April, 2003

PART 1 GENERAL

1.1 References

.1 American Society for Testing and Materials.

.1 ASTM E 202-94A, Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.

PART 2 PRODUCTS

2.1 Cleaning Solutions

.1 Tri-sodium phosphate: 0.40 kg per 100 L water in system.

.2 Sodium carbonate: 0.40 kg per 100 L water in system.

.3 Low-foaming detergent: 0.01 kg per 100 L water in system.

PART 3 EXECUTION

3.1 Cleaning Hydronic and Steam Systems

.1 Timing

.1 Systems to be operational, hydrostatically tested and with safety devices functional, before cleaning is carried out.

.2 Cleaning Agency:

.1 Retain qualified water treatment specialist to perform system cleaning.

.3 Install instrumentation such as flow meters, orifice plates, pitot tubes, flow metering valves only after cleaning is certified as complete [by water treatment specialist] .

.4 Cleaning procedures:

.1 Provide detailed report outlining proposed cleaning procedures at least 4 weeks prior to proposed starting date. Report to include:

.1 Cleaning procedures, flow rates, elapsed time.

.2 Chemicals and concentrations to be used.

.3 Inhibitors and concentrations.

.4 Specific requirements for completion of work.

.5 Special precautions for protecting piping system materials and components.

.6 Complete analysis of water to be used to ensure water will not damage systems or equipment.

.5 Conditions at time of cleaning of systems

.1 Systems to be free from construction debris, dirt and other foreign material.

.2 Control valves to be operational, fully open to ensure that terminal units can be cleaned properly.

.3 Strainers to be clean prior to initial fill.

.4 Install temporary filters on pumps not equipped with permanent filters.

.5 Install pressure gauges on strainers to detect plugging.

.6 Report on Completion of Cleaning

.1 When cleaning is completed, submit report, complete with certificate of compliance with specifications of cleaning component supplier.

.7 Hydronic Systems:

.1 Fill system with water, ensure air is vented from system.

.2 Fill expansion tanks 1/3 to 1/2 full, charge system with compressed air to at least 35 kPa (does not apply to diaphragm type expansion tanks).

.3 Use water meter to record volume of water in system to +/- 0.5%.

.4 Add chemicals under direct supervision of chemical treatment supplier.

.5 Closed loop systems: circulate system cleaner at 60°C for at least 36 h. Drain as quickly as possible. Refill with water plus inhibitors. Test concentrations and adjust to recommended levels.

.6 Flush velocity in system mains and branches to be adequate so as to ensure removal of debris. System pumps may be used for circulating cleaning solution provided that velocities are adequate.

.7 Add chemical solution to system.

.8 Establish circulation, raise temperature slowly to maximum design or 82°C minimum. Circulate for 12 h, ensuring flow in all circuits. Remove heat, continue to circulate until temperature is below 38°C. Drain as quickly as possible. Refill with clean water. Circulate for 6 h at design temperature. Drain and repeat procedures specified above. Flush through low point drains in system. Refill with clean water adding to sodium sulphite (test for residual sulphite).

.8 Glycol Systems:

.1 In addition to procedures specified above perform procedures specified herein.

.2 Test to prove concentration will prevent freezing to minus 40°C Test inhibitor strength and include in procedural report. Refer to ASTM E 202.

3.2 Start-up of Hydronic Systems

.1 After cleaning is completed and system is filled:

.1 Establish circulation and expansion tank level, set pressure controls.

.2 Ensure all air is removed.

.3 Check pumps to be free from air, debris, possibility of cavitation when system is at design temperature.

.4 Dismantle system pumps used for cleaning, inspect, replace worn parts, install new gaskets and new set of seals.

.5 Clean out strainers repeatedly until system is clean.

.6 Check water level in expansion tank with cold water with circulating pumps OFF and again with pumps ON.

.7 Repeat with water at design temperature.

.8 Check pressurization to ensure proper operation and to prevent water hammer, flashing, cavitation. Eliminate water hammer and all other noises.

.9 Bring system up to design temperature and pressure slowly.

.10 Perform TAB as specified Section 15950 - Testing, Adjusting and Balancing (TAB) .

.11 Adjust pipe supports, hangers, springs as necessary.

.12 Monitor pipe movement, performance of expansion joints, loops, guides, anchors.

.13 If sliding type expansion joints bind or if bellows type expansion joints flex incorrectly, shut down system, re-align, repeat start-up procedures.

.14 Re-tighten all bolts, etc. using torque wrench, to compensate for heat-caused relaxation. Repeat several times during commissioning.

.15 Check operation of drain valves.

.16 Adjust valve stem packings as systems settle down.

.17 Fully open all balancing valves (except those that are factory-set).

.18 Check operation of over-temperature protection devices on circulating pumps.

.19 Adjust alignment of piping at pumps to ensure flexibility, adequacy of pipe movement, absence of noise or vibration transmission.

END OF SECTION

PART 1 GENERAL

1.1 Shop Drawings and Product Data

.1 Submit shop drawings and product data in accordance with Section 01340 - Shop Drawings, Samples, and Mock-Ups.

.2 Submit manufacturer's detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices or ancillaries, accessories and controllers.

.3 Submit product data of pump curves for review showing point of operation.

.4 Indicate piping, valves and fittings shipped loose by packaged equipment supplier, showing their final location in field assembly.

1.2 Maintenance Data

.1 Provide maintenance data for incorporation into manual as specified in Section 01730 - Operations and Maintenance.

1.3 Extra Materials

.1 Furnish spare parts in accordance with Section 17000 – Spare Parts.

PART 2 PRODUCTS

2.1 In-Line Circulators

.1 Volute: cast iron radially split, with screwed or flanged design suction and discharge connections.

.2 Impeller: alloy steel cast bronze cast iron stainless steel.

.3 Shaft: alloy steel stainless steel with bronze sleeve bearing, integral thrust collar.

.4 Seal assembly: mechanical for service to 135°C.

.5 Coupling: flexible rigid self-aligning.

.6 Motor: resilient mounted, drip proof, TEFC, explosion proof, sleeve bearing, r/min, kW HP.

.7 Capacity: as indicated L/s, kPa.

.8 Design pressure: 860kPa.

PART 3 EXECUTION

3.1 Installation

.1 In line circulators: install as indicated by flow arrows. Support at inlet and outlet flanges or unions. Install with bearing lubrication points accessible.

.2 Base mounted type: supply templates for anchor bolt placement. Furnish anchor bolts with sleeves. Place level, shim unit and grout. Align coupling in accordance with manufacturer's recommended tolerance. Check oil level and lubricate. After run-in, tighten glands.

.3 Ensure that pump body does not support piping or equipment. Provide stanchions or hangers for this purpose. Refer to manufacturer's installation instructions for details.

.4 Pipe drain tapping to floor drain.

.5 Install volute venting pet cock in accessible location.

.6 Check rotation prior to start-up.

END OF SECTION

PART 1 GENERAL

1.1 References

.1 ANSI/ASMEB16.15-1985, Cast Bronze Threaded Fittings, Classes125 and 250.

.2 ANSIB16.18-1984, Cast Copper Alloy Solder Joint Pressure Fittings.

.3 ANSI/ASMEB16.22-1989, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.

.4 ANSIB16.24-1979, Bronze Pipe Flanges and Fittings, Class150 and 300.

.5 ANSI/AWWAC111/A21.11-85, Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.

.6 ASTMA307-89, Specification for Carbon Steel Bolts and Studs, 60,000psi Tensile.

.7 ASTM B88M-89, Specification for Seamless Copper Water Tube (Metric).

.8 ASTMF492-91, Specification for Propylene and Polypropylene (PP) Plastic-Lined Ferrous Metal Pipe and Fittings.

.9 CSAB242-M1980, Grooved and Shoulder Type Mechanical Pipe Couplings.

.10 MSS-SP-67-1990, Butterfly Valves.

.11 MSS-SP-70-1984, Cast Iron Gate Valves, Flanged and Threaded Ends.

.12 MSS-SP-71-1984, Cast Iron Swing Check Valves, Flanged and Threaded Ends.

.13 MSS-SP-80-1987, Bronze Gate, Globe, Angle and Check Valves.

1.2 Product Data

.1 Submit product data in accordance with Section 01340 - Shop Drawings, Samples and Mock-Ups.

.2 Submit data for following: valves.

1.3 Closeout Submittals

.1 Provide maintenance data for incorporation into manual specified in Section 01730 - Operations and Maintenance Manual

PART 2 PRODUCTS

2.1 Piping

.1 Domestic hot, cold and recirculation systems, within building.

.1 Above ground: copper tube, hard drawn, type K, L, M: to ASTMB88M.

.2 Buried or embedded: copper tube, soft annealed, type;K, L: to ASTMB88M, in long lengths and with no buried joints.

2.2 Fittings

.1 Bronze pipe flanges and flanged fittings, Class150 and 300: to ANSIB16.24.

.2 Cast bronze threaded fittings, Class125 and 250: to ANSI/ASMEB16.15.

.3 Cast copper, solder type: to ANSIB16.18.

.4 Wrought copper and copper alloy, solder type: to ANSI/ASMEB16.22.

.5 NPS 2 and larger: roll grooved to CSAB242.

2.3 Joints

.1 Rubber gaskets, 1.6 mm thick: to ANSI/AWWA C111/A21.11.

.2 Bolts, nuts, hex head and washers: to ASTMA307, heavy series.

.3 Solder: 95/5 silver. to ASTM B32.

.4 Teflon tape: for threaded joints.

.5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM flush seal gasket.

.6 Dielectric connections between dissimilar metals: dielectric fitting to ASTMF492, complete with thermoplastic liner.

2.4 Gate Valves

.1 NPS2 and under, soldered:

.1 Rising stem: to MSSSP-80, Class125, 860kPa, bronze body, screw-in bonnet, solid wedge disc.

.2 NPS2 and under, screwed:

.1 Rising stem: to MSSSP-80, Class125, 860kPa, bronze body, screw-in bonnet, solid wedge disc.

.3 NPS2-1/2 and over, flanged:

.1 Non-rising stem: to MSSSP-70, Class125, 860kPa, flat flange faces, cast-iron body, bronze trim, bolted bonnet.

2.5 Globe Valves

.1 NPS2 and under, soldered:

.1 To MSSSP-80, Class125, 860kPa, bronze body, renewable composition disc, screwed over bonnet.

.2 Lockshield handles: as indicated.

.2 NPS2 and under, screwed:

.1 To MSSSP-80, Class150, 1MPa, bronzé body, screwed over bonnet, renewable composition disc.

.2 Lockshield handles: as indicated.

2.6 Swing Check Valves

.1 NPS 2 and under, soldered:

.1 To MSSSP-80, Class125, 860kPa, bronze body, bronze swing disc, screw in cap, regrindable seat.

.2 NPS2 and under, screwed:

.1 To MSSSP-80, Class125, 860kPa, bronze body, bronze swing disc, screw in cap, regrindable seat.

.3 NPS2-1/2 and over, flanged:

.1 To MSSSP-71, Class125, 860kPa, cast iron body, flat flange faces, [regrind] [renewable] seat, bronze disc, bolted cap.

2.7 Ball Valves

.1 NPS2 and under, screwed:

.1 Class150.

.2 Bronze body, chrome plated brass stainless steel ball, PTFE Teflon adjustable packing, brass gland and PTFE Teflon BunaN seat, steel lever handle.

.2 NPS2 and under, soldered:

.1 To ANSIB16.18, Class150.

.2 Bronze body, chrome plated brass stainless steel ball, PTFE Teflon adjustable packing, brass gland and PTFE Teflon BunaN seat, steel lever handle, with NPT to copper adaptors.

2.8 Protective Conduit

.1 Provide protective conduit for all domestic water lines passing through walls and floors.

PART 3 EXECUTION

3.1 Installation

.1 Install in accordance with Canadian Plumbing Code, Provincial Plumbing Code, and local authority having jurisdiction.

.2 Cut square, ream and clean tubing and tube ends, clean recesses of fittings and assemble without binding.

.3 Assemble all piping using fittings manufactured to ANSI standards.

.4 Install tubing close to building structure to minimize furring, conserve headroom and space. Group exposed piping and run parallel to walls.

.5 Connect to fixtures and equipment in accordance with manufacturers instructions unless otherwise indicated.

3.2 Valves

.1 Isolate equipment, fixtures and branches with gate butterfly ball valves.

3.3 Pressure Tests

.1 Conform to requirements of Section 15010- General Requirements.

.2 Test pressure: greater of 11/2 times maximum system operating pressure or 860kPa.

3.4 Disinfection

.1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction,approval of Consultant.

.2 Upon completion, provide laboratory test reports on water quality for Consultant approval.

END OF SECTION

PART 1 GENERAL

1.1 References

.1 American Society for Testing and Materials (ASTM)

- .1 ASTM D2235-96a, Specification for Solvent Cement for Acrylonitrille-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
- .2 ASTM D2564-96a, Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.

.2 Canadian Standards Association (CSA)

- .1 CSA-B1800 Series-99, ABS Drain, Waste and Vent Pipe and Pipe Fittings.
- .2 CSA-B181.2-M1996, PVC Drain, Waste and Vent Pipe and Pipe Fittings.
- .3 /CSA-B182.1-M1996, Plastic Drain and Sewer Pipe and Pipe Fittings.

PART 2 PRODUCTS

2.1 Piping and Fittings

.1 For buried and or above ground DWV piping to:

- .1 CSA-B181.1.
- .2 CSA-B181.2.
- .3 CSA-B182.1.

2.2 Joints

.1 Solvent weld for PVC: to ASTM D2564.

.2 Solvent weld for ABS: to ASTM D2235.

PART 3 EXECUTION

3.1 Installation

.1 Install in accordance with Canadian Plumbing Code, Provincial Plumbing Code, and local authority having jurisdiction.

.2 Install buried pipe on 150 mm bed of washed clean sand, shaped to accommodate fittings, to line and grade as indicated.

- .1 Backfill with washed clean sand.

.3 Install above ground piping parallel and close to walls and ceilings to conserve headroom and space to grade as indicated.

3.2 Testing

.1 Pressure test buried systems before backfilling.

.2 Hydraulically test to verify grades and freedom from obstructions.

3.3 Performance Verification

.1 Cleanouts:

.1 Ensure accessible and that access doors are correctly located.

.2 Open, cover with linseed oil and re-seal.

.3 Verify cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Ensure fixtures are properly anchored, connected to system and effectively vented.

.4 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

END OF SECTION

PART 1 GENERAL

1.1 Scope

.1 Aboveground fuel oil storage tank.

1.2 Standards

.1 Comply with Territorial Government Regulations.

.2 Aboveground fuel storage tanks shall comply with CAN4-S602

PART 2 PRODUCTS

2.1 Above Ground Fuel Storage Tanks (Outside Building)

.1 Aboveground 10,000 L self contained.

.2 Construction: to CAN/ULC-S602 and S652-95.

.3 Primary tank to be enclosed in a leak tight reinforced steel containment casing having a capacity of 110% of the primary tank's capacity.

.4 Tank shall have interstitial monitoring port for leak detection of primary tank and be of sufficient size to enable product removal.

.5 Tank shall be equipped with a lockable truckfill spillbox with release device to drain accumulated spillage into tank.

.6 Tank shall be equipped with level indicator mounted directly on tank in plain view of fill point.

.7 100 diameter FILL complete with removable droptube, truckfill adaptor, and 95% fill limiting valve. Fill limiting valve: Ryanik Manufacturing OFV-2 Contact 1-800-697-5109.

.8 1-25 diameter bottom drawoff with ULC approved repad construction.

.9 2-50 diameter spare couplings.

.10 100 diameter primary tank vent c/w 3660 long 100 diameter vent pipe, vent cap, and whistle.

.11 100 diameter interstitial vent c/w vent pipe and cap.

.12 500 diameter lockable combination spillbox and manhole with 20 manual drain connection.

.13 50 diameter interstitial monitoring inspection port.

.14 50 diameter tank mounted level indicator port.

.15 Tank assembly to be complete with lifting lugs, grounding lug and formed plate skid.

.16 Exterior: 1-coat of red oxide primer painted to CAN/CGB-1.1401 coat of white marine enamel, corrosion resistant, polyeurethane 1.5 mil, factory applied.

.17 Provide 50mm black block lettering indicating tank contents.

.18 Tank gauging stick and chart to manufacturer's standard.

.19 Standard of Acceptance: Kingland Ford.

PART 3 EXECUTION

3.1 Installation

.1 Flush and clean fuel tank prior to delivery to site and keep sealed during construction.

.2 Provide fuel for testing of tanks.

.3 At turn over of job to Owner completely fill all tanks with intended fuel.

END OF SECTION

PART 1 GENERAL

1.1 References

.1 American Society of Mechanical Engineers (ASME)

.1 ANSI/ASME-98, Boiler and Pressure Vessels Code (BPVC).

.2 American Society for Testing and Materials (ASTM)

.1 ASTM A47/A47M-99, Specification for Ferritic Malleable Iron Castings.

.2 ASTM A278M-93, Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures up to 345°C Metric.

.3 ASTM A516/A516M-96(e1), Specification for Pressure Vessel Plates, Carbon Steel, for Moderate - and Lower - Temperature Service.

.4 ASTM A536-84(1999)e1, Specification for Ductile Iron Castings.

.5 ASTM B62-93, Specification for Composition Bronze or Ounce Metal Castings.

.3 Canadian Standards Association (CSA)

.1 CSA B51-1997, Boiler, Pressure Vessel, and Pressure Piping Code.

1.2 Product Data

.1 Submit product data in accordance with Section 01340 - Shop Drawings, Samples, and Mock-Ups.

.2 Indicate on product data expansion tanks, air vents, separators, valves, and strainers.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340 - Shop Drawings, Samples, and Mock-Ups.

1.4 Closeout Submittals

.1 Submit maintenance data in accordance with Section 01730 - Operations and Maintenance Manual

PART 2 PRODUCTS

2.1 Diaphragm Type Expansion Tank

.1 Vertical galvanized steel steel pressurized diaphragm type expansion tank.

.2 Capacity: 41 L.

.3 Size: 660 mm height x 305 mm diameter.

.4 Diaphragm sealed in elastomer EPDM suitable for 115°C operating temperature.

.5 Working pressure: 860 kPa with ASME stamp and certification.

.6 Air precharged to 84 kPa (initial fill pressure of system).

.7 Renewable diaphragm.

2.2 Automatic Air Vent

.1 Standard float vent: brass body and NPS 1/8 connection and rated at 310 kPa working pressure.

.2 Industrial float vent: cast iron body and NPS 1/2 connection and rated at 860 kPa working pressure.

.3 Float: solid material suitable for 115°C working temperature.

.4 Provide shut-off valve in piping to vent.

2.3 Air Separator - Boiler Mounted

.1 Complete with dip tube.

.2 Working pressure: ASME rated for 860 kPa and 188°C (550°F) maximum.

.3 Provide shut-off valve in piping to air vent.

2.4 Air Separator - Expansion Tank Fitting

.1 Complete with adjustable vent tube and built-in manual vent valve.

.2 Working pressure: ASME rated for 860 kPa and 228°C (550°F) maximum.

2.5 Pipe Line Strainer

.1 NPS 1/2 to 2: bronze body to ASTM B62, solder end screwed connections. Y pattern.

.2 NPS 2 1/2 to 12: cast steel body to ASTM A278M, Class 30, flanged connections.

.3 NPS 2 to 12: T type with ductile iron body to ASTM A536 malleable iron body to ASTM A47M, grooved ends.

.4 Blowdown connection: Line and valve to be same size as blown connection.

.5 Screen: Removable Type 304 stainless steelwith [1.19] mm perforations.

.6 Working pressure: 860 kPa.

.7 Provide valved blow down line run to discharge to nearest acceptable point of discharge.

2.6 Propylene Glycol Solution

.1 Provide high grade (minimum 99.9% pure by weight) industrial inhibited propylene glycol such as Dowfrost.

.2 Also, provide two additional drums of glycol above quantity required to fill systems

.3 50% aqueous solution by volume shall be from glycol specified using distilled water, deionized water, or water containing less than 25 ppm each of chloride and sulfate ions and 50 ppm each of hard water ions (calcium and magnesium as calcium carbonate) with total hardness not to exceed 100 ppm.

.4 Shall contain such inhibitors as deemed necessary by manufacturer to provide maximyum corrosion protection to system.

.5 The manufacturer of the fluid must supply written documentation stating fluid passed ASTM D1384 standards (less than 0.5 mil penetration per year for all system metals).

PART 3 EXECUTION

3.1 General

.1 Install as indicated and to manufacturer's recommendations.

.2 Run drain lines and blow off connections to terminate above nearest drain.

.3 Maintain proper clearance to permit service and maintenance.

.4 Should deviations beyond allowable clearances arise, request and follow Consultant's directive.

.5 Check shop drawings for conformance of all tappings for ancillaries and for equipment operating weights.

3.2 Strainers

.1 Install in horizontal or down flow lines.

.2 Ensure clearance for removal of basket.

.3 Install ahead of each pump.

.4 Install ahead of each automatic control valve larger than NPS 1 and as indicated.

3.3 Expansion Tanks

.1 Adjust expansion tank pressure as indicated to suit design criteria.

.2 Install lockshield type valve at inlet to tank.

3.4 Pressure Safety Relief Valves

.1 Run discharge pipe to terminate above nearest drain.

END OF SECTION

PART 1 GENERAL

1.1 References

.1 Canadian Standards Association (CSA).

- .1 CSAB242-M1980, Groove and Shoulder Type Mechanical Pipe Couplings.
- .2 CSAW47.1-92, Certification of Companies for Fusion Welding of Steel Structures.
- .3 CSAW47.1S1-M1989, Supplement No.1-M1989 to W47.1-1983, Certification of Companies for Fusion Welding of Steel Structures.

.2 American National Standards Institute (ANSI).

- .1 ANSI/ASMEB16.1-1989, Cast Iron Pipe Flanges and Flanged Fittings, Class25, 125, 250 and 800.
- .2 ANSI/ASMEB16.3-1985, Malleable-Iron Threaded Fittings, Classes150 and 300.
- .3 ANSI/ASME B16.5-1988, Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and other Special Alloys.
- .4 ANSI/ASMEB16.9-1986, Factory-Made Wrought Steel Buttwelding Fittings.
- .5 ANSIB18.2.1-1981, Square and Hex Bolts and Screws.
- .6 ANSI/ASMEB18.2.2-1987, Square and Hex Nuts.
- .7 ANSI/AWWAC111/A21.11-90, Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.

.3 American Society for Testing and Materials (ASTM).

- .1 ASTMA47M-90, Specification for Ferritic Malleable Iron Castings.
- .2 ASTMA53-90b, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
- .3 ASTMA536-84, Specification for Ductile Iron Castings.
- .4 ASTMB61-90, Specification for Steam or Valve Bronze Castings.
- .5 ASTMB62-90, Specification for Composition Bronze or Ounce Metal Castings.
- .6 ASTME202-88, Test Method for Analysis of Ethylene Glycols and Propylene Glycols.

.4 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).

- .1 MSS-SP-67-1990, Butterfly Valves.
- .2 MSS-SP-70-1984, Cast Iron Gate Valves, Flanged and Threaded Ends.
- .3 MSS-SP-71-1984, Cast Iron Swing Check Valves, Flanged and Threaded Ends.
- .4 MSS-SP-80-1987, Bronze Gate, Globe, Angle and Check Valves.
- .5 MSS-SP-85-1985, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.2 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340 - Shop Drawings, Samples and Mock-Ups.

.2 Indicate on manufacturers catalogue literature the following: - VALVES.

1.3 Closeout Submittals

.1 Provide maintenance data for incorporation into manual specified in Section 01730 - Operations and Maintenance Manual

1.4 Extra Materials

.1 Furnish following spare parts:

.1 Valve seats: one for every ten valves, each size. Minimum one.

.2 Discs: one for every ten valves, each size. Minimum one.

.3 Stem packing: one for every ten valves, each size. Minimum one.

.4 Valve handles: two of each size.

.5 Gaskets for flanges: one for every ten flanges.

PART 2 PRODUCTS

2.1 Pipe

.1 Steel pipe: to ASTMA53, Grade B, as follows:

.1 NPS6, Schedule 40.

2.2 Pipe Joints

.1 NPS 2 and under: screwed fittings with teflon tape or pulverized lead paste.

.2 NPS2-1/2 and over: welding fittings and flanges to CSAW47.1 and CSAW47.1S1.

.3 Roll grooved: standard rigid coupling to CSAB242.

.4 Flanges: plain or raised face, slip-on weld neck.

.5 Orifice flanges: slip-on raised face, 2100kPa.

.6 Flange gaskets: to ANSI/AWWAC111/A21.11.

.7 Pipe thread: taper.

.8 Bolts and nuts: to ANSIB18.2.1 and ANSI/ASMEB18.2.2.

.9 Roll grooved coupling gaskets: type EPDM.

2.3 Fittings

.1 Screwed fittings: malleable iron, to ANSI/ASMEB16.3, Class 150.

.2 Pipe flanges and flanged fittings:

.1 Cast iron: to ANSI/ASMEB16.1, Class125.

.2 Steel: to ANSI/ASMEB16.5.

.3 Butt-welding fittings: steel, to ANSI/ASMEB16.9.

.4 Unions: malleable iron, to ASTMA47M and ANSI/ASMEB16.3.

.5 Fittings for roll grooved piping: malleable iron to ASTMA47M ductile iron to ASTMA536.

2.4 Valves

.1 Connections:

.1 NPS2 and smaller: screwed ends.

.2 NPS2.1/2 and larger: Flanged ends.

.2 Gate valves: Application: Isolating equipment, control valves, pipelines:

.1 NPS 2 and under:

.1 Class125, non-rising stem, solid wedge disc.

.2 NPS 2 1/2 and over:

.1 Non-rising stem, solid wedge disc, bronze trim.

.1 Operators: Malleable iron handle.

.3 Globe valves: Application: Throttling, flow control, emergency bypass:

.1 NPS 2 and under:

.1 Globe, with composition disc.

.1 Operator: Handwheel Lockshield.

.2 NPS 2 1/2 and over:

.1 With composition bronze disc, bronze trim.

.2 Operators: Malleable iron handle.

.4 Balancing, for TAB:

.1 All sizes: Calibrated balancing valves, as specified this section.

.2 NPS 2 and under:

.1 Globe, with plug disc.

.5 Drain valves: Gate, Class 125, non-rising stem, solid wedge disc.

.6 Bypass valves on gate globe valves NPS8 and larger: NPS3/4, Globe, with PFTE disc.

.7 Swing check valves:

.1 NPS 2 and under:

.1 Class 125, swing, with composition disc.

.2 NPS 2-1/2 and over:

.1 Flanged Grooved ends.

PART 3 EXECUTION

3.1 Piping Installation

.1 Connect to equipment in accordance with manufacturer's instruction unless otherwise indicated.

.2 Install concealed pipes close to building structure to keep furring space to minimum. Install to conserve headroom and space. Run exposed piping parallel to walls. Group piping wherever practical.

.3 Slope piping in direction of drainage and for positive venting.

.4 Use eccentric reducers at pipe size change installed to provide positive drainage or positive venting.

.5 Provide clearance for installation of insulation and access for maintenance of equipment, valves and fittings.

.6 Ream pipes, clean scale and dirt, inside and outside, before and after assembly.

.7 Assemble piping using fittings manufactured to ANSI standards.

.8 Saddle type branch fittings may be used on mains if branch line is no larger than half the size of main. Hole saw or drill and ream main to maintain full inside diameter of branch line prior to welding saddle.

3.2 Valve Installation

.1 Install rising stem valves in upright position with stem above horizontal.

.2 Install butterfly valves on chilled water and condenser water lines only.

.3 Install gate, ball, or butterfly valves at branch take-offs and to isolate each piece of equipment, and as indicated.

.4 Install globe valves for balancing and in by-pass around control valves as indicated.

.5 Provide silent check valves on discharge of pumps and in vertical pipes with downward flow and as indicated.

.6 Provide swing check valves in horizontal lines on discharge of pumps and as indicated

.7 Provide plug cocks or ball valves for glycol service.

3.3 Circuit Balancing Valves

.1 Install flow measuring stations and flow balancing valves as indicated.

.2 Remove handwheel after installation and TAB is complete.

.3 Tape joints in prefabricated insulation on valves installed in chilled water mains.

3.4 Flushing and Cleaning

.1 Flush and clean in presence of Consultant.

.2 Flush after pressure test for a minimum of 4h.

.3 Fill with solution of water and non-foaming, phosphate-free detergent 3% solution by weight. Circulate for minimum of 8h.

.4 Refill system with clean water. Circulate for at least 4hours. Clean out strainer screens/baskets regularly. Then drain.

.5 Refill system with clean water. Circulate for at least 2hours. Clean out strainer screens/baskets regularly. Then drain.

.6 Drainage to include drain valves, dirt pockets, strainers, every low point in system.

.7 Re-install strainer screens/baskets only after obtaining EngineerConsultant's approval.

3.5 Filling of System

.1 Refill system with clean water adding water treatment as specified. glycol

3.6 Testing

.1 Test system in accordance with Section 15010- Mechanical General Requirements].

.2 For glycol systems, retest after cleaning. Repair any leaking joints, fittings or valves.

3.7 Balancing

.1 Balance water systems to within plus or minus 5% of design output.

.2 Refer to Section 15950- Testing Adjusting and Balancing for applicable procedures.

3.8 Glycol Charging

.1 Provide mixing tank and positive displacement pump for glycol charging.

.2 Retest for concentration to ASTME202 after cleaning.

END OF SECTION