

PART 1 GENERAL

1.1 General

- .1 All drawings and all sections of the specifications shall apply to and form an integral part of this section.

1.2 Work Included

- .1 Provide labour, material, equipment and services necessary for and incidental to the supply and installation of the systems shown on the drawings and hereinafter specified.
- .2 Generally this shall include:
 - .1 Sanitary Drainage System
 - .2 Storm Drainage System
 - .3 Cold and Hot Water Supply System
 - .4 Natural Gas Piping System
 - .5 Plumbing Fixtures and Equipment

1.3 References

- .1 AGA Z21.22 – Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.
- .2 ASME B16.1 – Cast Iron Pipe Flanges and Flanged Fittings.
- .3 ASME B16.3 – Malleable Iron Threaded Fittings.
- .4 ASME B16.18 – Cast Copper Alloy Solder Joint Pressure Fittings.
- .5 ASME B16.23 – Cast Copper Alloy Solder Joint Drainage Fittings – DWV.
- .6 ASME B16.29 – Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings – DWV.
- .7 ASME B31.2 – Fuel Gas Piping.
- .8 ASME B31.9 – Building Services Piping.
- .9 ASTM A53/A53M – Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- .10 ASTM A74 – Cast Iron Soil Pipe and Fittings.
- .11 ASTM B42 – Seamless Copper Pipe, Standard Sizes.
- .12 ASTM B251 – General Requirements for Wrought Seamless Copper and Copper-Alloy Tube.
- .13 ASTM C564 – Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- .14 ASTM D1785 – Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- .15 ASTM D2466 – Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- .16 ASTM D2665 – Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
- .17 ASTM E814 – Fire Tests of Through-Penetration Fire Stops.
- .18 ASTM F708 – Design and Installation of Rigid Pipe Hangers.

- .19 AWWA C651 – Disinfecting Water Mains.
 - .20 CISPI 301 – Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications.
 - .21 CISPI 310 – Joints with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
 - .22 MSS SP58 – Pipe Hangers and Supports – Materials, Design and Manufacturer.
 - .23 MSS SP69 – Pipe Hangers and Supports – Selection and Application.
 - .24 MSS SP89 – Pipe Hangers and Supports – Fabrication and Installation Practices.
 - .25 NCPWB – Procedure Specifications for Pipe Welding.
 - .26 NFPA 54 – National Fuel Gas Code.
 - .27 UL 1479 – Fire Tests of Through-Penetration Firestops.
- 1.4 Related Work
- .1 Common Work Results – Mechanical Section 23 05 00
 - .2 Acceptable Materials & Equipment Section 23 05 14
 - .3 Insulation Section 23 07 12
 - .4 HVAC Systems Section 23 54 11
 - .5 Controls Section 25 30 00
 - .6 Common Work Results – Electrical Section 26 05 00
- PART 2 PRODUCTS**
- 2.1 Pipe and Fittings
- .1 General
 - .1 Pipe and fittings shall conform to the standards listed in the applicable Building Code (latest revision).
 - .1 Flanged joints must have suitable gasket and bolts.
 - .2 Use brass nipples between copper piping and flush valves or c.p. brass goods.
 - .3 Where alternate piping materials or jointing are specified a uniform type of pipe and fittings shall be used throughout each system.
 - .2 Drains and vents – storm and sanitary
 - .1 Drains and vent pipes shall be in accordance with local or provincial regulations with the following exceptions, unless otherwise specified.
 - .2 All cast iron soil pipe shall be class 4000.
 - .3 Cast iron soil pipe may be hub and spigot or mechanical joint. Mechanical joint couplings shall have a corrugated stainless steel sleeve over the joint with stainless steel worm drive securing bands tack welded to the sleeve. Titan or approved equal.
 - .4 Polyvinyl chloride (PVC-DWV) pipe and fittings shall be solvent cement socket weld joint certified to ULC Standard CAN/OLC-S102.2.

- .5 No plastic, asbestos cement or aluminum pipe accepted unless specifically called by the Contract Administrator.
- .3 Water Piping – Domestic Cold, Hot, Hot Water Recirculating,
 - .1 Pipe – Type ‘L’ third party certified hard copper tube to ASTM B.88.
Fittings – Wrought copper or cast brass, solder joint pressure fitting.
Flanges – Cast brass 1034 kPa (150 lb.) ANSI B16.24.
- .4 Sewage and Sump Pump Discharge
 - .1 Up to 50mm (2”) Diam: Pipe – DWV copper. Fittings – DWV solder joint pipe.
 - .2 64mm (2 ½”) and larger: pipe – Schedule 40 galvanized steel victaulic roll grooved. Fittings – Victaulic malleable with Victaulic style 07 Zero-flex rigid couplings, flush seal grade ‘0’ gasket.
- .5 Natural Gas Systems
 - .1 Pipe
 - .1 Up to 150mm (6”): - Schedule 40 carbon steel, continuous weld or electric resistance weld pipe conforming to ASTM A53 Grade B.
 - .2 Fittings
 - .1 Up to 50mm (2”):
 - .1 Screwed fittings – 1034 kPa (150 psi) black malleable iron, banded.
 - .2 Socket weld fittings – 13,800 kPa (2000 psi forged steel).
 - .3 Unions – 1034 kPa (150 psi) brass to iron seat.
 - .2 64mm (2 ½”) and larger:
 - .1 Butt welding fittings to be Crane manufactured to ASTM A234. Flanges to be Grinnel forged carbon slip-on welding flanges conforming to ASTM A181, Grade 1. Gaskets to be Cranite pre-formed asbestos. Site or shop cut gaskets unacceptable. Use ring gaskets on raised face flanges and full faced gaskets on flat faced flanges. Use 1034 kPa (150psi) flanges on systems to 689 kPa (100 psi). Thread-O-Lets and Weld-O-Lets to be manufactured to ASTM A181, Grade 1.
- 2.2 Wall Sleeve Seals
 - .1 Where water and sanitary service lines are sleeved through concrete wall, provide schedule 40 steel pipe sleeves and LINK-SEAL sleeve seals.
- 2.3 Valves
 - .1 General
 - .1 Valve parts must be of material recommended by manufacturer for service specified. Valves must be installed with stems upright or horizontal, not inverted. Valves not specifically covered herein shall be of comparable quality to those specified.

- .2 Water
 - .1 Domestic cold, hot, hot recirculating:
 - .1 All valves up to 19mm (3/4") ball valves, bronze body (Appollo, Conbraco).
 - .2 Gate valves up to 50mm (2"): bronze body Crane 1334, Newman Hattersley T609, Kitz 43, Nibco S-134.
 - .3 Globe valves up to 50mm (2") bronze body – Toyo 221, Crane 1310, Newman Hattersley Fig. 13, Kitz 10, Nibco S-235Y.
 - .4 Swing check valves up to 50mm (2"): bronze body – Toyo 237, Crane 1342, Newman Hattersley A61, Nibco S413B.
 - .5 Spring loaded check valves up to 50mm (2"): bronze body MAS-700.
 - .6 Ball balancing valves with balancing plate up to 50mm (2"): bronze body – Toyo Fig. 5049A, Newman Hattersley 1979, Kitz 59, Crane 9322, Nibco S-585-70.
 - .7 Ball valves up to 50mm (2"): bronze body – Toyo Fig. 5049A, Newman Hattersley 1979, Kitz 59, Crane 9322, Nibco S-585-70.
 - .2 Sump and sewage pump discharge:
 - .1 Gate valves up to 50mm (2"): bronze body – Crane 1334, Newman Hattersley T609, Kitz 43, Nibco S134.
 - .2 Gate valves 64mm (2 1/2"): Crane 465-1/2, Newman Hattersley 504, Nibco F-617-0.
 - .3 Check valves up to 50mm (2"): Crane 1342, Toyo 237, Newman Hattersley A61, Nibco S413B.
 - .3 Drain valves up to and including 19mm (3/4"): Toyo Fig. 5046 ball valve with garden hose threaded outlet complete with chain and cap.
 - .4 Drain valves 25mm (1") and larger: Gate valves as specified above, with discharge piped to suitable drain.
 - .3 Natural Gas
 - .1 Valves up to 50mm (2") size – Toyo 5044A and Kitz Code No. 58 ball valve or Newman Hattersley 1969F. Newman-Milliken 200M, lubricated screwed plug valve.
 - .2 Valves 64mm (2 1/2") and larger: Newman-Milliken 201M flanged plug valve. Newman-Milliken 200M, lubricated screwed plug valve.
- 2.4 Strainers
 - .1 Water Systems:
 - .1 Up to 50mm (2") size – screwed bronze body Y pattern, with stainless steel perforated screen Newman Hattersley 807, Spirax Sarco Type BT.
 - .2 64mm (2 1/2") and larger – Spriax Sarco Type 733-125, flanged cast iron body basket type screen with bolted cover and drain plug, perforated stainless steel screen, w.p. 860 kPa (125 psig).
 - .3 Perforation Sizes: On pump suction – 3mm (1/8"). All other – 1.5mm (1/16").

- 2.5 Expansion Joints
 - .1 Copper Pipe sizes 75mm (3") and under:
 - .1 FLEXONICS Model HB bronze expansion compensators designed for the pressure to be external to the 2-ply bronze bellows for positive squirm elimination, and complete with anti-torque device, limit stops, internal guides with female streamline ends. All brazed joints to be by heliarc process.
 - .2 Steel Pipe sizes over 75mm (3") and under:
 - .1 FLEXONICS Model H expansion compensators designed for the pressure to be external to the 2-ply stainless steel bellows for positive squirm elimination, and complete with anti-torque device, limit stops, internal guides with female streamline ends.
 - .3 Anchors and guides in contact with copper pipe shall be copper, or copper-plated.
 - .4 Guides shall be FLEXONICS pipe alignment guides.
- 2.6 Trap Primers
 - .1 Provide approved Zurn trap primers where noted on plans and/or as required by Plumbing Code, to maintain trap seals.
- 2.7 Shock Absorbers
 - .1 Where shock absorbers are called for on water lines shall be Zurn Shoktrol sized in accordance with Plumbing and Drainage Institute standards.
- 2.8 Cleanouts
 - .1 Cleanouts in cast iron soil pipe shall consist of cast iron ferrule with brass plug having raised head.
 - .2 Cleanouts in copper drainage: Brass screwed plugs with raised head.
 - .3 Cleanouts in cast iron screwed drainage fittings, (galvanized waste lines) shall consist of nipple and cap. Iron plugs not accepted. Exposed c.o. caps shall be chrome plated.
- 2.9 Cleanout Access Covers
 - .1 Heavy traffic unfinished areas:
 - .1 Heavy duty cast iron cover and frame, with securing screws.
 - .2 Finished and unfinished areas:
 - .1 Select cleanout access covers in areas having floor finish such as sheet vinyl tile, terrazzo, or carpet, to suit the finish. Cooperate with appropriate trades to apply finish to cleanout covers so they will be flush with floor, inconspicuous, and accessible. Floor cleanouts for sheet vinyl flooring shall be clamping type, Zurn ZZN-211R6-ST style, to properly seal (SVF) Sheet vinyl flooring to cover. Refer to architectural room finish schedules for locations.
 - .2 On special floor, rough-in properly to conform to adjacent flooring material as per manufacturer's installation instructions.
 - .3 Cleanouts in walls to be located adjacent to access door, or to have a suitable finished access cover flush with wall so as to present a neat finished appearance and leave cleanout easily accessible.
- 2.10 Plumbing Fixtures and Equipment

- .1 General
 - .1 Supply, install and connect up, complete, all plumbing fixtures shown on mechanical and architectural drawings. Be responsible for protection of all fixtures until building is accepted by the City.
 - .2 All fixtures including trim shall be CSA approved, free from flaws or blemishes to approval of Contract Administrator. All finished surfaces shall be clear, smooth and bright, and guaranteed not to craze, discolour or scale. All fixtures shall be completely installed and connected to drain, vent, hot and cold water supply piping in approved manner.
 - .3 Except as noted, all visible parts of trimmings of all fixtures, including faucets, shower heads, piping, escutcheons, wastes, strainers, traps, tail pieces, supplies, stops, etc. shall be heavily chrome-plated. This shall also apply to Work at all NIC equipment and fixtures in finished areas.
 - .4 Except where specifically noted otherwise, supply and install screwdriver stop valve on hot and cold water supply to every fixture on project, in addition to valve or faucets on fixture itself.
 - .5 Provide adequate supports for all fixtures. Have these built into walls with back-up plates where required.
 - .6 Provide traps, and stops on supplies, for all fixtures and equipment.
 - .7 Provide domestic water, vent and waste connections to all equipment requiring plumbing services. This shall include NIC items shown on architectural and mechanical drawings.
 - .8 Provide shut-off valve on water supply connections at each piece of equipment.
 - .9 Contractor shall confirm mounting heights for all fixtures before roughing in water, waste and vent piping.
 - .10 Heating/Air-Conditioning Equipment:
 - .1 Connect water and drain to all heating and air-conditioning systems and equipment wherever noted in the specifications or on the drawings.
 - .11 Miscellaneous Equipment:
 - .1 Rough-in and connect services as required to all items of equipment requiring same.
 - .12 Silicone
 - .13 Sealing of Fixtures:
 - .1 Silicone seal perimeter edges of fixtures as specified herein.
 - .2 Silicone to be mildew-resistant, translucent white silicone, General Electric Sanitary Silicone Sealant #SCS 1752.
 - .3 Section 22 10 01 shall provide silicone sealing of following fixtures: china drinking fountains, urinals, water closets, sinks (all types), and lavatories (china and enamelled steel).
 - .4 Application of sealant shall be by experienced applicators, regularly employed for sealant application.
 - .5 Properly adjust and align fixtures prior to sealant application.

- .6 Sealant bead to be smooth and neat, with proper proportions. Apply sealant in strict accordance with manufacturer published data.
 - .7 For wall hung fixtures, seal only 3 edges; top and both sides, not bottom.
 - .8 For china and enamel steel lavatories, seal perimeter edge between countertop and lavatory.
 - .9 Do not apply silicone sealant onto stainless steel fixtures, unless not otherwise.
 - .10 Unless noted otherwise, silicone sealing of tubs, shower stalls and shower bases to be responsibility of architectural division, under direction of Contractor.
- .2 Fixtures
 - .1 See fixture schedule on drawings.
 - .3 Equipment
 - .1 See fixture schedule on drawings.
- 2.11 Backfill Material
- .1 Bedding and backfill material to 300mm (12") above the pipe shall conform to standard WCA 3 for granular fill.
 - .1 Passing $\frac{3}{4}$ " 100%
 - .2 No. 4 80-90%
 - .3 No. 50 5-30%
 - .4 No. 200 0-5%
 - .2 Granular backfill material other than as described in .1 above shall conform to standard WCA 2.
 - .1 Passing 3" 100%
 - .2 No. 4 40-80%
 - .3 No. 200 5-20%

PART 3 EXECUTION

- 3.1 General Installation
 - .1 Copper pipe shall not be buried except where specifically noted on drawings.
 - .2 All pipe shall be cut accurately to measurements taken at site, installed without springing or forcing. All changes in direction made with fittings.
 - .3 All connections to equipment made with unions or flanges.
 - .4 Remove valve working parts during installation to prevent damage from heat where brazing, soldering, or welding is used.
 - .5 Comply with latest CSA Standard W117.2 "Code for Safety in Welding and Cutting".
 - .6 Drain pipes dropping into slab on grade shall have sisson joint arranged to take up movement of slab.

- .7 Run all piping in accessible pipe spaces in such a way that it does not interfere with free access into pipe space.
 - .8 Co-operate with all sub-trades to properly locate all equipment connections.
 - .9 Provide a shutoff valve on supply connections at each piece of equipment.
- 3.2 Drainage Systems
- .1 Sanitary Drains
 - .1 Provide complete systems of sanitary drainage and venting to serve all fixtures and equipment. This includes local drains from equipment in Contract such as fan units, pump bases, etc.
 - .2 Run building sanitary drain from connection point outside building as noted on drawings.
 - .3 All drainage piping to W.C.'s shall be 100mm (4") diameter minimum.
 - .4 Provide trap primers where noted on drawings. Connect to trap in an approved manner.
 - .5 Cleanouts:
 - .1 Install cleanouts at all changes of direction, at intervals of not over 15m (50') in horizontal runs, at all points where obstructions might be formed and at points required by plumbing regulations or shown on drawings.
 - .2 Cleanouts shall be accessible. Cleanouts above furred ceilings or in concrete slabs on grade shall be extended to floor level with cleanout access cover and frame.
 - .3 Cleanouts on sink waste and vent pipes shall have a chrome-plated cap installed tight to wall. Cleanouts behind walls shall have access panel. Cooperate in locating cleanouts adjacent to access panels, etc. All cleanout plugs lubricated/sealed with mixture of graphite and linseed oil or Teflon tape. Check all cleanouts immediately prior to turning the job over to the City. Remove plugs, re-lubricate with graphite and oil, and re-install using only enough force to insure permanent joint, depending on location.
 - .6 Flash vents through roof in approved manner. Drains in floors shall be flashed or clamped to membrane water-proofing where required.
 - .2 Acid Drains
 - .1 General- provide acid drains where noted on plans to serve acid resisting floor drains, sinks, etc.
- 3.3 Water Supply System
- .1 General
 - .1 Provide complete system of water supply piping to serve all fixtures, equipment, etc. This shall include cold water, hot water and hot water recirc. piping. Tempered water piping shall be considered to be hot water piping of water temperature is above 29 deg. C. (85 deg. F).
 - .2 Provide water meter to approval of Contract Administrator.
 - .3 Grade horizontal runs of piping to drain through risers.

- .4 Install drain valves with hose thread outlet at water meter, hot water tanks and in mains where shown and/or necessary for complete drainage.
- .5 Install shut off valves at water meter, hot water tanks and heaters, at all connections to major pieces of equipment, in all branches to fixtures or groups of fixtures.
- .6 Install dielectric insulating unions between all pipes of apparatus constructed of dis-similar metals. Use brass nipples at flush valves, etc.
- .7 Connect ends of all hot water risers to re-circulation main and continue this main back through recirculating pump. Recirculating piping shall be so arranged as to provide continuous and positive circulation of hot water throughout system at all times.
- .8 Each recirculating branch shall have balancing valve.

.2 Water Pipe Sizes to Fixtures

	<u>Cold</u>	<u>Hot</u>
Lavatory basins	13mm (1/2")	13mm (1/2")
Flush valves	25mm (1")	
Flush tanks	13mm (1/2")	13mm (1/2")
Sinks	13mm (1/2")	13mm (1/2")
Hose bibs	19mm (3/4")	19mm (3/4)
Drinking fountains	13mm (1/2")	
Showers	13mm (1/2")	13mm (1/2")

.3 Shock Absorbers

- .1 Supply and install shock absorbers on hot and cold water lines at each group of fixtures, each isolated fixture, and where noted on drawings. Sizes shall be as noted or in accordance with Plumbing and Drainage Institute Standard WH-201.
- .2 Where piping is concealed and not accessible provide air chambers one size larger than supply and 600mm (24") high.
- .3 Provide shock absorber upstream of every solenoid valve or quick closing valve. This applies also to NIC equipment having solenoid valves supplied by other divisions, such as washing machines, dishwashers, etc.
- .4 Review proposed location and type of shock absorbers with Contract Administrator prior to installation.

.4 Backflow Preventers

- .1 Provide approved backflow preventers on all potable water supplies as noted on drawings, specified herein, or as required by provincial/municipal authorities. (Conbraco, Watts)
- .2 Test backflow preventers in accordance with manufacturer's recommendations, Contract Administrator or as required by provincial/municipal authorities.

3.4 Natural Gas Piping System

- .1 Make arrangements with gas utility company to bring in service and install meter and regulator. Pay all service and installation charges.
- .2 Run piping as shown to serve equipment. Take out permits and connect equipment ready for use. Provide gas regulators as required. Run vent piping

from relief valves to atmosphere. Install gas piping in accordance with Provincial Department of Labour regulations. Provide gas cock at each piece of equipment. Provide drip pockets at each piece of equipment and at low points. Grade horizontal piping 1:500 (1" in 40') to drain through risers.

- .3 All natural gas piping concealed above lay-in tile ceilings, in walls or other inaccessible locations shall have all welded joints and shall be stamped by the welder with his number.
- .4 Where gas piping is welded, arrange with provincial authorities to inspect and provide written approval to Contract Administrator prior to system use.

3.5 Jointing

- .1 All joints shall be made in accordance with manufacturer's recommendations.
- .2 Asbestos cement and cast iron soil pipe shall be installed as recommended by manufacturer. Fittings shall be braced where necessary to prevent joints coming apart under pressure.
- .3 Cast iron hub and spigot soil pipe may be joined with oakum and lead, or Bibby Bi-Seal compression sleeve. Do not use oakum on hot water drain lines where suspended in finished area.
- .4 Screwed joints in steel piping shall be made with full cut standard taper pipe threads, with approved non-toxic joint compound applied to male threads only. Joint compound shall not be applied to the first thread. Avoid squeezing excess compound into pipes. All pipes must be reamed or filed and left full bore, clean and free of scale.
- .5 Joints in copper drainage and water tube shall be in strict accordance with manufacturer's published recommendations and as follows:
 - .1 Water tube up to and including 50mm (2") and drainage tube all sizes shall be lead free solder consisting of tin, copper, and silver (Silvabrite 100 or equal).
 - .2 Water piping over 50mm (2") shall be brazed (Sil-Fos). Valve bonnets and inner parts must be removed from valve bodies when silver brazing valves and adjacent joints.
- .6 Where black steel pipe and welding fittings are specified or permitted, welding to be performed by welder holding current welder's certificate from Provincial Department of Labour.

3.6 Expansion and Contraction of piping

- .1 Make provision for expansion and contraction of all piping. Use swing connections where shown or necessary.
- .2 Install hot water supply and recirculation piping with expansion loops where required and anchor by approved rigid anchors, in order to control expansion.
- .3 Install expansion joints where shown on drawings. Provide anchors and guides as recommended by manufacturer.

3.7 Cleaning and Flushing

- .1 On completion, flush out piping systems before installation of equipment, fixtures, etc. in order to remove any foreign material in piping.

- .2 Clean out all plumbing fixtures and equipment and leave in first class operating condition.

3.8 Testing

- .1 All piping systems shall be pressure tested as follows:
 - .1 Plumbing, drainage and natural gas systems- in accordance with local regulations.
 - .2 Water supply piping – test with water to 690 kpa (100 psig) at the highest point of system. Maintain pressure without loss for 4 hours.