SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 – GENERAL

1.01 SUMMARY

A. The intent of Division 22, Plumbing and the accompanying Drawings is to provide a complete and workable facility with complete systems as shown, specified and required by applicable codes. Include all work specified in Division 22, Plumbing and shown on the accompanying Drawings, including appurtenances, connections, etc., in the finished job.

B. Division 22, Plumbing and the accompanying Drawings are complementary and as binding as if called for by both. Items shown on the Drawings are not necessarily included in the Specifications and vice versa. Specifications supersede drawings in case of conflict.

C. The Drawings that accompany the Division 22, Plumbing, are diagrammatic. They do not show every offset, bend, tee, or elbow which may be required to install work in the space provided and avoid conflicts. Offsets and transitions assumed at a minimum at each duct crossing, structural penetrations through shear walls or beams, structural grids where ceiling heights are restricted, and at piping mains. Follow the Drawing as closely as is practical to do so and install additional bends, offsets and elbows where required by local conditions from measurements taken at the Building, subject to approval, and without additional cost to the Owner. The right is reserved to make any reasonable changes in fixture location prior to roughing-in, without cost impact.

D. The General and Supplemental Conditions apply to this Division, including but not limited to:

1. Drawings and specifications.
2. Public ordinances, permits.
3. Include payments and fees required by governing authorities for work of this Division.

1.02 RELATED SECTION

A. Division 01, General Requirements

B. Division 22, Plumbing

1.03 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Products and equipment prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products or equipment within this specification contain these banned substances, provide complying products and equipment from approved manufacturers with equal performance characteristics.
2. General:
    a. Conform work and materials to local and State codes, and Federal, State and other applicable laws and regulations.
3. Responsible for obtaining and payment for permits, licenses, and inspection certificates required in accordance with provisions of Contract Documents.

B. New materials and equipment. Work of good quality, free of faults and defects and in conformance with the Contract Documents.

C. Build and install apparatus to deliver its full rated capacity at the efficiency for which it was designed.

D. Operate the entire plumbing system and apparatus at full capacity without objectionable noise or vibration.

E. Install equipment level and true. Use housekeeping pads and curbs to account for floor or roof slope.

F. Materials and Equipment:

1. Meet detailed requirements of the Drawings and Specifications and suitable for the installation shown. Equipment not meeting requirements will not be acceptable, even though specified by name along with other manufacturers.

2. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.

3. Furnish materials and equipment of size, make, type, and quality herein specified.

4. Equipment scheduled by performance or model number considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements or any other differences which impact the project.

G. Workmanship:

1. General:

a. Install materials in a neat and professional manner.

2. Manufacturer’s Instructions:

a. Follow manufacturer’s directions where they cover points not specifically indicated.

b. If in conflict with the Drawings and Division 22, Plumbing, obtain clarification before starting work.

H. Cutting and Patching:

1. Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.

2. Additional openings required in building construction made by drilling or cutting. Use of jackhammer is specifically prohibited.

3. Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.

4. Do not pierce beams or columns without permission of Architect and then only as directed.

5. Restore new or existing work cut or damaged to its original condition. Where there are alterations disturb lawns, paving, walks, etc., repair, refinish, and leave in condition existing prior to commencement of work.

1.04 SUBMITTALS

A. Shop Drawings:

1. Contract Drawings indicate the general layout of the piping, and various items of equipment.

2. Coordinate with other trades and field conditions.

3. Prepare Shop Drawings of piping, and equipment installations.

4. Prepare new Shop Drawings by Contractor and not reproductions or tracings of Architect's Drawings.
5. Overlay drawings with shop drawings of other trades and check for conflicts.
6. Drawings same size as Architect's Drawings with title block similar to Contract Drawings and identifying Architect's Drawing number or any reference drawings.
7. Fully dimensioned including both plan and elevation dimensions.
8. Shop drawings cannot be used to make scope changes.
9. Prepare in two-dimensional format.
10. Shop drawings include but are not limited to:
    a. Plumbing site plan drawn to same scale as site plan.
    b. Complete floor plans with plumbing to a minimum of 1/4-inch equals 1-foot scale.
    c. Plumbing in mechanical rooms to a minimum of 1/2-inch equals 1-foot scale.
    d. Sections of congested areas to a minimum of 1/2-inch equals 1-foot scale.
    e. Fabricated Equipment: Scale and drawing sizes to suit contractor except equipment not less than 1/2-inch equals 1-foot scale.
    f. Superplot plans of above ground work with a colored overlay of all trades including, but not limited to, HVAC piping, HVAC equipment, plumbing piping and equipment, sprinklers, lighting, lighting controls, cable tray, fire alarm devices, electrical power conduit, and ceiling system to a minimum of 1/2-inch equals 1-foot scale.
    g. Superplot plans of below ground work with a colored overlay of all trades including, but not limited to, structural footings and foundation, HVAC piping, civil piping, plumbing piping, and power conduit to a minimum of 1/2-inch equals 1-foot scale.
    h. Beam penetration drawings indicating beam penetrations meeting the requirements indicated on the floor plans and on the structural drawings to a minimum of 1/4-inch equals 1-foot scale.
    i. Slab penetration drawings of HVAC, plumbing, sprinklers, lighting and electrical to a minimum of 1/4-inch equals 1-foot scale.
11. Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.

B. Product Data:

1. Submit product data for review on scheduled pieces of equipment, on equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes. Include manufacturer's detailed shop drawings, specifications and data sheets. Data includes the following:
    a. Capacities
    b. RPM
    c. BHP
    d. Pressure Drop
    e. Design and Operating Pressures
    f. Temperatures

2. Manufacturer's abbreviations or codes are not acceptable.
3. List the name of the motor manufacturer and service factor for each piece of equipment.
4. Indicate equipment operating weights including bases and weight distribution at support points.
5. In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.

C. Submission Requirements:

1. Shop Drawings and Product Data:
   a. Refer to Division 01, General Requirements for additional requirements related to submittals.
   b. Submit copies of shop drawings and product data for Work of Division 22, Plumbing in a 3-ring loose leaf binder with each item filed under a tab and labeled with its respective specification section number, article and paragraph, and mark if applicable.
   c. Submit electronic copies of shop drawings and product data for Work of Division 22, Plumbing in PDF format with each item filed under a folder and labeled with its respective specification section number, article, and paragraph and mark, if applicable.
   d. Include a complete index in the original submittal. Indicate both original items submitted and note stragglers that will be submitted at a later date to avoid delay in submitting.
   e. The bulk of the shop drawings and product data, excepting Controls and Instrumentation, included with the original submittal. Controls and Instrumentation submittals may lag but still complete when submitted. Partial submittals will not be accepted. Other stragglers submitted after return of the original binder includes a tab similar to that originally submitted. Upon receipt of the returned late submittal, insert them in the previously submitted binder.

D. Contractor Responsibilities:

1. Submit submittals at one time and are in proper order.
2. Ensure equipment will fit in the space provided.
3. Assure that deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.

1.05 AS-BUILT DRAWINGS

A. Provide 3D model and record drawings at the end of the project on CD-ROM.

B. 3D model in the following format:

1. AutoCAD
2. Revit

C. Provide record drawings in hard copy and pdf format. Drawings include the following:

1. Project specific titleblock.
2. Notations reflecting the as built conditions of any additions to or variations from the construction documents provided as part of the BIM coordination, RFIs, ASIs, Owner Changes, and Field Coordination.

1.06 OPERATING AND MAINTENANCE MANUAL, PARTS LISTS, AND OWNER'S INSTRUCTIONS

A. Refer to Division 01, General Requirements for additional requirements.

B. Submit three bound copies of manufacturer's operation and maintenance instruction manuals and parts lists for each piece of equipment or item requiring servicing. Show literature on 8-1/2-inches by 11-inches sheets or catalogs suitable for side binding.

C. Submit data when the work is substantially complete, packaged separately, and clearly identified in durable 3-ring binder. Include name and contact information for location of source parts and service for each piece of equipment.

D. Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified. Provide wiring diagrams for electrically powered equipment.

E. Instruct Owner thoroughly in proper operation of equipment and systems, in accordance with manufacturer's instruction manuals. Operating instructions cover all phases of control.

F. Furnish competent engineer knowledgeable in this building system for minimum of five 8 hour days to instruct Owner in operation and maintenance of systems and equipment. Keep a log of this instruction including dates, times, subjects, and those present and present such log when requested by Architect.

1.07 PROJECT CONDITIONS

A. Existing Conditions:

1. Prior to bidding, verify and become familiar with existing conditions by visiting the site, and include factors which may affect the execution of this Work.

2. Include related costs in the initial bid proposal.

B. Coordinate exact requirements governed by actual job conditions. Check information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.

C. Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, City, and Utility Company.

1.08 WARRANTY

A. Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.

B. Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.

C. Correct warranty items promptly upon notification.

1.09 PROVISIONS FOR LARGE EQUIPMENT

A. Make provisions for the necessary openings in building to allow for admittance of equipment.

1.10 TEST REPORTS AND CERTIFICATES

A. Submit one copy of test reports and certificates specified herein to the Architect.

1.11 SUBSTITUTIONS

A. Submit requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

PART 2 – PRODUCTS

2.01 ACCESS PANELS

A. Furnish under this Division as specified in another Division of work.

2.02 PIPE SLEEVES

A. Interior Wall and Floor Sleeves: 18 gauge galvanized steel, or another pre-approved system.

B. Interior Wall and Floor Sleeves, Fire Rated: Fire rated and water tight system approved by Authority Having Jurisdiction and Owners Insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.

C. Exterior Wall Sleeves: Cast iron.

D. On Grade Floor Sleeves: Same as exterior wall sleeves.

E. Water Tight Sleeves: Combination steel pipe sleeves with water stop and anchor plate; Link Seal Model WS, mated with synthetic rubber links interlocked with bolts and nuts; Link Seal Model LS.

2.03 FLOOR, WALL AND CEILING PLATES

A. Furnish stamped split type plates as follows:

1. Floor Plates: Cast brass, chromium plated
2. Wall and Ceiling Plates: Spun aluminum

2.04 MACHINERY GUARDS

A. Furnish guards for protection on rotating and moving parts of equipment. Provide guards for metal fan drives and motor pulleys, regardless of being enclosed in a metal cabinet.

B. Design guards so as not to restrict airflow at fan inlets resulting in reduced capacity.

C. Provide shaft holes in guards for easy use of tachometers at pulley centers. Easily removable for pulley adjustment or removal and changing of belts.

D. Meet OSHA requirements including back plates.

E. Provide inlet and outlet screens on fans in plenums or where exposed to personnel.

2.05 ELECTRICAL EQUIPMENT

A. General:

1. Equipment and installed work as specified under Division 26, Electrical.

B. Coordinate with the electrical Drawings and electrical contractor for minimum electrical equipment bracing requirements based on the available interrupting current (AIC) rating at the bus of the panelboard or switchboard serving the piece of equipment. Provide equipment that meets the bracing requirement.

C. Motors – AC Induction:

1. Furnish as integral part of driven equipment. Drip-proof induction type with ball bearings unless noted otherwise. Motors 1 HP and above premium energy efficient type, except for emergency equipment motors. NEMA Standards for the service intended. Rated for the voltage specified, suitable for operation within the range of 10 percent above to 10 percent below the specified voltage.
2. Energy Efficient Motors:
   a. Baldor
   b. Westinghouse
   c. General Electric
   d. Or approved equal.
3. Meet the efficiency standards identified in the table below as determined using the IEEE Method B test at full load.

MINIMUM MOTOR EFFICIENCIES					
		RPM IEEE 112B Efficiency			
HP	KW	900	1200	1800	3600
1	0.75	--	82.5	85.5	80.0
1.5	1.15	--	86.5	86.5	85.5

MINIMUM MOTOR EFFICIENCIES					
		RPM IEEE 112B Efficiency			
HP	KW	900	1200	1800	3600
2	1.53	--	87.5	86.5	86.5
3	2.3	84.0	89.5	89.5	88.5
5	3.8	85.5	89.5	89.5	89.5
7.5	5.6	87.5	91.7	91.7	91.0
10	7.5	88.5	91.7	91.7	91.7
15	7.5	88.5	91.7	92.4	91.7
20	15.9	90.2	92.4	93.0	92.4
25	18.8	91.0	93.0	93.6	93.0
30	22.5	91.0	93.6	94.1	93.0
40	30.0	91.7	94.1	94.5	93.6
50	37.5	92.4	94.1	94.5	94.1
60	45.0	93.0	94.5	95.0	94.1
75	56.3	93.0	95.0	95.4	94.5
100	75.0	93.0	95.4	95.4	95.0
125	93.8	94.5	95.4	95.4	95.4
150	112.5	94.5	95.8	95.8	95.4
200	150.0	94.5	95.8	96.2	95.8
250	187.5	94.5	95.1	96.2	95.1
300	225.0	94.5	95.3	96.2	95.3
350	225.0	94.5	95.3	96.2	95.3
400	300.0	94.5	95.4	96.2	95.4
450	337.5	94.5	95.5	96.2	95.5
500	375.0	94.5	95.6	96.2	95.6

4. Refer to Equipment Schedules on the Drawings for motor horsepower, voltage, and phase.
5. Refer to individual product sections for additional motor requirements.
6. Built-in thermal overload protection, or protected externally with separate thermal overload devices with low voltage release or lockout. Hermetically sealed motors have quick trip devices.
7. Controlled by variable frequency drives, inverter duty rated and have Class F insulation or better. Able to withstand repeated voltage peaks of 1,600Vs with rise times of 0.1 microseconds and greater in accordance with NEMA Standard MG1 Part 31.
8. Motors served from variable frequency drives equipped with shaft grounding system which provide a path for current to flow between the shaft and motor frame. SGS or equal.
9. Motors located in environment air plenums not tied to air handling functions totally enclosed type motors.

D. Motors – Electronic Commutation (EC):

1. Furnish as integral part of driven equipment.
2. Permanently lubricated with ball bearings unless noted otherwise.
3. Internal motor circuitry convert AC power supplied to the motor to DC power to operate the motor.
4. Speed controllable down to 20 percent of full speed.
5. Motor efficiency minimum of 85 percent at speeds.

6. Refer to Equipment Schedules on the Drawings for motor horsepower, voltage, and phase.
7. Refer to individual product sections for additional motor requirements.
8. Built-in thermal overload protection, or be protected externally with separate thermal overload devices with low voltage release or lockout. Hermetically sealed motors have quick trip devices.
9. Motors located in environment air plenums not tied to air handling functions totally enclosed type motors.

E. Starters: Provided under Division 26, Electrical, suitable for performing the control functions required, with the exception of self-contained equipment and where the starters are furnished as part of the control package.

F. Equipment Wiring:

1. Provide interconnecting wiring within or on a piece of mechanical equipment with the equipment unless shown otherwise. This does not include the wiring of motors, starters and controllers provided under Division 26, Electrical.

G. Control Wiring: Provide control wiring for plumbing equipment

H. Codes: Electrical equipment and products bear the Underwriters label as required by governing codes and ordinances.

PART 3 – EXECUTION

3.01 ACCESS PANELS

A. Install in accord with manufacturer's recommendations, coordinated with architectural features.

B. Provide 2-hour fire rated doors where required bearing the UL label.

C. Furnish 18-inch by 18-inch panels for ceilings and for access to equipment in soffits and shafts, and 12-inch by 12-inch for walls unless indicated otherwise.

D. Furnish where indicated and where required to access valves, trap primers, shock arresters, and other appurtenances requiring operation, service, or maintenance. Submit proposed locations for review prior to installation.

3.02 SLEEVES

A. Interior Floor and Wall Sleeves:

1. Provide sleeves large enough to provide 3/4-inch clearances around pipe.
2. Where pipe is insulated, provide sleeves large enough to provide 3/4-inch clearance around insulation. Maintain continuous insulation as it passes through sleeve.
3. Penetrations through mechanical room and fan room floors made watertight by packing with safing insulation and sealing with Tremco Dymeric Sealant or approved system.

B. Sleeves Through Rated Floors and Walls:

1. Similar to interior sleeves except install fire rated system approved by Authority Having Jurisdiction and Owners insurance underwriter
2. Rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.

C. Exterior Wall Sleeves Below Grade:

1. Provide water tight sleeves. Install at pipes entering building below grade and where shown. Adjust to provide positive hydrostatic seal.
2. Responsible for following manufacturer's procedure for installing and tightening seal. Secure sleeves against displacement.

D. On Grade Floor Sleeves: Same as below grade exterior wall sleeves, caulked from inside.

E. Exterior Wall Sleeves Above Grade: Similar to interior wall sleeves except caulk outside with Tremco Dymeric Sealant.

F. Layout work prior to concrete forming. Do cutting and patching required. Reinforce sleeves to prevent collapse during forming and pouring.

G. Floor sleeves maintain a water barrier by providing a water tight seal or they extend 1-inch above finished floor except through mechanical equipment room floors and shafts where sleeves extend 2-inches above finished floor level. Sleeves through roof extend 8-inches above roof. Wall sleeves flush with face of wall unless otherwise indicated. Waste stacks using carriers have sleeves flush with floor and sealed. Sleeves through planters extend 8-inches above planter base.

H. Do not support pipes by resting pipe clamps on floor sleeves. Provide supplementary members so pipes are floor supported.

I. Special sleeves detailed on drawings take precedence over this Section.

3.03 CLEANING

A. General: Clean plumbing equipment, fixtures and piping of stampings and markings (except those required by codes), iron cuttings, and other refuse.

B. Painted Surfaces: Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.

C. Additional requirements are specified under specific Sections of this Division.

3.04 EQUIPMENT PROTECTION

A. Keep pipe and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, fixtures, equipment, and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated fixtures, equipment, or apparatus to original conditions or replace at no cost to the Owner.

B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.

C. Cover or otherwise suitably protect equipment and materials stored on the job site.

3.05 ACCESSIBILITY

A. General: Locate valves, thermometers, cleanout fittings and other indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.

B. Thermometers and Gauges: Install thermometers and gauges so as to be easily read from the floors, platforms, and walkways.

3.06 FLOOR, WALL AND CEILING PLATES

A. Install on piping passing through finished walls, floors, ceilings, partitions, and plaster furrings. Plates completely cover opening around pipe.

B. Secure wall and ceiling plates to pipe, insulation, or structure.

C. Plates not to penetrate insulation vapor barriers.

D. Plates not required in mechanical rooms or unfinished spaces.

3.07 PAINTING

A. General:

1. Coordinate painting of mechanical equipment and items with products and methods in conformance with the appropriate Division of Work, Painting.

2. Exposed work under this division receives either a factory painted finish or a field prime coat finish, except:
3. Exposed copper piping.
4. Aluminum jacketed outdoor insulated piping.

B. Equipment Rooms and Finished Areas:
1. Insulation: Not painted.
2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Structural Steel Stands, Uninsulated Tanks, and Equipment Bases: Paint one coat of black enamel.
3. Steel Valve Bodies and Bonnets: One coat of black enamel.
4. Brass Valve Bodies: Not painted.
5. Equipment:
a. One coat of grey machinery enamel.
b. Do not paint nameplates.

C. Concealed Spaces (above ceilings, not visible):
1. Insulation: Not painted.
2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Valve Bodies and Bonnets: Not painted.

D. Exterior Steel: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel.

E. Exterior Black Steel Pipe: Wire brush and apply two coats of rust-inhibiting primer and one coat of exterior enamel. Painting schemes comply with ANSI A13.1.

3.08 ADJUSTING AND CLEANING

A. Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations made accordingly and that recommended lubricants have been used.

B. Use particular care in lubricating bearings to avoid damage by overlubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.

3.09 ELECTRICAL EQUIPMENT

A. Do not install piping for plumbing systems not serving electrical space in switchgear room, transformer vault, telephone room, or electric closet except as indicated.

B. Piping for plumbing systems not to pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

3.10 EQUIPMENT CONNECTIONS

A. Make final connections to equipment specified in sections other than Division 22, Plumbing of the specifications and Owner furnished equipment in accordance with manufacturer’s instructions and shop drawings furnished and as indicated.

B. Piping:
1. Connections include hot and cold water, deionized water, distilled water, natural gas, medical gases, medical air, and vacuum, dental air and vacuum, lab air and vacuum, sanitary waste and vent, lab waste and vent and fuel oil.
2. Provide valves and specialties as specified and as detailed on the Drawings. Provide increasers, reducers, and any other fittings required for complete installation.

3. Independently support piping connections to prevent undue strain on equipment.

END OF SECTION

SECTION 22 05 23

GENERAL DUTY VALVES AND SPECIALTIES FOR PLUMBING

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes:

1. Ball Valves

1.02 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 22, Plumbing

1.03 SUBMITTALS

A. Submit product data.

1.04 DEFINITIONS

A. CWP Cold working pressure

B. EPDM Ethylene propylene copolymer rubber

C. NBR Acrylonitrile-butadiene, Buna-N, or nitrile rubber

D. NRS Nonrising stem

E. OS&Y Outside screw and yoke

F. RS Rising stem

G. PTFE Polytetrafluoroethylene plastic

H. SWP Steam working pressure

I. Lead Free Section 1417 of the Safe Drinking Water Act (SDWA) establishes the definition for lead free as a weighted average of 0.25 percent lead calculated across the wetted surfaces of a pipe, pipe fitting, plumbing fitting, and fixture and 0.2 percent lead for solder and flux. The Act provides a methodology for calculating the weighted average of wetted surfaces.

1.05 QUALITY ASSURANCE

A. ASME Compliance:

1. ASME B16.10 for ferrous valve dimensions.

2. ASME B31.9 for building services piping valves.

B. NSF Compliance: NSF/ANSI 61 and/or NSF/ANSI 372 for valve materials for potable-water service. ANSI/NSF-359

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. General: Where only NIBCO figure numbers are listed, equivalent products by those specified below are acceptable.

1. Ball Valves:

a. Gruvlok

b. Apollo

c. Crane

d. Hammond

e. Milwaukee

f. Victaulic

B. Other Manufacturers: Submit substitution request.

C. Use only one manufacturer.

D. Valve ends may be threaded, flanged, soldered, or grooved, as applicable to piping system. Refer to Section 22 21 13, Pipe and Pipe Fittings Plumbing for allowable fittings.

2.02 BALL VALVES

A. Lead Free Bronze Ball: Two piece, full port, lead free silicon bronze body, Stainless steel or silicon bronze trim, Reinforced PTFE or TFE seats, 600 psi CWP NIBCO T/S-585-80-LF or T/S-585-66-LF.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Provide valves at connections to equipment where shown or required for equipment isolation.

B. Provide separate support for valves where necessary.

C. Provide drain valves in low points in the piping system, at coils and equipment, and as indicated.

D. Coordinate gas pressure regulator selection with inlet pressure available at the regulator and the capacity and outlet pressure required by the equipment served.

E. Install in accordance with manufacturer's recommendations.

F. Locate gas cocks and gas regulator readily accessible for servicing.

G. Provide approved gas cock immediately upstream of each gas pressure regulator.

H. Provide separate vent to the outside for each regulator.

3.02 APPLIED LOCATIONS PLUMBING VALVES

A. In piping 2-inches and smaller:

System	Valve Types				
	Gate	Globe	Swing Check	Ball	Butterfly
Domestic Hot	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Not Allowed
Domestic Cold	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Not Allowed
Industrial Cold Water	Bronze	Bronze	Bronze	Bronze	Not Allowed
Compressed Air	Bronze	Bronze	Bronze	Bronze	Not Allowed
Medical Gas	Not Allowed	Not Allowed	Not Allowed	Bronze, Clean Service	Not Allowed
Specialty Gas	Not Allowed	Not Allowed	Not Allowed	Bronze, Clean Service	Not Allowed
Medical Vacuum	Not Allowed	Not Allowed	Not Allowed	Bronze, Clean Service	Not Allowed
Deionized/Distilled Water	Not Allowed	Not Allowed	Not Allowed	PVC	Not Allowed
Solar Hot Water	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Not Allowed

System	Valve Types				
	Gate	Globe	Swing Check	Ball	Butterfly
Reclaimed Water	Bronze	Bronze	Bronze	Bronze	Not Allowed
Cold Process Water	Bronze	Bronze	Bronze	Bronze	Not Allowed
Process Grey Water	Bronze	Bronze	Bronze	Bronze	Not Allowed

B. Calibrated balancing valves on domestic hot water. Size balancing valves based on the published performance curve characteristics for the scheduled flow rate for each location to ensure proper operation at design conditions.

C. Provide gauge cock for all pressure gauges.

3.03 VALVE IDENTIFICATION

A. General: Identify valves to indicate their function and system served.

B. Refer to Section 22 05 53, Identification for Plumbing Piping and Equipment.

3.04 INSTALLATION

A. Manual Air Vents:

1. Install at high points where automatic air vents are not used, where noted, and where required for proper venting of system.

2. Install in accordance with manufacturer's recommendations.

B. Mold and produce gaskets by the coupling manufacturer, and suitable for the intended service. Coupling manufacturer's factory trained representative to provide on-site training for the contractor's field personnel in the use of grooving tools and installation of grooved joint products. Representative to periodically visit the project site to ensure best practices in grooved installation are being followed. Distributor's representative is not considered qualified to conduct the training of field visits.

C. Test Plugs: Install where indicated and in accordance with the manufacturer's recommendations.

END OF SECTION

SECTION 22 05 29

HANGERS SUPPORTS AND ANCHORS FOR PLUMBING

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes:

1. Supports, Anchorage and Restraint
2. Pipe Attachments
3. Pipe Rollers, Insulation Protection Shields and Insulation Protection Saddles
4. Building Attachments

1.02 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 22, Plumbing

C. Section 22 07 00, Insulation for Plumbing

D. Section 22 21 13, Pipe and Pipe Fittings Plumbing

1.03 SUBMITTALS

A. Submit the following:

1. Shop Drawings of contractor fabricated piping support structures.
2. No other submittals required under this section.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Supports, Anchorage and Restraint:

1. Unistrut
2. Superstrut
3. Powerstrut and Kinline
4. B-Line Systems
5. AnvilStrut

B. Pipe Attachments:

1. Anvil
2. Superstrut
3. B-Line Systems
4. Tolco
5. ERICO

C. Pipe Rollers, Insulation Protection Shields and Insulation Protection Saddles:

1. Anvil or equivalent
2. Super Strut
3. B-Line Systems
4. Tolco
5. ERICO

D. Building Attachments:

1. Anvil as listed or equivalent products
2. Elcen

3. Superstrut
4. B-Line Systems
5. Tolco
6. ERICO

2.02 SUPPORTS, ANCHORAGE AND RESTRAINT

A. General:

1. Provide pipe and equipment hangers and supports in accordance with the following:
    a. Equipment, supports, and seismic restraints for conduit, piping, and ductwork are not shown on the Drawings, the contractor responsible for their design.
    b. Resist seismic forces as specified in the latest edition of the International Building Code for the seismic zone in which the project is constructed.
    c. Seismic restraint not to introduce excessive stresses in the piping caused by thermal expansion or contraction.
    d. Connections to structural framing not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.
    e. In accordance with the latest edition of the SMACNA Seismic Restraint Manual - Guidelines for Mechanical Systems for the Seismic Hazard Level corresponding to the seismic zone in which the project is constructed.
    f. In accordance with the applicable code.
    g. Follow provisions described in Section 22 05 48, Vibration and Seismic Controls for Plumbing Piping and Equipment.

B. Engineered Support Systems: Design, detail, and bear the seal of a professional engineer registered in the State having jurisdiction.

1. Supports and seismic restraints for suspended piping and equipment.
2. Support frames such as pipe racks or stanchions for piping and equipment which provide support from below.
3. Equipment and piping support frame anchorage to supporting slab or structure.

C. Fabricate support members from welded standard structural shapes, pipe, and plate to carry the necessary rollers, hangers, and accessories as required.

D. Support piping less than 4-inch pipe size from or by prefabricated roll-formed channels with necessary accessories to adequately support piping system.

E. Supports and Accessories: Preformed roll-formed channels and accessories with matching compatible accessories as shown, as specified, and as required.

F. Dissimilar Metal Protection: Hydra-Zorb cushions or Cush-a-strip.

G. Clamps: Super Strut Series 700 through 702 or AnvilStrut Series 1000 through 1200.

2.03 PIPE ATTACHMENTS

A. Uninsulated Horizontal Copper Piping:

1. 2-inch and Smaller: Anvil CT-65, CT-69, CT-99C.
2. Larger than 2-inch:
    a. Anvil 260 field or factory copper plated, plastic coated or other recognized industry methods.
    b. Electricians' tape is unacceptable.

B. Insulated Horizontal Copper Pipe with Hangers Inside of Insulation: Same as Uninsulated Horizontal Copper Pipe.

C. Insulated Horizontal Copper Pipe with Hangers Outside of Insulation:

1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
2. Larger than 2-inch: Anvil 260.

D. Other Uninsulated Horizontal Pipe:

1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
2. Larger than 2-inch: Anvil 260.

E. Other Insulated Horizontal Pipe With Hangers Inside of Insulation:

1. 2-inch and Smaller: Anvil 65, 70, 104, 260 or 300.
2. Larger than 2-inch: Anvil 260.

F. Other Insulated Horizontal Pipe with Hangers Outside of Insulation:

1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
2. Larger than 2-inch: Anvil 260.

G. Riser Clamps Copper Pipe:

1. 4-inch and Smaller: Anvil CT-121, CT-121C or 261C.
2. Larger than 4-inch: Anvil 261C.

H. Riser Clamps Other Piping: Anvil 261.

2.04 PIPE ROLLERS, INSULATION PROTECTION SHIELDS AND INSULATION PROTECTION SADDLES

A. Pipe Rollers:

1. Anvil 174 or 274 as required.
2. Size for pipe plus insulation for insulated pipe.

B. Insulation Protection Shields: Anvil 167

C. Insulation Protection Saddles: Anvil 160 through 166A as required. Saddles for copper pipe, factory, or field copper plated.

2.05 BUILDING ATTACHMENTS

A. Beam Hangers:

1. On piping 6-inch and smaller: Anvil 86 with retaining clip Figure 89.
2. On piping larger than 6-inch: Anvil 228, or 292.

B. Inserts:

1. Anvil 152 malleable iron or 281 steel inserts.
2. Inserts sized for required rod to support load being carried.

C. Expansion Plugs: Similar and equal to Phillips red-head self-drilling flush shell selected for safety factor of 4.

D. Powder actuated fasteners with silencers as approved by Architect.

PART 3 – EXECUTION

3.01 HANGERS AND SUPPORTS

A. General:

1. Install support systems as detailed and in accordance with manufacturer's recommendations. Provide pipe racks, pipe stands, trapeze hangers, etc., as required, and as detailed on the Drawings.

2. Provide adjustable hangers for pipes complete with inserts, adjusters, bolts, nuts, swivels, all-thread rods, etc., except where specified otherwise.
3. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping and do not support piping from other piping.
4. Except as otherwise indicated for exposed continuous pipe runs, install hangers, and supports of same type and style as installed for adjacent similar piping.
5. Install cast iron piping in accordance with Cast Iron Soil Pipe Industry (CISPI) Standards.
6. Support piping within 2-feet of each change of direction on both sides of fitting.

B. Insulated Piping Systems:
1. Refer to Section 22 07 00, Insulation for Plumbing for insulation requirements.
2. Insulated Piping Systems with Vapor Barrier Insulation:
   a. Install hangers outside of insulation.
   b. On piping 1-1/2-inch and larger, provide insulation protection shields at each support location.
3. Insulated Piping Systems with Non-Vapor Barrier Insulation:
   a. At the contractor's option, hangers may be installed inside or outside of insulation for piping 2-inch and smaller.
   b. If hangers are installed outside of insulation, provide insulation protection shields at support locations on piping 1-1/2-inch and larger.
   c. On piping larger than 2-inch, provide insulation saddles at each support location.
4. Insulation Protection:
   a. Band insulation protection shields firmly to insulation to prevent slippage.
   b. Tack weld insulation protection saddles to steel pipe. Braze saddles to copper pipe.

C. Vertical Piping:
1. Support with U-clamps fastened to wall to hold piping away from wall unless otherwise approved.
2. Riser clamps on steel pipe to be directly welded to pipe. Riser clamps on copper pipe to be installed directly under fitting.
3. Risers that are not subject to thermal change to be supported at each floor of penetration.
4. Risers that are subject to thermal change require engineered supports. Size supports to carry forces exerted by piping system when in operation. Riser supports follow provisions described in Section 22 05 48, Vibration and Seismic Controls for Plumbing Piping and Equipment.

D. Horizontal Piping:
1. Trapeze Hangers:
   a. Multiple pipe runs where indicated supported on channels with rust resistant finish.
   b. Provide necessary rods and supporting steel.

2. Support Spacing:

a. Provide support at minimum spacing per MSS SP-69-1996 Pipe Hangers and Supports - Selection and Application:

1) Support piping within 2-feet of each change in direction.

2) Steel Pipe, Copper Tubing:

Minimum Pipe Size	Maximum Span Steel	Maximum Span Copper	Maximum Span Pex A pipe with Pex a Pipe Channel	Rod Size
1-inch and smaller	7-feet	5-feet	6-feet	1/4-inch
1-1/4-inch to 2-inch	8-feet	8-feet	8-feet	3/8-inch
2-1/2-inch to 3-inch	11-feet	9-feet	8-feet	1/2-inch
4-inch to 5-inch	14-feet	12-feet	-	1/2-inch
6-inch	17-feet	14-feet	-	1/2-inch
8-inch or larger	19-feet	16-feet	-	5/8-inch
10-inch	20-feet	18-feet	-	3/4-inch
12-inch	23-feet	19-feet	-	7/8-inch
14-inch	25-feet		-	1-inch
16-inch	27-feet		-	1-inch

3) Fuel Gas Piping: Support in accordance with local code requirements.

4) Plumbing Piping: Support in accordance with local plumbing code.

5) Plastic Pipe: Supported a maximum of 3-feet on center for piping 1-inch and smaller and 4-feet on center for piping 1-1/4-inch and larger with rod sizes as recommended by the manufacturer.

6) Piping provided with acoustical lagging wrap supported a maximum of 5-feet on center. Install hangers outside of acoustical lagging.

E. Building Attachments:

1. Fastening or attaching to steel deck (without concrete fill) is prohibited. It will be necessary to support piping from structural members, beams, joists, or provide intermediate angle iron supporting members between joists. Supports may be attached to concrete filled steel deck with load limitations shown on the structural drawings or otherwise obtained from the structural engineer.

2. Provide horizontal bracing on horizontal runs 1-1/2 inch and larger and exceeding 50-feet in length at 75-foot intervals and as required to provide stabilized piping systems.

3. Provide additional structural steel angles, channels, or other members required to support piping where structures do not occur as required for proper support.

4. Arrange supports to prevent eccentric loading of joists and joist girders. Locate supports at joist panel points.

END OF SECTION

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes:

1. Valve Identification
2. Piping Markers

1.02 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 22, Plumbing

1.03 SUBMITTALS

A. Submit the following:

1. Valve Tag Directory: Submit for approval prior to fabrication of valve tags.
2. Equipment Nameplate Directory: Submit for approval prior to fabrication.
3. Operating and Maintenance Data: Include a copy of valve tag and equipment nameplate directories in each set of Operating and Maintenance manuals.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Piping Markers:

1. W.H. Brady
2. Seton
3. Marking Systems, Inc. (MSI)
4. Other Manufacturers: Submit substitution request.

2.02 VALVE IDENTIFICATION

A. Valve Tags:

1. General: Identify valves with metal tags, legends to be stamped or embossed. Indicate function of the valve and its normal operating position.

56 HW	(NUMBER AND CONTENT OF PIPE)
ISOLATION	(VALVE FUNCTION)
NO	(NORMAL OPERATION POSITION)

2. Size: Valve tags 2-inch diameter with 1/4-inch high letters.
3. Material: Use 0.04-inch brass tags.
4. Automatic Valves and Regulating Valves: Use 1/16-inch thick laminated 3-ply plastic, center ply white, outer ply red, lamicoid, or equal. Form letters by exposing center ply.
5. Buildings Systems: Contact the Owner for coordination with existing building tagging system and supplementary information required for specific systems before valve tagging begins.

B. Valve Tag Directory: Include tag number, location, exposed or concealed, service, valve size, valve manufacturer, valve model number, and normal operating position of valve.

2.03 PIPING MARKERS

A. Label pipes with all-vinyl, semi-rigid plastic or strap-on labels.

B. For pipes O.D. smaller than 3/4-inch and for valve and fitting identification, use valve tag.

C. For sizes from 3/4 to 1-1/4-inch outside diameter, 1/2-inch letters, 8-inch marker width.

D. For sizes from 1-1/2 to 2-inch outside diameter, 3/4-inch letters, 8-inch marker width.

E. For sizes from 2-1/2 to 6-inch outside diameter, 1-1/4-inch letters, 12-inch marker width.

F. For sizes from 8 to 10-inch outside diameter, 2-1/2-inch letters, 24-inch marker width.

G. For sizes 10-inche outside diameter and larger, 3-1/2-inch letters, 32-inch marker width.

H. Identify and color-code pipe markers as follows with directional arrows.

PLUMBING SERVICE	PIPE MARKER*	BACKGROUND/TEXT COLOR
COLD WATER	DOMESTIC COLD WATER	GREEN/WHITE
HOT WATER	DOMESTIC HOT WATER SUPPLY	GREEN/WHITE
	DOM. HOT WATER RECIRC	GREEN/WHITE
SANITARY WASTE	SANITARY WASTE	GREEN/WHITE
VENT	VENT	GREEN/WHITE
* Directional arrow applied adjacent to pipe marker indicating direction of flow.		
** Provide custom marker labels for piping for which no standard manufactured marker is available. Submit sample for approval.		

PART 3 – EXECUTION

3.01 PIPING MARKERS

A. Unless recommendations of ANSI A13.1 are more stringent, apply labels or letters after completion of pipe cleaning, insulation, painting, or other similar work, as follows:

1. Every 20-feet along continuous exposed lines.
2. Every 10-feet along continuous concealed lines.
3. Adjacent to each valve, flange, and stub-out for future.
4. On pipe before and after wall, floor, and ceiling penetrations.
5. On pipe into and out of concealed spaces.
6. Adjacent to changes in pipe direction.
7. On each riser.
8. Adjacent to each leg of a T.
9. Locate conspicuously where visible. Position pipe labels on pipe to achieve the best visibility.
10. Provide pipe identification (over insulation) for reclaimed water systems in accordance with current local codes and rulings.
11. Apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above.

B. Apply arrow labels indicating direction of flow.

END OF SECTION

SECTION 22 07 00

INSULATION FOR PLUMBING

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes:

1. Pipe Insulation
2. Accessories Piping

1.02 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 22, Plumbing

C. Section 22 05 29, Hangers, Supports and Anchors for Plumbing

1.03 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Insulating products prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products within this specification contain these banned substances, provide complying products from approved manufacturers with equal performance characteristics.
2. Flame and Smoke Ratings: Installed composite flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by UL 723 or ASTM E84.
3. Energy Codes: Local Building and Energy Codes govern where insulation performance requirements for thickness exceeds thickness specified.

B. Protection: Protect against dirt, water, chemical, or mechanical damage before, during, and after installation. Repair or replace damaged insulation at no additional cost.

C. Source Quality Control:

1. Service: Use insulation specifically manufactured for service specified.
2. Labeling: Insulation labeled or stamped with brand name and number.
3. Insulation and accessories not to provide nutritional or bodily use to fungi, bacteria, insects, rats, mice, or other vermin. Asbestos free and no interaction with corrosively with equipment, piping, or ductwork.

1.04 SUBMITTALS

A. Submit the following.

1. Product Data: For each type including density, conductivity, thickness, jacket, vapor barrier, and flame spread and smoke developed indices.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. General:

1. Johns Manville
2. Knauf
3. Owens Corning
4. CertainTeed
5. Such insulation by one manufacturer.
6. Other Manufacturers: Submit substitution request.

B. Pipe Insulation:

1. Fiberglass:

a. Johns Manville Microlok HP

2. Calcium Silicate:

a. Johns Manville Thermo-12 Gold

3. Elastomeric:

a. Armacell AP Armaflex, Rubatex, K-Flex.

2.02 PIPE INSULATION

A. Fiberglass: Split sectional or Snap-On type with 0.23 per inch maximum thermal conductivity (K-factor) at 75 degrees F mean temperature, 850 degrees F maximum service rating and white, vapor barrier jacket with pressure sensitive closure system.

B. Elastomeric:

1. Expanded closed cell, 0.27 per inch maximum K-factor at 75 degrees F mean temperature, 220 degrees F maximum service rating with fitting covers and paintable surface.

2. Color:

a. Concealed Locations: Black

b. Exposed Locations: White

2.03 ACCESSORIES PIPING

A. Adhesives:

1. General: Maximum Flame Spread/Smoke Developed Rating of 25/50, SCAQMD Rule 1168 compliant.

2. Fiberglass: Integral closure system.

3. Calcium Silicate: Benjamin Foster 30-36.

4. Elastomeric: Armacell 520 BLV.

B. Cements:

1. Insulating: Ryder.

2. Heat Transfer: Chemax Tracit-300.

C. Wire Mesh: 1-inch mesh with 20 gauge annealed steel wire.

D. Pipe Fitting Covers:

1. One piece PVC insulated pipe fitting covers.

2. Zeston, Ceel-Co.

E. Grooved Coupling Insulation:

1. One piece PVC insulated fitting cover.

2. Zeston, Ceel-Co.

F. Metal Pipe Jacket: 0.016-inch thick aluminum jacket with formed fitting covers, aluminum snap straps and sealant.

G. Cloth Facing: Presized fiberglass cloth.

H. Tapes:

1. Pressure sensitive, weather resistant, and for temperatures up to 150 degrees F.

2. Zeston Z-tape.

I. Paint: Ultraviolet resistant latex paint with special adherence capabilities to the PVC fitting covers, elastomeric, aluminum facing, Kraft paper, tapes, and adhesives.

PART 3 – EXECUTION

3.01 GENERAL

A. Workmanship:

1. Installation: Insulation installed in first class, neat professional manner.
2. Applicators: Employed by firm that specializes in insulation work.

B. Preparation: Surfaces of piping and equipment clean, free of oil or dirt, and dry before insulation is applied.

C. Stamps: ASME stamps, UL labels, and similar stamps and labels are not covered.

3.02 PLUMBING PIPE AND EQUIPMENT INSULATION APPLIED LOCATIONS

A. Insulation Applied Locations – Plumbing Piping:

System	Pipe Size	Insulation Type	Insulation Thickness	Notes
Domestic Cold Water, Above Grade	1-1/4-inch and smaller	Fiberglass, all-purpose jacket or Elastomeric	1-inch	Note 1 Note 2
Domestic Hot Water Supply/Return, Above Grade	1-1/2-inch and smaller	Fiberglass, all-purpose jacket or Elastomeric	1 1/2-inch	Note 1 Note 2
Traps and trap priming lines (In unheated Spaces)	All	Fiberglass, all-purpose jacket	1-inch	Insulate over heat tape
Condensate or other cold water drains	All	Elastomeric	1/2-inch	Note 2
Note 1: Cover with metal pipe jacket where exposed to weather, and over heat trace cable. Note 2: Elastomeric insulation not allowed over heat trace cable. Note 3: Drain bodies, insulate the first 10-feet connected to the drain body, and horizontal piping. Do not insulate main vertical stack.				

B. The following piping is not insulated:

1. Waste and vent, except where heat traced.
2. Natural Gas
3. Fuel Oil
4. Specialty Gases
5. Medical Gases
6. Domestic cold water runouts to single fixture less than 12-inch long and exposed supplies.
7. Priming lines except where heat traced.

C. Insulation include the following:

1. Fittings
2. Unions
3. Flanges
4. Mechanical Couplings
5. Valve Bodies
6. Valve Bonnets
7. Piping through Sleeves except Valve Bonnets

8. Unions and Flanges need not be insulated on the following systems:
    a. Domestic Hot Water
    b. Solar Hot Water
    c. Inside Building

D. Insulate valves and irregular fittings with section of pipe insulation and insulating cement, securely fastened, and finished with 6 oz. canvas and Foster 30-36 lagging adhesive.

E. Flanges, valves, strainers, not requiring a vapor barrier to insulate with removable replaceable pads fabricated of 1-inch layer of Pittsburgh Corning Temp Mat sandwiched between inner and outer layer of 8 oz. glass cloth held together with stainless staples with sufficient stainless lacing hooks to hold pad firmly to flange or valve with minimum 3-inch overlap onto adjacent pipe insulation using 18 gauge SS lacing wire.

F. Expansion Joints and Flexible Connectors: Pipe insulation or block of same material and thickness as adjacent piping.

3.03 PIPING INSTALLATION

A. General:

1. Joints: Coat both sides of complete joining area with applicable adhesive.
    a. Longitudinal Joints: Make joints on top or back of pipe to minimize visibility. Except foam plastic, seal with closure system or 3-inch wide tape.
    b. Butt Joints: Butt lightly together and, except for foam plastic, seal with 3-inch wide tape or butt straps.
    c. Multiple Layered Insulation: Joints staggered.
2. Access: Strainer and other items requiring service or maintenance with easily removable and replaceable section of insulation to provide access.
3. Voids:
    a. Fill voids, chipped corners and other openings with insulating cement or material compatible with insulating material.
    b. In insulation with heat tracing where piping is shown or specified to be heat traced, bed heat tape into heat transfer cement with insulation over heat tape and cement.
4. Seal joints, seams, and fittings of metal watertight jackets at exterior locations.

B. Fiberglass Insulation: Exterior insulation encased in metal jacket.

C. Elastomeric Insulation:

1. Slit full length and snap around pipe.
2. Make cuts perpendicular to insulating surface leaving no cut section exposed.
3. Do not stretch insulation to cover joints or fittings.
4. Seal joints in elastomeric insulation with adhesive.
5. Exterior insulation painted with two coats of specified paint in accordance with the manufacturer’s instructions and encase in metal jacket.
6. Sealing joints with tape will not be allowed.

D. Fittings: Insulation specified with continuous vapor barrier, the vapor barrier must not be violated.

1. On Elastomeric Insulation: Fittings covered with covers made up of mitered sections of insulation or with formed pipe fitting covers.

2. In Other Insulation: Fittings covered with insulation to the same level of the adjoining insulation or fill with insulating cement. Finish with pipe fitting covers or cloth facing and tape.

E. Unions, Mechanical Joints, Valves, Etc.:

1. General:

a. As specified for fittings.

b. Minimum thickness same as specified for piping.

2. Unions: Build up insulation at least 1/2-inch beyond adjoining insulation.

3. Flanges: With square corners. Where flanges are not insulated, terminate adjacent insulation so flange bolts can be removed.

4. Flanged Valves: Insulation with square corners.

F. Vapor Barrier Insulation:

1. Refer to Section 22 05 29, Hangers, Supports, and Anchors for Plumbing for support requirements.

2. Piping which requires vapor barrier protection of continuous vapor barrier, which may not be pierced or broken. The following piping systems require vapor barrier protection:

a. Domestic cold water.

b. Industrial cold water.

c. Non-potable cold water.

d. Other piping systems with a nominal operating temperature below 65 degrees F.

3. Vapor Barrier Insulation:

a. Insulation for pipe requiring vapor barrier protection 1-1/4-inch or smaller, insulation continuous through pipe hangers and rollers.

b. For pipe 1-1/2-inch and larger, 18-inch section of calcium silicate, same thickness as pipe insulation with continuous vapor barrier jacket at each hanger or roller. Provide pipe shield specified in Section 22 05 29, Hangers, Supports, and Anchors for Plumbing.

G. Non-Vapor Barrier Insulation:

1. Refer to Section 22 05 29, Hangers, Supports, and Anchors for Plumbing for support requirements.

2. At contractor's option, insulation may be interrupted at supports. Butt insulation tight to support.

3. If contractor elects to continue insulation at supports, installation as specified for piping systems with vapor barrier installation.

4. Void between saddle and pipe filled with insulation.

3.04 FIELD QUALITY CONTROL

A. Field Test: Test and approve systems prior to installation of insulation.

B. Existing Insulation:

1. Repair existing insulation damaged during construction.

2. Make neat connections where new and existing insulation meet.

3. Where existing piping, or equipment is removed, cover existing surfaces neatly to match existing.

END OF SECTION

SECTION 22 21 13

PIPE AND PIPE FITTINGS PLUMBING

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes:

1. Cast Iron Soil Pipe, Service Weight (No-Hub)
2. Copper Pipe
3. Unions
4. Solder and Brazing

1.02 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 22, Plumbing

C. Section 22 05 29, Hangers, Supports, and Anchors for Plumbing

D. Section 22 05 23, General Duty Valves for Plumbing

1.03 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Piping material and installation to meet requirements of the local plumbing, fire, and building codes and serving utility requirements.
2. Provide chlorination of domestic cold and hot water piping in accordance with County and State health requirements.

B. Pipe Cleaning: If pipe gets plugged or should foaming of water systems occur, disconnect piping, reclean, and reconnect without additional expense to the Owner.

C. Correct damages to the building or systems resulting from failure to properly clean the system without additional expense to the Owner.

D. Products with a wetted surface installed in potable water systems UL classified in accordance with ANSI / NSF-61 for Drinking Water System components, ANSI/NSF-14 for Plastic Piping System Components and certified to the low lead requirements of NSF-372.

1.04 SUBMITTALS

A. Submit the following:

1. List of piping materials indicating the service it is being used for. (Do not submit piping product data).
2. Product data on mechanical couplings and related components, double wall fuel oil pipe and fittings, and polypropylene waste and vent pipe.

B. Test Reports and Certificates: Submit certificates of inspections and pipe tests to Owner.

C. Other: Make certified welders' certificates available.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. As indicated.

2.02 CAST IRON SOIL PIPE, SERVICE WEIGHT (NO-HUB)

A. General: A code approved hubless system conforming to Cast Iron Soil Pipe Institute Standard 301.

B. Pipe and Fittings:

1. Service weight hubless cast iron conforming to ASTM A 888, marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International.

2. Manufacturers:

a. Tyler

b. AB&I

c. Charlotte

C. Gaskets: Compression type conforming to ASTM C 564.

D. Above Grade Couplings: Band type coupling in conformance with Cast Iron Soil Pipe Institute (CISPI) 310-90, consisting of stainless steel clamp, and corrugated shield assemblies with a neoprene sealing sleeve ANSI A21.6, ANSI A21.10 Fittings.

1. Service:

a. Sanitary, storm, and overflow drain.

b. Vent piping 2 inches and above.

2.03 COPPER PIPE

A. Pipe: Hard drawn copper tubing, Class L or K, ASTM B 88.

B. Fittings:

1. Wrought copper, 150 psi; ANSI B16.22 for soldered joints, ANSI B16.50 for brazed joints; Chase, Revere, Mueller or approved equal.

2. System using mechanically extracted collars in main with branch line inserted to not obstruct flow may be used on domestic water piping above ground, similar to T-drill.

C. Service:

1. Domestic hot and cold water piping below ground (Type K, hard drawn) on piping 3 inches and smaller.

2. Trap priming lines (Type L, annealed).

3. Miscellaneous drains and overflows.

2.04 UNIONS

A. 150 psi malleable iron, brass to iron seat, ground joint, black or galvanized to match pipe. 200 psi WOG bronze, ground joint, solder type for copper tubing.

1. Unions or flanges for servicing or disconnect are not required in installations using grooved mechanical joint couplings. Couplings serve as disconnect points.

B. Dielectric fittings nationally listed, have a dielectric thermoplastic interior lining, and meet requirements of ASTM F1545. Fittings suitable for the pressure and temperature to be encountered.

2.05 SOLDER AND BRAZING

A. Brazed Joints:

1. Wrought Copper Piping Fittings: Westinghouse Phos-Copper or Dyna-Flow by J.W. Harris Co., Inc.

2. Applied locations:

a. Below grade piping.

b. Above grade piping larger than 2-inches for the following services: Industrial cold water, domestic hot and cold water, and pumped waste.

c. Oxygen, nitrous oxide, carbon dioxide, medical vacuum, lab vacuum and lab air. Braze in accordance with Copper Development Association Copper Tube Handbook using BCUP series filler material.

d. Joints in Domestic Hot and Cold Water Piping: Use mechanically extracted collars. Braze in accordance with Copper Development Association Copper Tube Handbook using BCUP series filler material.

e. Solar hot water.

B. Soldered Joints:

1. Wrought Copper Pipe Fittings: All-State 430 with Duzall Flux, Engelhard Silvabrite with Engelhard General Purpose Flux or J.W. Harris Co.

2. Valves, Cast Fittings or Bronze Fittings: Harris Stay-Silv-15 or Handy & Harmon Sil-Fos.

3. Applied locations: Above grade piping 2-inch and smaller for the following services: Industrial cold water, domestic hot and cold water, pumped waste, trap priming lines.

PART 3 – EXECUTION

3.01 PIPING INSTALLATION

A. Install unions in non-flanged piping connections to apparatus and adjacent to screwed control valves, traps, and appurtenances requiring removal for servicing so located that piping may be disconnected without disturbing the general system.

B. Install piping as to vent and drain. Install according to manufacturer's recommendations.

C. Support piping independently at apparatus so that its weight not carried by the equipment.

D. Run piping clear of tube cleaning or removal/replacement access area on heat exchangers, water heaters, etc.

E. Dielectric Fittings:

1. Provide dielectric couplings, unions, or flanges between dissimilar metals.

2. Provide dielectric couplings as required to isolate cathodically protected piping and equipment.

F. No-Hub Couplings: Install per manufacturer's instructions.

3.02 PIPING JOINTS

A. Pipe and fittings joined using methods and materials recommended by manufacturer in conformance with standard practice and applicable codes. Cleaning, cutting, reaming, grooving, etc. done with proper tools and equipment. Hacksaw pipe cutting prohibited. Peening of welds to stop leaks not permitted.

B. Purge oxygen, nitrous oxide, nitrogen, medical air, lab vacuum, lab air, nitrogen, and carbon dioxide piping with nitrogen continuously during the piping installation, and seal each branch outlet with Visqueen and tape or similar method to assure continued cleanliness of interior of piping until system is completed.

C. Copper Piping:

1. Pipe cut evenly with cutter, ream to full inside diameter; end of pipe and inside of fitting thoroughly cleaned and polished.

2. Joints uniformly heated, and capillary space completely filled with solder or braze material, leaving full bead around entire circumference.

D. No couplings installed in floor or wall sleeves.

E. Welded Joints:

1. Preparation for Welding: Bevel piping on both ends before welding:

a. Use following weld spacing on buttwelds:

Nominal Pipe Wall Thickness	Spacing	Bevel
1/4-inch or less	1/8-inch	37-1/2
Over 1/4-inch, less than 3/4-inch	3/16-inch	27-1/2

b. Before welding, remove corrosion products and foreign material from surfaces.

2. Welded Joints:

a. Use arc-welding process using certified welders.

b. Port openings of fittings must match the inside diameter of the pipe to which they are welded.

c. Use full radius welding elbows for turns, use welding tees for tees.

d. Reducing fittings must be used for size reduction.

e. Weldolets may be used for branches up through one-half the pipe size of the main to which they are attached.

f. Nipples are not allowed.

3. Welding Operation:

a. After deposition, clean each layer of weld metal to remove slag and scale by wire brushing or grinding. Chip where necessary to prepare for proper deposition of next layer.

b. Weld reinforcement no less than 1/16-inch not more than 1/8-inch above normal surface of jointed sections. Reinforcement crowned at center and taper on each side to surfaces being joined. Exposed surface of weld present professional appearance and be free of depressions below surface of jointed members.

c. Do not weld when temperature of base metal is lower than 0 degrees F. Material to be welded during freezing temperatures made warm and dry before welding is started. Metal warm to the hand or approximately 60 degrees F.

F. Flexible Connector: Provide where indicated on the Drawings.

3.03 ADJUSTING AND CLEANING

A. General:

1. Clean interior of piping before installation.

2. Flush sediment out of piping systems after installation before connecting plumbing fixtures to the piping.

3. When placing the water systems in service during construction, each system cleaned in accordance with Section 22 25 00, Plumbing Water Treatment prior to being placed in service.

4. Clean strainers prior to placing in service.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes:

1. Fixture Trim
2. Plumbing Fixtures

1.02 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 22, Plumbing

1.03 QUALITY ASSURANCE

A. Electric Water Coolers and Drinking Fountains: Certified to NSF/ANSI 61 and California AB1953

1.04 SUBMITTALS

A. Submit the following:

1. Product data for each item specified.
2. Operating and Maintenance Data: Electric Water Coolers
3. Mounting heights for fixtures.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers are stated for each fixture specified. The following manufacturers are also acceptable, except when indicated only.

B. Fixture Trim:

1. Supply Stops:
   a. Chicago
   b. NPT McGuire (LK series)
   c. Brasscraft (SCR series)
2. Traps:
   a. McGuire
   b. Kenney
   c. Brasscraft
3. Support Rims:
   a. Hudee
4. Vacuum Breakers:
   a. Chicago Faucet
   b. A.W. Cash
   c. Febco, chrome plated

C. Electric Water Coolers:

1. Elkay
2. Halsey Taylor
3. Oasis

4. Sunroc
5. Haws

D. Other Manufacturers: Submit substitution request.

2.02 FIXTURE TRIM

A. Supply Stops: Chicago cast brass rigid riser supplies with loose key angle stops, wall flanges, NPT female inlet, chrome plate finish; equivalent NPT McGuire (LK series), Brasscraft (SCR series), or NPT stops by fixture supplier.

B. Vacuum Breakers:

1. Chicago Faucet
2. A.W. Cash
3. Febco, chrome plated

2.03 PLUMBING FIXTURES

A. EWC-1 Electric Water Cooler (ADA):

1. Elkay EZH20 series dual height wall hung water cooler with bottle filling station
2. Surface mounted
3. Push pad operated bubblers
4. Anti-microbial bubbler guards
5. Bottle Filler:
   a. Sensor activated
   b. 20 second automatic shut-off
   c. 1.1 GPM
6. Water Chiller:
   a. 8 GPH, 50 degree F water at 90 degree F ambient and 80 degree F inlet water temperature.
   b. 120V, single phase, 5 FLA
7. 3000 gallon water filter

PART 3 – EXECUTION

3.01 FIXTURE TRIM

A. Provide plumbing fixture trim where applicable on fixtures, including but not limited to supply stops, traps, support rims, flush valve, and vacuum breakers.

B. Provide rough-in and final piping connection to fixtures. Carefully review all construction documents to assure that all fixtures are provided with necessary services for a complete operating system.

C. Rigidly secure rough-in piping, carriers and supports, and other service piping to structure.

3.02 PLUMBING FIXTURES

A. Americans with Disabilities Act:

1. Those fixtures indicated by ADA complies with and be installed in accordance with Americans with Disabilities Act Guidelines (ADAAG). Where applicable building code requirements are more stringent than ADAAG guidelines, building code requirements followed.

B. Fixture Mounting Heights: Fixtures standard rough-in catalogued heights unless shown otherwise on the Architectural Drawings.

C. Water Supplies: When both hot and cold water to a fixture is required, connect the hot on the left and the cold on the right.

D. Cleanout:

1. Where shown or required.
2. Cover set flush with finished surface.

E. Water Hammer Arresters: Provide where shown and where recommended by Plumbing Drainage Institute (PDI).

F. Water Coolers and Drinking Fountains:

1. Water-bearing materials comply with the Safe Drinking Water Act of 1986 and the Lead Contamination Control Act of 1988. The waterway system of the unit manufactured of copper components and other completely lead-free materials.
2. Water cooler refrigerants will be non-CFC.
3. Provide fixture manufacturer's wall mounting plate or floor mounted support for all wall-hung water coolers or drinking fountains.

END OF SECTION