1. GENERAL

1.1 Scope

.1 Provision and installation of piping and mechanical systems, including pipe, fittings, piping specialties, and welding and jointing supplied in accordance with this section, and valves and supports provided in accordance with other sections of this Specification.

1.2 Quality Assurance

.1 Welding materials, fabrication standards and labour qualifications must conform to ANSI/ASME B31.1, ANSI B16.25, ASME Section IX, CSA W59, and the Provincial Board of Labour Regulations.

.2 Use welders fully qualified and licensed by Provincial Authorities, and in accordance with CSA W59.

.3 Potable Water Process Piping: ASTM A53 Grade B, or AWWA C200.91 seamless or welded

.4 Gas Piping: National Standard of Canada CAN1-B149.1 (latest edition), installation Code for Natural Gas Burning Appliances and Equipment.

.5 Domestic Water, Drainage and Vent Piping: Provincial and Municipal Codes.

.6 Non specified pipe joining and pipe fitting methods such as T-drill and press fit are not permitted in any piping system, unless specifically approved by the Contract Administrator.

2. PRODUCTS

2.1 Pipe

	Service	**Material**
.1	Potable water pipe 650 to 900 mm	Steel, ASTM A53, or AWWA C200.91, seamless or welded, 9.5mm wall
.2	Potable water pipe 75 to 600 mm	Steel, ASTM A53, or AWWA C200.91, seamless or welded, standard wall
.3	Potable water pipe 40 to 65 mm	Steel, ASTM A53, or AWWA C200.91, seamless or welded, Sch 40
.4	Cooling water, above ground (inside building)	Type `L' hard copper for cold water and Type 'K' hard copper for hot water and recirc. water for sizes up to 100 mm, ASTM B88M Ductile Iron centrifugally cast for cold water main sizes 100 mm and larger, ANSI/AWWA C151/A21.51.

.5 Equipment drains and overflows	Galvanized steel, ASTM A120, Sch.40, Type `L' hard copper ASTM B88M	

2.2 Fittings and Joints

Service	Material	Joint
.1 Potable water pipe 650 to 900 mm	Steel, ASTM A234 Grade WPB, 9.5 mm wall	Butt weld
.2 Potable water pipe 75 to 600 mm	Steel, ASTM A234 Grade WPB, standard weight	Butt weld
.3 Service water pipe 65 mm and smaller	Steel, ASTM A197 Class 300 malleable iron	Screwed
.4 Cooling water, above ground	Wrought copper, bronze	Lead free solder, brazed for pipes over 50 mm
	Cast bronze	Screwed
	Ductile Iron pipe	Grooved mechanical
.5 Equipment drains and overflows	Galvanized banded malleable iron	Screwed
	Wrought copper, bronze	50-50 solder
	Cast brass	Screwed

.6 Use factory fabricated butt welded fittings for welded steel pipes.

2.3 Flanges

.1 Primary flange rating is Class 150, ANSI B 16.5.

Size	Material	Type
.1 650 to 900 mm	Steel, AWWA C207 Class D	Slip-on, flat faced, serrated finish
.2 75 to 600 mm	Steel, ANSI 16.5 or AWWA C207, Class D	Slip-on or weld-neck, raised face

2.4 Gaskets

.1 Use full-face gaskets with flat-faced flanges and ring gaskets with raised-face flanges

2.5 Fasteners

.1 Use steel bolts with heavy hex head nuts.

2.6 Welding

.1 Welding materials shall be in accordance with CSA W48.

2.7 Expansion Joints

.1 Provide expansion joints on pump discharge piping, EVR SJ-221 or equal, complete with retaining rings and control units.

2.8 Dielectric Couplings

.1 Insulating unions for pipe sizes 50mm and smaller, and insulating flanges for pipe sizes larger than 50mm.

2.9 Unions and Couplings

.1 Size 50 mm and under: 1033 kPa malleable iron, bronze to iron ground joint unions for threaded ferrous piping, air tested for gas service, all bronze for copper piping.

.2 Sizes 65 mm and over: 1033 kPa forged steel welding neck flanges for ferrous piping, 1033 kPa bronze slip-on flanges for copper piping. Gaskets shall be 1.5 mm thick performed synthetic rubber bonded asbestos. Gaskets for gas service shall be synthetic rubber.

.3 Flange bolting: For systems up to 120ºC, use carbon steel stud bolts, semi-flushed and heavy hex nuts, ASTM A307-GrB. For systems up to 215ºC, use alloy steel bolts ASTM A193-GrB7, and semi-finished heavy hex nuts ASTM A194-Gr2H.

.4 Where permitted by the Contract Administrator, use grooved mechanical couplings to engage and lock grooved or shouldered pipe ends and to allow for some angular deflection, contraction and expansion. Couplings consist of malleable iron housing-clamps, C-shaped composition sealing gasket EPDM Grade `E' and steel bolts. Use galvanized couplings for galvanized pipe.

2.10 Painting

.1 All potable water steel pipes, valves, couplings, and fittings shall be epoxy coated internally and externally.

.2 All interior epoxy coatings shall be to NSF Standard 61 – Drinking Water System Components, suitable for use in potable water applications.

.3 Coating materials shall be a two-component epoxy liquid.

.4 Interior coating shall be white, external coating shall match existing colours in DBPS.

.5 Exterior epoxy coatings shall be a 3-coat system with the final coat colour to match the existing colours in DBPS.

.6 Ungalvanized steel pipe, fittings, valves, supports and structural steel for non-submerged applications shall have:

.1 -1st coat: alkyd metal

.2 -2nd coat: machinery enamel

.3 -3rd coat: machinery enamel

.7 Equipment and fittings having factory applied finish:

.1 Primer: touch up with primer compatible with manufacturer's finish

.2 Finish: enamel compatible with primer and factory-applied finish, colour to match existing colours in DBPS

.8 Equipment and fittings having prime coat only:

.1 1st coat: touch up prime coat with primer compatible with manufacturer's finish

.2 2nd coat: enamel compatible with factory applied finish

.3 3rd coat: enamel compatible with factory applied primer, co;our to match existing colours in DBPS.

3. EXECUTION

3.1 Piping Design and Installation

.1 The Contractor is responsible for the design and installation of all pipe fittings. Design in accordance with ANSI B31 code for pressure piping.

.2 Prepare pipe ends in accordance with ANSI B16.25 for weld connections.

.3 Install flanged or welded nozzles, branch connections, welding outlets, and taps true and faced at right angles to the axis of the pipe. Do not extend connections inside of pipe.

.4 Install dielectric fittings wherever pipes of dissimilar metals are joined.

.5 Support piping during installationto prevent abnormal stresses on the pipe

.6 Install pipe supports where shown on drawings. Minor adjustments may be required for actual support locations.

.7 For bolting flanges to valves, clean gasket surfaces, flange faces, and butt weldoing connections. Protect connecting surfaces.

.8 For bolted connections, clean pipe ends and gaskets, lubricate gaskets with soapy water, and bolts with non-corrosive thread lubricant. Tighten bolts progressively using crossover method. Tighten bolts to torque recommended by the manufacturer. Use properly sized wrenches to prevent rounding of nut and bolt heads.

3.2 Piping Drawings

.1 Provide isometric drawings of the pipe installation for review by the Contract Administrator.

3.3 Preparation

.1 Ream pipes and tubes. Clean off scale and dirt, inside and outside, before assembly. Remove welding slag or other foreign material from piping.

.2 Protect all steel pipes when stored on site from external conditions and ensure protective coating remains intact. If in the opinion of the Contract Administrator, deterioration of the protective coating has instigated corrosion, all rust must be removed down to bare metal and prime coated with red oxide paint.

3.4 Connection

.1 Screw joint steel piping up to and including 40 mm. Weld piping 65 mm and larger, including branch connections. Screw or weld 50 mm piping for liquid systems, weld 50 mm piping for gas systems.

.2 Make screwed joints with full cut standard taper pipe threads with approved non-toxic joint compound applied to male threads only.

.3 Make joints for plain end pipe with gasket and clamp type mechanical fastener.

.4 Clamp cast iron water pipe at fittings with 20 mm rods and properly anchor and support.

.5 Use grooved mechanical couplings and mechanical fasteners, only where allowed.

.6 Use galvanized couplings with galvanized pipe.

.7 Make connections to equipment, specialty components, and branch mains with unions or flanges.

.8 Provide dielectric type connections wherever joining dissimilar metals in open systems. Brass adapters and valves are acceptable.

.9 Use insulating plastic spacers for copper pipe installation in metal studs.

3.5 Route and Grades

.1 Route piping in orderly manner and maintain proper grades. Install to conserve headroom and interfere as little as possible with use of space. Run exposed piping parallel to walls. Group piping wherever practical at common elevations. Install concealed pipes close to the building structure to keep furring to a minimum.

.2 Equip low points with drain valves and quick-connect hose nipples.

.3 Provide air collection chambers with manual air vent at all high points of system.

.4 Make reductions in water pipes with top-flat eccentric reducing fittings installed to provide drainage and venting.

.5 Grade horizontal drainage and vent piping 2% minimum, unless noted otherwise.

.6 Pipe the discharge from all relief valves, safety valves, vents, drains and overflows to the nearest building drain.

3.6 Installation

.1 Install piping to allow for expansion and contraction without unduly stressing pipe or equipment connected.

.2 Provide clearance for proper installation of insulation and for access to valves, air vents, drains and unions.

3.7 Handling of Pipe and Fittings

.1 Handle all pipe and fittings in a manner to prevent damage to pipe, fittings and coatings. Lift pipe and fittings using canvas slings and protective sheeting, or equivalent non-damaging materials with strength appropriate to the intended use. Do not use chains or hooks.

3.8 Welded Pipe Branch Connections

.1 Make branch connections according to the following schedule.

Legend:
T: Forges tee or reducing tee
S: Socolet
W: Weldolet

Header	**Branch**												
	15	20	25	30	40	50	65	75	100	150	200	250	300
15	T												
20	T	T											
25	T	T	T										
30	T	T	T	T									
40	T	T	T	T	T								
50	S	S	S	T	T	T							
65	S	S	S	S	T	T	T						
75	S	S	S	S	S	T	T	T					
100	S	S	S	S	S	T	T	T	T				
150	S	S	S	S	S	W	T	T	T	T			
200	S	S	S	S	S	W	W	W	T	T	T		
250	S	S	S	S	S	W	W	W	W	T	T	T	
300	S	S	S	S	S	W	W	W	W	W	T	T	T

3.9 Welding

.1 Submit details of welding procedures for Contract Administrator's review.

.2 All welding shall be carried out in accordance with CSA W59.

.3 Prior to welding, all joints shall be thoroughly cleaned, and deleterious material, which may adversely affect the quality of the weld, removed.

.4 Where more than one pass is required, each pass, except the first and final passes, shall be peened to relieve shrinkage stresses. All dirt, slag, and flux shall be removed before the succeeding bead is applied.

.5 The Contract Administrator shall have the right to inspect all welds by visual, radiological or other non-destructive testing methods. Inspection may be made during welding or after welding is completed. Under visual examination, welds shall be free of cracks, inadequate penetration, unrepaired burn-through, or other defects. Radiological examination may be used to determine the penetration, slag inclusion, cracks and other defects. The Contract Administrator is the sole judge of weld acceptability. The cost of radiological examination will be borne by the City unless the testing is requested by the Contractor. The cost of re-inspecting or re-testing defective or unacceptable welding shall be borne by the Contractor.

.6 For welding of pipe that is to be epoxy-coated, all welds shall be continuous with no intermittent welds. All sharp edges shall be removed, and edges ground off to a minimum radius of 3mm. Surface preparation shall be in accordance with the requirements of the coating manufacturer.

3.10 Painting

.1 Protect any surfaces and items not being painted with clean, dry cover sheets.

.2 Remove dust, dirt, loose material, and other extraneous material.

.3 Prepare surfaces as specified or to manufacturer's recommendations.

.4 Provide temporary heating and ventilation as required for painting and curing.

.5 Surface preparation of all interior steel surfaces shall be by blast cleaning to white metal, SSPC-SP5.

.6 Coatings shall be factory- or shop-applied by the piping or fitting manufacturer or by a specialized coating firm, subject to approval of the Contract Administrator, including for the repair of welded joints.

.7 Coating shall be cold applied and holiday-free in accordance with the coating manufacturer's specifications to a total dry film thickness (TDFT) of 12-16 mils, and cured in accordance with the coating maunfacturer's recommendations.

.8 Damaged areas of internal shop coated surfaces shall be field-repaired in accordance with the coating manufacturer's recommendations.

.9 Surface preparation of all exterior surfaces shall be by blast cleaning to near-white metal, SSPC SP6.

.10 Provide enclosures during blast cleaning to protect other work areas.

.11 Notify the Contract Administrator 24 hours in advance of painting operations at DBPS.

.12 Obtain Contract Administrator's acceptance of prime coating before proceding with finish coatings.

.13 Interior coatings including field repairs shall be pinhole-free and tested with a holiday detector. The Contractor shall provide a testing procedure for the Contract Administrator's approval. All pinholes shall be marked, repaired and retested to ensure a pinhole-free coating.

.14 Post "Wet Paint" signs during painting or curing. Remove rags, cans and debris at completion of each day's work.

.15 On completion of the work, clean off all paint spots, remove protective devices, and leave the area and work in a clean condition. Remove all unused material, equipment and tools.

END OF SECTION