1. **GENERAL**
	1. **Summary**
		1. Provide sanitary sewer and vent systems, including piping, equipment and necessary accessories for complete system.
	2. **References and Related BCIT Standards**
		1. ASSE 1018Performance Requirements for Trap Seal Primer Valves – Potable Water Supplied, latest adopted edition.
		2. ASSE 1044 Performance Requirements for Trap Seal Primer Devices – Drainage Types, latest adopted edition.
		3. ASSE 1079Performance Requirements for Dielectric Pipe Unions, latest adopted edition.
		4. ASTM A74 16 Standard Specification for Cast Iron Soil Pipe and Fittings, latest adopted edition.
		5. ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
		6. BC Building Code, latest adopted edition.
	3. **Submittals**
		1. Submit in accordance with Section 01 33 00 Submittal Procedures.
		2. Product Data: Include manufacturer's literature and data with full item description and optional features and accessories. Provide detailed Shop Drawings where clamping devices and extensions are required in connection with waterproofing membrane or floor drain.
		3. Prior to submitting the request for final inspection, provide Certification documentation to include the following:
			1. Test results.
			2. Names of individuals performing work for the testing agency on this project.
			3. Detailed procedures followed for all tests.
			4. Certification that all results of tests were within limits specified.
	4. **Quality Assurance**
		1. Perform work to BC Plumbing Code, latest edition standards.
		2. Valves: Manufacturer's name and pressure rating marked on valve body.
		3. Welding Materials and Procedures: Conform to ASME SEC IX and applicable provincial labour regulations.
		4. Welders Certification: To ASME SEC IX, NCPWB Standard Procedure Specifications and Province of BC Boiler and Pressure Vessel Act.
2. **PRODUCT AND DESIGN REQUIREMENTS**
	1. **Prohibited Materials**
		1. PVC piping and fittings shall not be used for the following applications:
			1. Waste collected from steam condensate drains.
			2. Spaces such as mechanical equipment rooms, kitchens, sterile processing services, sterilizer areas, and areas designated for sleep.
			3. Vertical waste and soil stacks serving more than two (2) floors.
			4. Exposed in mechanical equipment rooms.
	2. **Sanitary Waste, Drain, and Vent Piping**
		1. Cast iron waste, drain, and vent pipe and fittings.
		2. Provide cast iron waste, drain, and vent pipe and fittings for the following applications:
			1. Pipe buried in or in contact with earth.
			2. Interior waste and vent piping above grade.
			3. Cast iron pipe hubless (plain end or no-hub or hubless) with stainless steel mechanical joints.
			4. Soil Pipe and Fittings: Conforming to the requirements of CISPI 301, ASTM A888, or ASTM A74.
			5. Joints for Hubless Pipe and Fittings: Conforming to CISPI 310. Install joints for hub and spigot pipe shall be installed with compression gaskets conforming to ASTM C564.
		3. Polyvinyl Chloride (PVC):
			1. Polyvinyl chloride (PVC) pipe and fittings are permitted where the waste temperature is below 60°C (140°F).
			2. Polyvinyl Chloride Sanitary Waste, Drain, and Vent Pipe and Fittings: Solid core sewer piping conforming to ASTM D2665, sewer and drain series with ends for solvent cemented joints.
			3. PVC Fittings: Solvent welded socket type using solvent cement conforming to ASTM D2564.
			4. Acid Waste and Vent Pipe from Laboratories or Other Corrosive Waste Streams: Acid resistant polypropylene DWV pipe. Acceptable products:
				1. Orion.
				2. IPEX Enfield and IPEX Labline.
				3. IPEX PlenumLine flame retardant PVDF mechanical joint acid waste pipe system for high temperature corrosive chemical waste applications.
	3. **Exposed Waste Piping**
		1. Exposed Waste Piping: Chrome plated brass piping of full iron pipe size in finished rooms, casework, cabinets, equipment and reagent racks when not concealed by apron.
			1. Pipe: Conforming to ASTM B43, regular weight.
			2. Fittings: Conforming to ASME B16.15 and ASTM D2665.
			3. Unions: Brass or bronze with chrome finish. Unions 65 mm (2½ inches) and larger shall be flange type with approved gaskets.
		2. In unfinished rooms such as Mechanical Rooms and Kitchens, Chrome-plated brass piping is not required. Pipe materials specified under the paragraph “Sanitary Waste, Drain, and Vent Piping” can be used.
	4. **Specialty Pipe Fittings**
		1. For transition sleeve coupling, use the following material:
			1. Cast iron soil pipes: Rubber sleeve material conforming to ASTM C564.
			2. PVC soil pipes: Elastomeric seal or PVC conforming to ASTM F477.
			3. Dissimilar pipes: PVC sleeve material conforming to ASTM D5926.
	5. **Cleanouts**
		1. Cleanouts: Same size as the pipe, up to 100 mm; and not less than 100 mm for larger pipe.
			1. Ensure cleanouts are easily accessible, gastight and watertight. Provide minimum clearance of 600 mm for clearing a clogged sanitary line.
		2. Floor Cleanouts: Gray iron housing with clamping device and round, secured, scoriated, gray iron cover conforming to ASME A112.36.2M. Include a gray iron ferrule with hubless, socket, inside calk or spigot connection and counter sunk, taper-thread, brass or bronze closure plug. Frame, cover material and finish shall be nickel-bronze copper alloy with a square shape.
			1. Ensure cleanout is vertically adjustable for a minimum of 50 mm. When a waterproof membrane is used in the floor system, provide clamping collars on the cleanouts.
			2. Cleanouts in the resilient tile floors, quarry tile and ceramic tile floors: Provide with square top covers recessed for tile insertion.
			3. Use heavy duty type loading classification for cleanouts in sidewalk areas or areas subject to vehicular traffic.
		3. Provide cleanouts at or near the base of vertical stacks with cleanout plug approximately 600 mm above the floor. Where no fixtures are installed on the lowest floor, install cleanout at base of stack. Extend cleanouts to the wall access cover. Cleanout shall consist of sanitary tees. Furnish nickel-bronze square frame and stainless steel cover with minimum opening of 150 x 150 mm at each wall cleanout.
		4. Horizontal Runs Above Grade: Use cleanouts of cast brass tapered screw plug in fitting or caulked/hubless cast iron ferrule. Plain end (hubless) piping in interstitial space or above ceiling may use plain end (hubless) blind plug and clamp.
	6. **Floor Drains**
		1. General: Provide floor drains in all mechanical rooms for maintenance.
		2. General Data: Floor drains shall comply with ASME A112.6.3. Provide a caulking flange, inside gasket, or hubless connection for connection to cast iron pipe, screwed or no hub outlets for connection to steel pipe.
			1. Drain connection shall be bottom outlet.
			2. Provide a membrane clamp and extensions if required, where installed in connection with waterproof membrane.
			3. Puncturing membrane other than for drain opening will not be permitted.
			4. Double drainage pattern floor drains shall have integral seepage pan for embedding into floor construction, and weep holes to provide adequate drainage from pan to drain pipe.
			5. Membrane Flashing: For drains not installed in connection with a waterproof membrane, provide a 1.1 to 1.8 Kg (2.5 to 4 lbs.) flashing membrane, 600 mm square or approved alternative.
	7. **Floor Sinks**
		1. Galvanized cast iron body with stainless steel dome strainer and seepage flange.
		2. Square lacquered cast iron body with integral seepage pan, epoxy coated interior, aluminum dome strainer, clamp collar, epoxy coated sediment bucket, nickel bronze frame and full grate.
	8. **Traps**
		1. Provide traps on all sanitary branch waste connections from fixtures or equipment not provided with traps.
		2. Traps General: Correspond to fittings on cast iron soil pipe or steel pipe respectively and size as required by connected service or fixture.
		3. Exposed brass shall be polished brass chromium plated with nipple and set screw escutcheons.
		4. Concealed traps may be rough cast brass or same material as the piping to which they are connected to.
		5. Slip joints are not permitted on sewer side of trap.
	9. **Primer Valves and Trap Seal Primer Systems**
		1. Trap Primer: The trap seal primer valve shall be hydraulic, supply type with a pressure rating of 861 kPa (125 psig) and conforming to standard ASSE 1018.
			1. The inlet and outlet connections shall be 15 mm or DN15.
			2. The trap seal primer valve shall be fully automatic with an all brass or bronze body.
			3. The trap seal primer valve shall be activated by a drop in building water pressure, no adjustment required.
			4. The trap seal primer valve shall include a manifold when serving two (2), three (3), or four (4) traps.
	10. **Penetration Sleeves**
		1. Sleeve Flashing Devices - General: Provided at points where pipes pass through membrane waterproofed floors or walls.
		2. Sleeve Flashing Devices: Manufactured, cast iron fitting with clamping device that forms a sleeve for the pipe floor penetration of the floor membrane.
		3. Include a galvanized steel pipe extension in the top of the fitting that will extend 50mm above finished floor, and galvanized steel pipe extension in the bottom of the fitting that will extend through the floor slab.
	11. **Accessories**
		1. Provide miscellaneous materials for proper installation of hangers, supports and accessories as specified, required, directed or as noted on the drawings. If the vertical distance exceeds 6.1 m (20 ft.) for cast iron pipe provide additional support in the center of that span. Provide all necessary auxiliary steel to ensure that support.
		2. Cast Escutcheon with Set Screw: Provide at each wall, floor and ceiling penetration in exposed finished locations and within cabinets and millwork.
3. **EXECUTION**
	1. **Pipe Installation**
		1. Install pipe in accordance with requirements of the BC Plumbing Code, latest edition, and standards referenced in this Section, including pipe identification complete with legible lettering and flow arrows.
		2. Install branch piping for waste from respective piping systems and connect to all fixtures, valves, cocks, outlets, casework, cabinets and equipment, including those furnished by BCIT or specified in other Sections.
		3. Install pipe round and straight. Perform cutting with proper tools. Ream pipe to full size after cutting.
		4. Lay pipe runs to avoid interference with other work.
		5. Install piping:
			1. Above accessible ceilings where possible.
			2. To permit valve servicing or operation.
			3. Free of sags and bends.
		6. Install seismic restraint where required by Code.
		7. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends and long sweep bends. Sanitary tees and short sweep quarter bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
		8. Use long turn double wye branch and eighth bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90°. Proper size of standard increaser and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
	2. **Underground Piping**
		1. Lay buried soil and waste drainage and vent piping beginning at the low point of each system. Install piping true to grades and alignment indicated with unbroken continuity of invert. Place hub ends upstream. Install required gaskets according to manufacturer’s written instruction for use of lubricants, cements, and other installation requirements.
		2. Install cast iron piping according to CISPI’s “Cast Iron Soil Pipe and Fittings Handbook” Chapter IV, “Installation of Cast Iron Soil Pipe and Fittings”.
	3. **Above Ground Piping**
		1. Install aboveground PVC piping according to ASTM D2665**.**
	4. **Joint Construction**
		1. Join hub and spigot, cast iron piping with gasket joints in accordance with CISPI’s “Cast Iron Soil Pipe and Fittings Handbook” for compression joints.
		2. Install hub and spigot, cast iron piping with calked joints shall be joined in accordance with CISPI’s “Cast Iron Soil Pipe and Fittings Handbook” for lead and oakum calked joints.
		3. Hubless or no-hub, cast iron piping in accordance with CISPI’s “Cast Iron Soil Pipe and Fittings Handbook” for hubless piping coupling joints.
		4. Install threaded joints, and thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp disc cutters. Ream and remove butts of threaded pipe ends and restore to full pipe inside diameter. Join pipe fittings and valves as follows:
			1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is required by the pipe service.
			2. Replace pipe sections with damaged threads with new sections of pipe.
		5. For joints in PVC piping, use solvent cement joints for joints. Clean and dry surfaces prior to applying the primer and solvent cement. Installation practices shall comply with ASTM F402. The joint shall conform to ASTM D2855 and ASTM D2665 appendixes.
	5. **Specialty Pipe Fittings**
		1. Install transition coupling at pipe joints with small differences in pipe outside diameters.
		2. Dielectric fittings shall be installed at connections of dissimilar metal piping and tubing.
	6. **Pipe Hangars, Supports, and Accessories**
		1. Support piping according to the BC Plumbing Code, latest edition.
		2. Paint hangers, supports, rods, inserts and accessories used for pipe supports according to Division 09, Painting.
		3. Support horizontal cast iron piping with the following maximum horizontal spacing and minimum hanger rod diameters:
			1. 40 mm or DN40 to 50 mm or DN50 1500 mm (60 inches) with 10 mm rod.
			2. 75 mm or DN75 1500 mm with 15 mm rod.
			3. 100 mm or DN100 to 125 mm or DN125 1500 mm with 18 mm rod.
			4. 150 mm or DN150 to 200 mm or DN200 1500 mm with 20 mm rod.
			5. 250 mm or DN250 to 300 mm or DN300 1500 mm with 23 mm rod.
		4. Maximum spacing for plastic pipe shall be 1.22 m.
		5. Support vertical piping and tubing at base, at each floor, and at intervals no greater than 4.6 m.
	7. **Installation at Waterproofing and Firestopping**
		1. Penetrations:
			1. Fire Stopping: Where pipes pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases as specified in Division 07, Firestopping. Completely fill and seal clearances between raceways and openings with fire stopping materials.
			2. Water proofing: At floor penetrations, completely seal clearances around pipe with sealant, to make water-tight.
	8. **Installation**
		1. Exhaust vents: Extend separately through roof. Ensure sanitary vents are not connected to exhaust vents.
	9. **Field Quality Control – Tests**
		1. Test sanitary waste and drain systems either in their entirety or in sections.
		2. Conduct Waste System tests before trenches are backfilled or fixtures are connected. Conduct a water test or air test as directed by Consultant.
		3. Water Test:
			1. Where entire system is tested, tightly close all openings in pipes except highest opening, and fill system with water to point of overflow.
			2. Where the waste system is tested in sections, tightly plug each opening except highest opening of section under test, fill each section with water and test with at least a 3 m head of water.
			3. In testing successive sections, test at least upper 3 m of next preceding section so that each joint or pipe except upper most 3 m of system has been submitted to a test of at least a 3 m head of water. Prior to starting inspection, keep water in the system, or in portion under test, for at least 15 minutes. System shall then be tight at all joints.
		4. Air Test:
			1. Maintain air pressure of 34 kPa gauge for at least 15 minutes without leakage.
			2. Use a force pump and mercury column gage for the air test.
		5. After installing all fixtures and equipment, open water supply so that all p-traps can be observed. Inspect P-traps for at least 15 minutes for leaks and correct any leaks found.

\*\*\* END OF **FACILITY SANITARY AND VENT PIPING** SECTION \*\*\*