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SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1: GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Transition fittings.
 - 3. Mechanical sleeve seals.
 - 4. Sleeves.
 - 5. Escutcheons.
 - 6. Grout.
 - 7. Plumbing demolition.
 - 8. Supports and anchorages.

1.03 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
 - 2. CPVC: Chlorinated polyvinyl chloride plastic.
 - 3. PE: Polyethylene plastic.
 - 4. PVC: Polyvinyl chloride plastic.
- G. The following are industry abbreviations for rubber materials:
 - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
 - 2. NBR: Acrylonitrile-butadiene rubber.

1.04 SUBMITTALS

- A. Submit product data for the following in accordance with requirements of Division 1 Specification Section 01 33 00, "Submittals."
 - 1. Transition fittings.
 - 2. Dielectric fittings.
 - 3. Mechanical sleeve seals.
 - 4. Escutcheons.
- B. Welding certificates.

1.05 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. Required electrical modifications must be approved by the Electrical Engineer and be provided at no additional cost to the Owner. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.
- C. Storage of materials and equipment shall not impede the work of other contracts.
- D. Handling of equipment and products shall be according to manufacturers instructions and in compliance with the articles of their warranty.
- E. Protect products from weather, unless product is slated for exterior installation. If outdoor storage is necessary, support products off the ground or pavement in watertight enclosures.

1.07 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

- C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

1.08 PRODUCT SUBSTITUTIONS

- A. Equipment manufacturer's where indicated on the drawings are the basis for design. The contractor accepts responsibility for all design implications when providing approved equipment other than the design basis.
- B. Electrical Characteristics for Equipment: Equipment of higher electrical characteristics than the basis of design may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.
- C. Dimensional and Weight Changes: Equipment with dimensions or weight different than the basis of design may be furnished provided such proposed equipment is approved in writing. The contractor is responsible for verifying proposed equipment maintains the design intent for access and serviceability and reserves space for future equipment where required. Cost implications to other trades are the responsibility of the contractor.

1.09 INTERPRETATION OF PLANS

- A. In general, the Drawings are to scale. However, to determine exact locations of walls and partitions, the Contractor shall consult the architectural and/or structural Drawings which are dimensioned. Drawings shall not take precedence over field measurements.
- B. Drawings are diagrammatic only. They are intended to indicate size and/or capacity where stipulated, approximate location and/or direction, and approximate general arrangement of one phase of work to another, but not the exact detail of construction. All work shall be constructed from field measurements taken at the site. This shall include all rises, drops and offsets necessary to avoid structural members or equipment and materials installed by other trades. The contractor shall coordinate the ductwork and piping layout before construction. No additional costs will be allowed for piping and ductwork fabrications without field verification of available space. If it is found, before installation, that a more convenient, suitable or workable arrangement of any or all phases of construction would result by altering the arrangement indicated on the Drawings, the architect/engineer may require the contractor to change the arrangement of his work without additional cost to the owner.
- C. The drawings and specifications are intended to supplement each other. Any items shown on the drawings and not mentioned in the specifications, or vice versa, shall be executed the same as if mentioned and shown.
- D. The greatest quantity or more expensive work shall govern where there is a conflict noted anywhere on the drawings and/or specifications.

1.10 COST BREAKDOWN

- A. Submit a cost breakdown for each claim according to General Conditions of the Contract. Include project name, location, Architect/Engineer, Contractor and date.
 - 1. List the cost breakdown for labor and material separately and include a total.
 - 2. Breakout and detail the cost according to specification sections.

1.11 RECORD DOCUMENTS

- A. Prepare record documents in accordance with the requirements in Division 1 Section "Project Record Documents." In addition to the requirements specified in Division 1, refer to specific sections for additional record documentation.

1.12 MAINTENANCE MANUALS

- A. Prepare maintenance manuals in accordance with Division 1 Section "Operating, Maintenance, and Warranty Data". Submit copies for review by Architect/Engineer. In addition to the requirements specified in Division 1, include the following information:
1. Descriptive summary of function, normal system operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
 2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 4. Servicing instructions and lubrication charts and schedules.
 5. Warranty information for all mechanical items shall be included in one tabbed section.

1.13 FIRE SAFETY PRECAUTIONS

- A. The Contractors shall exercise extreme care to maintain and exercise adequate fire safety precautions throughout the work. This shall include providing sufficient fire fighting devices, watchmen, standby helpers or other precautions during construction, in use of temporary heat, welding, brazing, sweating, testing or other phases of work.
- B. At all times, access shall be maintained for fire department trucks to the building.
- C. All welding brazing, cutting and sweating operations performed in vicinity of or accessible to combustible materials shall be adequately protected to make certain that sparks or hot slag does not reach the combustible material and start a fire.
- D. All glass, glazed materials and other finish, in the vicinity of welding, brazing and cutting, shall be masked by the Contractor performing the welding work.
- E. When necessary to do cutting, welding, brazing, sweating and similar work in vicinity of wood, in shafts, or vicinity of any combustible material (and the combustible material cannot be removed), the materials shall be adequately protected with fire resistant blankets or similar approved coverings. In addition, a helper shall be stationed nearby with proper fire extinguishers (provided by the Contractor performing the work) to guard against sparks and fire.
- F. Whenever combustible materials have been exposed to sparks, molten metal, hot slag or splatter, a person shall be kept at the place of work to make sure the smoldering fires have not been started. Whenever cutting or welding operations are carried on in a vertical pipe shaft, a person to act as a fireguard shall be employed to examine all floors below the point of cutting or welding. This fireguard shall be kept on duty after completion of work to guard against fires and shall examine each level after this time, prior to leaving. There shall be no exceptions to this requirement and failure to comply will be construed as negligence.

1.14 PERSONAL SAFETY REQUIREMENTS

- A. The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions required in connection with his work, including regulations of the Occupational Safety and Health Administration (OSHA) and other governing agencies.

1.15 PERMITS, LICENSES AND FEES

- A. The Contractor shall secure all permits and licenses, both temporary and permanent required for their work. The Contractor shall pay all fees and expenses required for the permits and licenses.
 - 1. The Contractor shall make all arrangements with each utility company and pay all service charges associated with new services or modifications to existing services.
 - 2. The Contractor shall request inspections as required by regulating agencies and/or regulations. The Contractor shall pay all charges for inspections.
 - 3. Contractor shall furnish the Owner with a certificate of final inspection and approval by enforcement authorities.
 - 4. Comply with requirements of Division 00.

PART 2: PRODUCTS

2.01 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.02 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements for Joining Plastic Piping:
 - 1. ABS Piping: ASTM D 2235.
 - 2. CPVC Piping: ASTM F 493.
 - 3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

4. PVC to ABS Piping Transition: ASTM D 3138.

I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.03 TRANSITION FITTINGS

- A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
- B. Plastic-to-Metal Transition Fittings: One-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
- C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
- D. Plastic-to-Metal Transition Unions: MSS SP-107, four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.
- E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.04 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 - 1. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Stainless steel. Include two for each sealing element.
 - 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.05 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

2.06 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening. Provide brass material with polished chrome plated finish.

2.07 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3: EXECUTION

3.01 PLUMBING DEMOLITION

- A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove plumbing systems, equipment, and components indicated to be removed.
 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.
- D. Lead Containing Materials: The existing building may contain lead-containing materials, including lead paint. It is the Contractor's responsibility to meet all governmental regulations when dealing with the disposing of lead containing materials.

3.02 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.

- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install chrome plated brass escutcheons for penetrations of walls, ceilings, and floors that are not concealed above a ceiling.
- M. Sleeves are not required for core-drilled holes.
- N. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 - 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. Steel Sheet Sleeves: Penetrating gypsum-board partitions.
 - 1) For pipes NPS 6 and larger
 - 2) Not required for pipes less than NPS 6.
 - b. Cast Iron Sleeves: For all penetrations other than gypsum board partitions.
 - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Flashing" for flashing.
 - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Sealants and Caulking" for materials and installation.
- O. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Firestopping" for materials.
- P. Verify final equipment locations for roughing-in.
- Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.03 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
 - 3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 5. PVC Nonpressure Piping: Join according to ASTM D 2855.
 - 6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.04 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.05 PAINTING

- A. Painting of plumbing systems, equipment, and components is specified in Division 09 Sections "Painting."
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.06 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.07 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.08 GROUTING

- A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 22 05 00

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

PART 1: GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following for soil, waste, and vent piping inside the building:
 - 1. Pipe, tube, and fittings.
 - 2. Special pipe fittings.

1.03 DEFINITIONS

- A. PVC: Polyvinyl chloride plastic.

1.04 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.
 - 2. Sanitary Sewer, Force-Main Piping: 100 psig.

1.05 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Field quality control inspection and test reports.

1.06 QUALITY ASSURANCE

- A. Comply with the following Codes and Standards:
 - 1. Plumbing Code Compliance: Comply with applicable State Codes.
 - 2. ASTM A 888: Standard Specifications for Hubless Cast Iron Soil Pipe and Fittings.
 - 3. ASTM A 74: Standard Specifications for Hub and Spigot Cast Iron Soil Pipe and Fittings.
 - 4. ASTM C 564: Standard Specifications for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
 - 5. ASTM C 1277: Standard Shielded Couplings for Hubless Cast Iron Pipe and Fittings.
 - 6. ASTM C 1540: Heavy duty shielded couplings for Hubless Cast Iron Pipe and Fittings.
- B. Piping material shall bear label, stamp, or other markings of specified testing agency.

PART 2: PRODUCTS

2.01 PIPING MATERIALS

- A. Hubless Cast Iron Soil Pipe and Fittings: Conform to ASTM A888 and mark with the certified trademark of the independent third party certification agency.
 - 1. Standard shielded couplings: Conform to ASTM C1277 assembly. Provide with stainless steel metal shield, stainless steel bands and tightening devices and ASTM C564 rubber sleeve with integral center pipe stop.
 - 2. Heavy duty shielded couplings: Conform to ASTM C1540. Provide with stainless steel metal shield, stainless steel bands and tightening devices and ASTM C564 rubber sleeve with integral center pipe stop.
- B. Copper Tube: ASTM B 88, Type L Water Tube, drawn temper with ASTM B16.22 wrought copper solder joint fittings.

PART 3: EXECUTION

3.01 PIPE APPLICATIONS

- A. Above Ground: Install hubless cast iron soil pipe and fittings with heavy duty shielded couplings.
- B. Below Ground: Install cast iron pipe and hubless fittings with stainless steel bands or service weight hub and spigot with push on gasketed fittings.
- C. Indirect Waste: Install Type L, drawn copper tube with wrought copper fittings and solder joints. This includes but is not limited to louver drain piping.

3.02 EXAMINATION

- A. Verify all dimensions by field measurements. Verify that all drainage and vent piping and specialties may be installed in accordance with pertinent codes and regulations, the original design, and the referenced standards.
- B. Verify all existing grades, inverts, utilities, obstacles, and topographical conditions prior to installations.
- C. Examine rough-in requirements for plumbing fixtures and other equipment having drain connections to verify actual locations of piping connections prior to installation.
- D. Examine walls, floors, roof, and plumbing chases for suitable conditions where piping and specialties are to be installed.
- E. Review soil testing information provided to verify conditions are suitable for piping installations.
- F. Do not proceed until unsatisfactory conditions have been corrected.

3.03 UNDERGROUND PIPE INSTALLATION

- A. Grade trench bottoms to provide a smooth, firm, and stable foundation, free from rock, throughout the length of the pipe.
- B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with clean sand or pea gravel to indicated invert elevation.
- C. Shape bottom of trench to fit bottom $\frac{1}{2}$ of the circumference of pipe. Fill unevenness with tamped granular sand backfill. At each pipe joint dig bell holes to relieve the bell of the pipe of all loads, and to ensure continuous bearing of the pipe barrel on the foundation.

- D. Install underground building drains to conform with State Plumbing Code, and in accordance with the Cast Iron Soil Pipe Institute Engineering Manual and Handbook. Lay underground building drains beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.
- E. Backfill trench with clean sand or gravel. Removed trench soil may be used as backfill if suitable compaction can be obtained.
- F. Install building drain pitched down at minimum slope of 1/4" per foot (2 percent) for piping 3" and smaller, and 1/8" per foot (1 percent) for piping 4" and larger.
- G. Extend building drain to connect to sewer piping, of size and in location indicated for service entrance to building. Sewer piping is specified in a separate section of Division 2.
- H. Install sleeve and mechanical sleeve seal through foundation wall for watertight installation.
- I. Install 1" thick extruded polystyrene over underground building drain piping not under building. Width of insulation shall extend minimum of 12" beyond each side of pipe. Install directly over, and center on pipe center line.
- J. Make changes of direction using appropriate 45 degree wyes or long sweep bends. No change of direction in flow greater than 90 degrees shall be made. Where different sizes of drainage pipes and fittings are connected, use proper size, standard increasers and reducers. Reduction of the size of drainage piping in the direction of flow is prohibited.

3.04 JOINING PIPES AND FITTINGS

- A. Cast-Iron Soil Pipe: Hubless joints shall be supported and restrained in accordance with ASTM 1540/CISPI 310 standards.
- B. Soldered Joints: Use ASTM B813, water-flushable, lead-free flux; ASTM B32, lead-free-alloy solder, and ASTM B828 procedures, unless otherwise indicated.

3.05 HANGER AND SUPPORT INSTALLATION

- A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Install individual, straight, horizontal piping runs: MSS Type 1, adjustable, steel clevis hangers.
 - 3. Multiple, Straight, Horizontal Piping Runs: MSS SP-69 and MSS SP-89, field-fabricated trapeze pipe hangers.
- B. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
- C. Support vertical piping and tubing at base and at each floor. Support vertical cast iron piping at a minimum of every 15 feet. Support vertical copper tubing at a minimum every 10 feet.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

- E. Install hangers with the following minimum rod sizes and maximum spacing in accordance with state code. For cast iron pipe, hangers shall be at 5 feet intervals unless 10 foot lengths are used.

<u>Nom. Pipe Size – Inches</u>	<u>Cast Iron Pipe Max. Span – Feet</u>	<u>Copper Tube Max. Span – Feet</u>	<u>Min. Rod Dia. – Inches</u>
Up to 3/4	–	5	3/8
1	–	6	3/8
1¼	7	6	3/8
1½	9	8	3/8
2	10	8	3/8
2½	10	9	3/8
3	10	10	3/8
4	10	10	5/8
5	10	10	5/8
6	10	10	3/4
8	10	10	7/8
10	10	10	7/8
12	10	10	7/8

- F. Make changes in direction for drainage and vent piping using appropriate 45 degree wyes, half-wyes, or long sweep quarter, sixth, eighth, or sixteenth bends. Sanitary tees or short quarter bends may be used on vertical stacks of drainage lines where the change in direction of flow is from horizontal to vertical, except use long-turn tees where two fixtures are installed back to back and have a common drain. Straight tees, elbows, and crosses may be used on vent lines. No change in direction of flow greater than 90 degrees shall be made. Where different sizes of drainage pipes and fittings are connected, use proper size, standard increasers and reducers. Reduction of the size of drainage piping in the direction of flow is prohibited.

3.06 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.

3.07 FIELD QUALITY CONTROL

- A. Inspections:
1. Do not enclose, cover, or put into operation drainage and vent piping system until it has been inspected and approved by the authority having jurisdiction.
 2. During the progress of the installation, notify the plumbing official having jurisdiction, at least 24 hours prior to the time such inspection must be made. Perform tests in accordance with State and Local code requirements in the presence of the plumbing official.
 - a. Rough-in Inspection: Arrange for inspection of the piping system before concealed or closed-in after system is roughed-in, and prior to setting fixtures.

- b. Final Inspection: Arrange for a final inspection by the plumbing official to observe the tests specified below and to insure compliance with the requirements of the Michigan Plumbing Code.
3. Reinspections: Whenever the piping system fails to pass the test or inspection, make the required corrections, and arrange for re-inspection by the plumbing official.
4. Reports: Prepare inspection reports, signed by the plumbing official.

B. Piping System Test:

1. Test for leaks and defects all new drainage and vent piping systems and parts of existing systems, which have been altered, extended or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
2. Leave uncovered and unconcealed all new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose all such work for testing, that has been covered or concealed before it has been tested and approved.
3. In the absence of State or Local code requirements, the following minimum level of testing shall be performed. Drainage and Venting System Testing Procedures:
 - a. Rough Plumbing: Except for outside leaders and perforated or open jointed drain tile, test the piping of plumbing drainage and venting systems upon completion of the rough piping installation as follows:
 - 1) Cast Iron Piping Systems:
 - a. Attach an air compressor or testing apparatus to any suitable opening and close all other inlets and outlets to the system by means of proper testing plugs. Plaster of paris shall not be used in roof terminals. Air shall be forced into the system until there is a uniform pressure of five pounds per square inch on the portion of the system being tested. The pressure shall remain constant for 15 minutes without the addition of air.
 - b. Finished Plumbing: After the plumbing fixtures have been set and their traps filled with water, their connections shall be tested and proved gas and water-tight. Plug the stack openings on the roof and building drain where it leaves the building, and introduce air into the system equal to a pressure of 1" water column. Use a "U" tube or manometer inserted in the trap of a water closet to measure this pressure. Air pressure shall remain constant without the introduction of additional air throughout the period of inspection. Inspect all plumbing fixture connections for gas and water leaks.
4. Repair all leaks and defects using new materials and re-test system or portion thereof until satisfactory results are obtained.
5. Prepare reports for all tests and required corrective action.

3.08 ADJUSTING AND CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Clean drain strainers, domes, and traps. Remove dirt and debris.
- C. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- D. Place plugs in ends of unoccupied piping at end of day and when work stops.

3.09 PROTECTION

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

END OF SECTION 22 13 16

SECTION 22 13 19

SANITARY WASTE PIPING SPECIALTIES

PART 1: GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following sanitary drainage piping specialties:
 - 1. Cleanouts.
 - 2. Floor drains.
 - 3. Miscellaneous sanitary drainage piping specialties.
 - 4. Flashing materials.
- B. Related Sections include the following:
 - 1. Division 22 Section "Storm Drainage Piping Specialties" for trench drains for storm water, channel drainage systems for storm water, roof drains, and catch basins.
 - 2. Division 22 Section "Plumbing Fixtures" for specialties provided with plumbing fixtures and requiring installation.

1.03 DEFINITIONS

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

1.04 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:
 - 1. Floor drains.
- B. Field quality-control test reports.
- C. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.05 QUALITY ASSURANCE

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

1.06 COORDINATION

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

PART 2: PRODUCTS

2.01 CLEANOUTS

- A. Metal Cleanouts:
 - 1. Standard: ASME A112.36.2M cast iron for cleanout test tee.
 - 2. Size: Same as connected drainage piping.
 - 3. Body Material: Match connected piping material and connection method.
 - 4. Closure: Countersunk plug.
 - 5. Options – Floor Cleanouts
 - a. Closure: Brass plug with straight threads and gasket.
 - b. Adjustable Housing Material: Cast iron with threads.
 - c. Frame and Cover Material:
 - 1) Finished Areas: Polished bronze.
 - 2) Unfinished Areas: Rough bronze.
 - 3) Carpeted Areas: Stainless steel carpet marker with vandalproof screw.
 - 6. Options – Wall Cleanouts
 - a. Closure: Countersunk brass plug.
 - b. Closure Size: Same as cleanout size.
 - c. Wall Access: Round, flat, chrome plated brass coverplate with screw.

2.02 FLOOR DRAINS

- A. Subject to compliance with requirements, provide drainage systems from one of the following:
 - 1. Josam Mfg. Co.
 - 2. Smith (Jay R) Mfg. Co.
 - 3. Tyler Pipe; Subs, of Tyler Corp.
 - 4. Zurn Industries Inc.; Hydromechanics Div.
 - 5. Watts Regulator Company
 - 6. Mifab

- B. All floor drains on grade shall be supplied with backwater valves unless otherwise noted.
- C. General: Provide floor drains of size as indicated on drawings; and type, including features, as specified herein: (Typical units listed below are of Josam manufacture).
- D. Floor Drain Type FD-1: Schedule 40 PVC floor drain with double drainage flange, weepholes, 8" oversized adjustable satin nikaloy round "Super-Flo" strainer. Josam Series No. 30000. Provide with 4'-0" x 4'-0" chloraloy flashing.
 - 1. These drains are for use in pools.

2.03 ROOF FLASHING ASSEMBLIES

- A. Roof Flashing Assemblies:
- B. Description: Manufactured assembly made of 6.0-lb/sq. ft. thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
 - 1. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.04 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

- A. Sleeve Flashing Device:
 - 1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 2 inches above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
 - 2. Size: As required for close fit to riser or stack piping.
- B. Stack Flashing Fittings:
 - 1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
 - 2. Size: Same as connected stack vent or vent stack.

2.05 FLASHING MATERIALS

- A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
 - 1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
 - 2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
 - 3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.
- B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:
 - 1. General Applications: 12 oz./sq. ft.
 - 2. Vent Pipe Flashing: 8 oz./sq. ft..

- C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.
- D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.
- E. Fasteners: Metal compatible with material and substrate being fastened.
- F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- G. Solder: ASTM B 32, lead-free alloy.
- H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3: EXECUTION

3.01 INSTALLATION

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
- B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 - 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 - 2. Locate at each change in direction of piping greater than 45 degrees.
 - 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
 - 4. Locate at base of each vertical soil and waste stack.
 - 5. Locate where there is an increase in pipe size.
 - 6. Locate at new to existing piping connections.
 - 7. Locate at fixtures that are common vented at the same level.
 - 8. Locate at upper most terminal of horizontal drains where traps are concealed, so that all lines are accessible for cleaning.
- C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 - 1. Position floor drains for easy access and maintenance.
 - 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
 - G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
 - H. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
 - I. Install wood-blocking reinforcement for wall-mounting-type specialties.
 - J. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.02 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.03 FLASHING INSTALLATION

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
 1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
 2. Copper Sheets: Solder joints of copper sheets.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.
- E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Coping and Flashing."
- F. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.04 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled their installation, including piping and electrical connections, and to assist in testing.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.05 PROTECTION

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

3.06 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain grease removal devices. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 22 13 19