SECTION 22 10 00 - PLUMBING PIPING

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PART 1 GENERAL

1.1 SUMMARY

A. Work Included:

1. Sanitary, Drainage (Rain/Stormwater) DWV Piping, Buried Within 5 feet ofBuilding
2. Sanitary, Drainage (Rain/Stormwater) DWV Piping, Above Grade
3. Water Piping, Buried Within 5-feet of Building
4. Hot and Cold Domestic Water Above Grade
5. Condensate Piping
6. Primer Piping
7. Chemical Resistant DWV Piping
8. Cleanouts

B. Related Sections:

1. Contents of Division 22, Plumbing and Division 01, General Requirements apply tothis Section.

1.2 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing and Division 01, General Requirements.

B. In addition, meet the following:

1. NSF 61, Annex G.
2. Steel pipe to conform to ASTM and ANSI Standards as specified in this Section.
3. Copper piping to conform to ASTM B88, B306 and B208 and the standards of Copper Development Association (CDA), and American Welding Society, (AWS).
4. Cast Iron Piping to conform to standards of ASTM A-74, CISPI 301 and FM 1680.
5. Manufacturer's Standards Society (MSS) for valving and support referencestandard.
6. American Water Works Association (AWWA) for Valving Assembly Standards.

7. American Society of Sanitation Engineers (ASSE) for Valving Standards.

8. American National Standards Institute (ANSI) for Piping Standards.

9. NFPA Standard 51B - "Fire Prevention in Use of Cutting and Welding Processes".

10. Crosslinked polyethylene (PEX) pipe conforming to ASTM F876, F877 and CSAB1375, or DIN 16892 and 16893.

1.3 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing andDivision 01, General Requirements.

1.4 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing and Division 01, General Requirements.

1.5 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing and Division 01, General Requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. See component manufacturers listed in individual articles below.

B. Uponor

C. Cerro

D. Tyler

E. ADS

F. Charlotte

G. Elkhart

H. Enfield

I. Fuseseal

J. Gruvlok

K. Spears

L. Nibco

M. Orion

N. American-USA

O. Sioux Chief

P. Viega

Q. Mueller

R. Or equal.

S. Cleanouts:

1. J.R. Smith
2. Zurn
3. Wade
4. Watts
5. Sioux Chief
6. Or equal.

T. Firestopping Penetrations in Fire Rated Wall Floor Assemblies:

1. Hilti
2. Proset
3. Or equal.

2.2 GENERAL

A. Provide pipe, tube and fittings of the same type, fitting requirements, grade, class and the size and weight indicated or required for each service, as indicated in other Division 22, Plumbing Specifications. Where type, grade, or class is not indicated, provide proper selection as determined by installer for installation requirements, and comply with governing regulations and industry standards.

B. Manufactured materials delivered, new to the Project Site and stored in their original containers.

C. Product Marking: Furnish each item with legible markings indicating name brand and Manufacturer, manufacturing process, heat number and markings as required per ASTM and UL/FM Standards.

2.3 SANITARY, DRAINAGE (RAIN/STORMWATER) DWV PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A888/CISPI 301 hubless.

1. Fittings: Cast iron.
2. Coupling Assembly:

a. Heavy Duty: ASTM C1540, Clamp-All Hi-Torq 125, Husky SD 4000, MissionHeavyWeight couplings.

B. PVC Pipe: ASTM D 2665 IPS Schedule 40, **SOLID WALL** piping for drainage/waste andvent (DWV).

1. Fittings: PVC DWV ASTM D2665.

2. Joints: Solvent welded, with ASTM D2564 solvent cement, 2-step glue (primer andglue) is required.

2.4 SANITARY, DRAINAGE (RAIN/STORMWATER) DWV PIPING, ABOVE GRADE

~~A. Cast Iron Pipe: ASTM A888/CISPI 301 hubless.~~

~~2. Fittings: Cast iron.~~

~~3. Coupling Assembly:~~

~~. Standard Duty: ASTM C1277 or CISPI 310.~~

~~A. Copper Tube: ASTM B 306, DWV~~

~~6. Fittings: ASME B16.29, wrought copper.~~

~~7.~~1. ~~Joints: ASTM B32, alloy Sn50 solder.~~Not used.

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2.5 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Pipe: ASTM B88, hard drawn, Type K (A).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper andbronze.

2. Joints: Brazed - BCuP2.

B. Ductile Iron Pipe: AWWA C151/A21.51.

1. Fittings: Ductile or gray iron, standard thickness.

2. Joints: AWWA C111/A21.11, rubber gasket with 3/4-inch diameter rods, mega lugtype.

2.6 HOT AND COLD DOMESTIC WATER ABOVE GRADE

A. Copper Tube: 3-inches and above. ASTM B88 (ASTM BA88m), Type L (B), Drawn.

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper andbronze.

2. Joints: Brazed BCuP2.

B. Copper Tube: 2-1/2-inches and smaller. ASTM B88 (ASTM B88M), Type L (B), Drawn.

1. Fittings: ASME B16.18 copper.

2. Joints: ASTM B32, alloy Sn95 solder.

C. Copper Tube: Water pressures up to 250 PSI gauge. ASTM B 88 (ASTM BA 88m), TypeK (A), Drawn.

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper andbronze.

2. Joints: Brazed BCuP2.

D. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn.

1. Fittings: ASME B16.22, wrought copper.

2. Joints: Roll grooved mechanical coupling. ASTM A536.

2.7 CONDENSATE PIPING

A. Copper Tube: ASTM B 88 (ASTM B898M), Type K (A), L (B), or M (C).

1. Fittings: ASME B16.29, wrought copper.

2. Joints: ASTM B32, alloy Sn50 solder.

B. Use chemical resistant piping for drainage of condensate from combustion fuel sources (such as condensing boilers and water heaters), as noted in this Section forarea of application.

C. CPVC (Chlorinated Poly Vinyl Chloride) Pipe and Fittings:

1. Pipe and Fittings: Schedule 40, NSF-14, ASTM 439, IAPMO IS20-96, socket fittings,solvent weld.

2.8 PRIMER PIPING

A. Above Ground: Type L hard-drawn copper tubing with wrought sweat fittings andsoldered joints.

B. Below Ground: Type L soft annealed copper tubing with wrought sweat fittings andbrazed joints.

C. Below Ground: Cross-linked polyethylene (PEX) and engineered plastic fittings.

2.9 CHEMICAL RESISTANT DWV PIPING

A. High Silicon Alloy Cast Iron Pipe: At all locations and rated assemblies. 14.5 percentsilicon content ASTM A518 and A861.

1. Fittings: Matching high silicon alloy. Cast iron.

2. Joints: Acid resistant jute and poured lead or mechanical stainless steel fitting with PTFE/PFA liners.

B. Stainless Steel Pipe: Locations above grade. Austenitic 316 stainless steel.

1. Fittings: 316 stainless steel push fit (hub/spigot)

C. PVDF Pipe: At all locations and rated assemblies F1673.

1. Fittings: PVDF.

2. Joints: Socket thermal fusion ASTM 2657.

D. Polypropylene - Fire Retardant Pipe: All locations except plenums and rated assemblies. Polypropylene, flame retardant. ASTM F1412.

1. Fittings: Polypropylene.

2. Joints: Electrical resistance fusion. ASTM 1290.

2.10 CLEANOUTS

A. Locate cleanouts as shown on Drawings and as required by local code. Cleanoutssame size as pipe except that greater than 4-inches will not be required. Plastic components not allowed, except unless specifically noted.

B. Types:

1. Tile Floor Cleanouts: J. R. Smith 4020 with round heavy-duty nickel bronze top,taper thread, ABS plug and standard screws.

2. Carpeted Floor Cleanout: J. R. Smith 4020-X with carpet clamping frame, round heavy-duty nickel bronze top, taper thread, ABS plug, carpet clamping device andstandard screws.

3. Concrete Floor Cleanout (General): J. R. Smith 4020 with round heavy-duty nickelbronze top, taper thread and ABS plug with standard screws.

4. Parking, Drives and Concrete Floor Cleanouts (Heavy Load): J. R. Smith 4100 withround heavy-duty nickel bronze top, taper thread and ABS plug with standard screws.

5. Wall Cleanout: J. R. Smith 4472-U, countersunk bronze taper thread plug,stainless steel shallow cover and vandal proof screws.

6. Outside Area Walks: J. R. Smith 4020-U with round heavy-duty nickel bronze top,taper thread, ABS plug and top secured with vandal proof screws. Install in 18- by18- by 6-inch-deep concrete pad flush with grade.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Underground Piping Systems:

1. Examination: Verify that excavations are to required grade, dry, and not over-excavated.

2. Perform necessary excavation and backfill required for installation of plumbingwork. Repair piping or other work at no expense to Owner.

3. Water: Keep excavations free of standing water. Re-excavate and fill back excavations damaged or softened by water or frost to original level with sand,crushed rock, or other approved material at no expense to Owner.

4. Tests: During progress of work for compacted fill, Owner reserves right to request compaction tests made under direction of testing laboratory.

5. Trench Excavation: Excavate trenches to necessary depth and width, removing rocks, unstable soil (muck, peat), roots and stumps. Excavation material is classified as "base fill" and "native." Base fill excavation material consisting of placed crushed rock may be used as backfill above "Pipe Zone." Remove and dispose of site native excavation material. Adequate width of trench for properinstallation of piping or conduit.

6. Support Foundations:

   a. Foundations: Excavate trenches located in unstable ground areas below elevation required for installation of piping to depth which is determined by Architect as appropriate for conditions encountered. Place and compact approved foundation material in excavation up to "Bedding Zone." Dewatering, placement, compaction, and disposal of excavated materials to conform to requirements contained in other Specification Sections or Drawings.

   b. Over-Excavations: Where trench excavation exceeds required depths, provide,place and compact suitable bedding material to proper grade or elevation at no additional cost to Owner.

   c. Foundation Material: Where native material has been removed, place andcompact necessary foundation material to form base for replacement of required thickness of bedding material.

	Class A		Class B	
MaterialPassing	Min.	Max.	Min.	Max.
3/4-inchSquare Opening	27	47	0	1

   d. Bedding Material: Full bed piping on sand, pea gravel, or 3/4-inch minus crushed rock. Place minimum 4-inch-deep layer of sand, pea gravel, or crushed rock on leveled trench bottom for this purpose. Remove bedding to necessary depth for piping bells and couplings to maintain contact of pipe onbedding for its entire length. Provide additional bedding in excessively wet, unstable, or solid rock trench bottom conditions as required to provide firm foundation.

7. Backfilling:

   a. Following installation and successful completion of required tests, backfillpiping in lifts.

      1) In "Pipe Zone" place backfill material and compact in lifts not to exceed 6-inches in depth to height of 12-inches above top of pipe. Place backfillmaterial to obtain contact with entire periphery of pipe, without disturbing or displacing pipe.

      2) Place and compact backfill above "Pipe Zone" in layers not to exceed 12 inches in depth.

   b. Backfill Material:

1) Backfill Material in "Pipe Zone": 3/4-inch minus crushed rock, sand, or peagravel.

2) Crushed rock, fill sand or other backfill material approved elsewhere in Specifications may be used above "Pipe Zone."

8. Compaction of Trench Backfill:

a. Where compaction of trench backfill material is required, use one of followingmethods or combination thereof:

1) Mechanical tamper,

2) Vibratory compactor, or

3) Other approved methods appropriate to conditions encountered.

b. Architect to have right to change methods and limits to better accommodatefield conditions. Compaction sufficient to attain 95 percent of maximum density at optimum moisture content unless noted otherwise on Drawings or elsewhere in Specifications. Water "puddling" or "washing" is prohibited.

B. General Installation:

1. Work performed by experienced journeyman plumbers. No exceptions.

2. Provide access panels for concealed valves, shock arrestors, trap primers and thelike.

3. Install pipes and pipe fittings in accordance with recognized industry practices and Manufacturer's recommendations.

4. Align piping accurately at connections, within 3/32-inch misalignment tolerance.Comply with ANSI B31 Code for Pressure Piping.

5. Locate piping runs, as indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details, and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, and other structural and permanent-enclosure elements of building. Limit clearance to 1/2-inch where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1-inch clearance outside insulation. Whenever possible in finished and occupied spaces, conceal piping from view by locating it in column enclosures, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as indicated.

a. Do not run piping through transformer vaults, telephone, elevator, electrical or electronic equipment spaces or enclosures unless indicated on Drawings.

b. Concealed Piping Above Suspended Ceiling: Plan and coordinate to avoid interferences; install to maintain suspended ceiling heights shown on Architectural Drawings. Allow sufficient space above removable ceiling panels for panel removal. Locate piping so that valves are visible and accessible within 24-inches horizontally and

vertically from point of access to the ceiling space. Provide plenum rated materials for ceiling spaces which are being used as plenums.

c. Exposed Work: Run pipes parallel to the closest wall unless otherwise shown on Drawings; maintain maximum headroom; avoid light fixtures.

d. Insulation Space Allowance: In piping work, allow space for pipe insulation and jackets. If interferences occur, move the piping to accommodate insulation thickness specified.

e. Pipe Lengths: Do not use short lengths or nipples at locations where a full length of pipe will fit.

f. Alignment Prior to Supporting and Anchoring: Place piping in proper alignment and position prior to connection to anchors, expansion loops, and equipment. Furnish jacking devices, temporary steel structural members, and assembled structures as necessary. Remove temporary equipment and structures supplied by Contractor at completion; such items to remain Contractor property.

g. Valve and Equipment Connections: Piping not to place undue stress on flanged valves and equipment connections. Install mating flange faces true and parallel to each other and not requiring springing of piping for assembly. Pipe hangers and supports to carry the full weight of the pipe and fluid.

h. Piping Leaks: Correct immediately; use new materials; leak-sealing compounds or peening not permitted.

i. Pressure Ratings of Fittings, Valves, and Devices in Piping Systems: Pressure rating to be equal to, or greater than, the maximum working pressure of the system.

j. Equipment Vents and Drains: Provide for coils and vessels which contain water. Provide isolation valves and outlet valves at piping high and low points to permit venting and draining of the vessel without venting and draining connected piping. Provide hose connections and caps on drain lines.

k. Escutcheon Plates: Where exposed insulated and uninsulated piping passes through walls, floors, or ceilings; provide spring clip type. Provide plates on both sides of wall or floor.

C. Testing:

1. General:

a. Provide temporary equipment for testing, including pumps, compressors, tanks, and gauges, as required. Test piping systems before insulation (if any) isinstalled and remove or disengage control devices before testing. Where necessary, test sections of each piping system independently, but do not use piping valves to isolate sections where test pressures exceed local valve operating pressure rating. Fill each section with water, compressed air, or nitrogen and pressurize for the indicated pressure and time.

b. Notify Architect and local Plumbing Inspector 2 days before tests.

c. Drainage, Waste and Vent Piping: Test in accordance with governing plumbingcode or as follows: Test drainage and venting systems, with necessary openings plugged, to permit system to be filled with water and subjected to water pressure of minimum of 5 PSI head. System to hold water without water level drop greater than 1/2 pipe diameter of largest nominal pipe size within 24-hour period. Test system in sections if minimum head cannot be maintained in each section. 5 PSI head to be minimum pressure at highest joint.

d. Water Piping: Eliminate air from system. Fill and test at 125 PSIG or minimum1-1/2 times static pressure at connection to serving utility main for period of two hours with no loss in pressure.

e. Send test results to Architect for review and approval and include inOperation and Maintenance Manual.

2. Testing of Pressurized Systems:

a. Test each pressurized piping system at 150 percent of operating pressureindicated, but not less than 125 PSIG test pressure.

b. Observe each test section for leakage at end of test period. Test fails if leakageis observed or if pressure drop exceeds 2 percent of test pressure.

3. Test hot and cold domestic water piping systems upon completion of rough-inand before connection to fixtures at hydrostatic pressure of 125 PSIG.

D. Corrosive Soil Conditions:

1. Wrap steel, iron, copper, or other metal piping materials/fittings with ProtectoWrap 200, 30 mils or greater. Maintain a 1/2-inch overlap and install per Manufacturer's recommendations.

2. Provide epoxy coated cast iron pipe and fittings for drainage systems.

3. Obtain and review Project soils report for verification of requirements concerningcorrosive soils.

E. Protection:

1. Keep pipe openings closed by means of plugs or caps to prevent entrance of foreign matter. Protect piping, ductwork, fixtures, equipment, and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore to its original condition or replace fixtures, equipment or apparatus damaged prior to final acceptance of work.

F. Firestopping Penetrations in Fire-Rated Wall/Floor Assemblies:

1. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled holeand pipe passing through to meet requirements of ASTM E814.

G. Cut piping squarely, free of rough edges and reamed to full bore. Insert piping fully into fittings.

H. Provide joints of type indicated in each piping system.

I. Thread pipe in accordance with ANSI/ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Remove excess cutting oil from piping prior to assembly. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by Pipe/Fitting Manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed.

J. Sleeves:

1. Pipe Sleeves:

   a. Layout work in advance of pouring concrete, furnish, and set sleeves necessary to complete work.

   b. Floor Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Extend sleeve 1-inch above finished floor. Caulk pipes passing through floor with non-shrinking grout or approved caulking compound (Except DWV Piping penetrating a concrete slab set on finish grade), provide "Link-Seal" sleeve sealing system for concrete/slab penetrations which are below grade. Caulk/seal piping passing through fire rated building assembly with UL rated assemblies. Provide fire-rated assemblies per local AHJ requirements

   c. Wall Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Provide sleeve flush with finished face of wall. Caulk pipes passing through walls with non-shrinking caulking compound. Provide modular link sealing system for concrete penetrations which are below grade. Caulk/seal piping passing through fire-rated assemblies per local AHJ requirements.

   d. Beam Sleeves: Coordinate with trades for locations of pipe sleeves in reinforced concrete and steel beams. Indicate penetrations on structural shop drawings. See Drawings and Specifications for specific sleeve location limitations. Plumbing Drawings are diagrammatic. Offset piping as required to meet these limitations. Pipe sleeve locations must be indicated on reinforced concrete and steel beam shop drawings. Field cutting of beams not allowed without written approval of structural engineer. No extra costs allowed for failure to coordinate beam penetrations prior to reinforced concrete and steel beam shop drawing submittal.

2. Installation of metallic or plastic piping penetrations through non-fire-rated walls and partitions and through smoke-rated walls and partitions:

   a. Install fabricated pipe sleeve.

   b. After installation of sleeve and piping, tightly pack entire annular voidbetween piping or piping insulation and sleeve identification.

   c. Seal each end airtight with a resilient nonhardening seal per code.

3. Piping penetrations through fire-rated (1 to 3 hour) assemblies:

a. Select and install pre-engineered pipe penetration system in accordance withUL listing and Manufacturer's recommendation.

b. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet requirements of ASTM E84.

3.2 SANITARY, DRAINAGE (RAIN/STORMWATER) DWV PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Excavation and Backfill:

1. See 3.1.A. above.

B. Drainage, Waste and Vent Piping: Test in accordance with governing plumbing code or as follows: Test drainage and venting systems, with necessary openings plugged, topermit system to be filled with water and subjected to water pressure of minimum of5 PSI head. System to hold water without water level drop greater than 1/2 pipe diameter of largest nominal pipe size within 24-hour period. Test system in sections ifminimum head cannot be maintained in each section. 5 PSI head to be minimum pressure at highest joint.

C. Corrosive Soil Conditions:

1. Wrap steel, iron, copper, or other metal piping materials/fittings with ProtectoWrap 200, 30 mils or greater. Maintain a 1/2-inch overlap and install per Manufacturer's requirements.

2. Provide epoxy coated cast iron pipe and fittings for drainage systems.

D. Cast-Iron Joints: Comply with Coupling Manufacturer's Cast Iron Soil Pipe InstituteStandards and installation instructions.

E. Sanitary and Storm Drainage:

1. Grade piping at a uniform pitch of 2 percent unless otherwise noted on Drawings.

2. Indirect Waste or Drain Piping: Extend piping to discharge as shown on Drawings.Maintain minimum air gap. Provide traps on indirect waste or drain piping exceeding 60-inches.

3. Fixture Carriers: Concealed fixture carriers for wall hung plumbing fixtures arespecified in Section 22 40 00, Plumbing Fixtures.

4. Drains:

a. Install drains to suit finished floor. Install drains and components per Manufacturer's instructions. Slope flooring to floor drain or sink a minimum of1/2-inch below finished floor elevation.

b. Install P-traps for hub drains, floor drains and floor sinks. P-traps to be of thesame materials as soil and waste piping. Provide trap primer assembly for each drain or floor sink.

5. Wall Access Panel: Secure to wall framing and install so that flange forms a close-fitting joint with the finished wall surface.

6. Heat trace and insulate P-traps exposed to freezing conditions. Provide heat trace and electronic components to Division 26 for installation.

7. Insulate horizontal branch lines from floor sinks, receptors and drains receiving cold discharge from equipment and appliances.

F. Epoxy Coated Cast Iron Pipe and Fittings: Coat the piping terminus of any cut pipingwith an applied epoxy per Manufacturer's instructions. Denso Protal 7200 fast-cure epoxy repair coating.

3.3 SANITARY, DRAINAGE (RAIN/STORMWATER) DWV PIPING, ABOVE GRADE

A. Drainage, Waste and Vent Piping: Test in accordance with governing plumbing code or as follows: Test drainage and venting systems, with necessary openings plugged, topermit system to be filled with water and subjected to water pressure of minimum of5 PSI head. System to hold water without water level drop greater than 1/2 pipe diameter of largest nominal pipe size within 24-hour period. Test system in sections ifminimum head cannot be maintained in each section. 5 PSI head to be minimum pressure at highest joint.

B. Firestopping Penetrations in Fire-Rated Wall/Floor Assemblies:

1. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled holeand pipe passing through to meet requirements of ASTM E814.

C. Solder copper tube and fitting joints with lead free nickel/silver bearing solder meeting ASTM Std. B-32, in accordance with IAPMO Is 3-93, ASTM B-828 and CopperDevelopment Association recommended procedures. Clean joints by other than chemical means prior to assembly. "Shock" cooling is prohibited. Fluxes to be water soluble for copper and brass potable water applications, and meeting CDA standard test method 1.0 and ASTM B813-91. Apply solder until a full fillet is present around the joint. Do not apply solder and flux in such excessive quantities as to run down interior of pipe. Lead solder or corrosion flux not to be present at the jobsite.

D. Cast-Iron Joints: Comply with Coupling Manufacturer's Cast Iron Soil Pipe InstituteStandards and installation instructions.

E. Sanitary and Storm Drainage:

1. Grade piping at a uniform pitch of 2 percent unless otherwise noted on Drawings.

2. Indirect Waste or Drain Piping: Extend piping to discharge as shown on Drawings.Maintain minimum air gap. Provide traps on indirect waste or drain piping exceeding 60 inches.

3. Fixture Carriers: Concealed fixture carriers for wall hung plumbing fixtures arespecified in Section 22 40 00, Plumbing Fixtures.

4. Drains:

a. Install drains to suit finished floor or roof surface. Install drains and components per Manufacturer's instructions. Slope flooring to floor drain orsink a minimum of 1/2-inch below finished floor elevation.

b. Install P-traps for hub drains, floor drains and floor sinks. P-traps to be of thesame materials as soil and waste piping. Provide trap primer assembly for each drain or floor sink.

5. Wall Access Panel: Secure to wall framing and install so that flange forms a close-fitting joint with the finished wall surface.

6. Heat trace and insulate P-traps exposed to freezing conditions. Provide heat trace and electronic components to Division 26 for installation.

7. Insulate horizontal branch lines from floor sinks, receptors and drains receiving cold discharge from equipment and appliances.

3.4 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Excavation and Backfill:

1. See 3.1.A. above.

B. Water Piping: Eliminate air from system. Fill and test at 125 PSIG or minimum 1-1/2times static pressure at connection to serving utility main for period of two hours with no loss in pressure.

C. Domestic Water:

1. "Piping" to include pipes, fittings, nipples, valves, and accessories connectedthereto.

2. Run piping generally parallel to the axis of the building, arranged to conform to the building requirements and to suit the necessities of clearance for other mechanical ducts, flues, conduits, and work of other trades, and as close to ceilingor other construction as practical, free of unnecessary traps or bends.

3. Grade water supply piping for complete drainage of the system. Install hose bibbsat low points.

4. Use unions for piping connections to equipment.

5. Provide sufficient elbows, swings, and offsets to permit free expansion andcontraction.

6. Use reducers or increasers. Use no bushings.

7. Ream or file each pipe to remove burrs. Inspect each length of pipe and eachfitting for workmanship and clear passageways.

8. Cover, cap or otherwise protect open ends of piping during construction to prevent damage to threads or flanges and prevent entry of foreign matter. Disinfect and sterilize water supply piping as specified. Furnish written report onfinal water quality results.

9. Install exposed connections to equipment with special care, showing no toolmarks or threads at fittings and piping. No bowed or bent piping permitted.

10. Make ferrous to non-ferrous connections with dielectric fittings.

11. Use extra heavy pipe for nipples, where unthreaded portion is less than 1-1/2inches. Use no close nipples. Use only shoulder-type nipples.

12. Through-Wall Pipes: Type 'L' copper tubing for through-wall pipes which connect to exposed stops at wall surface. Anchor the pipes in the wall; attach pipe with U-bolts to steel back-up plates or steel angles anchored in the wall. Provide wroughtcopper elbow which securely anchors ears in wall at through-wall pipes.

13. Provide drain valves at base of risers and at low points on the system.

14. Backflow Preventers: Pipe relief to nearest drain. Slope at 2 percent.

D. Sterilization of Domestic Water System:

1. General: Upon completion of tests and necessary replacements, thoroughly flush and disinfect domestic water piping.

2. Method: After thoroughly flushing system with water to remove sediment, fill system with a solution containing 50 parts per million of chlorine for not less than 24 hours or 200 parts per million of chlorine for not less than 3 hours. Afterretention, drain, reflush and return system to service.

3. Certification: Provide copy of domestic water chlorination certificate in eachoperation and maintenance manual.

4. Provide water line disinfections performed by a licensed contractor with trainingin potable water line disinfections.

E. Buried Pre-Insulated Pipe Installation:

1. Installation and Testing: Install and test products in accordance with Manufacturer's installation instructions.

2. Manufacturer's installation instructions are to describe the following:

   a. Storage and handling of pipes.

   b. Trench preparation.

   c. Installing pipe.

   d. Installing accessories.

   e. Installing fittings.

   f. Building penetrations.

   g. Field insulation kits.

h. Testing.

3.5 HOT AND COLD DOMESTIC WATER ABOVE GRADE

A. Water Piping: Eliminate air from system. Fill and test at 125 PSIG or minimum 1-1/2times static pressure at connection to serving utility main for period of two hours with no loss in pressure.

B. Testing of Pressurized Systems:

1. Test each pressurized piping system at 150 percent of operating pressureindicated, but not less than 125 PSIG test pressure.

2. Observe each test section for leakage at end of test period. Test fails if leakage isobserved or if pressure drop exceeds 2 percent of test pressure.

C. Test hot and cold domestic water piping systems upon completion of rough-in andbefore connection to fixtures at hydrostatic pressure of 125 PSIG.

D. Firestopping Penetrations in Fire-Rated Wall/Floor Assemblies:

1. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled holeand pipe passing through to meet requirements of ASTM E814.

E. Solder copper tube and fitting joints with lead free nickel/silver bearing solder meeting ASTM Std. B-32, in accordance with IAPMO Is 3-93, ASTM B-828 and CopperDevelopment Association recommended procedures. Clean joints by other than chemical means prior to assembly. "Shock" cooling is prohibited. Fluxes to be water soluble for copper and brass potable water applications, and meeting CDA standard test method 1.0 and ASTM B813-91. Apply solder until a full fillet is present around the joint. Do not apply solder and flux in such excessive quantities as to run down interior of pipe. Lead solder or corrosion flux not to be present at the jobsite.

F. Braze copper tube and fitting socket with BCuP series filler metal without flux. Use listed brazing flux for joining of copper tube to brass or bronze fittings, meeting AWSFB3A or FB3C. "Shock" cooling is prohibited. A continuous fillet is to be visible aroundthe completed joint. After cooling, thoroughly remove flux residue with warm water and a brush prior to testing. Do not use BCuP filler on copper alloys containing over 10 percent nickel. Cap or plug piping during construction to prevent entry of foreign material.

G. Domestic Water:

1. "Piping" to include pipes, fittings, nipples, valves, and accessories connected thereto.

2. Run piping generally parallel to the axis of the building, arranged to conform to the building requirements and to suit the necessities of clearance for other mechanical ducts, flues, conduits, and work of other trades, and as close to ceiling or other construction as practical, free of unnecessary traps or bends.

3. Grade water supply piping for complete drainage of the system. Install hose bibbs at low points.

4. Use unions for piping connections to equipment.

5. Provide sufficient elbows, swings, and offsets to permit free expansion and contraction.

6. Use reducers or increasers. Use no bushings.

7. Ream or file each pipe to remove burrs. Inspect each length of pipe and each fitting for workmanship and clear passageways.

8. Cover, cap or otherwise protect open ends of piping during construction to prevent damage to threads or flanges and prevent entry of foreign matter. Disinfect and sterilize water supply piping as specified. Furnish written report on final water quality results.

9. Install exposed connections to equipment with special care, showing no tool marks or threads at fittings and piping. No bowed or bent piping permitted.

10. Make ferrous to non-ferrous connections with dielectric fittings.

11. Use extra heavy pipe for nipples, where unthreaded portion is less than 1-1/2 inches. Use no close nipples. Use only shoulder-type nipples.

12. Through-Wall Pipes: Type 'L' copper tubing for through-wall pipes which connect to exposed stops at wall surface. Anchor the pipes in the wall; attach pipe with U-bolts to steel back-up plates or steel angles anchored in the wall. Provide wrought copper elbow which securely anchors ears in wall at through-wall pipes.

13. Provide drain valves at base of risers and at low points on the system.

14. Backflow Preventers: Pipe relief to nearest drain. Slope at 2 percent.

H. Sterilization of Domestic Water System:

1. General: Upon completion of tests and necessary replacements, thoroughly flush and disinfect domestic water piping.

2. Method: After thoroughly flushing system with water to remove sediment, fill system with a solution containing 50 parts per million of chlorine for not less than 24 hours or 200 parts per million of chlorine for not less than 3 hours. After retention, drain, reflush and return system to service.

3. Certification: Provide copy of domestic water chlorination certificate in each operation and maintenance manual.

4. Provide water line disinfections performed by a licensed contractor with training in potable water line disinfections.

3.6 CONDENSATE PIPING

A. Firestopping Penetrations in Fire-Rated Wall/Floor Assemblies:

1. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled holeand pipe passing through to meet requirements of ASTM E814.

3.7 PRIMER PIPING

A. Drainage, Waste and Vent Piping: Test in accordance with governing plumbing code or as follows: Test drainage and venting systems, with necessary openings plugged, topermit system to be filled with water and subjected to water pressure of minimum of5 PSI head. System to hold water without water level drop greater than 1/2 pipe diameter of largest nominal pipe size within 24-hour period. Test system in sections ifminimum head cannot be maintained in each section. 5 PSI head to be minimum pressure at highest joint.

3.8 CHEMICAL RESISTANT DWV PIPING

A. Installation Guidelines for Polypropylene Pipe:

1. Install hangers and supports at intervals specified in the applicable Plumbing Codeand as recommended by Pipe Manufacturer.

2. Support vertical piping at each floor and as specified in the applicable PlumbingCode.

3. Fusion Welding of Joints:

a. Install fittings and joints using socket-fusion, electrofusion, or butt-fusion as applicable for the fitting type. Make fusion-well joints in accordance with thePipe and Fitting Manufacturer's specifications and product standards.

b. Fusion-weld tooling, welding machines, and electrofusion devices as specifiedby the Pipe and Fittings Manufacturer.

c. Prior to joining, prepare the pipe and fittings in accordance with F 2389 andthe Manufacturer's specifications.

d. Joint preparation, setting and alignment, fusion process, cooling times andworking pressure to be in accordance with Manufacturer's installation guidelines.

B. Testing of Pressurized Systems:

1. Test each pressurized piping system at 150 percent of operating pressureindicated, but not less than 125 PSIG test pressure.

2. Observe each test section for leakage at end of test period. Test fails if leakage isobserved or if pressure drop exceeds 2 percent of test pressure.

C. Test hot and cold domestic water piping systems upon completion of rough-in andbefore connection to fixtures at hydrostatic pressure of 125 PSIG.

D. Corrosive Soil Conditions:

1. Wrap steel, iron, copper, or other metal piping materials/fittings with ProtectoWrap 200, 30 mils or greater. Maintain a 1/2-inch overlap and install per Manufacturer's requirements.

2. Provide epoxy coated cast iron pipe and fittings for drainage systems.

E. Firestopping Penetrations in Fire-Rated Wall/Floor Assemblies:

1. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet requirements of ASTM E814.

3.9 CLEANOUTS

A. Install in aboveground piping and building drain piping as indicated, as required by code; at each change in direction of piping greater than 135 degrees; at minimum intervals of 100-feet; and at base of each vertical soil or waste stack. Install floor and wall cleanout covers for concealed piping. Select type to match adjacent building finish. Provide shop drawings to Architect to coordinate locations and types of cleanouts with Architect prior to installation.

B. Drainage, Waste and Vent Piping: Test in accordance with governing plumbing code or as follows: Test drainage and venting systems, with necessary openings plugged, to permit system to be filled with water and subjected to water pressure of minimum of 5 PSI head. System to hold water without water level drop greater than 1/2 pipe diameter of largest nominal pipe size within 24-hour period. Test system in sections if minimum head cannot be maintained in each section. 5 PSI head to be minimum pressure at highest joint.

C. Corrosive Soil Conditions:

1. Wrap steel, iron, copper, or other metal piping materials/fittings with ProtectoWrap 200, 30 mils or greater. Maintain a 1/2-inch overlap and install per Manufacturer's requirements.

2. Provide epoxy coated cast iron pipe and fittings for drainage systems.

D. Cast-Iron Joints: Comply with Coupling Manufacturer's Cast Iron Soil Pipe InstituteStandards and installation instructions.

END OF SECTION

SECTION 22 14 29 - SUMP PUMPS

This Section includes sump pumps for installation in sumps to pump effluent or drain water from homes, farms, trailer courts, motels, schools, hospitals, and industry.

Manufacturers found in SpecAgent for this Section were identified as representative and not as an endorsement for meeting the requirements of this specification.

This Section includes performance, proprietary, and descriptive type specifications. Edit to avoid conflicting requirements.

This Section includes the term Architect/Engineer. "Architect" is used in AIA contract documents; "Engineer" is used in EJCDC contract documents. Retain appropriate term.

See the Drawing Coordination Considerations for information needed to coordinate this specification Section with the Drawings.

Some of the paragraphs may be deleted. When deleting, do not renumber all the paragraphs. Simply leave the section number and title as is, delete the text, and add the words "Not Used".

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sump pumps.

B. Related Sections:

List sections specifying installation of products included in this section and indicate specific items.

Division 22 - Input required from mechanical subconsultant.

1. Section 22 05 03 - Pipes and Tubes for Plumbing Piping and Equipment.
2. Section 22 05 23 - General-Duty Valves for Plumbing Piping.
3. Section 33 31 10 - Sanitary Utility Sewerage Piping.
4. Section <_____-_____>: Electrical work for sump pumps.

1.2 DESING REQUIREMENTS

A. Design Criteria:

1. Refer to schedule at end of this section.

1.3 SUBMITTALS

Only request submittals needed to verify compliance with Project requirements.

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings:

1. Submit installation details for pumps, piping, controls, and accessories including wiring schematics.

C. Product Data: Submit data for specified Products.

D. Manufacturer's Certificates: Certify [**Products**] <_____> meet or exceed [**specified requirements**] <_____>.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Operation and Maintenance Data: Submit installation instructions, servicing requirements, assembly views, lubrication instructions, and replacement parts list.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with [**[State] [Municipality] of <_____> [Highways] [Public Work's] standard.**]

Include the following paragraph only when cost of acquiring specified standards is justified.

B. Maintain [**one copy**] [**<_____> copies**] of [**each**] document on site.

1.6 QUALIFICATIONS

A. Manufacturer: company specializing in manufacturing Products specified in this section with minimum [**three**] <_____> years [**documented**] experience.

B. Installer: Company specializing in performing work of this section [**with minimum <_____> years [documented] experience**] [**approved by Manufacturer**].

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Prepare pumps and accessories for shipment to prevent entry of foreign matter into product body.

C. Store products in areas protected from weather, moisture, or possible damage; do not store products directly on ground; handle products to prevent damage to interior or exterior surfaces.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

B. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

1.9 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate work with [[State] [Municipality] of <_____> [Highways] [Public Work's] standards] and utilities within construction area.

PART 2 PRODUCTS

2.1 SUMP PUMPS

In this article, list manufacturers acceptable for this Project.

A. Manufacturers:

1. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

2. Substitutions: [Section 01 60 00 - Product Requirements] [Not Permitted].

******** [OR] ********

B. Furnish materials in accordance with [[State] [Municipality] of <_____> [Highways] [Public Work's] standards.]

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers' products specified above.

C. Impeller: Cast iron, semi-open, non-clog.

D. Casing: Cast iron.

E. Mechanical Seal: Silicon carbide.

F. Shaft: Stainless steel.

G. Designed for continuous operation.

H. Bearings: Upper and lower heavy duty ball bearings.

2.2 PUMP MOTORS

A. Fully submerged in high-grade turbine oil for lubrication and efficient heat transfer.

B. Power Cable: Severe duty rated, oil and water resistant, epoxy seal on motor end.

C. Built-in overload with automatic reset.

D. Class B insulation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify connections, size, and location are as indicated on Drawings.

3.2 INSTALLATION

A. Install sump pumps in accordance with Drawings and Manufacturer's instructions.

B. Provide necessary piping, fittings, and valves as indicated on Drawings.

******** [OR] ********

C. Install Work in accordance with [**[State] [Municipality] of <_____> [Highways] [Public Work's] standards.**]

3.3 FIELD QUALITY CONTROL

A. Section [**01 40 00 - Quality Requirements**] [**01 70 00 - Execution and Closeout Requirements**]: Field inspecting, testing, adjusting, and balancing.

B. Upon completion of installation, examine, adjust, and test each pump for proper operation.

C. Test each pump with clean water through minimum of four complete cycles.

3.4 MANUFACTURER'S FIELD SERVICES

A. Section 01 40 00 - Quality Requirements: Requirements for Manufacturer's field services.

B. Provide services of Manufacturer's representative for period of not less than <_____> man days to inspect installations and for performance testing.

3.5 SCHEDULES

Include schedule when project includes more than one pump of each type. Include units of measurement to suit individual pumps included in schedule.

Consider the following examples when developing Project schedule.

A. Sump Pumps:

Description Location	Pump Criteria			
	Capacity	Head	Motor Hp.	V/Ph

END OF SECTION