

## SECTION 093000

### TILING

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Tile and Accessories:
  - 1. Ceramic Floor and Wall Tile.
  - 2. Natural Stone.
  - 3. Trim and Accessories.
  - 4. Setting Materials.

##### 1.2 REFERENCES

- A. American National Standards Institute (ANSI):
  - 1. ANSI A108.1B - Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
  - 2. ANSI A108.4 - Specifications for Ceramic Tile Installed with Organic Adhesives or Water-Cleanable Tile Setting Epoxy Adhesive.
  - 3. ANSI A108.5 - Specifications for Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
  - 4. ANSI A108.9 - Specifications for Ceramic Tile Installed with Modified Epoxy Emulsion Mortar/Grout.
  - 5. ANSI A108.10 - Specifications for Installation of Grout in Tilework.
  - 6. ANSI A118.1 - Standard Specification for Dry-Set Portland Cement Mortar.
  - 7. ANSI A118.4 - Latex-Portland Cement Mortar.
  - 8. ANSI A118.6 - Standard Ceramic Tile Grouts.
  - 9. ANSI A118.7 - Polymer Modified Cement Grouts
  - 10. ANSI A118.8 - Modified Epoxy Emulsion Mortar/Grout.
  - 11. ANSI A118.9 - Test Methods and Specifications for Cementitious Backer Units
  - 12. ANSI A136.1 - Organic Adhesives for Installation of Ceramic Tile.
  - 13. ANSI A137.1 - Specifications for Ceramic Tile.
- B. ASTM International (ASTM):
  - 1. ASTM C 50 - Standard Practice for Sampling, Sample Preparation, Packaging, and Marking of Lime and Limestone Products.
  - 2. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.
  - 3. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes.
  - 4. ASTM C 503 - Standard Specification for Marble Dimension Stone.
- C. Tile Council of North America (TCNA): TCA Handbook for Ceramic Tile Installation, 2007.

##### 1.3 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: Tile on walkway surfaces shall be provided with the following values as determined by testing in conformance with ASTM C 1028.
  - 1. Level Surfaces: Minimum of 0.6 (Wet).

2. Step Treads: Minimum of 0.6 (Wet).
3. Ramp Surfaces: Minimum of 0.8 (Wet).

#### 1.4 SUBMITTALS

- A. Submit under provisions of Sections 00 and 01.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  1. Preparation instructions and recommendations.
  2. Storage and handling requirements and recommendations.
  3. Installation methods.
- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- D. Selection Samples: Color charts illustrating full range of colors and patterns.
- E. Selection Samples: Samples of actual tiles for selection.
- F. Samples: Mount tile and apply grout on two plywood panels, illustrating pattern, color variations, and grout joint size variations.
- G. Manufacturer's Certificate:
  1. Certify that products meet or exceed specified requirements.
  2. For each shipment, type and composition of tile provide a Master Grade Certificate signed by the manufacturer and the installer certifying that products meet or exceed the specified requirements of ANSI A137.1.
- H. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum two years' experience.
- B. Single Source Responsibility: Obtain each type and color of tile from a single source. Obtain each type and color of mortar, adhesive and grout from the same source.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging until ready for installation.
- B. Protect adhesives and liquid additives from freezing or overheating in accordance with manufacturer's instructions.
- C. Store tile and setting materials on elevated platforms, under cover and in a dry location and protect from contamination, dampness, freezing or overheating.

#### 1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not install adhesives in an unventilated environment.

- B. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during tiling and for a minimum of 7 days after completion.

1.8 EXTRA MATERIALS

- A. Provide for Owner's use a minimum of 2 percent of the primary sizes and colors of tile specified, boxed and clearly labeled.

2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Garden State Tile, 2401 Walnut Street, Philadelphia PA 19103, 215-564-1420, contact Jessica Ogg [jogg@gstile.com](mailto:jogg@gstile.com).
- B. Substitutions: Products are listed as "Basis Of Design", not as proprietary.
- C. Requests for substitutions will be considered in accordance with provisions of Section 00 and 01.

2.2 TILE

- A. General: Provide tile that complies with ANSI A137.1 for types, compositions and other characteristics indicated. Provide tile in the locations and of the types colors and pattern indicated on the Drawings and identified in the Schedule and the end of this Section. Tile shall also be provided in accordance with the following:
1. Factory Blending: For tile exhibiting color variations within the ranges selected under Submittal of samples, blend tile in the factory and package so tile taken from one package shows the same range of colors as those taken from other packages.
  2. Mounting: For factory mounted tile, provide back or edge mounted tile assemblies as standard with the manufacturer, unless otherwise specified.
  3. Factory Applied Temporary Protective Coatings: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by pre-coating with a continuous film of petroleum paraffin wax applied hot. Do not coat unexposed tile surfaces.
  4. Pattern: As indicated on the Drawings.
  5. Trim Units: Matching bullnose, cove/inside finger cove, cove base, shapes in sizes coordinated with field tile.
- B. WALL TILE:
1. USCU7614310 Glossy Finish - Tender Grey Brt. 4":x10" Color Collection
  2. USCU761S4310 Glossy Finish - Tender Grey Brt. 3"x10" Bullnose Color Collection
  3. Grout: HYGG00835V25 Mobe Pearl Vivid Grout, Rapid Curing, by Bostick
- C. FLOOR TILE
1. Silver Natural Mosaic, Olympia by Alfalux, 2"x2" Mosaic Mesh Mounted on 12"x12" sheet
  2. Grout: HYGG00813V25 Storm Vivid Grout, Rapid Curing, by Bostick.

## 2.3

### TRIM AND ACCESSORIES

- A. Stone Thresholds: Provide stone thresholds uniform in color and finish and fabricated as follows:
  - 1. Material:
    - a. Marble, complying with ASTM C 503 for exterior use and with a minimum abrasive hardness of 10 when tested in accordance with ASTM C 241.
    - b. White Carrera - Standard Finish.
  - 2. Color/Finish: As selected from the manufacturers standard range.
  - 3. Size:
    - a. Fabricate 2 inches (50 mm) wide by full width of wall or frame opening; 1/2 inch (12 mm) thick; beveled one long edge with radiused corners on top side; without holes, cracks, or open seams.
    - b. Fabricated in the sizes and profiles indicated.
  - 4. Provide to provide transition between tile surface and adjoining finishes and at the following locations:
    - a. At doorways where tile terminates.
    - b. At open edges of floor tile where adjacent finish is a different height.

## 2.4

### SETTING MATERIALS

- A. Organic Adhesive: ANSI A136.1, thinset bond type; use Type I in areas subject to prolonged moisture exposure.
- B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4
- C. Crack-resisting additive at thin-set floor: BOD Laticrete 125 Sound and Crack Adhesive.
- D. Polymer modified cement grout (walls): Sanded or unsanded, as specified in ANSI A118.7; color as selected.
- E. Epoxy Grout (floors): ANSI A118.8, 100 percent solids epoxy grout; color as selected.
- F. Silicone Sealant: Silicone sealant, moisture and mildew resistant type, clear.
- G. Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced with 2 inch (50 mm) wide coated glass fiber tape for joints and corners:

## 3

### EXECUTION

### 3.1

#### EXAMINATION

- A. Verify that wall surfaces are free of substances which would impair bonding of setting materials, smooth and flat within tolerances specified in ANSI A137.1, and are ready to receive tile.
- B. Verify that sub-floor surfaces are dust-free, and free of substances which would impair bonding of setting materials to sub-floor surfaces, and are smooth and flat within tolerances specified in ANSI A137.1.
- C. Verify that concrete sub-floor surfaces are ready for tile installation by testing for



moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

- D. Verify that required floor-mounted utilities are in correct location.

### 3.2 PREPARATION

- A. Protect surrounding work from damage.
- B. Remove any curing compounds or other contaminants. Verify compatibility of existing concrete slab for adhesion of setting materials. Notify DPP Project Coordinator if slab is found to be incompatible.
- C. Vacuum clean surfaces and damp clean.
- D. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- E. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge.
- F. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

### 3.3 INSTALLATION - GENERAL

- A. Install tile and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and TCA Handbook recommendations.
- B. Lay tile to pattern indicated. Arrange pattern so that a full tile or joint is centered on each wall and that no tile less than 1/2 width is used. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
- E. Form internal angles square and external angles bullnosed.
- F. Install thresholds where indicated.
- G. Sound tile after setting. Replace hollow sounding units.
- H. Keep expansion joints free of adhesive or grout. Apply sealant to joints.
- I. Allow tile to set for a minimum of 48 hours prior to grouting.
- J. Grout tile joints. Use standard grout unless otherwise indicated.
- K. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.4 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over interior concrete substrates, install in accordance with TCA Handbook Method F113, dry-set or latex-portland cement bond coat, with epoxy grout.
- B. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F131.

3.5 INSTALLATION - WALL TILE

- A. Over cementitious backer units on studs, install in accordance with TCA Handbook Method W244, using membrane at toilet rooms.
- B. Over cementitious backer units install in accordance with TCA Handbook Method W223, organic adhesive.
- C. Over gypsum wallboard on wood or metal studs install in accordance with TCA Handbook Method W243, thin-set with dry-set or latex-portland cement bond coat, unless otherwise indicated.
  - 1. Where mortar bed is indicated, install in accordance with TCA Handbook Method W222, one coat method.
  - 2. Where waterproofing membrane is indicated other than at showers and bathtub walls, install in accordance with TCA Handbook Method W222, one coat method.
- D. Over interior concrete and masonry install in accordance with TCA Handbook Method W202, thin-set with dry-set or latex-portland cement bond coat.
- E. Over wood studs without backer install in accordance with TCA Handbook Method W231, mortar bed, with membrane where indicated.
- F. Over metal studs without backer install in accordance with TCA Handbook Method W241, mortar bed, with membrane where indicated.

3.6 CLEANING

- A. Clean tile and grout surfaces.

3.7 PROTECTION OF FINISHED WORK

- A. Do not permit traffic over finished floor surface for 72 hours after installation.
- B. Cover floors with kraft paper and protect from dirt and residue from other trades.
- C. Where floor will be exposed for prolonged periods cover with plywood or other durable walkway covering.

END OF SECTION

## SECTION 102800

### WASHROOM ACCESSORIES

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Washroom accessories as scheduled in this Section and as indicated on the Drawings.

##### 1.2 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry, coordination with blocking.
- B. Section 092000 - Plaster and Gypsum Board, coordination with blocking.
- C. Section 093000 - Tiling, coordination with layout and installation.
- D. Section 102113 - Toilet Compartments, coordination with accessories.
- E. Section 102814 - Baby Changing Stations, for baby changing stations.

##### 1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's data sheets for each product specified, including the following:
  - 1. Installation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Cleaning and maintenance instructions.
  - 4. Replacement parts information.
- B. Schedule: Submit a toilet accessory schedule, indicating the type and quantity to be installed in each washroom. Use room numbers as indicated on the Drawings.

##### 1.4 QUALITY ASSURANCE

- A. Manufacturer: Provide products manufactured by a company with a minimum of 10 years successful experience manufacturing similar products.
- B. Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.
- C. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirements as applicable.

##### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

## 1.6 WARRANTY

- A. Manufacturer's Warranty for Washroom Accessories: Manufacturer's standard 1 year warranty for materials and workmanship.
- B. Manufacturer's Warranty for Electric Hand Dryers: Manufacturer's standard 5 year warranty on parts, except 3 year warranty on motor brushes from date of purchase.

## PART 2 PRODUCTS

### 2.1 MANUFACTURER

- A. Basis of Design Products: Based on the quality and performance requirements of the project, specifications are based solely on the products of Bobrick Washroom Equipment, Inc.. [www.bobrick.com](http://www.bobrick.com). Location of manufacturing shall be the United States.
- B. Substitutions: The Architect will consider products of comparable manufacturers as a substitution, pending the contractor's submission of adequate documentation of the substitution in accordance with procedures in Division 1 of the Project Manual.

### 2.2 TOILET ACCESSORY SCHEDULE

- A. Single-User Washroom, Heavy Duty:
  - 1. TA-1: B-3706-50 (\$.25) Ladies' Package Goods
  - 2. TA-2: B-3961 ClassicSeries Recessed Touch Free, Pull-Towel, Universal Roll Paper Towel Dispenser and Waste Receptacle with 3944-134 LinerMate Accessory.
  - 3. TA-3: B-2112 Wall-Mounted Soap Dispenser.
  - 4. TA-4: B-6806 Series Concealed Mounting Grab Bars – 1-1/2 inch diameter - see drawings for quantity and lengths.
  - 5. TA-5: KB-200-00 Baby Changing (mount 27" AFF to bottom of open work surface.
  - 6. TA-6: B-290 Series Angle-Frame Mirror.
  - 7. TA-7: B-3888 ClassicSeries Recessed Multi-Roll Toilet Tissue Dispenser.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
  - 1. Verify blocking has been installed properly.
  - 2. Verify location does not interfere with door swings or use of fixtures.
  - 3. Comply with manufacturer's recommendations for backing and proper support.
  - 4. Use fasteners and anchors suitable for substrate and project conditions
  - 5. Install units rigid, straight, plumb, and level, in accordance with manufacturer's installation instructions and approved shop drawings.
  - 6. Conceal evidence of drilling, cutting, and fitting to room finish.
  - 7. Test for proper operation.

### 3.2 CLEANING AND PROTECTION

- A. Clean exposed surfaces using methods acceptable to the manufacturer.
- B. Touch-up, repair or replace damaged products until Substantial Completion.

END OF TABLE OF CONTENTS

SECTION 220509  
GENERAL REQUIREMENTS - PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes general requirements for work of Division 22 - Plumbing.

1.2 INTENT OF DOCUMENTS

- A. Consider drawings and specifications as supplementing each other. Provide work specified but not shown, or shown but not specified, as though mentioned in both specifications and drawings.
- B. Consider flow diagrams and details as part of Contract Documents. Provide equipment, valves, piping and other accessories shown on flow diagrams and details as if they were shown on drawings.
- C. Provide minor items, accessories or devices as necessary for completion and proper operation of systems, whether or not they are specifically called for by specifications or drawings.
- D. Work includes providing labor, material, equipment and services necessary and reasonably incidental to proper completion of systems as indicated on Drawings and as specified.
1. "Provide" means to furnish and install complete and in place, and place in service.
2. "Furnish" means to furnish at site of work unless otherwise indicated.
- E. Coordinate work and equipment of Division 22 Sections with work and equipment of other Divisions, to assure complete and satisfactory installation.
1. Perform work such as excavation, backfill, concrete, and flashing, required under Division 22 in compliance with requirements of applicable Division of specifications.

1.3 REPAIR WORK INCLUDED

- A. Repair damage to work installed under Division 22 or to work of other Divisions, caused by neglect on the part of the Division 22 Contractor no additional cost, and to satisfaction of Architect.

1.4 UNFINISHED OR FINISHED AREA, GENERAL DEFINITION

- A. Finished Area: Space with walls either tiled, plastered, covered or painted, except certain concrete or concrete block foundation walls below grade.
1. Run vertical piping through finished spaces in chases or concealed in walls or

partitions.

2. Conceal piping and conduit above ceilings, where there are ceilings in finished areas. Where indicated "at ceiling," piping may be exposed below the ceiling.
3. Areas where undersides of floor or roof slabs serve as finished ceilings are considered as finished areas.

- B. Unfinished Area: Spaces without wall finish, with or without ceilings.
- C. Where in doubt as to classification of space, obtain written clarification from Architect before beginning work.

#### 1.5 CONTRACT DRAWINGS

- A. Drawings indicate arrangements, approximate sizes and relative locations of principal apparatus, equipment, devices and services provided as part of the Work.
- B. Check and compare layout of equipment indicated on drawings against all drawings, specifications of all Divisions, and exact locations determined using approved shop drawings of such equipment.
  1. Where physical interference occurs, consult with Architect and prepare dated, dimensioned drawings correcting such interferences. Submit to Architect for review of such drawings.
- C. Do not scale drawing to determine working dimension. Such measurements shall be taken from figured dimensions.

#### 1.6 LOCATIONS OF FIXTURES

- A. Locate fixtures, equipment, sleeves outlets, registers, grilles, piping and ductwork and their connections as directed by Architect and to avoid conflicts with work of other Divisions.
- B. When directed by Architect, prepare 1/4-inch scale drawings to indicate and dimension, size, and locations of sleeves in slabs, partitions, foundation wall, beams and columns.
- C. Obtain approval of Architect of above drawings before continuing with work.

#### 1.7 EQUIPMENT DEVIATIONS FROM DESIGN

- A. Dimensions and ratings of equipment specified or indicated on drawings establish desired outlines and characteristics of such equipment. Minor deviations will be permitted to allow manufacturers specified to bid on their nearest stock equipment, providing that equipment conforms to basic performance requirements indicated.
- B. Manufacturer's catalog or model numbers and types indicated in Contract Documents are intended to be used as guides and shall not be interpreted as taking precedence over specific ratings or duty called for or shown, which modify stipulations in such catalog.

1. Verify duty specified with particular characteristics of equipment to be submitted for approval, and submit only items which comply with specification requirements.
- C. Where equipment furnished differs in physical character from that specified or indicated, or where equipment substituted at request of Division 22 Contractor, which is acceptable to Owner and Architect, requires increased services or facilities to be provided, pay costs for such services and other modifications that may be required to accommodate substituted equipment.

## 1.8 SUBSTITUTIONS

- A. Substituted equipment or equipment options, where permitted and approved, must fit within the allowable physical space and satisfy all manufacturer-required service clearances.
- B. Whether substituted equipment is approved or not, replace substituted equipment that cannot fit into the allowable space, at no additional cost.
- C. Provide modifications to related systems, required as a result of substitutions, at no additional cost.

## 1.9 GUARANTEE AND CERTIFICATION

- A. Guarantee work, equipment and materials and certify work to be free from defects and leaks for not less than one year following Date of Substantial Completion, unless specified for a longer period elsewhere.
- B. Repair or replace, as directed by Architect, defective work, equipment and materials, and damage to work of other Divisions resulting from defects, for duration of stipulated guarantee period.

## PART 2 - PRODUCTS

### 2.1 STANDARD OF QUALITY

- A. Provide materials that comply with quality, style and sizes specified and shown on Drawings.
  1. Manufacturer's names and model numbers may be stated in contract documents for the purpose of establishing standards of quality, style, size and type, and shall not be construed to exclude equipment or materials of other acceptable manufacturers, subject to compliance with contract requirements.
- B. Where manufacturer is specified, provide specified item of product of other acceptable manufacturer, provided that alternate item conforms in all respects to Indicated requirements.
  1. Consideration will not be given to claims that another manufacturer's item meets



performance requirements with lesser construction.

2. Performance as delineated on contract drawings and in specifications shall be interpreted as minimum performance requirements.

### PART 3 - EXECUTION

#### 3.1 INTENT OF DOCUMENTS

- A. Provide general arrangement of ductwork, piping and equipment as indicated on Drawings.
  1. Deviations: Submit detailed drawings of proposed deviations, due to actual field conditions or other causes, to Architect for review and approval
  2. Provide approved deviations no additional cost to the Owner.
- B. Carefully investigate structural and finish conditions affecting work of Division 22 and arrange such work accordingly, furnishing such fittings, valves, transitions and accessories as required to meet such conditions.
  1. Diagrammatic Nature of Contract Drawings: Inasmuch as drawings are generally diagrammatic, and because of small scale of drawings, it is not possible to indicate each offset, fitting, and accessory which may be required.
  2. Provide these offsets, fittings and accessories at no additional cost to the Owner.

#### 3.2 COORDINATION WITH OTHER DIVISIONS

- A. Coordinate work with work of other Divisions in order to best arrange equipment, ducts, piping, fixtures, finish work, and conduits.
- B. Reconcile points of conflict between work of this Division and work of other Divisions.
- C. Carefully study contract documents pertaining to work of project, examine building site during construction and compare drawings with existing conditions.

#### 3.3 WORK PRACTICE AND PROTECTION OF EQUIPMENT

- A. Protect surfaces, whether finished, in preparation for finishing or finish material application, against damage from welding, cutting, burning, soldering or similar construction activities.
  1. Division responsible for installation of item damaged shall make good for damage, as directed by Architect, at no additional cost to Owner.
  2. Maintain protective coverings and coatings, and replace when so directed by Architect, until work is ready for acceptance.

- B. Apply and maintain protective coatings on exposed polished metal fittings, parts and devices during course of construction. Do not remove protection until adjoining tile or masonry work has been finally acid-cleaned.

#### 3.4 INSTALLATION PROVISIONS

- A. Install equipment, piping and ducts to preserve access to fittings, valves and accessories. In general, conceal piping and ducts unless otherwise indicated on Drawings, but when exposed, install to allow maximum head room consistent with proper pitch.

#### 3.5 LINES AND GRADES

- A. Lay out work, establish heights and grades for exterior and interior piping and ductwork included in specifications in accordance with intent of drawings, physical conditions of building and finished site grades. Verify that accuracy of such heights and grades meet physical conditions of building and specification requirements.

#### 3.6 LEAKS

- A. Repair leaks in Division 22 work during construction and guarantee period, and rectify, at no additional cost to Owner, such leaks that occur, immediately upon notification by Owner.
- B. Repair damage to other work resulting from such leaks which may occur during construction and guarantee period at once, at no additional cost to Owner.

#### 3.7 CUTTING, REPAIRING AND PATCHING

- A. Provide cutting and patching required for work of Division 22.
- B. Except as otherwise indicated or approved by Architect, provide materials for cutting and patching which will result in equal-or-better work than work being cut-and-patched, in terms of performance characteristics and including visual effect where applicable.
  - 1. Comply with requirements, and provide materials identical to original materials where feasible, and where recognized that satisfactory results can be produced.
- C. Provide adequate temporary support for work to be cut, to prevent failure.
  - 1. Do not endanger other work.
  - 2. Provide adequate protection for other work during cutting and patching, to prevent damage; and provide protection of work from adverse weather exposure.
  - 3. Correct and repair damage caused by cutting and patching work.

#### 3.8 PLUMBING VENTS THROUGH ROOF

- A. Except where otherwise indicated on drawings, terminate vents passing through roof 24 inches above roof.

- B. Provide lead flashing.
- C. Provide curb and counter-flashing.

### 3.9 ACCESS PANELS

- A. Where possible, arrange mechanical work so that access panels are not required.
- B. Where air volume control units, valves, dampers, steam traps, drain traps, junction boxes, and other devices are concealed in finished solid construction, and where access panels have not been indicated on Drawings, provide access panels of adequate size to permit servicing, adjustment or removal of such concealed items.
  - 1. Where possible, provide access panels not smaller than 12 x 12 inches.
- C. Coordinate panel types with project architect.
- D. Deliver access panels, with screwdriver locking device for installation by applicable Contractor.

++ END OF SECTION ++

220517  
SLEEVES AND SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section describes pipe sleeves and pipe sleeve seals for plumbing piping.

1.2 SUBMITTALS

- A. Submit for review:
1. Product data for items provided.
  2. Shop drawings for all items provided.

PART 2 - PRODUCTS

2.1 PIPE SEALS FOR WATER-EXPOSED, NON-FLASHED CONSTRUCTION

- A. Acceptable Manufacturers, subject to compliance with requirements:
1. Thunderline, "Link-Seal".
  2. Metraflex, "Metraseal".
  3. Innerlynx.
- B. Provide sealing element made of synthetic rubber material, especially compounded to resist aging, ozone, sunlight, water and chemical action and having low-temperature flexibility and resistance to high temperature environments.
1. Elements shall be suitable for temperature ranges of minus 40 deg. F to plus 225 deg. F.
- C. Bolts and Metal Parts: Carbon steel with zinc phosphate plating.
- D. Pressure Plates: Plastic.
- E. Provide manufacturer's matching wall sleeve with combination waterstop and anchor plate.

2.2 SEALANT MATERIALS-FOR NON-FIRE RATED CONSTRUCTION

- A. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:
1. Mineral Fireproofing: Thermafiber by USG Acoustical Products Company.

- 2 . Polyethylene Foam: Ethafoam by Dow Chemical Company.
  - 3 . Polyurethane Foam: Denver Foam by Plateau Supply.
  - 4 . Butyl Elastomer: Foster 95-44.
  - 5 . Epoxidized Polyurethane Terpolymer: Dymeric by Tremco.
- B . Provide mineral fireproofing filler material in thicknesses required for each pipe sleeve.
  - C . Provide closed-cell polyethylene foam or open-cell polyurethane foam backup strip for filler material.
  - D . Provide butyl elastomer or epoxidized polyurethane terpolymer flexible vapor barrier sealant for sealing both ends of pipe sleeve.
  - E . See Section 230548 for vibration-isolated pipe penetration requirements.

### 2.3 SEALANT MATERIALS - FOR FIRE-RATED CONSTRUCTION

- A . Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:
  - 1 . Dow Corning, Fire Stop System Sealant.
  - 2 . 3M Electrical Products Division, Fire Barrier Non-Sag Caulk CP 25N/S or Self-Leveling Caulk CP 25S/L.
  - 3 . Hevi-Duty/Nelson/Unit of General Signal, FSP Firestop Putty.
- B . Sealant materials shall be UL listed and have a fire rating equal to the wall or floor penetrated.
- C . All pipe penetration seal systems shall be UL approved and approved by the local authority having jurisdiction for the application.
- D . For uninsulated metal pipes when each pipe penetrates through individual sleeve:
  - 1 . Provide smoke-tight and fire-tight seal using an intumescent elastomeric material in putty or caulk form.
- E . For uninsulated metal pipes when multiple pipes penetrate through one sleeve and when each pipe penetrates through individual sleeve.
  - 1 . Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:
    - a . Dow Corning, Fire Stop System Two-Part Silicone RTV Foam.
    - b . General Electric Company, Pensil Fire Stop System.
  - 2 . Provide smoke-tight and fire-tight seal using a foamed-in-place silicone

elastomeric material to fill the annular space between the pipe and sleeve.

- 3 . Provide alumina-silicate fireboard or other suitable damming material.

F . For Insulated Metal Pipes

- 1 . Acceptable Manufacturers: Subject to compliance with requirements, provide products of the following:
  - a . 3M Electrical Products Division, Fire Barrier Wrap/Strip FS-195.
- 2 . Provide smoke-tight and fire-tight seal using an intumescent elastomeric material with aluminum foil on one side in wrap/strip form.
- 3 . Provide precut aluminum-faced fire barrier sheets for sealing either round or rectangular penetrations.

2.4 PIPE SLEEVES FOR INTERIOR FLOOR SLABS (OTHER THAN WATERPROOFED SLABS) AND GRADE BEAMS

- A . Fabricate sleeves from standard-weight carbon steel pipe in length to match slab or grade beam thickness.
- B . Pipes, 8 Inches in Diameter and Smaller: Make sleeve inside diameter at least 2 inches larger than outside diameter of finished pipe.
  - 1 . For insulated pipe, make sleeve inside diameter at least 2 inches larger than outside diameter of pipe insulation.
- C . Pipes Larger Than 8 Inches in Diameter: Make sleeve inside diameter at least 3 inches larger than outside diameter of finished pipe.
  - 1 . For insulated pipe, make sleeve inside diameter at least 3 inches larger than outside diameter of pipe insulation.
- D . Where sleeve seals are UL Listed assemblies, size pipe sleeve to conform to designated UL assembly standards.

2.5 PIPE SLEEVES FOR CONCRETE OR MASONRY INTERIOR WALLS, PARTITIONS AND FIRE-RATED WALLS

- A . Fabricate sleeves from standard-weight carbon steel pipe in length to match finished wall thickness.
- B . Pipes, 8 Inches in Diameter and Smaller: Make sleeve inside diameter at least 2 inches larger than outside diameter of finished pipe.
  - 1 . For insulated pipe, make sleeve inside diameter at least 2 inches larger than outside diameter of pipe insulation.

- C . Pipes Larger Than 8 Inches in Diameter: Make sleeve inside diameter at least 3 inches larger than outside diameter of finished pipe.
  - 1 . For insulated pipe, make sleeve inside diameter at least 3 inches larger than outside diameter of pipe insulation.

## 2.6 PIPE SLEEVES FOR ABOVE GRADE EXTERIOR WALLS AND WATERPROOFED FLOOR SLABS

- A . Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:
  - 1 . National Pipe Hanger, Figure 840.
  - 2 . Calpico.
- B . Fabricate sleeves from standard-weight carbon steel pipe with continuously welded dam/anchor metal ring extending radially, a minimum of 2 inches from the outside diameter of the pipe sleeve.
- C . Fabricate sleeves for above grade exterior walls to match finished wall thickness.
- D . Fabricate sleeves for waterproofed floor slabs of sufficient length to extend at least 2 inches above the finished floor to permit flashing of the membrane waterproofing.
- E . Pipes, 8 Inches in Diameter and Smaller: Make sleeve inside diameter at least 2 inches larger than outside diameter of finished pipe.
  - 1 . For insulated pipe, make sleeve inside diameter at least 2 inches larger than outside diameter of pipe insulation.
- F . Pipes Larger Than 8 Inches in Diameter: Make sleeve inside diameter at least 3 inches larger than outside diameter of finished pipe.
  - 1 . For insulated pipe, make sleeve inside diameter at least 3 inches larger than outside diameter of pipe insulation.

## 2.7 PIPE SLEEVES FOR BELOW GRADE FOOTINGS, EXTERIOR WALLS AND ROOF DECKS

- A . Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:
  - 1 . National Pipe Hanger, Figure 840.
- B . Fabricate sleeves from standard-weight carbon steel pipe with continuously welded water dam/anchor metal ring extending radially a minimum of 2 inches from the outside diameter of the pipe sleeve.
- C . Fabricate sleeves to match finished footing, wall or roof deck thickness.

- D. Pipes, 8 Inches in Diameter and Smaller: Make sleeve inside diameter at least 2 inches larger than outside diameter of finished pipe.
  - 1. For insulated pipe, make sleeve inside diameter at least 2 inches larger than outside diameter of pipe insulation.
- E. Pipes Larger Than 8 Inches in Diameter: Make sleeve inside diameter at least 3 inches larger than outside diameter of finished pipe.
  - 1. For insulated pipe, make sleeve inside diameter at least 3 inches larger than outside diameter of pipe insulation.
- F. Where sleeve seals are required, size pipe sleeve in accordance with seal manufacturer's published standards.

## 2.8 PIPE SLEEVES FOR ROOF PENETRATIONS

- A. Provide relief valve vent pipe penetrating the roof with special sleeves that permit a flow of air between the pipe and the sleeve.
- B. Provide pipe seals as specified elsewhere in this Division for vents and piping penetrating the roof.

## PART 3 - EXECUTION

### 3.1 INSTALLATION - SEALS AND SLEEVES

- A. For Pipe Sleeves Receiving Non-Fire-Rated Seals
  - 1. Wedge filler materials between bars or insulated pipe, and sleeve over the full length of the pipe sleeve.
  - 2. Recess the filler material 1/4 inch back from the end of the sleeve.
  - 3. Trowel or gun a continuous bead of sealant for a complete seal over filler material at both ends of sleeve.
- B. For Pipe Sleeves Receiving Fire-Rated or Watertight Seals
  - 1. Remove insulation from piping at the portion of the pipe passing through the sleeve.
  - 2. Install seals in accordance with manufacturer's instructions to meet UL listing.
- C. Unless already provided, place sleeves to be embedded in concrete or masonry floors and walls in the forms before concrete is poured or masonry wall is erected.
  - 1. Provide sleeves with integral waterstop flanges where sleeves are to receive either watertight or hydrostatic seals.
- D. Select correct size, location and alignment of sleeves for plumbing work before and



during concrete placement or masonry erection.

- E . In finished areas, set floor sleeves flush with the top of the finished floor surface.
- F . In Kitchens, Mechanical Rooms and areas with similar service, set floor sleeves 4 inches above the finished floor, unless such areas are slab-on-grade.
- G . Extend wall sleeves through and cut flush with each surface.
- H . Locate piping in sleeve to allow for movement. Do not allow steel sleeves to touch copper piping at any time.
- I . Grout opening between outside of sleeve and inside of core-drilled penetrations.

++ END OF SECTION ++

SECTION 220523  
GENERAL DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section describes valves used in plumbing piping systems.

1.2 SUBMITTALS

- A. Submit for review:

1. Product Data: Include materials of construction of component parts and their arrangement, pressure and temperature ratings, end connection details, dimensions and required clearances, weights, and installation instructions.
2. Provide statement that ball and butterfly valves will be provided with extended stems to match insulation thickness.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Prepare valves for delivery as follows:

1. Ensure valves are dry and internally protected against rust and corrosion.
2. Protect valve ends against damage to threads, flange faces and weld-end preparations.
3. Pack valves in best position for handling. Set globe and gate valves closed to prevent rattling; set ball and plug valves open to minimize exposure of bearing/sealing surfaces; set butterfly valves closed or slightly open; and block swing check valves with soft material in either closed or open position.

- B. Precautions During Storage:

1. Do not remove valve end protectors unless necessary for inspection; then reinstall for storage.
2. Protect valves from weather or other harmful environmental conditions. Store valves indoors, where possible, and maintain valve temperature higher than ambient dew point temperature. If outdoor storage is necessary, support valves off ground or pavement, in watertight enclosures.

PART 2 - PRODUCTS

2.1 DOMESTIC COLD AND HOT WATER

- A. Manufacturers: Stockham, Watts, Apollo.

- B. Provide extended stem on ball and butterfly valves to suit insulation thickness.
- C. Shut-off Valves:
  - 1. 2 Inches and Smaller, Three-Piece Full-Port Design:
    - a. Manufacturer: Watts B-6800.
    - b. Three-Piece Full-Port Design: Serviceable in line, blowout-proof stem, ASTM A 584 bronze body, chrome-plated brass ball, reinforced PTFE stem packing and seats, plated carbon steel handle with vinyl insulating cover, threaded ends.

## PART 3 - EXECUTION

### 3.1 GENERAL REQUIREMENTS

- A. Do not install valves with stem down.

++ END OF SECTION ++

## HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section describes hangers and supports for piping and equipment in plumbing systems.

## 1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated.
  - 1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
  - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

## 1.3 SUBMITTALS

- A. Submit for record:
  - 1. Product data, including installation instructions for each type of support and anchor, materials of construction, finish and rated load capacities.

## 1.4 QUALITY ASSURANCE

- A. Materials, design and manufacturer of pipe hangers and supports shall conform to MSS SP-58.
- B. Selection and application of pipe hangers and supports shall conform to MSS SP-69.
- C. Fabrication and installation practices of pipe hangers and supports shall conform to MSS SP-89.
- D. Conform to applicable ANSI/ASME Codes for Pressure Piping.
- E. Comply with the applicable plumbing code.

## PART 2 - PRODUCTS

## 2.1 APPROVED MANUFACTURERS

- A. The following manufacturers are approved for use:

1. Pipe Hangers: Grinnell, Carpenter & Patterson, National Pipe Hanger, B-Line, Pipe Shields, Inc.
  2. Pipe Clamps: Grinnell, Carpenter & Patterson, National Pipe Hanger, B-Line, Pipe Shields, Inc.
  3. Pipe Insulation Protection Shields: Grinnell, Carpenter and Patterson, National Pipe Hanger, B-Line.
  4. Wall Brackets: Grinnell, B-Line, Carpenter & Patterson, National Pipe Hanger.
  5. Hanger Inserts: Grinnell, National Pipe Hanger, B-Line.
  6. Trapeze Hangers: Unistrut, Grinnell (Power-Struct), National Pipe Hanger, B-Line.
  7. U-Bolts: Grinnell, B-Line, Carpenter & Patterson, National Pipe Hanger.
- B. Specific manufacturer's model numbers are cited in the following paragraphs to establish the desired quality and performance of the work. Equivalent products by the other approved manufacturers listed above are also acceptable.

2.2 HANGER RODS

- A. Hanger rods shall be threaded at both ends, or continuous threaded rods of circular cross-section. Provide adjusting locknuts at upper attachments and hangers.
- B. Provide hanger rods for the following pipe sizes as tabulated as a minimum for single rigid rod hangers, subject to the load ratings of MSS-SP-58. Hanger rods may be reduced one (1) size for double rod hangers with 3/8 inch minimum diameter.

PIPE SIZE - INCHES	MIN. ROD DIA. - INCHES
1/2 to 2	3/8
2-1/2 to 3	1/2
4 to 5	5/8

2.3 HORIZONTAL NON-INSULATED WASTE, VENT AND STORM WATER PIPING HANGERS

- A. Uninsulated pipes 2 inch and smaller:
  1. Adjustable steel swivel ring (band type) hanger, B-Line B3170.
  2. Malleable iron ring hanger, B-Line B3198R or hinged ring hanger, 3198H.
  3. Adjustable steel clevis hanger, B-Line B3104 or B3100.

- B. Uninsulated pipes 2-1/2 inch and larger:
  - 1. Adjustable steel clevis hanger, B-Line B3100.

#### 2.4 UNINSULATED COPPER TUBING SUPPORTS

- A. Size hangers to fit copper tubing outside diameters.
  - 1. Adjustable steel swivel ring (ban type) hanger, B-Line B3170 CT.
  - 2. Malleable iron ring hanger, B-Line B3198RCT or hinged ring hanger B3198HCT.
  - 3. Adjustable steel clevis hanger, B-Line B3104CT.
- B. For supporting vertical runs use epoxy painted or plastic coated riser clamps, B-Line B3373CT or B3373CTC.

#### 2.5 INSULATED HORIZONTAL PIPING HANGERS

- A. Domestic Cold and Hot Water and Rain Water Piping
  - 1. 2 inch and Smaller Pipe: Use adjustable steel clevis. B-Line B3104 with B3151 or B3380 series.

#### 2.6 PIPE INSULATION PROTECTION SHIELDS

- A. Provide pipe insulation protection shields on insulated piping and tubing. Fabricate shields from galvanized steel. Provide length and gage thickness of shields based on MSS SP-58.
- B. Provide calcium silicate insulation at each pipe insulation protection shield. Cut calcium silicate insulation to at least the length of the protection shield.
- C. Provide supports at spacing as specified in this Section.
- D. Approved Pipe Insulation Protection Shields: B-Line B-3151, Grinnell, Carpenter & Paterson, National Pipe Hanger.

#### 2.7 VERTICAL SUPPORTS

- A. Riser clamp sized to fit outside diameter of pipe, B-Line B3373.
- B. Riser clamp sized to fit outside diameter of copper tubing, B-Line B3373CT.

#### 2.8 CONCRETE INSERTS

- A. Use cast in place spot concrete inserts where applicable, either steel or malleable iron body, B-Line B2500 or B3014. Spot inserts shall allow for lateral adjustments and have means for attachment to forms. Select inserts to suit threaded hanger rod sizes, B-line

N2500 or B3014N series.

- B. Use continuous concrete inserts where applicable. Channels shall be 12 gage, ASTM A 1011/A 1011M Grade 33 structural quality carbon steel, complete with Styrofoam inserts and end caps with nail holes for attachment to forms. The continuous concrete insert shall have a load rating of 2,000 lbs/ft. in concrete, B-Line B221, 321, or 521. Select channel nuts suitable for strut and rod sizes.

## 2.9 BRACKETS

- A. Welded strut bracket and pipe straps, B-Line B3064 and B2000 series.
- B. Welded steel brackets, B-Line B3066 or B3067, with roller chair or adjustable steel yoke pipe roll. B-Line B3120 or B3110.

## 2.10 U-BOLTS

- A. Heavy-Duty Carbon Steel: B-Line Numbers B3188 and B3188N5.

## 2.11 DIELECTRIC CONTROL

- A. For copper tubing in contact with metallic pipe clamps, brackets or supports, provide an insulating pipe clamp assembly with plastic cushion. Pipe clamp assembly shall eliminate metal-to-metal contact and form an insulating liner to prevent galvanic action between copper tubing and metallic clamps, brackets and supports.

## PART 3 - EXECUTION

### 3.1 INSTALLATION - PIPE HANGERS AND SUPPORTS

- A. Support horizontal pipe runs using hangers and supports. Space the hangers so that the supported load does not exceed the load recommended by the hanger manufacturer. Space the hangers so they do not exceed the support spacing requirements listed in this Section. The supported load shall not overstress the building structural members.
- B. Support vertical pipe at each floor using riser clamps. When run in a shaft, support riser clamps on both sides of the clamp. Support vertical plastic piping (all sizes) and metal piping less than 1-1/4 inch every 8 feet with pipe clamps.
- C. Support cast iron pipe under each section and at each hub.
- D. Wall brackets are acceptable where pipes are adjacent to walls or other vertical surfaces which may be used for support.
- E. Provide hangers and supports not more than 12 inches from each face of a horizontal elbow for all piping 6 inches in diameter and larger.
- F. Furnish embedded inserts for pipe hangers installed in concrete slabs or masonry walls for installation during concrete forming or masonry erection.

- G. For the support of two or more pipes of similar temperatures running adjacent to each other at the same elevation and at the same slope, structural steel trapeze hangers are permitted. Limit the longitudinal hanger spacing to suit the smaller diameter pipe.
- H. Support riser piping independently from the connected horizontal piping.
- I. Do not use pipe hooks, chains or perforated steel strap for pipe supports.
- J. Cut off excess hanger rod lengths. Secure rods by use of locknuts or elastic stop nuts.
- K. Support the base of all vertical pipe stacks, except soil pipe stacks and copper water pipe risers, with a base leg. Cut the top of the base leg to shape and completely weld to the heel of the base elbow. Weld leg support to a bearing plate and bolt to the floor. Locate base leg on the vertical pipe centerline.
- L. Install hanger inserts prior to installation of concrete or masonry. Select correct locations and positions of the inserts for plumbing work.
- M. Support vertical drops to plumbing fixtures and equipment.
- N. Provide maximum support spacing as listed below. Locate one support within one foot on both sides of concentrated pipe-mounted loads, including valves, meters, and pumps. Adjust the span, if required, to conform with the load ratings of the supports/hangers.
  - 1. Support cast iron and ductile iron piping with clevis hangers every 5 feet for 5-foot sections of pipe, or every 10 feet for 10-foot sections of pipe, with at least one hanger per section.
  - 2. Support copper tubing as follows:

Nominal Pipe Size Inches	Water Service
1/2	5
3/4	5
1	6
1-1/4	7
1-1/2	8
2	8

++ END OF SECTION ++



220700  
PLUMBING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This section describes the insulation of piping, used in plumbing system.

1.2 SUBMITTALS

- A. Submit for record:
  - 1. Product data and installation instructions for insulations, mastics, sealants, coatings, adhesives and jacketing materials.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with affixed manufacturer's stamp or label, showing fire hazard ratings.
- B. Protect insulation against dirt, water, and mechanical damage.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Submit certification that Contractor has completed minimum five years of satisfactory experience on projects using similar materials and techniques as required for this project.

PART 2 - PRODUCTS

2.1 FIBERGLASS PIPE INSULATION

- A. Acceptable Manufacturer, subject to compliance with requirements: Johns-Manville Micro-Lok APT, or approved equivalent by Knauf, or Owens-Corning.
- B. Pipe insulation, meeting ASTM Standard C 547, consisting of inorganic glass fibers bonded with thermosetting resin, molded into tubular sections split lengthwise, approximately 3.5 lb per cu ft, thermal conductivity of 0.23 Btu·in/h·sq ft·°F at 75 deg F.
- C. Jackets shall be factory-applied, composite with insulation, with maximum water vapor permeance of 0.02 perms, fabricated from white kraft paper bonded to aluminum foil, reinforced with fiberglass scrim.

2.2 TAPES

- A. Approved Manufacturer: PermTape by Compac.
- B. Vapor barrier type, self-sealing (with release paper) non-corrosive, fire-retardant, 3/4 inch and 3 inches wide by 6.9 mils thick.

## 2.3 PREMOLDED PIPE-FITTING INSULATION AND COVERS

- A. Fiberglass, molded in two matching half-sections, matching the density, thermal conductivity and thickness of the adjoining pipe insulation.
  - 1. For fiberglass, provide Types 450/650/850 by Hamfab, Inc.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Apply insulation on clean, dry surfaces after leakage and other tests have been completed.
- B. Piping equipment located within shaft spaces, above acoustical tile or GWB ceilings, in crawl spaces, and in pipe trenches shall be considered as concealed. Other piping and equipment shall be considered exposed.
- C. Do not insulate domestic water pipes that are chrome-plated for applications in exposed finished areas except for piping to handicapped fixtures.
- D. Install insulation neatly, accurately and without voids, in accordance with manufacturer's instructions and NIAC National Commercial and Industrial Insulation Standards.
- E. Insulate fittings, strainers, valves and flanges using premolded covers with precut insulation inserts, or with removable insulation jackets.
- F. Do not use staples in vapor barrier jackets.

### 3.2 FIBERGLASS PIPING INSULATION

- A. For Rainwater Conductors, Domestic Cold and Hot Water Systems
  - 1. For piping located indoors apply insulation as specified and seal butt joints with fire-retardant tape.
  - 2. Insulate horizontal rainwater conductors, including elbow turning up and down, and first vertical drop.
  - 3. Insulate roof drain bodies.
  - 4. For piping located outdoors, apply insulation as specified, seal butt joints with fire-retardant tape, and cover with a stainless steel jacket and fitting covers. Provide 1-1/2 inch overlap at the circumferential joints of metal jacket.

### 3.3 PIPE INSULATION SCHEDULE

- A. Insulate piping in accordance with the following schedule:

SERVICE	COMMENT	PIPE DIAMETER	MATERIAL	THICKNESS (INCHES)
Domestic Hot and Cold Water	---	All	Fiberglass	1

++ END OF SECTION ++

221116  
DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section describes pipe and pipe fittings used in domestic water piping systems.

1.2 SUBMITTALS

- A. Submit for review:

1. Manufacturer's technical product literature for pipe, fittings and bolting.
2. Field Test Reports.
3. Chemical Cleaning Effluent Disposal Plan.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Protect flange faces with wood, plastic or soft metal to prevent damage.
- B. Factory apply plastic end-caps for piping, except for hub-and-spigot pipes. Maintain end-caps in place until pipe is installed.
- C. Store pipe and fittings inside for protection from moisture and dirt, or with weatherproof packaging.
- D. Stack pipes to prevent distortion.
- E. Follow specific requirements of manufacturers.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Domestic Cold Water and Domestic Hot Water Within Building:
  1. Pipe: Copper tubing, Type L, drawn temper, conforming to ASTM B 88.
  2. Fittings: Wrought copper, solder joint, conforming to ANSI B16.22.
- B. Domestic Cold Water and Domestic Hot Water Exposed in Finished Areas:
  1. Pipe: Chrome-plated, seamless red brass, iron pipe size, regular wall thickness, conforming to ASTM B 43, matching fixture or equipment connection.

2. Fittings: Cast bronze to ASTM B 61, chrome-plated.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Unless otherwise indicated, route piping in the most direct manner, parallel to building lines.
- B. Locate piping to maintain clearance around equipment, and minimum piping headroom of 7 feet, except where otherwise indicated.
- C. Space piping so that insulation and flanges, if any, have at least 2 inch clearance after maximum movement.
- D. Close open ends of piping and equipment, when it is not being worked on, with flange covers, caps or plugs.
- E. Do not use pipes smaller than 1/2 inch, unless otherwise indicated.
- F. For pressures over 15 psig, use nipples and caps instead of plugs for permanent closures. Plugs in equipment provided by the equipment manufacturer are acceptable.
- G. Do not bend steel or copper pipe.
- H. Clean piping materials before installation to remove grease, loose dirt, mill scale and other foreign
- I. Provide escutcheons at locations where piping, installed exposed to view, penetrates walls, partitions, floors and ceilings.
- J. Do not install pipes in transformer vaults, electrical equipment rooms, elevator machine rooms or similar areas containing electrical equipment. Do not install pipes over, around, in front of, in back of, or directly below, electrical controls, panels, switches, terminals, boxes, or similar electrical equipment. Provide drip pans over electrical equipment, at no additional cost, only after approval by the Owner.
- K. Reduce pipe sizes with reducing fittings. Bushings are not acceptable.

#### 3.2 SOLDERED PIPE JOINTS

- A. Solder: lead-free, 95/5 (tin/antimony).
- B. Solder joints in accordance with the current edition of the Copper Tube Handbook of the Copper Development Association.
- C. Tin tubing and fittings 2 inches and larger prior to soldering.
- D. Remove excess solder and flux with a cloth or brush.

#### 3.3 DOMESTIC WATER PIPING

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DOMESTIC WATER PIPING

- A. Support piping risers and stacks by metal brackets attached to building construction or by other Architect approved methods.
- B. Branch Piping: As indicated, minimum 3/4 inch with last ten feet to each 1/2 inch outlet fixture a minimum of 1/2 inch.

#### 3.4 ELECTROLYSIS CONTROL

- A. See Section 220529, for isolation between piping and pipe supports.
- B. Isolate non-ferrous piping passing through openings in structural steel with nonconductive material permanently attached to the pipe.
- C. Make connections between non-ferrous metallic piping and ferrous piping, fittings, or equipment with dielectric fittings, nipples or unions specified in this Section.

#### 3.5 PIPING SYSTEM DRAINS

- A. Pitch each piping system to low points where entire system can be emptied through drains. Wherever isolation valves are installed, provide a drain plug to ensure that all piping can be drained.

#### 3.6 PIPING SYSTEM TESTING

- A. Before testing, complete the installation of each pipe line, including final supports, hangers and anchors, insulation and painting. Clean piping and equipment of metal cuttings and foreign matter as they are installed and in accordance with all applicable codes and standards.
- B. Provide two days notice of testing to the Owner. Testing may be witnessed by an Owner representative.
- C. Pressure test piping in accordance with the applicable Codes, and applicable NFPA Standards.
- D. Do not subject pressure vessels, tanks, pumps, rotating and other mechanical equipment to the piping field pressure test.
- E. Disconnect from the piping and the end of the pipe, blank off by a blind flange, plug or cap, or isolate by insertion of a line blind or spool piece as required to protect equipment, instruments and piping specialties which are not be included in the test.
  - 1. Disconnect instrument air lines and close all openings.
- F. Test piping in sections as required.
- G. Provide systems to be pressurized with gauges and pressure-relieving devices.
- H. Lines containing check valves: Locate source of test pressure on the high-pressure side of the valves.

- I. Set and maintain line control valves in wide-open position.
- J. Maintain a record of all tests, showing line designation, test pressure, ambient temperature, date of test, retests, and signature of Owner.
- K. Perform pneumatic testing in accordance with ANSI/ASME B31.9, except for the following:
  - 1. Perform pneumatic test using either oil-free compressed air or dry nitrogen.
  - 2. Prior to application of full pneumatic test pressure, make preliminary test at 10 psig for 10 minutes.
  - 3. Test pressure: As indicated elsewhere in this Section.
  - 4. After the preliminary test, apply pressure gradually in stages of not more than 25 psig until test pressure is reached, allowing a minimum of 10 minutes between stages.
    - a. Maintain test pressure for a minimum of thirty minutes without fluctuation; then reduce pressure to operating pressure and begin checking for leaks.
  - 5. Check all joints, welds, and valves, for leaks with a thick soap-water solution or with a special fluid made specifically for this purpose and hold pressure for a minimum of eight hours.
  - 6. Provide protection of persons and property during leak testing.
- L. Perform hydrostatic testing in accordance with ANSI/ASME B31.9 except for the following:
  - 1. Test Pressure: As indicated elsewhere in this Section.
  - 2. Maintain test pressure for a minimum of thirty minutes before examining all joints, welds, valves, and hold test pressure for a minimum of four hours.
- M. Apply test pressures as follows:

SYSTEM	HYDROSTATIC TEST PRESSURE (PSIG)	DURATION (HOURS)
Domestic Water Systems	165	0.5

3.7 FLUSHING OF PIPING SYSTEMS (DOMESTIC WATER)

- A. Complete pressure testing before flushing piping systems. Flushing may be witnessed by the Owner, and shall be performed in accordance with the following procedures:

1. Flush clean with new potable water and drained at all low points. Isolate connected equipment, including coils, and flush individually with a hose.
2. Flushing for piping and equipment shall be complete when water samples taken at all low points indicate clean discharge, with no visible solids. If not clean, continue flushing and sampling until discharge is clear.

### 3.8 CLEANING OF PIPING SYSTEMS

- A. Submit a plan for disposal of the chemical cleaning effluent to the Owner for approval. Obtain written permission from the Owner to drain effluent on the site from cleaning and flushing operations. Otherwise, dispose of effluent offsite in a manner acceptable to applicable codes and regulations.
- B. Complete flushing before cleaning piping systems.

### 3.9 DISINFECTION OF DOMESTIC WATER SYSTEM

- A. Upon completion of tests and necessary repairs or replacements, disinfect hot and cold domestic water piping and other systems that may be connected to same supply source. Disinfect piping after thoroughly flushing with water to remove sediment.
- B. Chlorinating materials shall be either liquid sodium hypochlorite solution or granular calcium hypochlorite. Introduce materials into system, as specified in AWWA Standard for Water Mains, C601. Provide connections for pumping chlorine solution into system.
- C. Following flushing, disinfect piping system in accordance with one of following methods:
  1. Disinfect outside mains, to point inside building at main shutoff valve, as described in AWWA Standard C 6018 for a minimum contact time of 24 hours.
  2. Fill piping system inside building, beginning at point of main shutoff valve, with solution containing 100 ppm of available chlorine.
    - a. Retain solution in systems for not less than 4 hours,
    - b. Open each valve and faucet for flushing, until chlorine is no longer detected. Drain system.
- D. After sterilization, flush solution from system with clean drinking water until residual chlorine content is not greater than 1.0 ppm at extreme end of system.
- E. Spent chlorine is industrial waste.
  1. Dechlorinate prior to discharge from piping if final concentration exceeds 1.0 ppm or if municipal system receiving this discharge requires dechlorination.
- F. Obtain representative water sample from system for analysis by recognized bacteriological laboratory.
  1. If all samples tested for coliform organisms are negative, submit letter and



laboratory reports, certifying successful completion of sterilization.

2. If one or more samples tested indicate presence of coliform organisms, repeat entire sterilization procedure.

++ END OF SECTION ++

221316  
SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section describes pipe and pipe fittings used in sanitary waste and vent systems.

1.2 SUBMITTALS

- A. Submit for review:

1. Manufacturer's technical product literature for pipe, fittings and bolting.
2. Field Test Reports.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Factory apply plastic end-caps for all piping, except for hub-and-spigot pipes. Maintain end-caps in place until pipe is installed.
- B. Store pipe and fittings inside for protection from moisture and dirt, or with weatherproof packaging.
- C. Stack pipes to prevent distortion.
- D. Follow specific requirements of manufacturers.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Sanitary and Vent Piping:

1. Underground, within building and to point outside building walls or as shown on Drawings.
  - a. Pipe: Service weight, externally coated cast iron hub-and-spigot soil pipe and fittings, conforming to ASTM A 74.
  - b. Joints: ASTM B 29 caulked oakum and lead joints, or ASTM C 564 elastomer push-on joints with "Multi-tite" gasket as manufactured by U.S. Pipe and Foundry Co. or equal.
  - c. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute or receive prior approval of the engineer.
2. Above Ground, Interior Building:
  - a. Service weight, coated, hubless, cast iron soil pipe and fittings conforming to CISPI 301 and ASTM A 888 with

- 1) Hubless Joints: ASTM C1277 and CISPI 310 made of Neoprene sealing coupling sleeve surrounding by Series 300 stainless steel shield and clamp assembly.
- 2) No-Hub Couplings: No-Hub coupling shall conform to CISPI Standard 310 and ASTM C 1277.
- 3) Heavy Duty Couplings: Heavy duty couplings shall conform to the requirements of ASTM C 1540.
- 4) Piping smaller than 2 inches in diameter shall be standard weight galvanized steel pipe conforming to ASTM A 53 Grade A, with galvanized banded and recessed threaded drainage fittings conforming to ASTM A 126 cast iron with dimensions to ANSI B16.12.

or

- 5) Copper tube to ASTM B 306, Type DWV, drawn temper for nonpressure application, with cast bronze solder-joint drainage fittings conforming to ANSI B16.23 or wrought copper solder-joint drainage fittings with dimensions to ANSI B16.29.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Unless otherwise indicated, route piping in the most direct manner, parallel to building lines.
- B. Locate piping to maintain clearance around equipment, and minimum piping headroom of 7 feet, except where otherwise indicated.
- C. Close open ends of piping, when it is not being worked on, with caps or plugs.
- D. Do not use pipes smaller than 1/2-inch, unless otherwise indicated.
- E. Do not bend steel or copper pipe.
- F. Clean piping materials before installation to remove grease, loose dirt, mill scale and other foreign matter.
- G. Provide escutcheons at all locations where piping, installed exposed to view, penetrates walls, partitions, floors and ceilings.
- H. Maintain the following minimum pitches:
 

Sanitary piping 2-1/2" and smaller	1" in 4'
Sanitary piping 3" and larger	1" in 8'
- I. Do not install pipes in transformer vaults, electrical equipment rooms, elevator machine rooms or similar areas containing electrical equipment. Do not install pipes over, around, in front of, in back of, or directly below, electrical controls, panels, switches, terminals,

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SANITARY WASTE AND VENT PIPING

boxes, or similar electrical equipment. Provide drip pans over electrical equipment, at no additional cost, only after approval by the Owner.

- J. Changes in pipe size of soil, waste, and drain lines shall be made with increasers. Changes in direction, where space permits, shall be made with long sweep bends, wye-fittings, and 1/8- or 1/16-bends, or combination wye and 1/8-bends.
- K. Hubless joints for horizontal pipe and fittings five inches and larger shall be suitably braced to prevent horizontal movement,. This shall be done at every branch opening or change of direction by the use of braces, blocks, or rodding, to prevent movement.

### 3.2 SOLDERED PIPE JOINTS

- A. Solder joints in the following piping:
  - 1. Drainage copper piping D.W.V.
- B. Use lead-free, 95/5 (tin/antimony) solder.
- C. Solder joints in accordance with the current edition of the Copper Tube Handbook of the Copper Development Association.
- D. Tin tubing and fittings 2 inches and larger prior to soldering.
- E. Remove excess solder and flux with a cloth or brush.

### 3.3 CAULKED PIPE JOINTS

- A. Following piping shall have caulked joints:
  - 1. Cast iron soil pipe.
- B. Hub-and-spigot, cast iron pipe joints shall be caulked firmly with oakum of hemp and filled with molten lead not less than 1" deep and not to extend more than 1/8" below rim of hub. Joint shall be poured full, at one pouring, with sixteen ounces of soft pig lead for each inch in diameter of cast iron pipe. Paint, varnish, and other coatings are not permitted on jointing material until after joint has been tested and approved.
- C. To join screwed pipe to cast iron pipe, provide ring on screwed pipe to form spigot end.

### 3.4 ELECTROLYSIS CONTROL

- A. See Section 220529, for isolation between piping and pipe supports.
- B. Isolate non-ferrous piping passing through openings in structural steel with nonconductive material permanently attached to the pipe.
- C. Make connections between non-ferrous metallic piping and ferrous piping, fittings, or equipment with dielectric fittings, nipples or unions specified in this Section.

### 3.5 PIPING SYSTEM TESTING

- A. Before testing, complete the installation of each pipe line, including final supports, hangers and anchors, and painting. Clean piping of metal cuttings and foreign matter as they are installed and in accordance with all applicable codes and standards.
- B. Provide two days notice of testing to the Owner. Testing may be witnessed by an Owner representative.
- C. Test piping in sections as required before connection to fixtures.
- D. Maintain a record of all tests, showing line designation, test pressure, ambient temperature, date of test, retests, and signature of Owner.
- E. Perform hydrostatic testing in accordance with ANSI/ASME B31.9 except for the following:
  - 1. Test pressure shall be as indicated elsewhere in this Section.
  - 2. Maintain test pressure for a minimum of thirty (30) minutes before examining all joints and hold test pressure for a minimum of four (4) hours.
- F. Test pressures shall be as follows:

SYSTEM	HYDROSTATIC TEST PRESSURE (PSIG)	DURATION (HOURS)	REFERENCE INFORMATION
Sanitary Waste Piping	Static Fill - No Leakage	0.5	

++ END OF SECTION ++

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SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section describes: Sanitary Drainage System.

1.2 SUBMITTALS

A. Submit for Review:

1. Product Data: Include manufacturer brochures, diagrams, standard schedules, performance and design data, instruction that illustrate physical size, appearance capacity and other characteristics of materials and equipment.
  - a. Clearly mark each copy to show applicable choices and options.
  - b. Clearly identified products, equipment and material submitted by detailed number.
  - c. Highlight or otherwise indicate deviations from Contract Documents.
2. Field Quality Control Reports: Submit test reports, including nonconforming work and remedial actions taken.
3. Operation and Maintenance Data: Include manufacturer's installation instructions, and operation and maintenance data.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Unless otherwise specified, provide similar items not furnished as an integral part of equipment from one manufacturer.

2.2 TRAPS

- A. Traps in Sanitary Drainage Systems: Cast brass, 17 gage "P" traps above ground and cast iron underground with 2 inch minimum trap seal with gasketed cleanout plugs made of machined bar stock. Locate traps as required by applicable code.

2.3 CLEANOUT

- A. Cast Iron Pipe Cleanouts: Tapped extra heavy cast iron ferrule, caulked into cast iron fittings, and extra heavy lead seal plug with solid hexagonal nut or countersunk plug to suit.
- B. No-hub Cast Iron Pipe Cleanouts: No-hub cleanout plug or extra heavy brass screw plug in tapped cast iron fittings, with solid hexagonal nut or countersunk plug to suit.

- C. Steel Pipe Cleanouts: Extra heavy brass screw plug in drainage fitting.
- D. Cleanout Plugs: Comply with the Plumbing Code; American Standard pipe threads with "Permacel" or approved teflon tape applied to the male threads.
- E. Extend cleanouts to walls and floor with long sweep ells or "y" or 1/8 bends with plugs and face or deck plates to conform to the architectural finish in the room. Where no definite finish is indicated on the architectural and/or mechanical drawings, use stainless steel wall plates and floor plates of nickel bronze.
- F. Cleanouts and Plates: J. R. Smith models as indicated below.
  - 1. Finished Floor: J. R. Smith 4028, duco cast iron body and frame, with round adjustable scoriated secured nickel bronze top, taper thread bronze plug.
  - 2. Finished Floor, Including Composition or Ceramic Tile and Terrazzo: J. R. Smith 4188, cast iron body and frame, with round adjustable recessed for floor material, nickel bronze top, taper thread bronze plug.
  - 3. Finished Floor, Carpeted: J. R. Smith 4025-Y, cast iron body with round adjustable nickel bronze top taper thread bronze plug and carpet cleanout marker.
  - 4. Concrete Floor: J. R. Smith 4228, duco cast iron body and frame, with round adjustable scoriated secured cast iron top, taper thread bronze plug.
  - 5. Finished Walls: J. R. Smith 4533 or 4558 cast iron cleanout tee with taper thread bronze plug, and square chrome plate frame and cover.

#### 2.4 DRAINAGE SPECIALTIES

- A. Approved Manufacturers: J. R. Smith, Josam, Zurn, Wade

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions, in locations as indicated on Drawings.

#### 3.2 CLEANOUTS

- A. Provide cleanouts on all drainage piping at:
  - 1. 50 ft. intervals on lines up to 4 inches.
  - 2. 100 ft. intervals on lines over 4 inches.
  - 3. At each change in direction of 45 degrees or more.
  - 4. At each additional location shown on the drawings.

- B. Provide full size cleanouts for pipes up to 4 inch.
- C. Provide minimum 4 inch cleanouts for pipes larger than 4 inches.

++ END OF SECTION ++



224000  
PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This section describes plumbing fixtures, fittings, carriers and associated accessories.

1.2 SUBMITTALS

A. Submit for Review:

1. Product Data and installation instruction for products provided.
2. Product Data that includes manufacturer brochures, diagrams, standard schedules, performance and design data, instruction that illustrate physical size, appearance capacity and other characteristics of materials and equipment.
3. Clearly mark each copy to show applicable choices and options.
4. Clearly identified products, equipment and material submitted by detailed number.
5. Highlight or otherwise indicate deviations from Contract Documents.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES

A. General:

1. Fixtures shall be white unless otherwise indicated.
2. Fixtures specified to be of vitreous ware shall be fired vitreous china ware of the best quality, non-absorbent and burned so that the whole mass is thoroughly fused and vitrified, producing a material white in color [unless indicated otherwise], which when fractured will show a homogenous mass, close grained and free from pores.
3. The glaze and vitreous china fixtures shall be white, thoroughly fused and united to the body, without discoloration, chips, or flaws and shall be free from craze.
4. Warped or otherwise imperfect fixtures are not acceptable.
5. Exposed metal shall be chromium-plated over nickel plating on copper or brass. White metal trim is not acceptable.

2.2 PLUMBING FIXTURES

- A. Manufacturers: American Standard, Zurn, Kohler or approved equal.
  - 1. Plumbing fixtures shall be supplied as specified on the plumbing drawings.

### 2.3 STAINLESS STEEL FIXTURES

- A. Approved Manufacturers: Elkay, Just.

### 2.4 FLOOR DRAININGS

- A. Floor Drain - Mark F.D.: At public toilet rooms) J. R. Smith 2005-AP, duco cast iron body and flashing collar and nickel bronze adjustable strainer head strainer head with secured 6" diameter strainer. Bottom outlet and mechanical trap seal (Sureseal or equal).

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Fixtures shall be free from imperfections, true as to line, angles, curves, and color; smooth, watertight, and practically noiseless in operation.

### 3.2 METHODS AND REQUIREMENTS

- A. All fittings, escutcheons, faucets, traps, exposed piping, etc., shall be brass, chrome plated over nickel plate with satin finish. Any hanger nuts visible shall likewise be chrome plated over nickel plate.
- B. Before roughing work is started, submit to the Architect complete figured drawings and cuts of each plumbing fixture, fitting, and trimming, and secure approval before proceeding with the installation of work.
- C. Provide hangers, supports, and brackets required for the proper installation of fixtures requiring support.
  - 1. Such supports shall be in accordance with the recommendations of the manufacturers of the fixtures, and if built into partitions or wall shall be set as the wall progresses.
- D. Mount fixtures at standard recommended mounting heights indicated by the fixture manufacturer or as indicated on Drawings.

++ END OF SECTION ++

SECTION 230523  
GENERAL DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section describes valves used in HVAC hydronic piping systems.
  - 1. Calibrated Balancing Valves.
  - 2. Ball Valves.

1.2 SUBMITTALS

- A. Submit for review:
  - 1. Product data, including, but not limited to materials of construction of component parts and their arrangement, pressure and temperature ratings, end connection details, dimensions and clearance requirements, weight, and installation instructions.
    - a. All Other Valves: Clearly demonstrate in the submittal that the design operating pressure and coincident operating temperature are within the manufacturer's pressure and temperature rating for the valve being submitted. Failure to do so will be a cause for rejection of the submittal.
  - 2. Ball and Butterfly Valves for Insulated Piping: Provide detailed information on extended stems where valves are installed in insulated piping.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Prepare valves for delivery as follows:
  - 1. Ensure valves are dry and internally protected against rust and corrosion.
  - 2. Protect valve ends against damage to threads, flange faces and weld-end preparations.
  - 3. Pack valves in best position for handling. Set ball and plug valves open to minimize exposure of bearing/sealing surfaces.
- B. Use following precautions during storage:
  - 1. Do not remove valve end protectors unless necessary for inspection; then reinstall for storage.
  - 2. Protect valves from weather or other harmful environmental conditions. Store valves indoors where possible and maintain valve temperature higher than ambient dew point temperature. If outdoor storage is necessary, support valves off ground or pavement in watertight enclosures.

- C. Use following procedures during handling:
  - 1. Use sling to handle valves, which have sizes that require handling by crane or lift.
  - 2. Rig valves to avoid damage to exposed valve parts.
  - 3. Do not use handwheels, stems or bypass connections as lifting or rigging points.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to HVAC 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 (DN 200) and larger.
  - 2. Handwheel: For valves other than quarter-turn types.
  - 3. Handlever: For quarter-turn valves NPS 6 (DN 150) and smaller.
- E. Valves in Insulated Piping: With NPS 2-inch (DN 50) stem extensions and the following features:
  - 1. 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. Flanged: With flanges according to ASME B16.1 for iron valves.
  - 2. Solder Joint: With sockets according to ASME B16.18.
  - 3. Threaded: With threads according to ASME B1.20.1.

### 2.2 CALIBRATED BALANCING VALVES FOR HYDRONIC SERVICE

- A. Type 1 Manual Calibrated Balancing Valve with Venturi Flow Meter (1/2 to 16 Inch Pipe Size).
  - 1. Acceptable Manufacturers, subject to compliance with requirements:

- a. Flow Design "Accusetter"
  - b. Griswold "Quickset"
  - c. Gerand Engineering "Balvalve Venturis"
  - d. Preso B-Plus & C-Plus Series
  - e. Taco "Accu-Flo"
2. Calibrated balancing valve shall be a combination flow measuring, balancing and tight shut-off type.
- a. Flow Measuring Element: Low loss/high signal Venturi type, with + 2% accuracy and 10:1 rangeability.
  - b. Furnish with two 1/4" capped pressure/ temperature test ports. Furnish with extended ports for insulated piping.
  - c. Furnish with calibrated nameplates.
3. Construction: ANSI Class 150 flanged steel venturi, and ball or butterfly valves for balancing and shut-off. Sizes 3/8" to 2" shall be rated for 600 PSIG at 250 deg. F. Sizes 2-1/2" to 16" shall be rated for 240 PSIG at 250 deg. F.
- a. Comply with two-piece ball valve and general service butterfly valve specification requirements in this specification section.
4. Furnish with one portable readout meter and hoses.

2.3 BALL VALVES FOR SHUT-OFF AND THROTTLING (NOT BALANCING) SERVICE (2 INCHES AND SMALLER)

- A. Furnish ball valves with extended stems to suit insulation thickness when installed in insulated piping systems.
- B. Two-Piece Ball Valve
- 1. Acceptable Manufacturers, subject to compliance with requirements:
    - a. Apollo
    - b. Crane
    - c. Flow-Tek
    - d. KF Industries
    - e. KTM (Tyco)
    - f. Milwaukee
    - g. Nibco
    - h. W-K-M
  - 2. 600 psi WOG, two-piece bronze body, brass stem, full port ASTM B62 hard chrome-plated brass ball, replaceable reinforced TFE seats, threaded ends.
- C. Hose End Ball Valve
- 1. Acceptable Manufacturers, subject to compliance with requirements:

- a. Apollo
- b. Crane
- c. Flow-Tek
- d. KTM (Tyco)
- e. Milwaukee
- f. Nibco
- g. W-K-M

- 2. Full port hard chrome-plated brass ball, reinforced TFE seats, TFE stuffing box, two-piece bronze body, bronze stem, dust cover with chain, 3/4-inch hose-end connection, threaded or soldered ends, 600 psi WOG.

**D. Three-Piece Ball Valve**

- 1. Acceptable Manufacturers, subject to compliance with requirements:
  - a. Apollo
  - b. Crane
  - c. Flow-Tek
  - d. KF Industries
  - e. KTM (Tyco)
  - f. Milwaukee
  - g. Nibco
  - h. W-K-M
- 2. Bronze body and stem, three-piece design, quarter-turn lever, full port ASTM B62 hard chrome-plated brass ball, PTFE seat, TFE stem packing, threaded or soldered ends.
- 3. Rate the valves for 600 psi WOG up to 1" and 400 psi WOG for 1-1/4" and larger.

**PART 3 - EXECUTION**

**3.1 CALIBRATED BALANCING VALVES**

- A. Provide for balancing of all hydronic systems, including brine systems.

**3.2 BALL VALVES SCHEDULE**

SERVICE	TYPE	STYLE
Hydronic Systems, including Inhibited Aqueous Glycol Solutions – Cabinet Unit Heaters, Unit Heaters, Convector, Radiant Ceiling Panels, Panel Radiators, Reheat Coils, Small Heating & Cooling Coils, and Fin Tube Radiation.	Standard Type specified	Two-Piece
Hydronic Systems, including Inhibited Aqueous Glycol Solutions – All other applications not specified for two-piece ball valves.	Standard Type specified	Three-Piece
Hydronic Systems, including Inhibited Aqueous Glycol Solutions – Strainer blow-offs and equipment drains.	Hose End	Two-Piece

### 3.3 GENERAL REQUIREMENTS

- A. Install shut-off valves at the inlet and outlet of each individual heat transfer coil and piece of equipment. Units having multiple coils shall have individual valves on inlet and outlet of each coil.
- B. Install calibrated balancing valves on the return side of each individual heat transfer coil.
- C. Valves shall be of the same size as the pipe in which they are installed, unless shown otherwise on the contract drawings.
  - 1. Provide reducers, as specified, for installation of control valves.
- D. Install valves with the stem on or above the horizontal.
  - 1. Install valves with the stem horizontal if requirements of headroom, access and chain operation must be met.
- E. Pack valves and adjust glands.

++ END OF SECTION ++