21, PVC, pressure-rated pipe; Schedule 80, PVC socket fittings; and solvent-cemented joints.
- D. Underground irrigation main piping, NPS 2.5 and larger, shall be the following:

1. NPS 2.5 and larger Class 200 SDR 21, PVC, push-on-joint pipe; push-on-joint fittings and gaskets; and gasketed joints.
- E. Circuit piping, NPS 2 and smaller, shall be the following:
  1. Class 200 SDR 21, PVC pipe and socket fittings; and solvent-cemented joints.
- F. Underground Branches and Offsets at Sprinklers and Devices: Schedule 80, PVC pipe; threaded PVC fittings; and threaded joints.
- G. Risers to Aboveground Sprinklers and Specialties: Schedule 80, PVC pipe and socket fittings; and solvent-cemented joints.

### **3.16 CLOSEOUT ACTIVITIES**

- A. Instruct Owner's personnel in operation and maintenance of system, including adjusting of sprinkler heads. Use operation and maintenance data as basis for demonstration.

**END OF SECTION**

**SECTION 329223  
SODDING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Preparation of subsoil.
- B. Placing topsoil.
- C. Fertilizing.
- D. Sod installation.

**1.02 RELATED REQUIREMENTS**

- A. Section 312200 - Grading: Topsoil material.
- B. Section 312200 - Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.
- C. Section 312323 - Fill: Topsoil material.
- D. Section 320190 - Operation and Maintenance of Planting: Post-occupancy maintenance.

**1.03 PRICE AND PAYMENT PROCEDURES**

- A. See Section 012200 - Unit Prices, for additional unit price requirements.
- B. Sodded Areas:
  - 1. Basis of Measurement: By the square foot.

**1.04 DEFINITIONS**

- A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

**1.05 REFERENCE STANDARDS**

- A. TPI (SPEC) - Guideline Specifications to Turfgrass Sodding; 2006.

**1.06 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Certificate: Certify grass species and location of sod source.

**1.07 QUALITY ASSURANCE**

- A. Sod Producer: Company specializing in sod production and harvesting with minimum five years experience, and certified by the State of Florida.
- B. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.
  - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
  - 2. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the National Association of Landscape Professionals:
    - a. Landscape Industry Certified Technician - Exterior.
    - b. Landscape Industry Certified Lawn Care Manager.
    - c. Landscape Industry Certified Lawn Care Technician.
  - 3. Pesticide Applicator: State licensed, commercial.

**1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver sod on pallets. Protect exposed roots from dehydration.
- B. Do not deliver more sod than can be laid within 24 hours. Protect from breakage.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Sod: TPI (SPEC), Certified Turfgrass Sod quality; cultivated grass sod; type indicated in plant schedule on Drawings; with strong fibrous root system, free of stones, burned or bare spots; containing no more than 5 weeds per 1000 sq ft. Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.
- B. Fertilizer: Slow-Release Fertilizer; recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, to the following proportions:
- C. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Prepare subgrade in accordance with Section 312200.
- B. Place topsoil in accordance with Section 312200.

### **3.02 FERTILIZING**

- A. Apply fertilizer in accordance with manufacturer's instructions.
- B. Apply after smooth raking of topsoil and prior to installation of sod.
- C. Apply fertilizer no more than 48 hours before laying sod.
- D. Mix thoroughly into upper 2 inches of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

### **3.03 LAYING SOD**

- A. Moisten prepared surface immediately prior to laying sod.
- B. Lay sod immediately after delivery to site to prevent deterioration.
- C. Lay sod smooth and tight with no open joints visible, and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces.
- D. Where new sod adjoins existing grass areas, align top surfaces.
- E. Where sod is placed adjacent to hard surfaces, such as curbs, pavements, etc., place top elevation of sod 1/2 inch below top of hard surface.
- F. Water sodded areas immediately after installation. Saturate sod to 4 inches of soil.
- G. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities.

### **3.04 SATISFACTORY TURF**

- A. Turf installations shall meet the following criteria as determined by Landscape Architect:
- B. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
- C. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

**END OF SECTION**

**SECTION 329300  
PLANTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Preparation of subsoil.
- B. Topsoil bedding.
- C. New trees, plants, and ground cover.
- D. Mulch and Fertilizer.
- E. Maintenance.
- F. Tree Pruning.

**1.02 RELATED REQUIREMENTS**

- A. Section 312200 - Grading: General fill material.
- B. Section 312323 - Fill: General fill material.

**1.03 PRICE AND PAYMENT PROCEDURES**

- A. Unit Prices:
  - 1. See Section 012200 - Unit Prices, for additional unit price requirements.
  - 2. Topsoil: By the cubic yard. Includes topsoil, placing topsoil.
  - 3. Plants: By the unit. Includes preparation of subsoil, placing topsoil, planting, watering and maintenance to specified time period.

**1.04 DEFINITIONS**

- A. Weeds: Any plant life not specified or scheduled.
- B. Plants: Living trees, plants, and ground cover specified in this Section , and described in ANSI Z60.1.

**1.05 REFERENCE STANDARDS**

- A. Florida Grades & Standards for Nursery Plants - Florida Grades and Standards for Nursery Plants 2015 Edition.
- B. ANSI/AHIA Z60.1 - American National Standard for Nursery Stock; 2014.
- C. ANSI A300 Part 1 - American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Management - Standard Practices (Pruning); 2017.

**1.06 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Submit list of plant life sources.
- C. Submit compost product data sheet or laboratory testing report.
- D. Submit photos of plant material that is to be installed. Photos should be of plant at nursery from which it is sourced. General stock photos will not be accepted.

**1.07 QUALITY ASSURANCE**

- A. Nursery Qualifications: Company specializing in growing and cultivating the plants with three years documented experience.
- B. Installer Qualifications: Company specializing in installing and planting the plants with 5 years experience.
- C. Non-native, Invasive Plant Species: Do not introduce, grow, or cultivate plant species that are non-native to the ecosystem of the project site, and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

1. Comply with laws regulating non-native and invasive plant species in the State in which the Project is located.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.
- B. Protect and maintain plant life until planted.
- C. Deliver plant life materials immediately prior to placement. Keep plants moist.

#### **1.09 FIELD CONDITIONS**

- A. Do not install plant life when ambient temperatures may drop below 35 degrees F or rise above 95 degrees F.
- B. Do not install plant life when wind velocity exceeds 30 mph.

#### **1.10 WARRANTY**

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide one year warranty.
- C. Warranty: Include coverage for one continuous growing season; replace dead or unhealthy plants.
- D. Replacements: Plants of same size and species as specified, planted in the next growing season per approval of Landscape Architect, with a new warranty commencing on date of replacement.

#### **1.11 MAINTENANCE (SEE END OF SECTION)**

- A. Maintain plants throughout Construction until final acceptance by Owner.
- B. Provide a separate maintenance proposal to the Owner for the service and maintenance of work specified in this section for 1 years from Date of Final Acceptance.

### **PART 2 PRODUCTS**

#### **2.01 REGULATORY REQUIREMENTS**

- A. Comply with regulatory agencies for fertilizer and herbicide composition.

#### **2.02 PLANTS**

- A. Plants: Species and size identified in plant schedule, grown in climatic conditions similar to those in locality of the work.

#### **2.03 SOIL MATERIALS**

- A. Topsoil: Type Planting Soil as specified in Section 312323.

#### **2.04 SOIL AMENDMENT MATERIALS**

- A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.
  1. Size: 21-gram tablets.
  2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.
  3. Typical application:
    - a. Trees: 1 tablet per 1/2" of trunk caliper.
    - b. Shrubs: Per manufacturer's recommendation.
- B. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
  1. Organic Matter Content: 50 to 60 percent of dry weight.

2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- C. Water: Clean, fresh, and free of substances or matter that could inhibit vigorous growth of plants.

## **2.05 MULCH MATERIALS**

- A. Mulching Material: Clean, certified beach sand to match local sand.

## **2.06 ACCESSORIES**

- A. Stakes: Softwood lumber, pointed end.
- B. Cable, Wire, Eye Bolts and Turnbuckles: Non-corrosive, of sufficient strength to withstand wind pressure and resulting movement of plant life.

## **2.07 PLANT SOIL MIX**

- A. A uniform mixture of 1 part compost and 3 parts beach sand fill soil by volume.

## **2.08 SOURCE QUALITY CONTROL**

- A. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt and organic matter; pH value.

# **PART 3 EXECUTION**

## **3.01 EXAMINATION**

- A. Verify that prepared subsoil is ready to receive work.
- B. Saturate soil with water to test drainage.
- C. Verify that required underground utilities are available, in proper location, and ready for use.
- D. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
- E. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
- F. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
- G. Uniformly moisten excessively dry soil that is not workable or which is dusty.

## **3.02 PREPARATION OF SUBSOIL**

- A. Prepare subsoil to eliminate uneven areas. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.
- C. Scarify subsoil to a depth of 3 inches where plants are to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.
- D. Dig pits and beds 6 inches larger than plant root system.

## **3.03 PLACING PLANT SOIL**

- A. Spread plant soil to a minimum depth of 4 inches over area to be planted. Rake smooth.
- B. Place plantsoil during dry weather and on dry unfrozen subgrade.
- C. Remove vegetable matter and foreign non-organic material from plant soil while spreading.
- D. Grade plant soil to eliminate rough, low or soft areas, and to ensure positive drainage.
- E. Install plant soil into pits and beds intended for plant root balls, to a minimum thickness of 6 inches.

## **3.04 FERTILIZING**

- A. Apply fertilizer in accordance with manufacturer's instructions.

- B. Apply planting tablets during planting in accordance with manufacturer's instructions.
- C. Mix thoroughly into upper 2 inches of plant soil.
- D. Lightly water to aid the dissipation of fertilizer.

### **3.05 PLANTING**

- A. Place plants for best appearance for review and final orientation by Landscape Architect. Contractor is responsible to schedule this event 5 days in advance.
- B. Set plants vertical.
- C. Remove non-biodegradable root containers.
- D. Set plants in pits or beds, partly filled with prepared plant mix, at a minimum depth as indicated on drawings under each plant. Remove burlap, ropes, and wires, from the root ball.
- E. Saturate soil with water when the pit or bed is half full of topsoil and again when full.

### **3.06 PLANT SUPPORT**

- A. Brace plants vertically with plant protector wrapped guy wires and stakes to the following:
  - 1. Tree Caliper: 2 to 4 inches; Tree Support Method: 3 guy wires with eye bolts and turn buckles
  - 2. Palm Bracing: Install bracing system at three or more places equally spaced around perimeter of trunk to secure each palm until established unless otherwise indicated.
    - a. Palm Bracing, Site-Fabricated Method:
      - 1) Place battens over padding and secure battens in place around trunk perimeter with at least two straps, tightened to prevent displacement. Ensure that straps do not contract trunk.
      - 2) Place diagonal braces and cut to length. Secure upper ends of diagonal braces with galvanized nails into battens or into nail attached blocks on battens. Do not drive nails, screws, or other securing devices into palm trunk; do not penetrate palm trunk in any fashion. Secure lower ends of diagonal braces with stakes driven into ground to prevent outward slippage of braces.
    - b. Palm Tree Rootball Staple Method:
      - 1) Basis-of-design product: Tree Staple.
      - 2) Install a minimum of three root ball staples equally spaced around the rootball of each palm.
      - 3) Staples shall extend a minimum of 12 inches below the bottom of the rootball.

### **3.07 TREE PRUNING**

- A. Prune trees as recommended in ANSI A300 Part 1.
- B. Prune newly planted trees as required to remove dead, broken, and split branches.

### **3.08 FIELD QUALITY CONTROL**

### **3.09 MAINTENANCE THROUGH FINAL ACCEPTANCE**

- A. Provide maintenance at no extra cost to Owner; Owner will pay for water.
- B. Irrigate sufficiently to saturate root system and prevent soil from drying out.
- C. Cultivate and weed plant beds and tree pits.
- D. Remove dead or broken branches and treat pruned areas or other wounds.
- E. Neatly trim plants where necessary.
- F. Immediately remove clippings after trimming.
- G. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions.
- H. Control insect damage and disease. Apply pesticides in accordance with manufacturers instructions.
- I. Remedy damage from use of herbicides and pesticides.

- J. Replace mulch when deteriorated or lost to specified depth.
- K. Maintain wrappings, guys, and stakes. Repair or replace accessories when required.

**END OF SECTION**