



DESIGN & CONSTRUCTION GUIDELINES

DIVISION 22 PLUMBING

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SECTION 22 00 00 GENERAL PLUMBING REQUIREMENTS**1.1 GUIDELINE INTENT**

- A. This division serves as a design and construction guideline for the Professional Architect/Engineer (A/E) and Contractors performing plumbing services at the University of South Florida (USF). This guideline is intended to establish the USF standard of quality and is not a specification. The A/E shall develop the permit and construction documents in accordance with the intent of the guideline and as necessary to comply with the given project scope and/or program.
- B. In some instances, a product is named to represent a minimum acceptable quality standard as a basis for the A/E. The intent is for the A/E to specify/schedule not less than three manufactures/ models based on similar style, appearance & performance characteristics of the named product.
- C. This guideline lists minimum material quality standards. Materials not contained here-in shall be selected by A/E based on application and where code allows.
- D. Substitution requests shall be in writing to the USF Project Manager (USF-PM). Notification of substitution acceptance will be in writing; otherwise the substitute is not accepted.

1.2 DESIGN CRITERIA

- A. This Section contains material and equipment for plumbing (domestic water, waste, roof drainage, condensate drainage, gas piping within five feet of the building perimeter), including plumbing fixtures, plumbing specialties, plumbing equipment and disinfection of the interior water distribution system.
- B. Professional Engineer shall provide Contract Documents prepared in accordance with 61G15, Florida Administrative Code.
- C. Requirements of the latest revision of the USF Cost Containment Guide (CCG), Florida Building Code (FBC), FBC Mechanical Code, FBC Energy Conservation Code, FBC Plumbing Code, and FBC Fuel Gas Code must be met.
- D. Appropriate American Society for Testing and Materials (ASTM), American National Standards Institute (ANSI), Underwriters Laboratory (UL), American Society for Testing Materials (ASME) and National Electrical Manufacturers Association (NFPA) standards must be met and specified for materials.

END OF SECTION 22 00 00

SECTION 22 05 00 COMMON WORK RESULTS FOR PLUMBING**PART 1 -- GENERAL****1.1 PRE-DESIGN REQUIREMENTS (Renovation and Remodel Projects)**

- A. During the early concept/design phase, the A/E (Plumbing Engineer) shall evaluate the existing building drainage system to determine if the system is capable of supporting the additional project load. If existing building drainage system is not capable, a new building drainage system shall be added for the additional project load.
- B. As a basic part of evaluating the existing building drainage system capacity, the A/E shall verify existing system drainage slopes; verify existing drain conditions (pipe material, dips, breaks, roughness, etc.) via camera and/or visual inspection of the system. Video-camera inspection of existing drainage systems is recommended.

1.2 PERMITS AND INSPECTIONS

- A. Follow USF Building Code Administration (BCA) requirements for permitting and scheduling inspections. Coordinate with USF BCA department.
- B. Minor Projects - Contractor is responsible for all permitting and inspecting fees.
- C. Major Projects - Coordinate with USF-PM for responsible party for permitting fees.
- D. Minor Projects with USF approved Construction Manager (CM) - Coordinate with USF-PM and assigned Construction Manager for responsible party for permitting fees.

1.3 COORDINATION

- A. Visit the site included in the scope of work to ascertain existing conditions. Verify all dimensions and locations before proceeding with work in the area and prior to purchasing equipment.
- B. Review and coordinate between all construction documents, all project specifications, and all sections in USF Design and Construction Guidelines (DCG). Notify USF-PM of conflicts or discrepancies prior to proceeding with work.
- C. Locate all underground utilities required by the Sunshine Law prior to proceeding with work. Contact USF-PM to obtain latest USF Campus Utilities Map for the area in scope of work prior to proceeding.
- D. Coordinate with USF-PM, USF Parking and Transportation Services (USF-PATS), and USF Police Department (USF-UPD) for required lane closures and parking spaces closures minimum 72 hours prior to closures. Contractor is responsible for all closure barriers and signs subject to USF review and approval.

1.4 SUBMITTALS

- A. Submit one electronic copy of Plumbing Submittals as a single bookmarked pdf. Include a table of contents, bookmark/tab manual based on specification chapters or sections.

1.5 SITE

- A. All existing utilities shall remain in place unless otherwise noted on the contract documents.
- B. Contractor shall restore back to original installation primary gear, primary feeders, utilities, irrigation, etc. damaged by the contractor in the area of demolition or construction.
- C. Provide an erosion control plan addressing prevention, control, and abatement of water pollution to USF-PM for approval prior to proceeding with work.
- D. Safety fencing shall be neon green. Orange or black safety fencing shall not be used.
- E. Conduit trenches shall be backfilled completely to provide safe crossing by the end of work day or whenever the work zone becomes inactive.
- F. Maintain access to side streets, drives, and sidewalks at all times during construction.
- G. Existing pedestrian/sidewalk lighting and roadway lighting shall remain operational during all phases of the construction until new lighting is energized.
- H. Construction Sites: Provide protective barriers around open plumbing trenches manholes. USF shall have clear vehicular access to these items at all times during construction.
- I. Plumbing manholes: Provide 10 feet square barricade around manhole cover. Manhole cover shall be accessible to USF at all times. Remove construction debris such as dirt, sod, ground cover, etc.

- J. Temporary services protective barricades shall allow 3 feet clearance on sides and rear (or required by code if greater), and 5 feet clearance in front of equipment.
- K. No construction materials or construction tools shall be stored within the protective barricades.
- L. No construction vehicles or personal vehicles shall be parked over plumbing manhole covers.
- M. Project site design and final site constructed conditions shall include clear vehicle access to all above mentioned equipment for maintenance.
- N. Fenced Construction Sites: An access point agreed to by USF-PM and USF Facilities Management-Operations (FM-OPS) shall be provided to USF. Chains shall have USF Standard 2000 Padlock and site contractor pad lock daisy chained. Project is responsible to provide the USF Standard 2000 Padlock, coordinate with USF-PM and FM-OPS.
- O. Areas where work is performed shall be kept clean of debris and materials and shall be cleaned at the end of each work day. Contractor is responsible to secure all tools and materials at all times.
- P. Remove existing equipment and materials, etc, identified to be removed on plans. Equipment removed should be offer to USF to be kept as spares. If USF elects to not keep equipment as spare, the Contractor shall remove and dispose of properly. Equipment disconnected or abandoned shall be removed by the Contractor and disposed of properly.
- Q. Provide Tree protection for any tree that may be located within the project construction site or near the lay-down or designated contractor parking area. Parking and Lay-down areas shall be located outside the drip edge of trees. If the project scope impacts within the drip edge of trees in the construction site, the trees shall be properly protected with barriers and/or proper root pruning by qualified arborist. For additional Tree Protection information refer to FM Facilities Management.

1.6 WARRANTY

- A. Contractor shall provide minimum one (1) year warranty for all labor and materials, whether included or not included by equipment manufacturers. Contractor shall replace defective materials during the first year of warranty without additional compensation from USF.
- B. Manufacturer warranties greater than one (1) year, or where lengthier warranties are required in the project documents, or in USF Design and Construction Guidelines (DCG) shall extend the standard one (1) year warranty.
- C. Warranty period shall begin on date of substantial completion.

1.7 MISCELLANEOUS

- A. USF Furnished Equipment:
 - 1. Contractor shall be responsible for receipt from USF, storage after receipt, and installation if required.
 - 2. Verify equipment connection requirements prior to rough-in and ordering materials.
 - 3. Install equipment in accordance with manufacturer instructions.
 - 4. Maintain equipment until project is turned over to USF at Substantial Completion.
- B. A/E for new construction and renovations or contractor for miscellaneous additions shall demonstrate that the existing services have the required additional capacity and can accommodate the load being added.
- C. A/E for new construction and renovations or contractor for miscellaneous additions shall demonstrate that the existing services are at adequate depth to accommodate the minimum slope requirements for tie-in of new to existing services.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 PROJECT CLOSE OUT

- A. Submit one electronic copy and one hard copy of Operations Manual as a single bookmarked .pdf. Include a table of contents, bookmark/tab manual based on specification chapters or sections.
- B. Provide record documents per USF-FM requirements. Coordinate with USF-PM. Record documents shall be submitted in accordance with the CAD & BIM Guidelines & Standards

requirements, include updated as-built drawings including clear delineation of main and branch shut-off valve locations and actual installed invert elevations for all applicable plumbing services. Submit working CAD drawings (with bound Xref files) on disk or other approved memory storage device. Include separate folder or disk including pdf copies of each as-built drawing. Filenames shall include drawing number as reference.

3.2 FIELD QUALITY CONTROL

- A. Inspect and test water distribution piping. Refer to FBC Plumbing Code for testing requirements.
- B. Inspect and test drainage and vent piping.
- C. Clean and disinfect water distribution piping.

3.3 COLOR CODING OR LABELING AND IDENTIFYING

- A. The following band colors and letter designations shall be used for Plumbing Piping:

Description	Acronym	Color
Domestic Cold Water	DCW	Green
Domestic Hot Water	DHW	Yellow
Domestic Hot Water Return	DHWR	Yellow
Distilled Water	DIST.W	Green
Deionized Water	DEION.W	Green
Soft Water	SOFT W	Green
Sanitary Drain	SAN	Yellow
Storm Drain	ST	Yellow
Compressed Air	A	Yellow
Nitrogen	NIT	Yellow
Oxygen	OXY	Yellow
Natural Gas	GAS	Yellow
Vacuum	VAC	Yellow
Fuel Oil	FUEL	Yellow

END OF SECTION 22 05 00

SECTION 22 05 13 COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT**PART 1 – GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and [Division 01, General Requirements](#) apply to this Section.

1.2 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
1. Motor controllers.
 2. Torque, speed, and horsepower requirements of the load.
 3. Ratings and characteristics of supply circuit and required control sequence.
 4. Ambient and environmental conditions of installation location.

1.4 REFERENCES

- A. [Anti Friction Bearing Manufacturers Association \(AFBMA\) 9](#) — Load Ratings and Fatigue Life for Ball Bearings.
- B. [AFBMA 11](#) — Load Ratings and Fatigue Life for Roller Bearings.
- C. [American National Standards Institute / Institute of Electrical and Electronics Engineers \(ANSI/IEEE\) 112](#) — Test Procedure for Polyphase Induction Motors and Generators.
- D. [American National Standards Institute / National Electrical Manufacturers Association \(ANSI/NEMA\) MG 1](#) — Motors and Generators.
- E. [ANSI/NFPA 70](#) — National Electrical Code.

1.5 OPERATION AND MAINTENANCE DATA

- A. Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

PART 2 PRODUCTS**2.1 GENERAL MOTOR REQUIREMENTS**

- A. Comply with requirements in this Section except when stricter requirements are specified in plumbing equipment schedules or Sections.
- B. Comply with [NEMA MG 1](#) unless otherwise indicated.
- C. Electrical Service: Refer to Section on Motor Control for required electrical characteristics.
- D. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, Service Factor, Power Factor, efficiency.
- E. Electrical Connection: Conduit connection boxes, threaded for conduit. For fractional horsepower motors where connection is made directly, provide conduit connection in end frame.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3,300 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Service Factor: 1.15.
- C. Multispeed Motors: Variable torque.
 - 1. For motors with other than 2:1 speed ratio, separate winding for each speed.
- D. Multispeed Motors: Separate winding for each speed.
- E. Rotor: Random-wound, squirrel cage.
- F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- G. Temperature Rise: Match insulation rating.
- H. Insulation: Class F.
- I. Code Letter Designation:
 - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - 2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
- J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.
- K. Starting Torque: Between one and one-half times full load torque.
- L. Starting Current: Six times full load current.
- M. Power Output, Locked Rotor Torque, Breakdown or Pullout Torque: NEMA Design B characteristics.
- N. Testing Procedure: In accordance with ANSI/IEEE 112, Test Method B. Load test motors to determine freedom from electrical or mechanical defects and compliance with performance data.
- O. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum AFBMA 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.
- P. Sound Power Levels: To ANSI/NEMA MG 1.
- Q. Motors for variable speed (PWM) application shall conform to NEMA Standard MG 1 2016, Part 30 and Part 31.
- R. Nominal Power Factor: Meet or exceed values in Schedules at full load and rated voltage when tested in accordance with ANSI/IEEE 112.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - 2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - a. Starting Torque: Less than 150 percent of full load torque.
 - b. Starting Current: Up to seven times full load current.
 - c. Breakdown Torque: Approximately 200 percent of full load torque.
 - d. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prefabricated sleeve or ball bearings.
 - e. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2. Split phase.
 - a. Starting Torque: Exceeding one fourth of full load torque.
 - b. Starting Current: Up to six times full load current.
 - c. Multiple Speed: Through tapped windings.
 - d. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.
3. Capacitor start, inductor run / Capacitor start, capacitor run.
 - a. Starting Torque: Three times full load torque.
 - b. Starting Current: Less than five times full load current.
 - c. Pull-up Torque: Up to 350 percent of full load torque.
 - d. Breakdown Torque: Approximately 250 percent of full load torque.
 - e. Motors: Capacitor in series with starting winding; capacitor-start/capacitor-run motors shall have two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
 - f. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve ball bearings.
 - g. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Motors 1/20 HP and Smaller: Shaded-pole type.
- D. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.6 EFFICIENCY

- A. All motors shall be NEMA Premium Efficient Electric Motors according to the latest Energy Independence and Security Act.

PART 3 EXECUTION

3.1 APPLICATION

- A. Motors drawing less than 250 Watts and intended for intermittent service may be germane to equipment manufacturer and need not conform to these specifications.
- B. Motors shall be open drip-proof type, except where specifically noted otherwise. Pump motors located in mechanical rooms shall be totally enclosed fan cooled motors. All motors installed outdoors shall be totally enclosed fan cooled motors.
- C. Single phase motors for shaft mounted fans shall be split phase type.

END OF SECTION 22 05 13

SECTION 22 05 19 METERS AND GAGES FOR PLUMBING PIPING**PART 1 – GENERAL****1.1 GENERAL REQUIREMENTS**

- A. Drawings shall show location of all gages and meters. Detail of installation shall be shown on drawing. Detail shall include all valves, nipples, unions, thermometers, wells, material of construction, range of gages/meters, etc. All meter locations should be easily serviceable and not in the way of other maintenance needs of other equipment.

1.2 MATERIALS

- A. The following meters (where applicable) shall be required on all projects, including garages.
 - 1. Domestic Water
- B. PRESSURE shall be read by a differential pressure (DP) gage, calibrated in “feet.” (DP gage has two inputs, one high pressure and one low pressure.)
- C. PRESSURE GAGES shall be selected so that failure will relieve pressure to the rear of gage.
- D. GAGES/METERS shall be selected to operate midway of their scale.

PART 2 – PRODUCTS**2.1 DOMESTIC WATER METERING**

- A. Neptune MACH 10 Ultrasonic Meter for pipe sizes up to 2 inches. Neptune TRU/FLO Compound Meter for pipe sizes above 2 inches.
- B. Neptune Cellular Meter Interface Unit (CMIU) shall be provided for automated meter reading (AMI). USF Utilities shall integrate the meter CMIU to USF account/system.

PART 3 – EXECUTION**3.1 EXECUTION**

- A. ALL GAGES/METERS shall be installed such that they can be read easily, i.e., grouped together and facing in the same direction.
- B. METERS for measuring utility services shall be installed before the first point of use in buildings.
- C. Install meters with appropriate distance from change in pipe direction and install with manufacturers recommended upstream and downstream straight length equivalents.

3.2 INTEGRATION

- A. Refer to [Section 23 05 19 Meters and Gages for HVAC Piping, Part 3 Execution 3.2 Integration](#).

END OF SECTION 22 05 19

SECTION 22 05 23 GENERAL-DUTY VALVES**PART 1 – GENERAL****1.1 GENERAL REQUIREMENTS FOR VALVES**

- A. All applicable products shall be in compliance with the Federal Lead Free mandate effective January 4, 2014.
- B. Isolation valves shall be accessible and provided so as to isolate each restroom or restroom group, break room, laboratory, or room with sink, etc. Valves shall be located within accessible ceilings adjacent to room before first branch feed or adjacent hallway/corridor no more than 10 feet from the first branch take-off.
- C. Check valves are to be Y-Pattern 200 PSI, WOG, bronze body swing check. 2 inches and smaller shall have integral seat with renewable bronze disc. Sizes larger than 2 inches shall include bronze disc, stainless steel spring, and cast iron body.
- D. Balancing Valves: For 2 inches and smaller, use screwed bronze with Pointer and calibrated readout plate and machined orifice. For sizes larger than 2 inches, specify flow meter with machined orifice and two (2) readout connections. Provide a valve with locks located five (5) pipe diameters up-stream of the orifice.
- E. All valves are to be rated at working Pressure of 200 PSIG, 250 degrees F minimum WOG, or greater if engineering design demands. Stems are to point vertically or horizontally and must be located for easy service or repair. A valve schedule showing details; number, size, type, material, etc. of all valves should be shown on the Drawings.
- F. Valves in Insulated Piping shall include stem extensions to account for installed insulation thickness sufficient to allow full stem movement/rotation.
- G. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- H. Shutoff Valve for Laboratories. Each laboratory space containing two or more gas outlets installed on tables, benches, or in hoods in educational, research, commercial, and industrial occupancies shall have a single shutoff valve through which all such gas outlets are supplied. The shutoff valve shall be accessible, located within the laboratory or adjacent to the laboratory's egress door, and identified.

PART 2 – PRODUCTS (Not Used)**PART 3 – EXECUTION****3.1 GENERAL VALVE APPLICATION (Domestic Water)**

- A. Above Ground Shutoff Service: Bronze body ball valves with stainless steel ball and Teflon seat (up to 4 inches) or butterfly valves (4 inches and larger).
- B. Below Ground Shutoff Service: Valves - Provide flanged 2-piece full port cast iron, stainless steel ball and stem, water, oil, gas, full close-off, 200 PSI ball valves. Valves below ground shall be installed in concrete valve box with corrosion resistant hinged access lid properly designed for the traffic condition. Floor of valve box shall not exceed 4 feet deep. If piping to enter valve box is below 4 feet, piping elevation shall transition into and out of valve box with 45 degree fittings. Each valve shall be installed in valve box with orientation and position so handwheel is accessible from surface access opening via to allow for periodic exercising of valves.
- C. Balancing Service: Globe style calibrated balancing valves with memory stop.
- D. Provide the following end connections for above ground piping:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends unless specified otherwise.
- E. Provide the following above ground Valve Actuator Types:
 - 1. Hand lever: For quarter-turn valves NPS 6 and smaller.

END OF SECTION 22 05 23

SECTION 22 05 29 HANGERS AND SUPPORTS**PART 1 – GENERAL****1.1 PERFORMANCE REQUIREMENTS**

- A. Design hangers without disengagement of supported pipe.
- B. General Locations: Steel pipe hangers, miscellaneous steel supports, hardware, bolts, washers, nuts, screws, etc., shall be hot dipped galvanized with a minimum of 1.50 oz./ft. on all sides and all field cuts shall be zinc coated.
- C. Located in Harsh and/or Corrosive Environments: Pipe hangers, equipment supports, miscellaneous structure components, hardware, bolts, washers, nuts, screws, etc., shall be non-metallic polyester resin, vinyl ester resin, fiberglass, glass reinforced polyurethane or 316 stainless steel.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Provide an adequate and complete pipe support system using approved hangers and supports complete with necessary attachments, shields, inserts, bolts, rods, nuts, washers, and other accessories. Shields shall be a minimum of 12 inches long and of sufficient strength to ensure pipe hangers do not cut into or compromise the insulation integrity.
- F. Provide adequate and complete pipe support system using hangers and supports to allow controlled thermal 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. Provide thermal expansion calculations for each system and component subject to stresses.

PART 2 – PRODUCTS (Not Used)**PART 3 – EXECUTION (Not Used)**

END OF SECTION 22 05 29

SECTION 22 05 53 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**PART 1 – GENERAL****1.1 PERFORMANCE REQUIREMENT**

- A. Identification of piping and equipment shall be specified by the A/E and in compliance with the University guidelines as set forth below:
- B. All Plumbing drawing symbols used shall be in accordance with standards of accepted practice.
- C. All equipment and piping including associated electrical devices, shall be labeled and tagged in accordance with the University's guidelines.

1.2 GENERAL

- A. Engraved signs and labels shall be permanently attached with Stainless-steel rivets or self-tapping screws unless approved otherwise.
- B. Label Content: Include caution and warning information, plus emergency notification instructions.
- C. Pipe Labels shall be color-coded according to pipe service, with lettering indicating service, showing flow direction and sized according to application for optimum visibility.
- D. Equipment Located Above Ceiling or in Walls (i.e., domestic water isolation valves, etc.): Provide engraved equipment label located on the access door, ceiling or ceiling grid directly adjacent or below the equipment.

1.3 ACCESS PANELS

- A. Access panels are required in each situation where items requiring maintenance are located above a concealed ceiling. Size of access panel shall provide the necessary clearances to perform maintenance and removals.

PART 2 – PRODUCTS (Not Used)**PART 3 – EXECUTION (Not Used)**

END OF SECTION 22 05 53

SECTION 22 07 00 PLUMBING INSULATION

PART 1 – GENERAL

1.1 PERFORMANCE REQUIREMENTS

- A. Design insulation systems for all piping and equipment in accordance with the requirements set forth and no less than the minimum per the latest Energy Code requirements. Insulation thickness/K-Value shall be designed to prevent condensation under all operating conditions especially in a hot humid environment.

1.2 DEFINITIONS

- A. Hot Surfaces - normal operating temperatures of 100 degrees F or higher.
- B. Cold Surfaces - normal operating temperatures of 75 degrees F or less.
- C. Dual Temperature Surfaces - normal operating temperatures that vary from hot to cold.

1.3 APPLICATIONS

- A. General: Materials and thicknesses are specified in schedules at the end of this section.
- B. Interior, Exposed Piping Systems and Concealed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
 - 1. Domestic hot water and hot water return.
 - 2. Sanitary drains for fixtures accessible to the disabled.
 - 3. Refrigerant suction lines.
 - 4. Condensate waste piping.
 - 5. Cold water lines exposed to interior unconditioned environment.
 - 6. Horizontal roof drains conductors.
- C. Exterior, Exposed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
 - 1. Domestic cold water, hot water and hot water return.
 - 2. Refrigerant suction lines.
 - 3. Condensate waste piping.
 - 4. Storm/Rain conductors.

PART 2 – PRODUCTS

2.1 PIPE INSULATION SCHEDULES (minimum thicknesses)

Pipe Sizes (NPS)	Materials	Thickness (Inches)	Vapor Barrier Required	Field applied Jacket
INTERIOR DOMESTIC HOT WATER				
1/2 - 2	Round Preformed Glass Fiber	1 1/2	Yes	None
Over 2	Round Preformed Glass Fiber	2	Yes	None
EXTERIOR EXPOSED DOMESTIC WATER (Add UV protection for outside installation)				
All	Round Preformed Flexible Elastomeric	3/4	No	
INTERIOR/EXTERIOR REFRIGERANT SUCTION (Add UV protection for outside installation)				
5/8 - 2-1/8	Round Preformed Flexible Elastomeric	1	No	None
INTERIOR/EXTERIOR CONDENSATE WASTE (Add UV protection for outside installation)				
All	Round Preformed Flexible Elastomeric	3/4	No	None
HORIZONTAL RAIN CONDUCTORS				
All	Round Preformed Glass Fiber	1-1/2	No	None

2.2 GENERAL

- A. Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting 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 and inspecting 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. 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. Foam plastic insulation is not permitted within buildings or in overhangs or within 5 feet of the building perimeter.
 - F. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.
 - G. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.
 - H. 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.
 - I. Keep insulation materials dry during application and finishing. Insulation shall not be applied until systems are cleaned and satisfactorily tested. All piping and other work to be insulated shall be clean, dry, and free of building debris, flux and rust prior to installation of insulation.
 - J. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
 - K. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
 - L. Armaflex shall not be split for installation.
 - M. Insulation and vapor barrier shall be continuous through sleeves, walls penetrations, openings and hangers.
 - N. Installation shall be in strict accordance with manufacturer's instructions.
 - O. Flanges, valves, vessels and fittings shall be insulated and finished the same as pipe.
 - P. Insulation for pumps, heat exchangers, and similar equipment, that may require periodic inspection or maintenance, shall be fabricated in easily removed sections.

PART 3 – EXECUTION (Not Used)

END OF SECTION 22 07 00

SECTION 22 11 00 PLUMBING PIPING**PART 1 – GENERAL****1.1 GENERAL REQUIREMENTS**

- A. Design piping systems in accordance with the requirements set forth and no less than the minimum per the latest Florida Plumbing Code requirements.
- B. Specialty piping systems shall be specified by A/E for the application consistent with existing base building system materials and intent of these Design and Construction Guidelines.
- C. Isometric drawings shall be prepared for all piping systems.
- D. Piping riser diagram shall show all valve locations.
- E. Slopes for drainage shall be 1/4 inch/foot minimum. A/E shall discuss with USF if this criteria cannot be met and recommend other slopes.
- F. All materials shall be new, of quality as specified and when required be clearly labeled and/or stamped.
- G. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- H. Shutoff Valve for Laboratories. Refer to [Section 22 05 23 General Duty Valves](#).

PART 2 – PRODUCTS**2.1 MATERIALS**

- A. Interior Domestic Water: Building domestic water distribution piping (within five feet of building perimeter) shall be type k copper with no-lead solder joints. Mechanical Joint piping systems are not satisfactory for concealed or below grade applications.

Mechanical pressed copper pipe jointing piping similar to Viega Pro Press System or approved equal may be used inside buildings for domestic water piping smaller than 3 inches upon written substitution request and approval by the USF Facilities Management. Mechanical copper pipe jointing piping systems similar to Victaulic Grooved-joint or approved equal may be used inside buildings for domestic water piping 2 inches thru 3 inches upon written substitution request and approval by the USF Facilities Management. Mechanical CPVC pipe jointing piping systems similar to Victaulic PGS-300 grooved end schedule 80 CPVC pipe or approved equal may be used inside buildings for domestic water piping 2 inches thru 6 inches upon written substitution request and approval by the USF Facilities Management.

Approvals will be contingent on base building system materials, cost considerations, installation time and use of space. All of the piping system components in project mechanical joining piping systems shall be of single manufacturer including joints, pipe, grooving tools, couplings, gaskets, fittings, valves and accessories, etc. A direct employee of the jointing system manufacturer shall provide on-site contractor training and installation inspection by the manufacturers authorized representative. The manufacturer's Installation Services representative shall inspect project for properly-installed pipe joints and complete system integrity. Upon completion of each inspection, the manufacturer's Installation Services representative shall provide a report to USF, Contractor and the Engineer to identify any deficiencies and/or contractor action items. Mechanical joining piping system manufacturers shall provide owner training and provide any/all installation tools needed for maintaining the system. Owner training shall be provided for up to 4 hours of hands on maintenance and repair training for 4 (four) USF Operations personnel as scheduled via USF-PM at time of Substantial Completion. Mechanical joining piping system manufacturers shall provide USF with long-term Extended Warranty on each project-accepted for installation.

- B. Exterior domestic water pipe service pipe (beyond five feet of the building perimeter) shall be as specified in [Division 33 Utilities](#). This Contractor shall transition piping as necessary at the five feet demarcation point to make proper tie-in to site distribution piping.
- C. Pressure relief piping shall be copper type k.
- D. Building Drains: Drain, Waste and Vent (DWV) Piping: DWV building drains for non-acid waste discharge of storm water and sanitary, shall be cast iron soil pipe. In ground below slab shall be hub and spigot conforming to ASTM A74, thickness Class (XH). Protection from corrosive soils shall be provided using polyethylene encasement conforming to ANSI A21.5/AWWA

- C105. Above slab in wall and ceiling spaces, drain pipe shall be hubless cast iron soil pipe conforming to ASTM A888 and CISPI Std. 301. Couplings shall be heavy duty conforming to ASTM 1540. Schedule 40 PVC is allowed under the slab for sanitary and storm lines. PVC storm and/or DWV piping used in buildings shall be approved by the USF FM. Approvals will be contingent on base building system materials, cost considerations, installation time and use of space. Approval of such will be at the discretion of the USF-FM after weighing the merits vs. risks involved.
- E. Acid Waste Lines outside the Building: Piping shall be Durion or equal. Joints in acid-resisting pipe shall be made with caulking lead conforming to ASTM B-29. The need for acid neutralizing sumps will be determined by project requirements and methods allowed by code.
 - F. Acid Waste Lines within the Building: Piping shall be Schedule 40, flame retardant, polypropylene with mechanical joints similar to Enfield Lab-Line. Schedule 40 PVC piping may be used in specific applications in lieu of polypropylene contingent on cost considerations, compatibility/use of space and upon review and written approval by the USF-PM, and FM-OPS department.
 - G. Natural Gas Piping installed above ground shall be Schedule 40 seamless Galvanized Steel with galvanized malleable screwed fittings. A/E shall select the grade and schedule. Underground Natural Gas Piping shall be as coordinated with the utility service provider.
 - H. Compressed Air Piping: Compressed air piping above grade shall be Schedule 40, galvanized steel conforming to ASTM A-53. Fittings shall be malleable screwed end.
 - I. Vacuum Piping: Vacuum piping shall be Schedule 40 black steel with malleable screwed fittings, or Type L, hard drawn copper tubing with no-lead solder joints.
 - J. Lab grade High Purity Water Piping: High purity water piping, fittings, and valves shall be Schedule 80 polypropylene with butt fusion, socket fusion or electrofusion joints. For higher grade water distribution systems, discuss options with USF prior to specifying materials and joining technology.

PART 3 – EXECUTION (Not Used)

END OF SECTION 22 11 00

SECTION 22 11 19 PLUMBING SPECIALTIES**1.1 GENERAL REQUIREMENTS**

- A. Water hammer arresters shall be installed in hot water and cold water piping where quick-closing valves are installed and where necessary to reduce the possibility of water hammer. The arresters shall be the hydro-pneumatic type and shall be sized properly to control the water hammer.
- B. Provide pressure gages on each side of water meters, water filters, and pressure reducing valves or regulators.
- C. Domestic water pumps shall be manufactured with lead free components.
- D. Traps, vents and clean-outs must be provided in accordance with the Standard Plumbing Code and follow the USF Cost Containment Guideline (CCG). Locations shall be specified on drawings. Clean-out plugs in piping shall be set with Teflon sealer or other approved lubricant.
- E. Wye Strainers shall be equipped with ball valves for blow-down cleaning equipped with 3/4 inch hose connection.
- F. Hose Bibs: All exterior and machinery space hose bibs shall be key operated. Exterior hose bibs shall be bronze finish, interior hose bibs shall be chrome finish. Locate hose bibs at intervals of 100 foot maximum around building exterior perimeter.

END OF SECTION 22 11 19

SECTION 22 30 00 PLUMBING EQUIPMENT
PART 1 – GENERAL**1.1 GENERAL REQUIREMENTS**

- A. The following gallons per flush or flow in gallons per minute are required maximum flows for project:

1. Water Closets Flushometer (new construction)	<u>1.28 gallons per flush</u>
2. Water Closets Flushometer (remodel)	<u>1.6 gallons per flush</u> (to be determined based on condition and type of existing facility)
3. Urinal Flushometer (new construction & remodel)	<u>0.5 gallons per flush</u>
4. Lavatory Faucet	<u>0.5 gallons per minute</u>
5. Showers Heads	<u>1.5 gallons per minute</u>
6. Pantry Sinks	<u>1.5 gallons per minute</u>
7. Mop Sinks	<u>Per ASME A112.18.1, 4.0 gallons per minute</u>

PART 2 – PRODUCTS**2.1 EQUIPMENT**

- A. WATER CLOSET: Provide water closets similar to American Standard. Afwall FloWise 3351.711 porcelain china, wall hung, ASME A112.19.2M, siphon jet, with elongated rim, exposed top spud, or concealed back-size per flush valve requirements, bolt caps; floor anchored carrier. Disabled Access: Where required. For Residence Halls, consult with USF-PM for acceptable model and flush valve.
- B. WATER CLOSET FLUSH VALVES: Provide exposed, long life AA battery powered, Solid Ring Pipe Support, manual override button, sensor operated flush valves similar to Zurn ZTR6200EV-LL (1.28 gpf) & Zurn ZTR6200WS1-LL (1.6 gpf).
- C. URINALS: Provide porcelain china, wall hung, washout or siphon jet, integral trap, exposed top spud type, size per flush valve requirements, floor anchored carrier high efficiency urinals similar to Kohler Bardon K-4991-ET or equal with anti-splash back dimensional bowl characteristics. Wall mounted with integral porcelain china trap. (i.e., no metal pipe p-traps will be acceptable). Position a minimum of one (1) urinal in each male toilet room at a height for disabled persons. For Residence Halls, consult with USF-PM for acceptable model and flush valve. Waterless urinals are unacceptable.
- D. URINAL FLUSH VALVES: Provide exposed sensor operated flush valve, quiet, long life AA battery powered, manual override button, exposed similar to Zurn ZTR6200EV-LL (0.5 gpf).
- E. WALL HUNG LAVATORIES: Enameled cast iron flat ledge mounted with arm carriers, with required drillings. For Residence Halls consult with USF-PM. Lavatories for disabled shall be mounted at height as required by Americans with Disabilities Act (ADA) with hot and cold water supply and drain pipes insulated per ADA.
- F. COUNTER TOP BASINS: Self-rimming lavatory-size as required with required drillings, front overflow, soap depression, seal of putty, caulking, or concealed vinyl gasket. For Residence Halls consult with USF-PM. Lavatories for disabled shall be mounted at height as required by ADA with hot and cold water supply and drain pipes insulated per ADA.
- G. UNDERCOUNTER LAVATORY: Unglazed rim for under counter mount with rear overflow, size as required with required drillings. For Residence Halls consult with USF. Lavatories for disabled shall be mounted at height as required by ADA with hot and cold water supply and drain pipes insulated per ADA.
- H. PROTECTIVE SHIELDING PIPE COVERS: Provide protective shielding pipe covers similar to Truebro Lav Guard 2. Manufactured insulating wraps for covering plumbing fixture hot- and cold- water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements. Shall be molded/form fitting, tamper- resistant, antimicrobial vinyl, stain resistant, cleanable safety cover, with valve access. Provide undersink protection insulation piping covers where required.
- I. METERED LAVATORY FAUCET: Provide Metered Lavatory Faucet ADA compliant, chrome

- plated brass, long life AA battery powered, sensor activated electronic hand washing faucet for tempered or hot/cold operation similar to Zurn Z6915-XL, 0.5 gpm flow, vandal resistant spray head, low voltage operated solenoid operator and infrared sensor. Provide with TMV on units requiring mixed hot/cold water.
- J. SINKS: Single and Multi-compartment self-rimming, counter-mounting, 304 stainless-steel commercial sink in counter with openings as required for accessories and faucet. Sink shall be No. 18 USSG genuine 18-8 solid nickel bearing stainless steel, seamlessly formed. Underside shall be sound deadened. Provide one piece with bowls welded integrally to tops. Horizontal and vertical corners of bowls shall be rounded to 1-3/4 inches radius. Bottom shall be pitched to drain outlet and drilled for trim as required. Faucets shall be selected based on the intended use for the given sink and as approved by the USF-PM.
- K. MOP SINKS: Provide Floor Mounted Basin similar to Fiat TSB-300. Enameled Cast Iron or Terrazzo nominally 32 inches x 32 inches x 12 inches, chrome plated strainer, stainless steel rim guard, 3 inch cast iron P-trap with adjustable floor flange. Provide Faucet similar to Chicago 897-CP. Provide with 1.5 feet of 5/8 inch diameter plain end reinforced plastic rubber hose with brass coupling at one end, stainless steel hose bracket with spring loaded rubber grip & 24 inches long x 3 inches wide, three tool stainless steel mop hanger with spring loaded rubber grips, 32 inches wide by 24 inches high stainless steel back splash wall mounted above rim at side of service sink with mop hanger.
- L. ELECTRIC WATER COOLERS: Provide Single EWC with bottle filling station and Bi-Level EWC with bottle filling station (without filter) similar to Elkay EZH2O.
- M. RETROFIT RECESS WALL ELECTRIC WATER COOLERS: Provide Single EWC with bottle filling station (without filter) similar Elkay EZWS-ERP8-RE.
- N. WATER HEATERS: Domestic hot water shall be provided for showers, hand sinks in food preparation areas, etc., where required by code and where required per the building program. The A/E shall evaluate and propose the type water heaters to be selected for use on the given project based on a life cycle analysis (anticipated demand, installation cost including distribution and utility service costs, maintenance costs, energy efficiencies and operating costs over a 20 year period). For Residence Halls consult with the USF-PM and FM-OPS.
- O. Domestic Water Booster Pumps: During the schematic phase of the project, the A/E shall evaluate the existing site water service conditions and determine if the designated site domestic water service is adequate to serve the domestic water system for the project (flow, static and residual pressure). If the A/E determines the service is not adequate, they shall immediately notify the USF-PM in writing. If a domestic water booster pump is deemed necessary, it shall include it as a basic part of the design. The A/E shall evaluate and propose the manufacturer and model. The domestic Water Booster Pumps shall be manufactured as an assembly, skid mounted and factory tested/certified for the specified service. Pumps/Header to be considered shall be stainless steel, duplex or triplex parallel pump design with Variable Frequency Drive (VFD) as specified by the A/E. Specified VFD shall be one of the University standard VFDs. Refer to Division 23, Heating, Ventilating & Air Conditioning.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation. Provide ball valves as required for isolation of each fixture if stop valves are not specified with fixture.
- B. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- C. Install copper tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system. If indirect waste is exposed to view below fixture, paint indirect drain same color as fixture unless directed otherwise by USF-PM.
- D. Provide chrome plated brass ring pipe support on urinal flush tube securely fastened to wall (wall shall include blocking for exact ring locations as coordinated during rough-in).
- E. Use carrier off-floor supports for wall-mounting fixtures.
- F. Install fixtures level and plumb. For fixtures indicated for children, install at height required by

- authority having jurisdiction and as coordinated with the USF-PM. Install water supply piping with shut-off valve on supply to each fixture connected to water distribution piping. Use ball valves for isolation. Install valves in locations where they can be easily reached for operation.
- G. Plumbing Equipment (water heaters, domestic water booster pumps, etc.) shall be located in designated custodial or mechanical rooms adequately sized to allow for proper installation and maintenance clearances. Equipment rooms shall include doorways and access for ease of maintenance and equipment replacement. Water heaters shall not be installed in attics or above ceilings.
- H. Contractor shall adjust all metered lavatory faucets. 0.5 gpm automatic lavatory faucets shall be adjusted to remain open for nominally 15 seconds.

END OF SECTION 22 30 00