SECTION 22010

PLUMBING GENERAL

1.0 GENERAL

1.01 DESCRIPTION

A. This Division 22 and the accompanying drawings cover the provision of all labor, equipment, appliances, and materials and performing all operations in connection with the construction of the plumbing systems as specified herein and as shown.

B. The General Provisions and Division 1, including the general, supplementary and other conditions and other Divisions, as appropriate, apply to work specified in this Division.

1.02 EXISTING CONDITIONS

A. Attention is called to the fact that the work is to be performed within an existing, operational facility. Prior to the submission of bids, each bidder shall visit the project site, thoroughly investigate and be familiar with all existing conditions which will affect their work; especially the work to be performed above the existing ceilings.

B. Connect new work to existing work in a neat and workmanlike manner. Where an existing structure must be cut or existing utilities interfere, such obstructions shall be bypassed, removed, replaced or relocated, patched and repaired. Work disturbed or damaged shall be replaced or repaired to its prior condition.

C. Prior to the start of any demolition or construction, secure the services of a qualified, EPA Certified asbestos abatement agency to check the existing insulation, etc. for asbestos. Should asbestos be found, do not proceed with demolition or construction; notify the Architect in any case in writing of the agency's findings.

1.03 INTENT OF DRAWINGS AND SPECIFICATIONS

A. The implied and stated intent of the drawings and specifications is to establish minimum acceptable standards for materials, equipment and workmanship, and to provide operable mechanical systems complete in every respect.

B. The engineering drawings are diagrammatic, intended to show general arrangement and sizes of system components, and shall not be scaled. Rather, the architectural and structural drawings shall govern space constraints, dimensions and finishes. All offsets and fittings which will be necessary to accomplish the finished installation shall be provided at no additional cost or increase in the Contract.

1.04 SPACE PRIORITY

A. Ensure optimum use of available space for materials and equipment installed above ceilings. Allocate space in the order of priority as listed below except as otherwise detailed. Items are listed in the order of priority, with items of equal importance listed under a single priority number.

1. Gravity flow piping systems
2. Vent piping systems
3. Recessed lighting fixtures
4. Concealed HVAC terminals and equipment
5. Air duct systems
6. Sprinkler piping systems
7. Pressurized piping systems
8. Electrical conduit, wiring, control air tubing

B. Order of space priority does not dictate installation sequence. Installation sequence shall be as required to install all affected trades.

C. The work of this Division 22 shall not obstruct access for installation, operation and maintenance of the work of any other Division.

D. All major items of equipment shall be arranged so as to provide a minimum of 28" clear aisle space. Additional space shall be provided between and around equipment for maintenance and proper operation as shown in the equipment manufacturer's literature.

1.05 COORDINATION

A. Coordinate all work under this Division 22 with work under all other Divisions, providing adjustment as necessary.

B. Coordination of space requirements with respect to Division 26 shall be performed such that:

1. No equipment, piping or ductwork, other than electrical, shall be installed within 42" of switchboards or panelboards.
2. No piping or ductwork which ever operates at a temperature in excess of 120 degrees F. shall be installed within 3" of any electrical conductor.

C. All items mounted in or below the ceiling, and all items penetrating the ceiling, shall be coordinated with the architectural reflected ceiling plans. If any items are not shown on these plans, or any items need to be relocated for coordination purposes, prepare a reflected ceiling plan and submit it to the Architect for approval.

1.06 CODE COMPLIANCE

A. All workmanship and materials provided under this Division 22 shall comply with all laws, ordinances, codes and regulations of all Federal, State and Local Authorities having jurisdiction.

B. All fire suppression, plumbing, heating, ventilating, and air conditioning materials and workmanship shall comply with the following codes and standards as minimum requirements:

1. NEC – 2012 edition
2. Life Safety Code (NFPA 101) – 2012 edition.
3. All other NFPA Codes and Standards – 2012 edition.
4. International Building Code – 2009 edition.
5. International Energy Code – 2012 edition.
6. International Fire Prevention Code – 2009 edition.
7. International Mechanical Code – 2009 edition.
8. International Plumbing Code – 2009 edition.
9. American with Disabilities Act.

C. Secure and pay all fees associated with all permits and licenses required for execution of the Contract. Arrange for all inspections required by city, county, state and other authorities having jurisdiction, and deliver certificates of approval to the Architect .

D. The code requirements are strictly a minimum and shall be met without incurring additions to the Contract. Where requirements of the drawings or specifications exceed the code requirements, the work shall be provided in accordance with these drawings or specifications. In the event of conflict or ambiguity between the various codes, the most stringent requirement shall govern.

1.07 ELECTRICAL REQUIREMENTS AND INTERFACE

A. All electrical equipment and wiring provided under this Division 22 shall comply with the electrical system characteristics indicated on the electrical drawings and specified in Division 26.

B. Electric controls, contactors, starters, pilot lights, push buttons, etc., shall be provided complete as part of the motor, heater or other equipment which it operates. All electrical components shall be in conformance with the requirements of the National Electrical Code and Division 26. Reference Division 26 and the electrical engineering drawings for those motor starters provided under that Division 26. All starters not shown shall be provided under this Division 22. Unless specified otherwise under other individual equipment Sections, motor starters shall conform to the following minimum requirements:

1. Starters for motors 1/3 horsepower or smaller shall be manual unless remote or automatic starting is required, in which case the starters shall be magnetic, full voltage, non-reversing, single-speed, unless otherwise indicated. All other starters shall be magnetic.
2. Each starter for a three-phase motor shall be furnished with three (3) overload relays sized for the full load running current of the motor actually provided. Provide an external "HAND-OFF-AUTO" selector switch with red "RUNNING" light. Provide a green pilot light to indicate motor "STOPPED". Each pilot light shall have a legend plate indicating reason for signal.
3. Each overload relay shall have a normally open alarm contact which will close only when actuated by an overload (not to be confused with N.O. or N.C. auxiliary contacts). These contacts shall be properly wired to their respective blue pilot light provided on the starter front cover and having a "TRIPPED" legend plate.
4. Individually mounted motor starters shall be in a NEMA Type 1 general purpose enclosure in unfinished areas and shall be flush mounted in all finished areas. All starters mounted in exterior areas shall have a NEMA 3R enclosure. Each starter shall have a laminated nameplate to indicate equipment unit number, function and circuit number.
5. All motor starters, push buttons and pilot lights shall be of the same manufacturer as the switchboard and shall be General Electric, Square D, Siemens I.T.E., or Westinghouse.

C. Motor starters for the following equipment shall be provided under this Division 15 by the manufacturer of the equipment:

1. Packaged booster pump systems
2. Other equipment hereinafter specified in other Sections to be provided with integral starters.

D. Unless otherwise noted or specified in individual Sections, all 3-phase motors shall be standard NEMA continuous duty "B" type, with Class B insulation, open drip-proof frame for indoor service, TEFC for outdoor service and a service factor of 1.15. All motors 5 HP and larger shall be U.S. Motors Hi-Efficiency Model or Reliance XE Hi-Efficiency Model.

E. All power wiring and final connections to equipment shall be provided under Division 26.

F. Control components, all interlocks (motor-operated dampers, fire alarm motors, etc.) and control wiring (120 volt, single phase and less) shall be provided under this Division 22 as required to achieve the specified control sequences.

G. All control wiring over 30 volts shall be installed by a Licensed Electrician working under this Division 22.

1.08 SLEEVES, SEALS AND ESCUTCHEONS

A. Sleeves shall be provided through all pipe penetrations of concrete or masonry walls, elevated floors and roofs, except those plumbing piping penetrations for fixtures, vents, etc.

B. Sleeves shall be fabricated from Schedule 40 steel pipe through 10" and Standard Wall steel pipe for sleeve sizes 12" and larger. All sleeves penetrating exterior walls, underground walls, pit or vault walls shall be provided with a 3" x 3/8" thick waterstop ring welded completely to the midpoint of the sleeve.

C. All sleeves penetrating exterior walls, underground walls, pit or vault walls and elevated floors shall be packed and sealed watertight.

D. Sleeves through roofs shall extend above the roof surface and be flashed watertight.

E. Sleeves through walls shall be cut and finished flush with each surface of the wall in which they are installed.

F. Sleeves shall be sized to provide a minimum of 1/2" clearance between the inside surface of the sleeve and the outside finished surface of the pipe plus any insulation specified.

G. Fire-stops shall be provided as specified herein. All annular spaces between piping and sleeves which do not require fire-stops shall be packed with mineral wool and caulked.

H. Provide round, chrome-plated escutcheons on all exposed piping penetrations passing through walls, floors, partitions and ceilings.

1.09 FIRE-STOPS

A. Where ductwork, piping, conduit, etc. pass through fire partitions, fire walls and floors, a fire-stop shall be provided that will ensure an effective barrier against the spread of fire, smoke and gases. Fire-stop material shall be packed tight and completely fill gaps between the ductwork, piping, conduit, etc. and the perimeter of their rough openings.

B. Fire-stopping material shall maintain its dimensions and integrity while preventing the passage of flame, smoke and gases under conditions of installation and use when exposed to the ASTM E119 time-temperature curve for a time period equivalent to the rating of the assembly penetrated. Fire-stopping material shall be noncombustible as defined by ASTM E136; and, for insulation materials, melt point shall be a minimum of 1700 degrees F. for 1-hour protection and 1850 degrees F. for 2-hour protection. Fire-stopping material shall be Dow-Corning RTV Foam or 3M Fire Barrier Products or Sohio Carborundum Fyre Putty.

C. See Section 22400 for fire-stopping of PVC piping.

1.10 CORE DRILLING

A. Cutting of holes through concrete and masonry shall be by diamond core or concrete saw. Pneumatic hammer, impact electric and hand or manual hammer type drills will not be allowed, except as permitted by the Architect where required by limited working space. Locate holes such that they will not affect structural sections such as ribs or beams. Holes shall be laid out well in advance of the installation. These layout locations shall be approved by the Architect prior to drilling.

2.0 PRODUCTS

2.01 BID BASIS AND SUBSTITUTION PROCEDURES

A. Manufacturers names, series and model numbers, as noted or specified, are for the purpose of describing type, capacity, and quality of equipment, materials and products to be used. Unless "or equal" is specifically stated, bids shall be based only on the specified "basis of design" manufacturer. The listing of a particular manufacturer as an "equal" or "acceptable substitute" manufacturer shall not be misconstrued as approving nor allowing the substitution of that manufacturer's standard product in place of the basis of design. No consideration will be given to a product which would require dimensional, spatial or aesthetic changes to the project. "Acceptable substitute" and "equal" manufacturers shall only bid those products which exactly match the size and other characteristics of the specified basis of design. Any changes to other disciplines and trades of work required by an "or equal" or "substitute" product shall be duly considered and priced accordingly prior to bidding or pricing. The decision as to whether or not a proposed substitute or "equal" product is actually equal to that specified shall rest solely with the Architect .

B. Requests to provide "equal" products in lieu of those specified shall be submitted to the Architect in writing at least ten (10) days prior to final pricing and execution of the Contract. No consideration will be given to substitute products after final pricing and execution of the Contract.

C. Any "or equal" product or proposed product substitution which will cause a change in the appearance, dimensions or design of any part of the building, it structure, electrical system or any other engineered systems shall be accompanied by a scaled drawing and written description of the required change(s) for approval by the Architect . If deemed necessary by the Architect , design changes shall be signed and sealed by a registered Professional Engineer, currently licensed in this State.

2.02 MINIMUM STANDARDS

A. Every piece of energy consuming equipment, all fire suppression products and life safety equipment shall comply with the following standards as applicable; especially in regard to prevailing codes:

1. Factory Mutual Laboratories (FM)
2. Industrial Risk Insurers (IRI)
3. Underwriters Laboratories, Inc. (UL)
4. ADC: Air Diffusion Council
5. AGA: American Gas Association
6. AMCA: Air Moving and Conditioning Association, Inc.
7. ANSI: American National Standards Institute
8. API: American Petroleum Institute
9. ARI: American Refrigeration Institute
10. ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers
11. ASME: American Society of Mechanical Engineers
12. ASTM: American Society of Testing and Materials
13. AWWA: American Water Works Association
14. IBR: Institute of Boiler and Radiator Manufacturers
15. MSS: Manufacturers Standardization Society
16. NBBPVI: National Board of Boiler and Pressure Vessel Inspectors
17. NEMA: National Electrical Manufacturer's Association
18. OSHA: Occupational Safety & Health Administration
19. PDI: Plumbing Drainage Institute
20. PPI: Plastic Pipe Institute
21. SMACNA: Sheet Metal and Air Conditioning Contractors National Association, Inc.

3.0 EXECUTION

3.01 SUBMITTALS

A. Before preparing submittals, study all Contract Drawings and specifications in detail, obtain manufacturer's recommended instructions, and have submittals prepared based on specific equipment and material proposed for installation. An officer of the contracting firm shall sign all shop drawings (certifying conformance with plans and specifications) before submitting to the Architect or releasing to the field.

B. The submittal process shall not be utilized as an avenue to substitute products after the execution of the contract. Should an unspecified or unequal product be submitted, it will be rejected. If a second attempt at substitution is made during the resubmittal of the same product, then no more reviews of that product will be performed without direct compensation to the Engineer being paid for the additional services required for the third review and any further reviews.

C. No more than four (4) copies of submittal data will be reviewed. Any additional copies will be returned unmarked. The responsibility of copying review comments on any additional copies will rest solely with the Contractor.

D. Submittals will not be accepted for review unless they:

1. Comply with the requirements of Division 1.
2. Include complete information pertaining to all appurtenances and accessories.
3. Are submitted as complete packages which pertain to all related items in Division 22. Separate packages shall be submitted as follows:
   a. All plumbing equipment, fixtures and components
   b. The automatic controls and EMS
4. Are properly marked with equipment, service or function identification as related to the project and are marked with pertinent specification paragraph number.

E. Submit catalog information, factory assembly drawings, field installation drawings and certifications as required for complete explanation and description of all items of equipment. The submittal data shall provide ample, unquestionable compliance with the Contract Documents.

F. Review of submittals shall not be construed as authorizing any deviations from the plans and specifications unless such deviations are clearly identified and separately submitted in the form of a letter that is enclosed with the submittals.

G. Submittals are required on all manufactured equipment, especially energy consuming equipment. Submittals shall include, but are not limited to, the following items of equipment:

1. Piping Specialties
2. Insulation
3. Water Heaters
4. Plumbing Fixtures

3.02 EXCAVATION, TRENCHING AND BACKFILLING

A. Perform all excavation, trenching and backfilling for underground work under this Division 22. During excavation, the excavated material shall be piled back from the banks of the trench to avoid overloading, slides or cave-ins. Do not exceed the angle of repose unless written approval is obtained in advance from the Architect Owner for sharing, bracing or other alternate excavation methods. All excavated material not used for backfilling shall be removed from the building and disposed of as indicated or directed by the Architect . Take measures to prevent surface water from flowing into trenches and other excavations and any water accumulating therein shall be removed by pumping. All excavation shall be made by open cut. Tunneling shall not be allowed.

B. The bottom of all trenches shall be evenly graded to provide firm support and an even bearing surface. Pipe shall be laid on firm soil, laid in straight lines and on uniform grades. Provide bell holes so that the barrel of the pipe rests evenly on the bottom of the trench along the entire length of the pipe.

C. Pipe shall be inspected and tested prior to backfilling. Trench shall be handfilled to a minimum of 12" above the top of pipe with suitable earth (free of rocks, trash, large clods and organic material) and compacted to a minimum 95% proctor. After the first layer is completed, subsequent layers shall be filled and compacted the same as the first layer. Settling the backfill with water shall not be permitted.

3.03 INSTALLATION REQUIREMENTS

A. All equipment shall be installed in strict conformance with the recommendations of the equipment manufacturer, as indicated on the Drawings and as specified.

B. Provide installation manuals for each piece of equipment. Submit in separately bound volumes after review of submittals.

C. Provide supplementary steel framing and welded steel equipment support stands as required for proper hanging and support of the mechanical systems. Steel angles, channels and tubing utilized for such framing shall be selected for a maximum deflection of 1/360th of the span.

D. All roof curbs shall be a minimum of 12" high and selected for the various roof pitches. Curbs installed on roofs having pitches of not more than 1/4" per foot may be standard curbs shimmed level with steel channels or Zs to provide suitable support and flashing surfaces.

3.04 CLEANING, LUBRICATION AND ADJUSTMENT

A. The exterior surfaces of all mechanical equipment, piping, conduit, etc., shall be cleaned and free of all dirt, grease, oil, paint splatter, and other construction debris.

B. Bearings that require lubrication shall be lubricated in strict accordance with the manufacturers recommendations.

C. All control equipment shall be adjusted to the settings required for the performance specified.

D. All coils shall be thoroughly cleaned and combed prior to final inspection.

3.05 PAINTING

A. All uncoated and uninsulated steel surfaces exposed to sight inside the building, such as piping, equipment hangers and supports which are not provided with factory prime coat or galvanizing, shall be cleaned and painted with one coat of rust inhibiting primer. In addition, all surfaces in finished spaces shall also be painted with two coats of finish paint in a color selected by the Architect.

B. Steel items exposed outside the building, such as equipment supports, uninsulated piping and hangers which are not factory painted or galvanized shall be cleaned and painted with one coat of rust inhibiting primer and two coats of asphaltic base aluminum paint. Insulated steel pipes outside the building shall be cleaned and painted with one coat of rust inhibiting primer before installing insulation.

C. Factory painted equipment that has been scratched or marred shall be repainted to match the original factory color.

3.06 PIPING LEAK TESTING

A. Soil, waste, storm and vent piping shall be tested with water before installing fixtures. Water test shall be applied to the system either in its entirety or to the individual sections. Each opening except the highest opening of the section under test shall be plugged, and the section shall be filled with water and tested with a head of water of at least ten (10) feet above the highest point in the system. The water shall be kept in the portion under test, for at least thirty (30) minutes; no drop in the water level will be acceptable.

B. The water piping systems shall be tested at a minimum pressure of 125 psi and proved tight at this pressure for not less than thirty (30) minutes or longer if required to permit inspection of all joints. No loss in pressure will be permitted.

D. All leaks shall be repaired by tightening, remaking joints, or replacing pipe and fittings. Caulking of joints shall not be permitted.

3.07 RECORD (AS-BUILT) DRAWINGS

A. At the completion of the project, provide a set of reproducible prints to the Architect which reflect all changes, deviations and revisions made to the original design documents. Locations of all underground piping and utilities shall be clearly shown and dimensioned from permanent reference points such as building column lines.

3.08 OPERATING AND MAINTENANCE MANUALS AND INSTRUCTIONS

A. Complete operating and maintenance manuals shall be provided to the Owner. Four copies shall be provided. Each copy shall be bound in a separate 3-ring, loose leaf notebook. Operating instructions shall be provided for each mechanical system, and shall each include a brief system description, a simple schematic and a sequence of operation. Operating and maintenance instructions shall be provided for each piece of equipment. A control system wiring diagram shall be included in each operating and maintenance manual.

B. Prior to final acceptance or beneficial occupancy, provide the services of a competent technician for not less than one (1) day to instruct the Owner in the operation of the mechanical systems.

3.09 WARRANTY

A. All work provided under this Division 22 shall be subject to a minimum one year warranty. The warranty shall include prompt repair or replacement of equipment or system failures and shall include all parts and labor. In addition, all reciprocating air conditioning compressors shall carry an additional four year parts-only warranty. Extended warranties shall be provided on all other equipment so specified in other Sections.

END OF SECTION

SECTION 22400

PLUMBING SYSTEMS

1.0 GENERAL

1.01 DESCRIPTION

A. All work specified in this Section is governed by the Plumbing General Section 22010.

B. This Section 22400 and the accompanying drawings cover the provision of all labor, equipment, appliances, and materials and performing all operations in connection with the construction of the plumbing systems as specified herein and as shown. These systems include, but are not limited to, the following:

1. Sanitary waste and vent systems.
2. Domestic water systems.

C. Provide all final plumbing connections to all equipment furnished by Owner.

D. Provide gate valve and reduced pressure backflow preventer or vacuum breaker at the service entrance and at those connections (especially to kitchen equipment) required by local plumbing code.

1.02 INTENT

A. It is the intent of this Section of the specifications to provide complete and operable plumbing systems as shown and specified which are free of leaks, properly vented, free of unreasonable noise, vibration and sweating, and fabricated so as to fit the space allotted and to exhibit a minimum resistance to fluid flow.

B. The word "piping" is defined to mean all piping, fittings, joints, hangers, coatings, valves, cocks, insulation and accessories necessary for the plumbing systems described, shown and specified.

1.03 GENERAL REQUIREMENTS

A. Provide all reducing fittings, flanges, couplings and unions of the size and type of material to match the piping connections at each fixture, piece of equipment, valve and accessory.

B. Union joints, couplings or flanges shall be provided in each pipe line connected to each piece of equipment, fixture and elsewhere as indicated and specified. Unions shall match the piping system in which they are installed.

1. Unions or flanges shall be provided between all copper to steel connections. These unions shall be dielectric, insulating type.

C. All changes in direction and branches shall be made with manufactured fittings.

D. The use of offset-type reducers is strictly prohibited in any piping system.

E. In all water piping systems, changes in horizontal pipe line sizes shall be made with eccentric reducers installed flat on top for proper air venting. Reducing tees, reducing elbows and concentric reducers shall only be allowed in water piping systems for changing pipe sizes in vertical risers and for making connections to equipment and accessories from vertical risers.

F. All pipe joints shall be cut square and all burrs shall be removed.

G. Open ends of pipe lines not currently being handled shall be plugged during installation to keep dirt, water and foreign material out of the system.

H. Sanitary waste and storm drainage piping shall slope down in the direction of flow as shown on the drawings or as prescribed by Code, but not less than 1 percent.

I. All vents through roof (VTR'S) shall be offset just below the roof such that their termination points are at least 10 ft. from any outside air intake of any HVAC unit; special attention is called to packaged rooftop units.

J. Trap primers shall be provided at all floor drains and hub drains.

1.04 IDENTIFICATION OF PIPING

A. All aboveground plumbing systems piping and valves sized 3/4" and larger which are installed in accessible locations (including piping above removable ceilings and behind access panels) shall be identified in strict conformance with the "Scheme for the Identification of Piping Systems" (ANSI A13.1 – 1981).

B. Each identification marker shall include the following:

1. Proper color-coded background.
2. Proper color of legend in relation to background color.
3. Proper legend letter size.
4. Proper marker length.
5. Direction of flow arrow shall be included on each marker.

C. Locations for pipe markers shall be as follows:

1. Adjacent to each valve and fitting.
2. At each branch and riser take off.
3. At each pipe passage through walls, floors and ceilings.
4. On all straight pipe runs every 25 feet.

D. Identification markers may be stenciled or shall be Setmark Pipe Markers, as manufactured by Seton Name Plate Corporation.

E. All valves shall be identified with the appropriate service designation and valve number brass valve tags. Each valve tag shall be 19 gauge brass with 1/4" black-filled letters over 1/2" black-filled numbers. Tags shall be fastened to valves with brass "S" hooks or brass jack chain. Brass tags and fasteners shall be as manufactured by Seton Name Plate Corporation

F. Provide charts of all valves. Valve charts shall include the following items:

1. Valve identification Number
2. Location
3. Purpose/Material

2.0 PRODUCTS

2.01 SANITARY WASTE AND VENT SYSTEMS

A. All underground sanitary waste and vent piping shall be service weight hub and spigot cast iron soil pipe with lead and oakum or neoprene double-seal compression gaskets. Hubless Cast iron pipe and fittings shall be manufactured from gray cast iron and shall conform to ASTM A 888 and CISPI Standard 301. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute ® and listed by NSF® International.

B. Cleanouts shall be provided at the locations indicated and, as a minimum, where required by Code. Floor cleanouts shall be a minimum of 4" and shall be complete with a flush plug and removable, scoriated bronze floor plate. Provide carpet buttons in carpeted areas.

C. All above ground sanitary, waste and vent piping shall be hubless cast iron soil pipe.

D. Joints on hubless cast iron soil pipe shall be made with neoprene couplings and stainless steel clamps. Hubless Couplings shall conform to CISPI Standard 310 for standard couplings and marked with "NSF" or ASTM C 1540 for heavy duty couplings where indicated.

E. Floor drains in toilets and finished areas shall be J. R. Smith 2000 Series with 6" Type B square adjustable strainers finished in satin nickel bronze; or equal products by Josam or Zurn. Provide vandalproof secured tops. All floor drains shall be provided with a trap primer.

F. Floor drains in mechanical rooms and unfinished concrete floors shall be J. R. Smith 2131 Series with round 11 3/4" cast iron grate, sediment bucket and deep-seal P-trap; or equal products by Josam or Zurn. Provide vandalproof secured tops. All floor drains shall be provided with a trap primer.

G. Type "K" floor drains in kitchens and food service areas shall be J.R. Smith 2000 Series with sediment bucket and 8" type "B" square adjustable stainer finished in nickel bronze; or equal products by Josam or Zurn. Provide vandalproof secured tops. All floor drains shall be provided with a trap primer.

H. Type "R" floor drains in kitchens and food service areas shall be J. R. Smith 2000 Series with sediment bucket and 7" type F37 round extended rim strainer finished in nickel bronze; or equal products by Josam or Zurn. Provide vandalproof secured tops. All floor drains shall be provided with a trap primer.

I. Floorsinks (FS) in kitchens and food service areas shall be J. R. Smith 3007-NB Series with 6" deep bodies, removable stainless steel sediment bucket, 12 1/2" square nickel bronze top and non-puncturing flashing clamps or equal products by Josam or Zurn. Grate configuration shall be coordinated with Kitchen Equipment Consultant to insure proper opening for equipment served; otherwise provide a full grate with openings cut out for equipment served.

2.03 DOMESTIC WATER SYSTEM

A. Underground domestic water service entrance piping 3" and smaller in size shall be Type K hard drawn copper tubing with wrought copper fittings. All joints shall be brazed.

B. All underground copper branch lines (1/2" and 3/4" only) shall be continuous lengths of soft Type K copper tubing with no joints allowed underground.

C. Underground domestic water service entrance piping above 3" in size shall be Class 150 ductile iron pipe with mechanical joints.

D. Aboveground domestic water system piping 3" in size and smaller shall be Type L hard drawn copper tubing with wrought copper fittings and soldered joints.

E. Aboveground domestic water piping 4" and larger shall by Type L hard drain copper tubing with rolled grooved joints and fittings.

F. Gate valves 3" or less in size shall be constructed with a bronze body, non-rising stem. Stem to be bronze ASTM B-62 or silicon bronze ASTM B-371 with malleable iron handwheels. Valve shall meet MSS-SP80. Valve shall be manufactured by Milwaukee, Hammond, Nibco or Stockham.

G. Ball valves 2 inch and smaller:

1. Ball valves shall be two piece bronze body, large port with solid, smooth bore chrome plated brass ball, meeting MSS-SP110. Seats shall be reinforced TFE with Teflon packing ring and threaded adjustable packing nut. Valves on insulated lines will be provided with stem extensions to provide clearance for two inches of pipe insulation. Valves to be Apollo 70, Hammond 8501 or Watts B-6000.

H. Backflow preventers shall be Watts Series 909 reduced pressure principle backflow preventers complete with strainer and shut-off valves. Air gap drain shall be piped into nearest floor drain or outside of building to a concrete splashblock.

I. All water hammer arresters (WHA) shall be PDI Certified, Size A, B, C, D, E or F, as indicated for the fixture units served; Josam, Jay R. Smith or Zurn.

J. Soldered joints shall be made with tin-antimony/silver solder. Solder containing lead shall not be permitted.

2.05 PLUMBING INSULATION

A. All pipe insulation products shall have a permanent composite insulation, jacket and adhesive fire and smoke hazard rating as tested by procedure ASTM-84, NFPA 255 and UL 723 not exceeding Flame Spread 25 or Smoke Developed 50.

B. Blanket-type insulation shall have an average thermal conductivity not to exceed 0.27 BTU-in. per sq. ft. per degree F. per hour at a mean temperature of 75 degrees F. Insulation shall have a minimum density of 1 lb./cu.ft. and shall be 2" thick.

C. Preformed insulation for all domestic hot and cold water piping shall be minimum 1" thick preformed fiberglass pipe insulation with white all-service jacket. All longitudinal joints shall be lapped, self-sticking type with all butt joints, tears, etc. sealed with a matching white vapor barrier tape. Elbows shall be mitered or may be Zeston covers filled with equivalent fiberglass insulation. The maximum K value of the insulation shall be 0.23 at 70 degrees F. All piping in unconditioned areas shall be insulated with a minimum R value of 6.5 in accordance with NCSPC 2009 section 305.6.

2.06 PIPE HANGERS AND SUPPORTS

A. Pipe hangers, hanger rods, trapeze type hangers, upper attachments and other supports shall be selected based on pipe size (plus insulation of pipes specified to be insulated) and the weight of the medium being transported or the medium used for testing, whichever is greater. Provide all hangers and rods, turnbuckles, angles, channels, and other structural supports to support the piping systems. Rods for pipe hangers shall be full size of the hanger manufacturer's catalog listed rod size for each type hanger specified. Hangers and supports shall be Michigan, ITT Grinnell or B-Line.

B. All material utilized for the hanging and support of the piping systems shall be manufactured products which are specifically intended for the purpose of hanging piping systems. The use of wire, steel straps, plastic ties, etc. is strictly prohibited.

C. Pipe hangers selected for supporting horizontal insulated piping shall be sized to fit around the outside of the pipe insulation. Insulated piping shall be supported on galvanized shields.

1. Shields shall be as follows:
   a. Pipes 2" and smaller: 18 gauge x 12" long.
   b. Pipes 2 1/2" and larger: 16 gauge x 18" long.
2. Shields shall be 180 degrees around the lower half of the pipe at all pipe hangers, except that on trapeze hangers, pipe racks and floor supported horizontal pipes, shields shall be 360 degrees around the entire pipe.

D. Pipe hangers for copper piping shall be copper plated or the piping shall be dielectrically isolated from any steel hangers or clamps that are used.

E. Steel rods, framing and clamps shall be plated or primed to prevent rust formation.

3.0 EXECUTION

3.01 ARRANGEMENT

A. Follow the general piping layout, arrangement, schematics and details. Provide all offsets, vents, drains and connections necessary to accomplish the installation. Fabricate piping accurately to measurements established at the project site to avoid interference with ductwork, other piping, equipment, openings, electrical conduits and light fixtures. Make suitable provision for expansion and contraction with expansion loops and offsets.

B. Water hammer arresters shall be installed at the top of each riser and on each fixture branch in accordance with Plumbing and Drainage Institute Standard WH201.

C. Cleanouts shall be provided at the base of all sanitary and storm risers.

3.03 MINIMUM HANGER SPACING

A. Pipe hangers or supports shall be provided within 18" of each horizontal fitting, equipment connection, valve, etc. and at not more than 10 ft. spacings along horizontal runs of straight, copper piping equal to or greater than 1-1/2" diameter, 6 ft. spacing for copper piping equal to or less than 1-1/2" diameter, and 4 ft. spacing for PVC piping in accordance with table 308.5 in the 2009 NCSPC. Follow Midstory guide for maximum vertical spacing of PVC pipe 2 inches and smaller.

B. Riser clamps shall be provided at each floor penetration.

3.05 INSULATION INSTALLATION

A. Provide blanket insulation over all horizontal roof drain piping which is within the building and including the vertical risers to the roof drains and the underbody of the roof drains.

1. Blanket insulation shall be wrapped around the piping and underbodies of roof drains. Ends of insulation shall overlap at least 2" and bottom of insulation shall overlap pipe insulation at pipe connection to roof drain at least 3". Adhere insulation to roof drain underbodies with 100% coverage of fire retardant adhesive and tape all joints with 3" wide foil reinforced kraft tape.

B. Provide insulation over all above ground hot and cold water piping, except that no insulation is required on cold water lines installed inside interior plumbing chases (those chases with no exterior wall).

1. All joints and tears shall be sealed with matching white vapor barrier tape.

3.06 PIPING INSTALLATION ABOVE CEILINGS

A. All domestic hot and cold water piping installed above the insulated ceilings shall be installed just above (within 2") of the top of the finished ceiling with the building insulation over the piping to avoid freeze-up.

3.07 DISINFECTION

A. All domestic water piping installed under this Division shall be disinfected with chlorine before it is placed into operation. The chlorinating material shall be liquid chlorine conforming to Federal Specification BB-C-120 and shall be introduced to the system by experienced operators only. The chlorine solution applied to the piping sections or system shall contain at least fifty parts per million of available chlorine and shall remain in the sections or system for a period of not less than sixteen (16) hours. During the disinfection period, all valves shall be opened and closed at least four times. After the disinfection period, the chlorinated water shall be flushed from the system with clear water until the residual chlorine content is not greater than two-tenths parts per million (0.2 PPM). Submit certification to the Architect that the system was disinfected.

END OF SECTION

SECTION 22424

WATER HEATERS AND ACCESSORIES

1.0 GENERAL

1.01 DESCRIPTION

A. All work specified in this Section is governed by the Plumbing General Section 22010.

B. This Section 22424 and the accompanying drawings cover the provisions of all labor, equipment, appliances, and materials and performing all operations in connection with the construction of the water heating systems as specified herein and as shown. These systems include, but are not limited to, the following:

1. Water heaters
2. Hot water circulator

2.0 PRODUCTS

2.02 INSTANTANEOUS WATER HEATER

A. The instantaneous water heaters shall be electric instantaneous type, with an electrical rating as shown in the schedule, and shall be wall-mounted. The heat exchanger shall be of brass and Lexan 140 construction.

B. The heater shall be fitted with an electronic, solid state temperature control system adjustable from 100 degrees F. to 140 degrees F; set at 105 degrees F.

C. The heating and control system shall be enclosed in an impact resistant and shock proof case of Cycolac KJW flame-retardant thermoplastic.

D. The water heaters shall be U.L. approved and labeled without the need for a T&P relief valve.

3.0 EXECUTION

3.01 INSTALLATION

A. The water heaters and accessories shall be installed in strict accordance with the manufacturer's recommendations and the Contract Documents.

B. All temperature and pressure relief valves shall be piped full size to an indirect waste such as the nearest floor drain, service sink, sink tailpiece, etc.

END OF SECTION

SECTION 22450

PLUMBING FIXTURES AND TRIM

1.0 GENERAL

1.01 DESCRIPTION

A. All work specified in this section is governed by the Mechanical General Section 22010.

B. This Section 22450 and the accompanying drawings cover the provisions of all labor, fixtures, equipment, appliances and materials, and performing all operations in connection with the construction and installation of the plumbing fixtures and trim as specified herein and as shown.

C. All exposed piping, valves, stops, P-traps, etc. shall be chrome-plated. Also, all exposed piping penetrations through walls, floors or ceilings shall be provided with chrome-plated cast brass escutcheons.

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△ Date	Description
08.18.2017	ISSUE FOR PERMIT AND CONSTRUCTION

Seal / Signature

STATE OF MAINE
BRAD J. RABINOWITZ
No. 15176
LICENSED
PROFESSIONAL ENGINEER
08/18/17

Project Name

Unum Workplace Transformation- Phase 1 (HO2)

Project Number

59.6481.000

Description

SPECIFICATIONS - PLUMBING

Scale

P1.001

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