SECTION 22 10 01

PLUMBING PIPING AND ACCESSORIES

PART 1 GENERAL

1.1 REFERENCES

A. The following is a list of standards which may be referenced in this section:
   1. American National Standards Institute (ANSI).
   2. American Society of Sanitary Engineering (ASSE):
      a. 1010, Performance Requirements for Water Hammer Arresters.
      b. 1050, Performance Requirements for Stack Air Admittance Valves for Sanitary Drainage Systems.
   3. American Society for Testing and Materials (ASTM):
      a. A47/A47M, Standard Specification for Ferritic Malleable Iron Castings.
      b. A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
      c. A74, Standard Specification for Cast Iron Soil Pipe and Fittings.
      d. A105/A105M, Standard Specification for Forgings, Carbon Steel, for Piping Components.
      e. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
      f. A179/A179M, Standard Specification for Seamless Cold-Drawn Low-Carbon Steel Heat-Exchanger and Condenser Tubes.
      g. A181/A181M, Standard Specification for Forgings, Carbon Steel, for General-Purpose Piping.
      h. A197/A197M, Standard Specification for Cupola Malleable Iron.
      i. A234/A234M, Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
      j. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
      k. A518/A518M, Standard Specification for Corrosion-Resistant High-Silicon Iron Castings.
      l. A563, Standard Specification for Carbon and Alloy Steel Nuts.
      m. A861, Standard Specification for High-Silicon Iron Pipe and Fittings.
      n. A888, Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Application.
      o. B32, Standard Specification for Solder Metal.
      p. B61, Standard Specification for Steam or Valve Bronze Castings.
      q. B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
      r. B75, Standard Specification for Seamless Copper Tube.
      s. B88, Standard Specification for Seamless Copper Water Tube.
      t. B98/B98M, Standard Specification for Copper-Silicon Alloy Rod, Bar, and Shapes.
      u. B127, Standard Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip.
      v. B139/B139M, Standard Specification for Phosphor Bronze Rod, Bar, and Shapes.

w. B164, Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire.
x. B194, Standard Specification for Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar.
y. B306, Standard Specification for Copper Drainage Tube.
z. C564, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
aa. C1277 Standard Specification for Shielded Couplings joining Hubless Cast Iron Soil Pipe and Fittings
bb. D1784, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
cc. D1785, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
dd. D2000, Standard Classification System for Rubber Products in Automotive Applications.
ee. D2466, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings.
ff. D2564, Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
gg. D2855, Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.
hh. E438, Standard Specification for Glasses in Laboratory Apparatus.
ii. F656, Standard Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
jj. F1412, Standard Specification for Polyolefin Pipe and Fittings for Corrosive Waste Drainage Systems.
kk. F1412, Standard Specification for Polyolefin Pipe and Fittings for Corrosive Waste Drainage Systems.

4. American Water Works Association (AWWA):
   a. C104/A21.4, Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.
   b. C110/A21.10, Ductile-Iron and Gray-Iron Fittings, 75 mm. Through 1200 mm for Water and Other Liquids.
   c. C111/A21.11, Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings.
   d. C115/A21.15, Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
   e. C151/A21.51, Ductile-Iron Pipe, Centrifugally Cast, for Water.
   f. C203, Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied.
   g. C207, Standard for Steel Pipe Flanges for Waterworks Service-Sizes 100 mm Through 3600 mm
   h. C606, Grooved and Shouldered Joints.
   i. C651, Disinfecting Water Mains.
5. Cast Iron Soil Pipe Institute (CISPI): 301, Standard Specification for Hubless Cast Iron Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Application.
6. Conform with the National Plumbing Code of Canada with Manitoba Plumbing Code Amendments.

1.2 DESIGN REQUIREMENTS

A. Where pipe diameter, thickness, pressure class, pressure rating, or thrust restraint is not shown or specified, design piping system in accordance with the following:
   1. Building Services Piping Systems: National Plumbing Code of Canada with Manitoba Plumbing Code Amendments.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product data sheets.
   2. Shop Drawings
      a. Drawings showing changes in location of fixtures or equipment that are advisable in the opinion of Contractor.
   3. Isometric riser diagrams.

B. Informational Submittals:
   1. Changes in location of equipment or piping that affect connecting or adjacent work, before proceeding with the work.
   2. Complete list of products proposed for installation.
   3. Test records produced during testing.

PART 2 PRODUCTS

2.1 PIPING

A. Piping Schedule: Refer to Section 40 27 00, Process Piping—General.

B. Piping Material: Refer to Piping Data Sheet(s), Article—Supplements and Section 40 27 00, Process Piping—General.

2.2 HOSE VALVES AND HYDRANTS

A. HV-1, Hose Valve:
   1. Cast bronze globe valve, 20 mm size, with NPT screwed ends, union bonnet, rising stem, teflon disc, hand wheel, and NPT x NST hose thread adapter outlet connection.
   2. Rated 1034 kPa service water pressure, 2069 kPa WOG.
   3. Manufacturers and Products:
      a. Stockham; Figure B-22T.
      b. Crane Co.; Catalog No. 7TF.

B. HV-2, Hose Valve:
   1. Cast bronze globe valve, 40 mm size, with NPT screwed ends, union bonnet, rising stem, teflon disc, hand wheel, and NPT x NST hose thread adapter outlet connection.
   2. Rated 1034 kPa SWP, 2069 kPa-WOG.
   3. Manufacturers and Products:
      a. Stockham; Figure B-22T.
      b. Crane Co.; Catalog No. 7TF.

C. HV-3, Hose Valve:
   1. Cast bronze globe valve, 50 mm size, with NPT screwed ends, union bonnet, rising stem, teflon disc, hand wheel, and NPT x NST hose thread adapter outlet connection.
   2. Rated 1034 kPa SWP, 2069 kPa-WOG.
   3. Manufacturers and Products:
      a. Stockham; Figure B-22T.
      b. Crane Co.; Catalog No. 7TF.

D. HV-4, Hose Valve:
   1. Cast bronze globe valve, 65 mm size, with NPT screwed ends, union bonnet, rising stem, teflon disc, hand wheel, and NPT x NST hose thread adapter outlet connection.
   2. Rated Class 150 SWP, Class 300 WOG.
   3. Manufacturers and Products:
      a. Stockham; Figure B-22T.
      b. Crane Co.; Catalog No. 7TF.

2.3 PIPE HANGERS AND SUPPORTS

A. As specified in Section 40 05 15, Piping and Cable Tray Support Systems.

2.4 INSULATION

A. As specified in Section 40 42 13, Piping Insulation.

2.5 VALVES

A. Refer to Section 40 27 02, Process Valves and Operators.

2.6 MISCELLANEOUS PIPING SPECIALTIES

A. Strainers for Water Service:
   1. Iron body, Y-pattern, Class 125 rated, with screwed bronze or bolted iron cap.
   2. Screen: Heavy-gauge stainless steel or monel, 30-mesh.
   3. Manufacturers and Products:
      a. Crane; No. 988-1/2.
      b. Asco Red Hat.

B. Flexible Connectors for Stainless Steel Gas Lines:
   1. Corrugated, Type 316 stainless steel hose, with 250 mm live length and Type 316 stainless steel male NPT pipe connectors at each end.
   2. Manufacturers:
      a. Flexonics Ltd.
      b. North American Mfg. Co.

C. Vacuum Breakers 50 mm and Smaller:
   1. Angle type, as required.
   2. Manufacturers:
      a. Febco.
      b. Watts.

D. Water Hammer Arrestors:
   1. Materials: ASSE 1010 certified, Type L copper tube, HHPP piston with two lubricated EPDM O-rings, approved lubricant, rolled piston stop, wrought copper male thread adapter.
   2. Manufacturers and Products:
      a. J. R. Smith; Series 5000.
      b. Zurn Z-1700.
      c. P.P.P. Inc., SS Series

E. Water Hose:
   1. Furnish 15 m length(s) of EPDM black cover and EPDM tube, reinforced with two textile braids. Furnish each length with brass male and female NST hose thread couplings to fit hose nozzle(s) and hose valve(s) specified.
   2. Rated minimum working pressure of 1369 kPa.
   3. Manufacturers:
      a. Goodyear.
      b. Boston.

F. Hose Nozzles:
   1. Furnish cast brass satin finish nozzle(s) with adjustable fog, straight-stream, and shut-off features and rubber bumper. Provide nozzle(s) with female NST hose thread.
   2. Manufacturers:
      a. Croker.
      b. Elkhart.

G. Sleeves:
   1. Manufacturers and Products:
      a. J. R. Smith; Figure 1720.
      b. Zurn Z198.

H. Flashing Sleeves for Roof Penetrations:
   1. Built-Up Bituminous Roofing: Fabricate of lead as specified in Section 07 62 00, Sheet Metal Flashing and Trim.
   2. Single-Ply Membrane Roofing: Pipe seals as specified in Section 07 70 01, Roof Specialties and Accessories.

I. Insulating Dielectric Unions and Flanges:
   1. Galvanically compatible with piping to which attached and pressure ratings suitable for system working pressures.
   2. Unions 50 mm and Smaller: Screwed or solder-joint type.
   3. Unions 65 mm and Larger: Flanged type, complete with bolt insulators, dielectric gasket, bolts, and nuts.
   4. Manufacturers:
      a. Epco Sales, Inc., Cleveland, OH.
      b. Capitol Insulation Unions.

J. Air Admittance Valve (AAV):
   1. PVC construction with internal air check valve and insect screen.

2. Unit shall meet ASSE 1051 for fixture and branch air admittance valves.
3. Unit shall bear seal of ASSE approval.
4. Manufacturer and Product: Studor, Inc., Dunedin, Florida; Maxi-Vent (50 mm to 100 mm).

K. Joint Solder: 95-5 wire solder, ASTM B32, Grade 95 TA. Do not use cored solder.

L. Pipe Joint Sealer: Compound insoluble in water or Teflon tape; approved by NFS for use in potable water.

M. Rubber Gaskets: ASTM C564.

2.7 METERING AND MEASURING DEVICES

A. Thermometers:
1. Adjustable angle, red reading mercury type with 225 mm case and scale range in degrees C, as shown.
2. Furnish with 90 mm stem length and separable NPT brass thermowell.
3. Manufacturers:
a. Weksler.
b. Trerice.

B. Pressure Gauges:
1. Construction: 90 mm gauge size, 0 to 690 kPa, 0 to 1103 kPa range, steel case, glass crystal, brass movement, and 6 mm NPT lower connection.
2. Furnish with 6 mm brass gauge cock.
3. Manufacturers and Products:
a. Ashcroft; Type 1008.
b. Marsh; J80.

PART 3 EXECUTION

3.1 GENERAL

A. Install plumbing systems to meet the National Plumbing Code of Canada with Manitoba Plumbing Code Amendments.

B. Field Obstructions:
1. Drawings do not attempt to show exact details of piping. Provide offsets around obstructions.
2. Do not modify structural components, unless approved by Contract Administrator.

C. Sleeves:
1. Pipe sizes shown are nominal sizes, unless shown or specified otherwise.
2. Provide piping passing through walls, floors, or ceilings with standard-weight pipe sleeves.
3. Provide pipes passing through finished walls with chrome-plated canopy flanges.
4. Dry pack sleeves in existing work in-place and provide finished appearance.

5. Pack holes left by removal of existing piping with grout and finish to match adjacent surface.

D. Provide unions in piping systems at connections to equipment.

E. Provide insulating dielectric unions and flanges between ferrous and nonferrous piping and where otherwise required for electrically insulated connection.

F. Pipe air release valves, water-lubricated bearings, and other appurtenances having water effluent to nearest drain with copper tubing.

3.2 INSTALLATION

A. Steel Pipe:
1. Ream, clean, and remove burrs and mill scale from piping before making up.
2. Seal joint with pipe joint sealer of Teflon tape.

B. Copper Tubing:
1. Cut tubing square and remove burrs.
2. Clean both inside of fittings and outside of tubing with steel wool and hydrochloric acid before soldering.
3. Prevent annealing of fittings and hard-drawn tubing when making connections.
4. Do not use mitered joints for elbows or notching of straight runs of pipe for tees.

C. Rigid PVC or CPVC:
1. Cut, make up, and install in accordance with pipe manufacturer's recommendations.
2. Ream, clean, and remove burrs from cut ends before joining pipe.
3. Lay in trench by snaking pipe from one side to other.
4. Offset: As recommended by manufacturer for maximum temperature variation between time of solvent welding and final use.
5. Do not lay pipe when temperature is below 4.5 degrees C or above 32 degrees C when exposed to direct sunlight.
6. Shield ends to be joined from direct sunlight prior to and during laying operation.
7. Use strap wrenches only for tightening threaded plastic joints. Do not over tighten fittings.

D. Water System Balancing: Provide a qualified registered engineer or firm specializing in testing and balancing to adjust domestic hot water system. Balance system for required water flows at each plumbing fixture, terminal device, and recirculating hot water loop.

E. Water Hammer Arrestors:
1. Install in piping systems where shown on Drawings and adjacent to pieces of equipment where quick closing valves are installed.
2. Install at all emergency safety showers and eyewashes.
3. Size and install in accordance with Plumbing and Drainage Institute Standard PDI-WH201.
4. Shock arresters to have access panels or to be otherwise accessible.

F. Valves: Install in accordance with manufacturer's recommendations.

G. Miscellaneous Piping Specialties: Install in accordance with manufacturer's recommendations.

H. Metering and Measuring Devices: Install in accordance with manufacturer's recommendations.

3.3 SANITARY AND WASTE DRAINS AND VENTS PIPING

A. Installation:
1. Set piping occurring above floor slab true and plumb.
2. Set exposed risers as close to walls as possible.
3. Where vent stacks pass through roof slab, fit with flashing sleeve secured to roof.
4. Extend vents minimum 305 mm above roof.
5. Provide cleanouts where shown and where required by code.

3.4 HVAC CONDENSATE PIPING

A. Set piping true and plumb.

B. Slope piping 1:100 minimum.

3.5 HOSE VALVES

A. Unless indicated otherwise, provide the following for each hose valve (HV-x) indicated on the drawing.
1. Hose Rack. Refer to Standard Detail on drawings for hose rack construction detail.
2. Water Hose complete with Hose Nozzle.
3. Water hose and hose nozzles shall match size of hose valves
4. Where a hose rack for a particular hose valve is not shown on the drawing, exact location of hose rack shall be coordinate during construction.

3.6 WATER SUPPLY PIPING

A. Water supply piping includes potable water (PW), domestic hot water (DHW), domestic hot water return (DHR), tempered domestic water (TDW) and nonpotable water (NPW) systems.

B. Flush water piping systems clean of internal debris, clean faucet aerators, and adjust plumbing fixture valves for manufacturer’s recommended flow.

C. Do not run water piping through electrical rooms, stairwells, or immediately over or within a 1 m horizontal clearance of electrical panels, motor starters, or environmental control panels.

D. Hose Valves and Hydrants: Attach handle with setscrew and provide manufacturer’s recommended gravel fill around drain hole of post hydrants.

E. Provide valve operators with position indicators, where indicated, to show position of valve disc or plug.

F. Provide bypass with globe valve for emergency throttling around each reducing valve.

G. Protect buried copper and steel pipe and fittings with a single wrap of coal-tar saturated felt in accordance with AWWA C203.

H. Vacuum Breakers 50 mm and Smaller: Install minimum 150 mm above flood line of equipment they serve.

I. Provide manual air vents at high points in domestic hot water system.

3.7 INSULATION

A. As specified in Section 40 42 13, Piping Insulation.

3.8 HANGERS AND SUPPORTS

A. In accordance with Section 40 05 15, Piping and Cable Tray Support Systems.

B. Install pre-engineered support equipment in accordance with the manufacturer's recommendations.

3.9 INTERIM CLEANING

A. As specified in Section 40 27 00, Process Piping—General.

B. Prevent accumulation of weld rod, weld spatter, pipe cuttings and filings, gravel, cleaning rags, and other foreign material within piping during fabrication and assembly.

C. Examine piping to assure removal of foreign objects prior to assembly.

D. Shop cleaning may employ conventional commercial cleaning method if it does not corrode, deform, swell, or otherwise alter physical properties of material being cleaned.

3.10 TESTING

A. As specified in Section 40 80 01, Process Piping Leakage Testing.

3.11 CLEANING AND DISINFECTION

A. Prior to final acceptance, following assembly and testing, flush pipelines with water, except for plant process air lines and instrument air lines, and remove accumulated construction debris and other foreign matter.

B. Minimum Flushing Velocity: 1.52 meter per second.

C. Insert cone strainers in the connections to attached equipment and leave until cleaning has been accomplished.

D. Remove accumulated debris through drains 50 mm and larger or by dropping spools and valves.

E. Immediately following drainage of flushed lines, dry piping with compressed air.

F. Plant process air and instrument air piping shall be blown clean of loose debris with compressed air.

G. Disinfect pipelines intended to carry potable water before placing in service:
   1. Meet the requirements of AWWA C651, unless otherwise specified.
   2. Disinfecting Mixture:
      a. A chlorine-water solution having a free chlorine residual of 40 ppm to 50 ppm.
      b. Prepare by injecting one of the following:
         1) Liquid chlorine gas-water mixture.
         2) Dry chlorine gas.
         3) Calcium or sodium hypochlorite and water mixture.
      c. Inject mixture into pipeline at a measured rate while freshwater is allowed to flow through the pipeline at a measured rate so the combined mixture of freshwater and chlorine solution or gas is of the specified strength.
      d. Apply liquid chlorine gas-water mixture by means of a chlorinating device.
      e. Feed dry chlorine gas through proper devices for regulating the rate of flow and providing effective diffusion of gas into water within pipe being treated.
      f. Chlorinating devices for feeding solutions of chlorine gas or gas itself must prevent backflow of water into chlorine cylinder.
      g. Calcium Hypochlorite: If this procedure is used, first mix dry powder with water to make a thick paste, then thin to approximately a 1 percent solution (10,000 ppm chlorine).
      h. Sodium Hypochlorite: If this procedure is used, dilute liquid with water to obtain a 1 percent solution.
      i. The following proportions of hypochlorite to water will be required:

Product	Quantity	Water
Calcium Hypochlorite [1] (65 - 70 percent C1)	0.5 kg	28.5 Litres
Sodium Hypochlorite [2] (5.25 percent C1)	3.8 Litres	16 Litres
1. Comparable to commercial products known as HTH, Perchloron, and Pittchlor. 2. Known as liquid laundry bleach, Clorox, and Purex.		

H. Point of Application:
   1. Inject chlorine mixture into pipeline to be treated at the beginning of the line through a corporation stop or suitable tap in the top of pipeline.
   2. Control clean water from the existing system or another source so it flows slowly into newly installed piping during chlorine application.
   3. Manipulate valves so the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Use check valves if necessary.

I. Retention Period:
   1. Retain treated water in pipeline for a minimum of 24 hours or long enough to destroy nonspore-forming bacteria.

2. At the end of the retention period, the disinfecting mixture shall have a strength of at least 10 ppm of chlorine.
3. Operate valves, hydrants, and other appurtenances during disinfection to assure disinfecting mixture is dispersed into all parts of the pipeline including dead ends, new services, and similar areas that otherwise may not receive the disinfecting solution.
4. Do not place concentrated quantities of commercial disinfectants in pipeline before filling with water.
5. After chlorination, flush the water from the permanent source of supply until water through pipeline is equal chemically and bacteriologically to the permanent source of supply.

J. Disposal of Disinfecting Water:
1. Dispose of disinfecting water in an acceptable manner that will protect the public and receiving waters from harmful or toxic concentrations of chlorine.
2. Do not allow disinfecting water to flow into a waterway without adequate dilution or other satisfactory method of reducing chlorine concentrations to a safe level.

3.12 CORROSION PROTECTION

A. As specified in Section 40 27 00, Process Piping—General.

3.13 PROTECTION OF INSTALLED WORK

A. Protective Covers:
1. Provide over floor and shower drains during construction, to prevent damage to drain strainers and keep foreign material from entering drainage system.
2. Cover roof drains and emergency overflow drains during roofing process so roofing material and gravel do not enter drain piping.
3. Remove at time of Substantial Completion.

3.14 FIELD FINISHING

A. In accordance with Section 40 27 00, Process Piping—General.

3.15 PIPING IDENTIFICATION

A. Refer to Section 40 27 00, Process Piping—General and Pipe Schedule.

3.16 SUPPLEMENTS

A. The supplements listed below, following “End of Section,” are part of this Specification.
1. 22 10 01.01, Plumbing Piping Schedule.

2. Plumbing Piping Data Sheets.

Section Number		Title
22 10 01.02		Polyvinyl Chloride Drain Waste and Vent (PVC DWV) Pipe and Fittings
22 10 01.03		Cast Iron Soil Pipe (CISP) and Fittings

END OF SECTION

SECTION 22 10 01.01

PLUMBING PIPING SCHEDULE

Legend	Service	Size(s) (mm)	Exposure	Piping Material	Specification Section	Operating Pressure (kPa)	Test Type	Test Pressure (kPa)	Pipe Colors and Labels	Notes
CON	Condensate Drain, HVAC	All	EXP/BUR	CU01	40 27 00.13	NA	H	34.5		
D	Sanitary Drain	All	EXP/BUR	CI01	22 10 01.03	NA	H	34.5		
DHW, DHR, NPH.	Hot Water, Potable and Non-potable	12-65	EXP/BUR	CU01	40 27 00.13		H			
DHW, DHR, NPH	Hot Water, Potable and Non-potable	>65	EXP/BUR	SS01	40 27 00.08		H			
RW	Roof Drainage Water	All	EXP/BUR	CI01	22 10 01.02	NA	H	34.5		
SPD	Sump Pump Discharge	25-80	EXP/BUR	SS01	40 27 00.08		H			
TP	Trap Primer	12-20	EXP/BUR	CU01	40 27 00.13	NA	H			
TDW	Tempered Domestic Water	All	EXP/BUR	CU01	40 27 00.13		H			
NPT	Non-potable Tempered Water	All	EXP/BUR	SS01	40 27 00.08		H			
VTA	Sanitary Vent	All	EXP	CI01	22 10 01.03	NA	H	34.5		
PW, NPW	Potable Water, Non-Potable Water	12-65	EXP/BUR	CU01	40 27 00.13		H			
PW, NPW	Potable Water, Non-Potable Water	>65	EXP/BUR	SS01	40 27 00.08		H			

Notes:

1. Refer Section 23 23 00, Refrigerant Piping, for testing requirements.

Legend		
Exposure	Pressure Test	Material
BUR Buried	H Hydrostatic	CISP Cast Iron Soil Pipe
EXP Exposed		CU0X Copper
		SS0X Stainless Steel

END OF SECTION

SECTION 22 10 01.02 POLYVINYL CHLORIDE DRAIN WASTE AND VENT (PVC-DWV) PIPE AND FITTINGS		
Item	Size	Description
Pipe and Fittings	All	PVC-DWV Schedule 40 nonpressure application, Class 12454B conforming to ASTM D2665 and ANSI/NSF Standard 14 system.
Joints	All	Solvent cemented conforming to ASTM D2855 except where connection to equipment may require future removal.
Solvent Cement	All	As recommended by the pipe and fitting manufacturer conforming to ASTM D2564.

END OF SECTION

SECTION 22 10 01.03 CAST IRON SOIL PIPE AND FITTINGS (CI01)		
Item	Size	Description
Pipe	150 mm and smaller	Hubless, CISPI 301, service weight, no-hub ends.
	200 mm and larger	Hub and spigot, ASTM A74, service weight, single hub and spigot.
Joints	150 mm and smaller	Compression: Neoprene sealing sleeve with 24-gauge Type 304 stainless steel shield and clamp assembly.
	200 mm and larger	Rubber gaskets, ASTM C564.
Fittings	All	ASME B16.4; ASME 16.12, CISPI 301.
Coating	All	Bituminous-coated inside and out; marked with manufacturer’s name or trademark and CISPI symbol.

END OF SECTION

SECTION 22 30 00

PLUMBING EQUIPMENT

PART 1 GENERAL

1.1 REFERENCES

A. The following is a list of standards which may be referenced in this section.
   1. Provincial Plumbing Code and the requirements of local authorities having jurisdiction.
   2. National Plumbing Code of Canada.
   3. Canadian Gas Association (CGA).
   4. CAN/CSA Label on Fixtures and Equipment.
   5. American Society of Heating, Refrigerating & Air-Conditioning Engineers, Inc. (ASHRAE): 90.1, Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings.
   6. American Society of Mechanical Engineer's (ASME).
   7. American Society of Sanitary Engineering (ASSE):
      a. 1013, Performance Requirements for Reduced Pressure Principle Backflow Preventers.
      b. 1015, Performance Requirements for Double Check Backflow Prevention Assembly.
   8. American Water Works Association (AWWA):
      a. C510, Double Check Valve Backflow Prevention Assembly.
      b. C511, Reduced-Pressure Principle Backflow Prevention Assembly.
      c. C550, Protective Epoxy Interior Coatings for Valves and Hydrants.
   9. American Society for Testing and Materials (ASTM):
      a. A48, Standard Specification for Gray Iron Castings.
      b. D4101, Specification for Polypropylene Injection and Extrusion Materials.
   10. Canadian Standards Association (CSA):
      a. B64.4, Backflow Preventers, Reduced Pressure Principle Type (RP).
      b. B64.5, Backflow Preventers, Double Check Valve Type (DCVA).
   11. Factory Mutual Global (FM).
   12. National Electrical Code (NEC).
   13. Foundation for Cross-Connection Control and Hydraulic Research (FCCHR): Manual of Cross-Connection Control.
   14. National Electrical Manufacturers Association, (NEMA): MG 1, Motors and Generators.
   15. National Sanitation Foundation International (NSF).
   16. Underwriters Laboratories of Canada (ULC).

1.2 SUBMITTALS

A. Action Submittals: Manufacturer's product data.

1.3 SPECIAL GUARANTEE

A. Where note below, provide manufacturer's extended guarantee in writing with the City named as beneficiary. Special guarantee shall provide for correction, or at the option of the City,

removal and replacement of products found defective during the stated period after date of Substantial Completion.

PART 2 PRODUCTS

2.1 WATER HEATERS

A. Electric Water Heater (Commercial):
   1. Description:
      a. Automatic, vertical, electric storage type.
      b. Regulatory Compliance: UL listed, ASME, ASHRAE 90.1, and NSF.
      c. Tank: Steel, glass-lined, 1034 kPa working pressure, and ASME rate with 100 mm by 150 mm handhole cleanout.
      d. Insulation: Foam or fiberglass type with minimum R value per ASHRAE 90.1.
      e. Dip Tube: Required on inlet connection down to bottom section of tank.
      f. Anode: Heavy-duty, tank-mounted, screw-in type.
      g. Pressure/Temperature Relief Valve: ASME rated.
      h. Connections: Inlet and outlet with factory-installed dielectric unions and brass drain valve with hose thread.
      i. Heating Element: Watt-density (maximum of 116 kW per square meter) incoloy sheath; immersion type.
      j. Controls: Fully automatic, house in hinged control panel, and including the following:
         1) Terminal block.
         2) Close differential immersion-type thermostat.
         3) Control transformer for 120-volt circuit and fusing.
         4) Magnetic contactors for each stage.
         5) Manual reset high-limit switch.
         6) Adjustable temperature range, 35 to 85 degrees C.
         7) Power circuit fusing as required by NEC, UL, and ULC.
      k. Guarantee: 3 years.
   2. Capacity: See Equipment Schedule at end of section.
   3. Manufacturers:
      a. AO Smith.
      b. Lochinvar Corporation.

B. Gas Water Heating System (Commercial):
   1. Description: Complete packaged system, including skid-mounted water heater, storage tank, circulation pump, controls, interconnecting piping, fittings, and valves.
      a. Water Heater: Automatic, gas-fired, instantaneous type with the following features:
         1) Direct vent.
         2) Sealed combustion chamber.
         3) Cupro-Nickel finned spiral heat exchanger.
         4) Ceramic-lined combustion chamber.
         5) ASME rated for 1103 kPa working pressure and 85 degrees C temperature.
      b. Regulatory Compliance: CGA, ASME, ASHRAE 90.1, and NSF.
      c. Tank: Steel, glass-lined, 1034 kPa working pressure.

d. Insulation: Foam or fiberglass type with minimum R value per ASHRAE 90.1.
e. Pressure/Temperature Relief Valve: ASME rated.
f. Connections: Inlet and outlet with factory-installed dielectric unions and brass drain valve with hose thread.
g. Burner: Stainless steel, 95 percent efficient, and cast iron with primary air injection.
h. Vent: Direct Vent through wall.
i. Controls: Fully automatic with the following:
   1) Premounted and wired pump and starter.
   2) Diagnostic controls.
   3) Hot surface ignition control.
   4) Terminal strip.
   5) Diagnostics control panel.
   6) Flow switch.
j. Recirculation Pump: Bronze fitted, in-line circulator, suitable for the circulated fluid.
k. Guarantee: 5 years.

2. Capacity: See data sheet at end of section.
3. Manufacturers:
   a. AO Smith, Cyclone Mxi Modulating series.
   b. Lochinvar Corporation.

C. Tankless Electric Instantaneous Water Heater:
1. Chronomite Laboritories Inc., INSTANT–TEMP tankless electric water heater as follows:
   a. A Model #ER-60L.208, CSA listed, instantaneous, low pressure, point of use water heater complete with back plate for surface mounting, built-in temperature fail safe, self cleaning celon waterways, stainless steel heating coils, differential pressure flow activated switch, on/off power switch assembly, electrical connection terminals, conduit access hole, compression connection fitting and cover.
   b. Unit shall be capable of heating 0.022 L/s to 0.252 L/s (0.35 gpm to 4.0 gpm), with factory preset temperature at 60°C (140°F) with a 12.5 kW heating coil, 208/1/60, 60 amp electric power supply.
2. Manufacturer: Chronomite Laboritories Inc.

2.2 GAS VENT STACK

A. For Gas-Fired Water Heaters:
1. UL listed, Type B double wall, insulated gas vent pipe with rain cap.
2. Stainless steel inner and outer jacket.
3. Insulating thimble.
4. Pier section with cleanout where stack is offset.
5. Manufacturer’s standard fittings as required.

B. Manufacturers and Products:
1. Selkirk; Metalbestos.
2. Van Packer.

2.3 DOMESTIC WATER EXPANSION TANK

A. Description:
   1. Type: Prepressurized diaphragm type, horizontal or vertical per expansion tank data sheet at end of section.
   2. Shell: Welded steel.
   3. Diaphragm: FDA-approved, heavy-duty butyl with polypropylene liner.
   4. Connection Size: Per expansion tank data sheet at end of section.
   5. Maximum Operating Pressure: Per expansion tank data sheet at end of section.
   6. Maximum Operating Temperature: Per expansion tank data sheet at end of section.
   7. Finish: Manufacturer's standard air-dry enamel.

B. Capacity: See data sheet at end of section.

C. Manufacturer:
   1. Amtrol Inc.
   2. Bell & Gossett.
   3. Taco Inc.

2.4 DOMESTIC HOT WATER CIRCULATING PUMP

A. Description:
   1. Type: In-line, direct-drive, close-coupled centrifugal pump.
   2. Construction: Bronze body, stainless steel face plate, glass-filled noryl impeller, carbon steel shaft, mechanical carbon on ceramic seals, and bronze oil lubricated motor bearings.
   3. NSF 372 certified
   4. Motor: Permanent split-capacitor with thermal overload protection.
   5. Accessories: Aquastat and automatic timer kit.

B. Capacity: See data sheet at end of section.

C. Manufacturers:
   1. S. A. Atrmstrong, Astro 2 Series
   2. Bell & Gossett.
   3. Taco, Inc.

2.5 BACKFLOW PREVENTERS

A. Reduced Pressure Backflow Preventers (6 mm Through 12 mm):
   1. Description:
      a. Regulatory Compliance: AWWA C511, CSA B64.4, FM.
      b. Valve Body: Bronze.
      c. End Connections: Threaded, NPT.
      d. Maximum Working Pressure: 1207 kPa (2413 kPa test).
      e. Temperature Range: 0 degrees to 60 degrees C.
      f. Shutoff Valve: Full port, resilient seated, bronze ball valve with bronze ball valve test cock.
      g. Accessories: Drainline air gap fitting.
   2. Sizes: See data sheet at end of section.

3. Manufacturer and Product: Conbraco Industries; Series 20-400.

B. Reduced-Pressure Backflow Preventers (20 mm Through 50 mm):
1. Description:
a. Regulatory Compliance: AWWA C511, CSA B64.4.
b. Valve Body: Bronze.
c. End Connections: Threaded, NPT.
d. Maximum Working Pressure: 1207 kPa (2413 kPa test).
e. Temperature Range: 0 degrees to 60 degrees C.
f. Shutoff Valve: Full port, resilient seated, bronze ball valve with bronze ball valve test cock.
g. Inlet Strainer: Bronze wye strainer, 40-mesh perforated, Type 304 stainless steel.
h. Accessories: Drainline air gap fitting.
2. Sizes: See data sheet at end of section.
3. Manufacturers and Products:
a. Febco; Model 860.
b. Watts; Model 909.

C. Reduced Pressure Backflow Preventers (65 mm Through 250 mm):
1. Description:
a. Regulatory Compliance: AWWA C511, CSA B64.4.
b. Valve Body: Ductile or cast iron, Class 125, epoxy-coated.
c. End Connections: Flanged.
d. Maximum Working Pressure: 1207 kPa (2413 kPa test).
e. Temperature Range: 0 degrees to 60 degrees C.
f. Shutoff Valve: Nonrising stem, resilient seated gate valve with bronze ball valve test cock.
g. Inlet Strainer: cast-iron wye strainer, Class 125 flanged, fusion epoxy AWWA C550 coated, perforated stainless steel screen (1.5 mm perforations on 65 mm to 100 mm; 3 mm perforation on 150 mm to 250 mm), threaded cap plug blowout opening.
h. Accessories: Drainline air gap fitting.
2. Sizes: See data sheet at end of section.
3. Manufacturers and Products:
a. Febco; Model 860.
b. Watts; Model 909.

D. Water Meter: : Provide water meter conforming to the City of Winnipeg By-Law.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install, arrange, and connect equipment as shown on Drawings and in accordance with manufacturer’s recommendations.

3.2 FIELD QUALITY CONTROL

A. Pumps: Do not hydrostatic test pumps with mechanical seals.

B. Startup:
   1. In accordance with Section 01 91 14, Equipment Testing and Facility Startup, and Section 23 05 93, Testing, Adjusting, and Balancing for HVAC.
   2. Piping Systems: Verify that flushing, cleaning, and testing has been completed prior to startup.

3.3 SUPPLEMENTS

A. Supplements listed below, following "End of Section," are a part of this Specification.
   1. Electric Water Heater (Commercial) Schedule.
   2. Gas Water Heater (Commercial) Schedule.
   3. Tankless Electric Instantaneous Water Heater Schedule.
   4. Domestic Water Expansion Tank Schedule
   5. Domestic Hot Water Circulating Pump Schedule
   6. Backflow Preventers Schedule.

END OF SECTION

ELECTRIC WATER HEATER (COMMERCIAL)

Tag Number	Storage Capacity (litre)	Total Input (kW)	No. of Elements	Simultaneous Element Operation	Voltage	Diameter (mm)	Height (mm)	Manufacturer, Model No.
TK-R530	76	3.0	1	NA	120v-1ph	525	900	AO Smith, Model DEL-20
TK-G530	76	3.0	1	NA	208v-1ph	525	900	AO Smith, Model DEL-20
TK-K531	450	12.0	1	NA	575v-3ph	750	1,700	AO Smith, Model DSE-120
Notes:								

GAS WATER HEATER (COMMERCIAL)

Gas Water Heater:									
Tag Number	Heating Capacity Input (kW)	Recovery @ 100F Rise (L/s)	Percent Efficiency	Length (mm)	Diameter (mm)	Height (mm)	Vent Size (mm)	Firing Control System	Manufacturer, Model No.
TK-C531	146	0.60	95%	---	841	1924	100	*	AO Smith, Model BTH-500(A)
TK-C532	146	0.60	95%	---	841	1924	100	*	AO Smith, Model BTH-500(A)
TK-C533	146	0.60	95%	---	841	1924	100	*	AO Smith, Model BTH-500(A)
Notes: 1. Intelligent Control system with LCD display compatible with the iCOMM remote monitoring system.									

TANKLESS ELECTRIC INSTANTANEOUS WATER HEATER

Tag Number	Storage Capacity (litre)	Total Input (kW)	No. of Elements	Simultaneous Element Operation	Voltage	Width (mm)	Height (mm)	Manufacturer, Model No.
TK-S510	NA	12.5	1	NA	208v-1ph	445	388	Chronomite, Model ER-60/208
Notes:								

DOMESTIC WATER EXPANSION TANK

Tag Number	Configuration (horiz / vert)	Total Volume (litre)	Acceptance Volume (litre)	Air Pre-charge (kPa)	Diameter (mm)	Height (mm)	Manufacturer, Model No.
V-C530	Vertical	95	41.8	275	406	813	Amtrol, Model ST-60VC

DOMESTIC HOT WATER CIRCULATING PUMPS

Tag Number	Flow Rate (L/s)	Pressure (m head)	Motor (kW)	Power (Volts/phase)	Manufacturer, Model No.
P-K531	0.36	2.22	0.075	120V/1ph	S A Armstrong, Model Astro 225BS
P-C530	0.59	2.04	0.210	208V/1ph	S A Armstrong, Model Astro 280SS

BACKFLOW PREVENTERS

Tag Number	Valve Type	Size (mm)	Flow Stream	Maximum Operating Flow (L/s)	Maximum Pressure Drop (kPa)	Manufacturer, Model No.
	(note 1)					
BFP-C510D	RP	40	NPH	2.8	82.7	Febco, Model 825Y
BFP-C510E	RP	40	NPH	2.8	82.7	Febco, Model 825Y
BFP-C530K	RP	100	PW	20.2	62.1	Febco, Model 825Y
BFP-C530L	RP	100	PW	20.2	62.1	Febco, Model 825Y
BFP-C530M	RP	100	NPW	20.2	62.1	Febco, Model 825Y
BFP-C530N	RP	100	NPW	20.2	62.1	Febco, Model 825Y

Notes: 1. Valve Type: RP - Reduced Pressure
2. Flow Streams: NPH – Non-potable Hot Water, PW - Potable Water, NPW – Non-potable Water

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 GENERAL

1.1 REFERENCES

A. The following is a list of standards which may be referenced in this section:
   1. Canadian Gas Association (CGA).
   2. American Society of Mechanical Engineers (ASME).
   3. American Society of Sanitary Engineering (ASSE): 1010, Performance Requirements for Water Hammer Arresters.
   4. CSA/CSA Label on Fixtures.
   5. Plumbing and Drainage Institute (PDI):
      a. Code Guide 302 and Glossary of Industry Terms.
      b. WH-201, Water Hammer Arrester Standard.
   6. Underwriters Laboratories of Canada (ULC).

1.2 SUBMITTALS

A. Action Submittals:
   1. Shop Drawings: Catalog information and rough-in dimensions for plumbing fixtures, products, and specialties.

1.3 REGULATORY REQUIREMENTS

A. Comply with the Plumbing Code and the requirements of provincial and local authorities having jurisdiction.

B. Comply with the Canadian with Disabilities Act, and local and provincial requirement.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fixture Trim:
   1. Supply Stops and Traps:
      a. McGuire.
      b. American Standard.
      c. Kohler.
   2. Flush Valves: Sloan.
   3. Water Closet Seats:
      a. Bemis.
      b. Centoco.
      c. Olsonite.

4. Lavatory Supply, Tailpiece, and Trap Insulation:
    a. McGuire.
    b. Trap Wrap.
    c. Truebro.

B. Plumbing Fixtures:
1. Water Closets, Lavatories, and Service Sinks:
    a. American Standard.
    b. Kohler.
    c. Crane.
2. Service Sinks:
    a. American Standard.
    b. Kohler.
    c. Eljer.
3. Faucet Fittings:
    a. Sinks:
        1) Chicago.
        2) American Standard.
    b. Lavatories:
        1) Chicago.
        2) American Standard
        3) Symmons.
4. Shower Trim:
    a. Symmons.
    b. Powers.
5. Stainless Steel Sinks:
    a. Elkay.
    b. Aristraline.
6. Mop Sinks:
    a. Stern-Williams.
    b. Fiat Products Inc.
    c. Fixture Manufacturers.

C. Emergency Showers and Eyewashes:
1. Haws.
2. Western.
3. Encon.

D. Plumbing Specialties:
1. Shock Arresters:
    a. Smith.
    b. Sioux Chief.
    c. Precision Plumbing Products.
2. Trap Primers:
    a. Precision Plumbing Products.
    b. Smith.
3. Pressure/Temperature Relief Valves:
    a. Cash-Acme.

b. Kunkle Valve.
c. Watts.

4. Pressure Gauges:
   a. Ashcroft.
   b. Marsh.
   c. Marshalltown.
5. Thermometers:
   a. Trerice.
   b. Weksler.

E. Drainage Products:
1. General:
   a. Smith.
   b. Watts.
   c. Zurn.
2. Acid Resistant:
   a. Enfield.
   b. Pegas.

2.2 GENERAL

A. Fixture Trim: Provide plumbing fixture trim where applicable on fixtures.

B. Plumbing Fixtures: Indicated by fixture number as shown on Drawings.

C. Drainage Products: Indicated by fixture number as shown on Drawings.

D. Plumbing Specialties: Indicated by fixture number as shown on Drawings.

E. Exposed fixture connections and piping shall be polished chrome-plated.

2.3 MATERIALS

A. Fixture Trim:
1. Supply Stop:
   a. Flexible supply with heavy cast brass, loose key, 12 mm IPS by 10 mm OD tubing angle stop to wall with escutcheon plate; chrome-plated finish.
   b. Provide stop with stuffing box.
   c. Manufacturer: McGuire Manufacturing Company, Inc., Model H16JLK.
2. Trap:
   a. Chrome-plated, 17-gauge, semicast P-trap with compression ring cast brass waste and vent connection and cleanout.
   b. 40 mm for lavatories and drinking fountains.
   c. 40 mm for sinks.
   d. Manufacturer: McGuire Manufacturing Company, Inc., Model 8872C-17T.
3. Water Closet Flush Valves: Sloan Valve Co., Royal Continental, low flush, quiet action with screwdriver stop and vacuum breaker.

B. Plumbing Fixtures:
   1. LAV-1, Lavatory (Wall-Hung Type, barrier free design):
      a. Fixture: 537 mm by 559 mm, vitreous china, for floor-mounted concealed arm carrier, three-hole punched on 100 mm centers for faucet. American Standard Companies, Inc.; Murro, Model 0955.000; 0059.02 Semi-China Pedestal.
      b. Faucet: Chicago Faucet Co.; Model 2200 with 0.03 L/s flow restricter.
      c. Trim: McGuire H165LKN3RB 10 mm supply stop with loose key, McGuire 8872C.17T 17-gauge chrome-plated cast brass P-trap.
      d. Insulation: McGuire Manufacturing Company, Inc., Prowrap PW2000WC antimicrobial PVC resin seamless insulation for trap, tailpiece, and hot and cold water supply piping.
      e. Strainer: McGuire Manufacturing Company, Inc.; Model 155A chrome-plated grid strainer with tailpiece.
      f. Carrier: Jay R. Smith Mfg. Co.; 700 series concealed arm.
   2. SK-1, Service Sink
      a. Fixture: 686 mm by 686 mm by 350 mm deep, 14-gauge, Type 304 stainless steel, 200 mm backsplash, adjustable stainless steel tubular legs. Aristalline SL2424-5.
      b. Faucet: Short spout with vacuum breaker, 20 mm hose thread outlet, pail hook, H supply arms, 100 mm to 215 mm adjustable centers, lever handles. Faucet mounted on backsplash. Chicago Faucet Co.; Model 305-VB.
      c. Trim: 40 mm OD, 17-gauge chrome-plated flat strainer, tailpiece, and cast brass P-trap with cleanout, and 12 mm wall supply stop with loose key. Elkay Mfg. Co.; Model LK-18.
   3. SK-2, Mop Sink (Floor Mounted):
      a. Fixture: Molded Terrazzo, corner set, 600 mm by 600 mm by 300 mm deep with stainless steel bumper guard, back panels and chrome-plated brass drain. Stern-Williams Co. Inc.; Model SBC-1700-BP.
      b. Faucet: Chicago Faucet Co.; Model 897 with hose threads, vacuum breaker, and rod support. Faucet mounted 900 mm above finish floor.
      c. Accessories: Stern-Williams Co. Inc.; Model T-35 hose and T-40 stainless steel mop hanger.
      1. SK-3, Service Sink
      a. Fixture: 750 mm by 2150 mm by 360 mm deep, 14-gauge, Type 304 stainless steel, 230 mm backsplash, right drainboard, adjustable stainless steel tubular legs. Aristalline RTL2454R-1.
      b. Faucet: Short spout with vacuum breaker, 20 mm hose thread outlet, pail hook, H supply arms, 100 mm to 215 mm adjustable centers, lever handles. Faucet mounted on backsplash. Chicago Faucet Co.; Model 305-VB.
      c. Trim: 40 mm OD, 17-gauge chrome-plated flat strainer, tailpiece, and cast brass P-trap with cleanout, and 12 mm wall supply stop with loose key. Elkay Mfg. Co.; Model LK-18.
   2. SH-1, Shower (Trim Only):
      a. Showerhead: Sloan Valve Co.; Model AC-11-B-2.5; with 0.16 L/s flow restricter.
      b. Mixing Valve: Chicago Faucets 2500 VOC, thermostatic and pressure balancing-type.
      c. Trim: Inlet strainer, check, integral stop, temperature limit stop.

3. WC-1, Water Closet (Flush Valve, Floor Mounted):
    a. Fixture: Vitreous china, direct-fed siphon jet action, top spud, elongated bowl. American Standard Companies, Inc.; Madera EL 1.6, Model 2234.105;
    b. Trim: Sloan Valve Co.; Royal Continental, Model 111 RC, flush valve, 6 litres per flush.
    c. Seat: Centoco 500 STS, white open front.

C. Safety Equipment:
1. Safety Shower/Eyewash Combination:
    a. Model: Haws; Model 8346.
    b. Shower: ABS plastic deluge.
    c. Eyewash: Stainless steel bowl with aerated eye/face wash.
    d. Valve: Stay open.
    e. Support: Freestanding, 32 mm galvanized pipe standard, stanchion, and floor flange.
    f. Modesty Curtain: Haws; Model 9037.
    g. Alarms: Magnetically operated proximity switches.
    h. Application:
        1) U-K512 for HRC facility
        2) U-C534, U-C535, U-C536, U-C537 for Chemical Building.
2. TV, Tempering Valve:
    a. Materials: Maximum flowrate 2.53 L/s.
        1) Inlet and Outlet: 32 mm IPS.
        2) Max Inlet Pressure: 862 kPa.
        3) Max Inlet Temperature: 82 degrees C.
        4) Constructed of bronze, brass, copper, and stainless steel.
        5) Application:
            a) TCV-K5120 for HRC facilty
            b) TCV-C510, TCV-C530 for Chemical Building
    b. Model: Haws Model 9202.

D. Drainage Products:
1. CO-1, Cleanout:
    a. Material: Taper thread, bronze plug, scoriated nickel bronze top.
    b. Manufacturer and Product: Jay R. Smith Mfg. Co.; Model 4023.
2. FCO-1, Floor Cleanout (Unfinished Areas):
    a. Service: Floor drainage system – exposed concrete.
    b. Material: Tapered thread, bronze plug with round adjustable scoriated secured cast iron top.
    c. Manufacturer and Product: Jay R. Smith Mfg. Co.; Model 4243S.
3. FD-1, Floor Drain (Unfinished Areas, General Drainage):
    a. Materials: Cast iron body and grate.
    b. Options: Sediment bucket, Jay R. Smith Mfg. Co.; Model 2696, trap primer connection, vandalproof screws.
    c. Manufacturer and Product: Jay R. Smith Mfg. Co.; Model 2210T-U.
4. FD-2, Floor Drain (Finished Areas):
    a. Materials: Cast iron body, adjustable nickel bronze strainer.
    b. Options: Jay R. Smith Mfg. Co.; Model 2696, trap primer connection, vandalproof screws.

c. Manufacturer and Product: Jay R. Smith Mfg. Co.; Model 2005T-U-round.

5. FD-3, Floor Drain (Unfinished Areas, Heavy Drainage):
   a. Materials: Cast iron body and grate.
   b. Options: Sediment bucket, Jay R. Smith Mfg. Co.; Model 2696, trap primer connection, vandalproof screws.
   c. Manufacturer and Product: Jay R. Smith Mfg. Co.; Model 2233T-U.
6. GD-1, Floor Drain (Gutter Drain):
   a. Materials: Rectangular cast iron body and grate.
   b. Manufacturer and Product: Jay R. Smith Mfg. Co.; Model 2585T-U.
7. HD-1, Floor Drain (Indirect Receptor):
   a. Materials: Cast iron body and strainer.
   b. Options: Round top, anti-flood rim strainer, Jay R. Smith Mfg. Co.; Model 2696, trap primer connection, vandalproof screws.
   c. Manufacturer and Product: Jay R. Smith Mfg. Co.; Model 2010T-U-F37.
8. FFD-1, Floor Drain with Funnel:
   a. Materials: Cast iron body and grate.
   b. Option: Oval funnel.
   c. Manufacturers: Jay r. Smith Mfg. Co., Model 2005Y/3591NB-P.
9. RD-1, Roof Drain:
   a. Materials: Cast iron body with combined flashing clamp and gravel stop, and cast iron dome.
   b. Options: Extension collar, sump receiver, underdeck clamp.
   c. Manufacturer and Product: Jay R. Smith Mfg. Co.; Model 1010Y-E-R-C-CID.
10. OD-1, Overflow Drain:
    a. Materials: Cast iron body with combined flashing clamp and gravel stop, and cast iron dome.
    b. Options: Extension collar, sump receiver, underdeck clamp, and 50 mm high cast iron standpipe.
    c. Manufacturer and Product: Jay R. Smith Mfg. Co.; Model 1070Y-E-R-C-CID-CIS.
11. ON-1, Overflow (Discharge) Nozzle:
    a. Material: Cast bronze body and flange.
    b. Manufacturer and Product: Jay R. Smith Mfg. Co.; Model 1770.
12. HD-2, Hub Drain:
    a. Coated cast iron reducing hub adapter with standard cast iron hub.
    b. Hub: Two pipe sizes larger than outlet.

E. Plumbing Specialties:
1. Water Hammer Arresters:
   a. Materials: ASSE 1010 certified, Type L copper tube, HHPP piston with 2 lubricated EPDM O-rings, FDA approved lubricant, rolled piston stop, wrought copper male thread adapter.
   b. Manufacturer and Product: P.P.P. Inc. SC Series, Sioux Chief Mfg. Co., Inc.; Series 650 and 660.
2. TP, Automatic Trap Priming System:
   a. Materials: Preset 24-hour clock, manual override switch, solenoid valve, 20 mm connection, calibrated water distribution manifold, water hammer arrestor, and steel cabinet.
   b. Power: 120V, single-phase with circuit protection.

c. Manifold outlet quantity as required.
d. UL listed.
e. Manufacturer and Product: Precision Plumbing Products, Inc.; Prime-Time Model PTS.
f. Application:
1) U-K511 for HRC Facility
2) U-C511 for Chemical Building
3) U-S558, U-S559 for Secondary Clarifier
4) U-R511 for Bioreactors Facility

3. Pressure/Temperature Relief Valve:
a. Materials: ASME/AGA rated, bronze body construction, vacuum relief valve vent in drain, backup emergency safety fuse plug, tamper-resistant bonnet screws, test lever, short thermostat, and automatic reseating.
b. Manufacturer and Product: Watts Industries, Inc.; Series 40.

4. Pressure Gauge:
a. Materials: 90 mm gauge size, 0 to 1100 kPa range, steel case, glass crystal, brass movement, and 8.5 mm NPT lower connection.
b. Manufacturer and Product: Ashcroft Dresser Instrument Division, Dresser Industries, Inc.; Type 1008.

5. Thermometer:
a. Materials: Adjustable angle, red reading mercury type with 225 mm case and -1 to 85 degrees C range, 90 mm aluminum stem, and separate NPT brass thermowell.
b. Manufacturer and Product: H.O. Trerice Co.; Model A005.

F. Sealant: In accordance with Section 07 92 00, Joint Sealants.

PART 3 EXECUTION

3.1 PREPARATION

A. Drawings do not attempt to show exact details of fixtures. Changes in locations of fixtures, advisable in opinion of Contractor, shall be submitted to Contract Administrator for review before proceeding with the Work.

3.2 INSTALLATION

A. Fixture Trim: Install fixture trim where applicable on fixtures.

B. Plumbing Fixtures, Mounting Heights:
1. Standard rough-in catalogued heights, unless shown otherwise on Drawings.
2. Caulk fixtures in contact with finished walls with waterproof, white, nonhardening sealant which will not crack, shrink, or change color with age. See Section 07 92 00, Joint Sealants.

C. Exact fixture location and mounting arrangement shall be as indicated on toilet room elevations and details as shown on Drawings.

D. Unless noted otherwise and as a minimum, fixtures shall be supported as indicated in PDI Code Guide 302.

E. Safety Equipment:
   1. System Shutoff Valves:
      a. Shutoff valves shall give visual indication of position (open or closed).
      b. Shutoff valves shall be lockable valves and locked in open position.
   2. Each safety shower, eyewash, combination safety shower/eyewash shall have red safety signoff tag. After completing requirements listed below, Contractor and the City shall sign red safety signoff tag. Requirements are as follows:
      a. Visually check safety shower/eyewash piping for leaks.
      b. Verify that upon operation, stay-open valves remain open.
      c. Showerheads to be between 2.1 m and 2.5 m above standing surface.
      d. Shower spray pattern, when valve is full open, shall be a minimum 500 mm in diameter at 1500 mm above standing surface.
      e. Water arcs from eyewash spray heads must cross. Test with eyewash gauge; Haws, Model 9015.
      f. Minimum flow rates for safety showers shall be 1.3 L/s.
      g. Minimum flow rates for eyewashes shall be 0.2 L/s.
      h. Tempered water shall be temperature indicated on Drawings.

F. Drainage Products:
   1. Floor Drains: Set top flush with floor. Provide membrane clamps where required.
   2. Cleanouts: Install where shown or required for purposes intended. Set cover flush with finished floor.
   3. Hub Drains: Set top of hub 50 mm above finished floor.
   4. Drain P-Trap Priming:
      a. Pipe: Type K, soft copper.
      b. Trap and prime floor drains and hub drains, unless shown otherwise on the Drawings. No attempt has been made to show trap primer valve locations or trap primer pipe routing.
      c. Field route trap primer piping during installation of floor drains and hub drains, and install trap primer valves in mechanical rooms, janitor rooms, or other locations acceptable to Contract Administrator.
      d. Priming System: Complete with connection to serving nonpotable water (NPW) system.

G. Plumbing Specialties:
   1. Shock Arresters:
      a. Install PDI-certified and rated shock arresters, sized and located in accordance with PDI WH-201 and as shown on Drawings.
      b. Install adjacent to equipment wherein quick closing valves are installed.
      c. Install at each emergency safety shower.
      d. Shock arresters to have access panels or to be otherwise accessible.

2. Drain P-Trap Priming:
   a. Pipe: Type K, soft copper.
   b. Trap and prime floor drains and hub drains, unless shown otherwise on the Drawings. No attempt has been made to show trap primer valve locations or trap primer pipe routing.
   c. Field route trap primer piping during installation of floor drains and hub drains, and install trap primer valves in mechanical rooms, janitor rooms, or other locations acceptable to Contract Administrator.
   d. Priming System: Complete with connection to serving NPW system.
3. Trap Priming Valves:
   a. Floor drain traps primed with priming valves, 12 mm copper to floor drain.
   b. Two traps maximum primed from one priming valve or as recommended by manufacturer. Locate in mechanical spaces or janitor's rooms and as indicated on Drawings.
   c. Provide shutoff valve ahead of priming valves.
4. Thermometers and Pressure Gauges:
   a. Arrange devices to facilitate use and observation.
   b. Install in orientation that will allow clear observation from ground level.
   c. Provide pressure gauges with block valves.
   d. Install thermometers in thermowells.

H. Caulk penetrations of exterior walls with weaterproof sealant in accordance with Section 07 92 00, Joint Sealants.

I. Adjust water flows in domestic water systems for reasonable water flows at each plumbing fixture, terminal device, and recirculation loop. Flush valve fixtures shall be adjusted for proper flush cycle time and water quantity.

3.3 FIELD QUALITY CONTROL

A. Perform visual inspection for physical damage, blocked access, cleanliness, and missing items.

B. Perform CCTV inspection of all concrete encased drains to confirm all drain piping has remained intact after concrete placement. Repair all drain piping showing blockage or damage.

C. Test safety shower and eyewash units. Water flow must be tested at both showerhead and eyewash/face ring.
   1. Shower Flow:
      a. Test with tube-type water gauge (Haws, Model 9010) and 20 litres container.
      b. Container shall fill in 10 seconds or less, with a minimum 1.3 L/s flow.
   2. Eyewash Flow:
      a. Test with tube-type water gauge (Haws, Model 9010) and 4 litres container.
      b. Container shall fill in 20 seconds or less.
   3. Contractor shall log, date, and initial inspection upon passing flow tests.

D. Verify alarm operation both locally and systemwide. Notify security prior to test if alarm is connected systemwide.

END OF SECTION