

Part 1 General

I.1 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

I.2 MAINTENANCE

- .1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:
 - .1 One mechanical seal for each size and type of pump utilizing a mechanical seal.
 - .2 One casing joint gasket for each size pump.
 - .3 One glass for each gauge glass.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.
- .3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

I.3 DELIVERY, STORAGE, AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements: Construction.
- .2 Do verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification.

Part 3 Execution

3.1 PAINTING REPAIRS AND RESTORATION

- .1 Do painting in accordance with Section 09 91 23 - Interior Painting.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

3.2 CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section [01 45 00 - Quality Control and submit report as described in PART I - SUBMITTALS.
 - .1 Testing to be witness by Authority Having Jurisdiction.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART I - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART I - QUALITY ASSURANCE.

3.4 DEMONSTRATION

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

- .4 Instruction duration time requirements as specified in appropriate sections.
- .5 Departmental Representative will record these demonstrations on video tape for future reference.

3.5 PROTECTION

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section includes:
 - .1 Material and installation of pipe work in general.

1.2 REFERENCES

- .1 American National Standards Institute/ American Society of Mechanical Engineers (ANSI/ASME)
 - .1 ANSI/ASME B24, Cast Copper Alloy Pipe Flanges and Flanged Fittings.
 - .2 ANSI/ASME B39, Malleable Iron Threaded Pipe Unions.
 - .3 ANSI/ASME B42, Ductile Iron Pipe Flanges and Flanged Fittings, Classes 150 and 300.
- .2 American Society for Testing and Materials (ASTM)
- .3 American Society of Mechanical Engineers (ASME)
 - .1 ASME B31.9 – Building Services Piping.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.

Part 2 Products

2.1 GENERAL

- .1 Installations shall include all devices, attachments, equipment, components and piping necessary to form a complete working system to code requirements.

2.2 VALVES

- .1 Refer to the specific pipe specification sections for valve types.
- .2 All valves of one type (e.g. gate valves) must be of one manufacturer. Ensure that working pressure, size and manufacturer's name are cast or stamped into the body of each valve.

- .3 Use O. S. & Y. design on all valves 100 mm and larger unless specifically noted otherwise.
- .4 Provide hand wheels on valves 75mm and larger accessible for operation.

2.3 STRAINERS

- .1 Provide Y-type strainers where, indicated on the drawings and where specified herein, in piping system, full size of the connected piping ahead of each pump, control valve, meter, etc. Install bucket or basket strainers only where indicated on the drawings.
- .2 All strainers shall have the same end connections and working pressure as the attached piping is specified.
- .3 Use monel screens with a reinforced edge. Perforations shall be 0.8 mm for water and 3.2 mm ahead of pumps.
- .4 Provide 20 mm blow-off lines with ball valves, piped directly to drain on all strainers over 50 mm.

2.4 DIELECTRIC PIPE FITTINGS /UNIONS

- .1 Dielectric fittings factory certified to withstand a minimum of 600 volts on a dry line with no flashover. Unions rated at 1.7 MPa conforming to ANSI B16.39. Flanged fittings rated at 1.2 MPa conforming to ANSI B16.24 (bronze) and B16.42 (iron).

2.5 PIPE SLEEVES AND SEALS

- .1 Where piping penetrates below grade walls or floors:
 - .1 Seal: modular, mechanical type, consisting of inter-locking synthetic rubber links shaped to continuously fill the annular space between the pipe and the wall opening complete with 316 stainless steel fasteners. Seal elements shall be sized and selected per manufacturer's recommendations and be suitable for the required fire-resistance rating and anticipated environmental conditions.
 - .2 Sleeve: custom-sized molded HDPE sleeves matched to the mechanical seal dimensions complete with reinforcing ribs, end caps, and integrally formed hollow water stop having a minimum outside diameter 100 mm larger than the diameter of the sleeve itself and allowing 13 mm movement between wall forms to resist pour forces.
- .2 Elsewhere: Schedule 40 black steel pipe sleeve.
- .3 All sleeves and floor penetrations to be water-tight.

Part 3 Execution

3.1 CONNECTIONS TO EQUIPMENT

- .1 In accordance with manufacturer's instructions unless otherwise indicated.
- .2 Provide valves and either unions, flanges or grooved joint couplings to isolate equipment and allow removal without interrupting operation of other equipment or systems.
- .3 Use double swing joints when equipment mounted on vibration isolation and when piping is subject to movement.

3.2 CLEARANCES

- .1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.
- .2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, and components.

3.3 DRAINS

- .1 Arrange pipe and fittings to ensure complete drainage.
- .2 Install drain valve at low points in piping systems, at equipment and at sectional/floor isolating valves.
- .3 Pipe each drain valve discharge separately to above floor drain. Discharge to be visible.
- .4 Provide air vents as required to assist in draining the piping.
- .5 Drain valves: Ball valves unless otherwise approved, NPS 3/4 minimum. Provide hose end male thread, cap and chain where not piped to drain.

3.4 DIELECTRIC COUPLINGS

- .1 General: Compatible with system, to suit pressure rating of system.
- .2 Locations: Where dissimilar metals are joined.
- .3 NPS 2 and under: isolating unions or bronze valves.
- .4 Over NPS 2: Isolating flanges.

- .5 Rated to 150C.

3.5 PIPEWORK INSTALLATION

- .1 Install exposed piping, equipment, rectangular cleanouts and similar items approximately as shown, parallel or perpendicular to building lines and as close to the structure as possible.
- .2 Conceal all piping except where otherwise approved. Install concealed piping to minimize furring space, maximize headroom, and conserve space.
- .3 Exposed piping must be carefully installed to be pleasing to the eye and meet the Architect's requirements.
- .4 Install all pipe mounted control devices, such as control valves and wells.
- .5 Assemble piping using fittings manufactured to ANSI standards.
- .6 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.
- .7 Use only eccentric reducing fittings at pipe size changes, installed with the piping in line at the top to ensure positive drainage and venting.
- .8 Use only long radius welding or soldered fittings in expansion loops, not screwed fittings.
- .9 American National Taper pipe thread must be used for all thread connections. Remove burrs and chips and ream or file the pipe ends out to size of bore.
- .10 Leave not more than 2 threads exposed on threaded joints when made up.
- .11 Screwed fittings jointed with Teflon tape.
- .12 Do not use:
 - .1 close nipples.
 - .2 threaded protectors as couplings.
 - .3 direct welded or screwed connections to valves, equipment or other apparatus.
- .13 Protect openings against entry of foreign material.
- .14 Ream pipes, remove scale and other foreign material before assembly.

- .15 Slope piping for positive drainage and venting.
- .16 Arrange piping to permit flushing.
- .17 Group piping, wherever possible.
- .18 Provide anchors and sway braces to Departmental Representative approval.
- .19 Provide for thermal expansion.
- .20 Provide for movement due to seismic events as required by the NBC.

3.6 EXPANSION OF PIPING

- .1 Install all piping systems with due regard and provision for expansion avoiding strain or damage to the building and equipment. Where pipe runs past building expansion joints, provide expansion compensation.
- .2 Only major expansion configurations and fittings have been detailed on the drawings. Provide all required additional compensators, loops and swing connections as specified herein, and in accordance with good trade practice.
- .3 Use swing connections with a minimum of 3 elbows (i.e. four fittings including the tee) where required. These swing connections are not always shown on the piping drawings for reasons of clarity; they must however, be installed. Where close tolerances do not permit the installation of a complete swing connection, consult the Departmental Representative prior to the closing of tender.
- .4 Install expansion loops cold spring 50 percent of the calculated expansion.
- .5 Schedule for Expansion Loops:

- .1 Maximum Distance between Anchors:
 - .1 Domestic Hot Water; copper 30 m, steel 45 m.
- .2 Loop Size Required:

Pipe Size NPS	Loop Size (m)
3/4	1.22
1	1.27
1-1/4	1.32
1-1/2	1.37
2	1.42

2-1/2	1.53
3	1.68
4	1.98

- .6 If the length between anchors is 50% of the maximum listed above, then the loop can be reduced to 67% of that listed.
- .7 Loops shall be located midway between guides.

3.7 PIPE GUIDES

- .1 Provide alignment guides where required for proper operation of the system.

3.8 PIPE ANCHORS

- .1 Provide substantial pipe anchors. Anchors shall be suitably attached to the structure and the pipe to prevent movement.

3.9 PIPE SLEEVES AND SEALS

- .1 General: Install where pipes pass through masonry structures, concrete structures, beams, fire rated assemblies, and elsewhere as indicated. Be responsible for maintaining the integrity of the building envelope when making penetrations. Enlist the services of qualified trade(s) to make openings in, and/or repairs to, building envelope.

- .2 Sleeve Sizes:
 - .1 Walls and beams: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.
 - .2 Floors: 20 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.
- .3 Sleeve Installation:
 - .1 Concrete walls, masonry walls, beams, and concrete floors on grade: Terminate flush with finished surface.
 - .2 Other floors:
 - .1 Terminate 50 mm above finished floor.
 - .2 Adjust as necessary to accommodate the requirements of through-penetration fire-stopping systems.
 - .3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.
- .4 Sealing:
 - .1 Foundation walls and below grade floors: Fire retardant, waterproof, modular mechanical seal.
 - .2 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.
 - .3 Sleeves installed for future use: Fill with lime plaster or other easily removable filler.
 - .4 Ensure no contact between copper pipe or tube and sleeve.

3.10 ESCUTCHEONS

- .1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.
- .2 Construction: One piece type with set screws. Chrome or nickel plated brass or stainless steel.
- .3 Sizes: Outside diameter to cover opening or sleeve. Inside diameter to fit around pipe or outside of insulation if so provided.

3.11 PREPARATION FOR FIRESTOPPING

- .1 Material and installation within annular space between pipes, ducts, insulation and adjacent fire separation to Section 07 84 00 - Firestopping.

- .2 Uninsulated unheated pipes not subject to movement: No special preparation.
- .3 Uninsulated heated pipes subject to movement: Wrap with non-combustible smooth material to permit pipe movement without damaging firestopping material or installation.
- .4 Insulated pipes and ducts: Ensure integrity of insulation and vapour barriers.

3.12 FLUSHING OUT OF PIPING SYSTEMS

- .1 In accordance as specified in relevant sections of Division 22.
- .2 Before start-up, clean interior of piping systems in accordance with requirements of Section 01 74 11 - Cleaning supplemented as specified in relevant sections of Division 22.
- .3 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

3.13 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

- .1 Advise Departmental Representative and Departmental Representative 48-hours minimum prior to performance of pressure tests.
- .2 Pework: Test as specified in relevant sections of Division 22 where specified, otherwise test to requirements of ASME B31.9.
- .3 Test all piping, with the exception of atmospheric vents and sanitary piping, hydraulically to 1½ times the operating pressure but not less than 860 kPag.
- .4 Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - .1 Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - .2 Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - .3 Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 30 kPa (10 ft WC). From 15 minutes before inspection starts to completion of inspection, water

level must not drop. Inspect joints for leaks. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

- .4 Prepare reports for tests and required corrective action.
- .5 Prove piping with less than 14 kPa pressure drop and no visible leakages for a period of 24 hours with a hydraulic test.
- .6 Test all sanitary piping in accordance with the applicable Plumbing code.
- .7 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or test media.
- .8 Conduct tests in presence of Departmental Representative or designate approved by the Departmental Representative.
- .9 Pay costs for testing, repairs or replacement, retesting, and making good. Departmental Representative to determine whether repair or replacement is appropriate.
- .10 Insulate or conceal work only after approval and certification of tests by Departmental Representative. Test underground piping prior to backfilling.

END OF SECTION

Part I General

I.1 SUMMARY

.1 Section includes:

- .1 This section includes a list of manufacturers whose products are approved for installation in the work, provided the product chosen meets with the required design characteristics as particularly noted in the specifications and equipment schedules, and matches the design features of the item where a particular trade name and model is given, and suits the installation. Conform to space limitations on products, which are approved as equal in design characteristics. If the model or size selection is doubtful, contact the Departmental Representative to ensure acceptability.

.2 Related Sections:

- .1 Everything in this Project Manual is a requirement for this Division. The following references constitute assistance to the Contractors. Refer to the Table of Contents for additional guidance.
 - .1 Sections beginning with 22 05.

I.2 APPROVED MANUFACTURER APPROVAL

- .1 The Drawings and Specifications are based upon manufacturers whose products are specified for installation in the work.
- .2 Any other manufacturers requesting "approved equal" status must request approval from the Department Representative by letter stating specifically the items on which he wishes to quote and enclosing all necessary engineering data. Submit electronic copies of all requests. Include the appropriate specification and/or drawing references. Requests should be made at least 14 days prior to closing of tenders, and an addendum may then be issued by the Departmental Representative, prior to closing of tenders, listing any further Acceptable Manufacturers. Late requests may not be approved. Provide additional information requested by the Departmental Representative to facilitate evaluation.
- .3 All fire suppression equipment shall be supplied from a manufacturer that has had an established local (Provincial) representative for a minimum of two (2) years, unless otherwise specified.
- .4 The Departmental Representative may also take other factors into account.

I.3 CHANGES DUE TO USE OF DIFFERENT MANUFACTURERS

- .1 Where the Contractor proposes to use an item of equipment other than that detailed on the Drawings which requires any redesign of the structure, partitions, foundations, piping, wiring or of any other part of the mechanical, electrical or architectural layout, all such redesign and all new Drawings and details required shall, with the approval of the Departmental Representative, be prepared by the Contractor at his own expense.
- .2 Where deviations are approved requiring a different quantity or arrangement of ductwork, piping, wiring, conduit and equipment from that indicated on the Drawings, this Division is responsible to furnish and install all such ductwork piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system, without additional compensation.

Part 2 Products

2.1 HEATING, VENTILATION & AIR CONDITIONING ACCEPTABLE MANUFACTURERS LIST

Equipment	Acceptable Manufacturers
.1 Access doors	Acudor PS-5030, Mifab CAD-FL-PL
.2 Alignment guides	Flexonics, Fulton, Yarway
.3 Automatic flow control valves	Griswold, Bell & Gossett
.4 Ball valves	Crane, Apollo, Bell & Gossett
.5 Butterfly valves	Nibco, Keystone, Bray, Watts
.6 Cast Iron Soil Pipe	Associated, Bibby
.7 Check valves	Nibco, Crane, Newco, Bell & Gossett, Watts
.8 Domestic hot water heaters	Rudd, Rheem, A.O. Smith, AERCO, Precision
.9 Expansion joints	Flexonics, Fulton, Northflex
.10 Gate valves	Nibco, Newco, Watts, Crane
.11 Globe Valves	Nibco, Newco, Watts, Crane
.12 Hangers and Supports	Adsko, Crane, Anvil, Myatt
.13 Sewage/Sump Pumps	Bell & Gossett, Aurora, Barnes, Giant, Zoeller
.14 Shock Absorbers	Zurn, Mifab, Ancon
.15 Thermostatic mixing valve	Powers, Watts, Zurn, Kohler

.16	Plumbing Fixtures (Water closet, Lavatory, Kitchen Sink, and etc.	American Standard, Kohler, Contrac, Franke
.17	Plumbing Brass	Delta, Chicago Faucets, Kohler, American standard

Part 3 Execution

.1 Not used.

END OF SECTION

Part I General

I.1 SUMMARY

- .1 Section includes:
 - .1 Material and installation of insulation of plumbing pipes and equipment.

I.2 REFERENCES

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE Standard 90.1, Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM B209, Specification for Aluminum and Aluminum Alloy Sheet and Plate
 - .2 ASTM C335, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - .3 ASTM C411, Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449/C449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .6 ASTM C921, Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
 - .7 ASTM C547 Standard Specification for Mineral Fiber Pipe Insulation
 - .8 ASTM C1136 Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
 - .9 ASTM C533 Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation
 - .10 CI427 Specification for Extruded Preformed Flexible Cellular Polyolefin Thermal Insulation in Sheet and Tubular Form
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.53, Poly (Vinyl Chloride) Jacketting Sheet, for Insulated Pipes, Vessels and Round Ducts

- .4 Manufacturer's Trade Associations
 - .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards.
- .5 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .3 CAN/ULC-S702, Thermal Insulation, Mineral Fibre, for Buildings

I.3 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" – plumbing piping in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - will mean "not concealed" as defined herein.
- .2 TIAC:
 - .1 CPF: Code Piping Finish.

I.4 QUALIFICATIONS

- .1 Installer to be specialist in performing work of this Section, and have at least 3 years successful experience in this size and type of project, qualified to standards of TIAC.

I.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Protect from weather, construction traffic.
- .3 Protect against damage from any source.
- .4 Store at temperatures and conditions required by manufacturer.

I.6 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide sample board with all types of insulation and proper labelling.

I.7 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

Part 2 Products

2.1 FIRE AND SMOKE RATING

- .1 In accordance with CAN/ULC-S102.
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.2 INSULATION

- .1 Provide and apply insulation in accordance with TIAC National Insulation Standards Specification 1501, Piping, and as herein specified:
- .2 Thermal conductivity (“k” factor) not to exceed specified values at 24 oC mean temperature when tested in accordance with ASTM C335.
- .3 Type P-1: Rigid moulded mineral fibre with factory applied vapour retarder jacket (ASJ).
 - .1 Mineral fibre: to ASTM C547.
 - .2 Jacket: to ASTM C1136.
 - .3 Maximum “k” factor: to ASTM C547.
- .4 Type P-2: Rigid moulded mineral fibre without factory applied vapour retarder jacket.
 - .1 Mineral fibre: to ASTM C547.
 - .2 Maximum “k” factor: to ASTM C547.
- .5 Type P-3: Flexible Cellular Polyolefin.
 - .1 Insulation: ASTM C1427.
 - .2 Maximum “k” factor: ASTM C1427.
- .6 Type P-4: Calcium Silicate.
 - .1 High temperature abuse resistant.
 - .2 ASTM C 411 to 649 C (1200 F).
- .7 Type P-5: Cellular Glass.

.1 Insulation to ASTM C552

2.3 INSULATION SECUREMENT

- .1 Tape: Self-adhesive, fibreglass reinforced foil-white kraft paper lamination, 50 mm wide minimum.
- .2 Contact adhesive: low VOC, air-drying adhesive.
- .3 Canvas adhesive: Washable.
- .4 Tie wire: 1.5 mm diameter stainless steel.
- .5 Bands: Stainless steel, 19 mm wide, 0.5 mm thick.

2.4 VAPOUR RETARDER LAP ADHESIVE

- .1 Water based, fire retardant type, compatible with insulation.

2.5 INDOOR VAPOUR RETARDER FINISH

- .1 Water based, fire retardant type, compatible with insulation.

2.6 JACKETS

- .1 Polyvinyl Chloride (PVC):
 - .1 One-piece moulded type and sheet with pre-formed shapes.
 - .2 Colour and finish: white, gloss.
 - .3 Service temperature range: -18oC to 66oC.
 - .4 Moisture vapour transmission: 0.02 perm.
 - .5 Thickness: 0.50 mm.
 - .6 Fastenings:
 - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
 - .2 Tacks.
 - .3 Pressure sensitive vinyl tape of matching colour.

Part 3 Execution

3.1 PRE- INSTALLATION REQUIREMENT

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
- .2 Surfaces to be clean, dry, free from foreign material.

3.2 INSTALLATION – GENERAL

- .1 Install in accordance with TIAC National Standards, following manufacturer's instructions and this specification. In case of conflict between TIAC National Standard's, manufacturer's instructions and this specification, this specification shall govern, unless otherwise directed by the Departmental Representative.
- .2 Use two layers with staggered joints when required nominal insulation thickness exceeds 75 mm.
- .3 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Hangers, supports to be outside vapour retarder jacket.
- .4 Supports, Hangers:
 - .1 Apply high compressive strength insulation, as indicated below, at oversized saddles where insulation shoes have not been provided.
 - .1 Hot piping: Calcium silicate or Perlite.
 - .2 Cold piping: cellular glass or high density foam.
 - .3 Wood blocks or plastic inserts are acceptable only where approved by the Departmental Representative.
- .5 Insulate valves, valve bonnets, strainers, flanges and fittings unless otherwise specified to same requirements as associated piping.
- .6 Carry insulation through floors and walls on services above 121°C (250°F) or below room temperature.
- .7 Ensure adequate ventilation is provided upon initial heating of insulation, where manufacturer indicates that fumes and odors may be released.

3.3 INSTALLATION OF TYPE P-1 AND P-2 INSULATIONS (FIBREGLASS):

- .1 Without integral jacket: mechanically fasten at 300mm centres.

- .2 With integral jacket: staple flap on 75mm centres.
- .3 Insulation with self-sealing lap seal integral to jacket requires no additional fastening.
- .4 Seal butt joints with self-sealing butt strips, minimum 50mm wide.

3.4 INSTALLATION OF TYPE P-3 INSULATION (ELASTOMERIC)

- .1 Follow manufacturer's instructions.

3.5 SPECIFIC APPLICATIONS

- .1 Thickness:
 - .1 As listed in following table.
- .2 Runouts:
 - .1 Runouts up to 50mm to individual terminal units, not exceeding 3.7m in length, may have insulation thickness reduced to 13mm.
 - .2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.
- .3 Jackets:
 - .1 Indoors:
 - .1 PVC.

3.6 INSULATION SCHEDULE

Service		Sizes	Type	Thick	Fittings
Dom Cold Water Pipe		13-25mm	P-1	13mm	YES
Dom Cold Water Pipe		32mm-up	P-1	25mm	YES
Dom Hot Water Pipe		13-51mm	P-2	25mm	YES
Dom Hot Water Pipe		64mm-up	P-2	38mm	YES
Dom Recirc Water Pipe		13-51mm	P-2	25mm	YES
Dom Recirc Water Pipe		64mm-up	P-2	38mm	YES
Plg Vents in Attics		ALL	P-1	25mm	YES
Piping Within 1.8m of Roof or O/S Wall Penetrations		ALL	P-1	25mm	YES

END OF SECTION

Part I General

I.1 SUMMARY

- .1 Section includes:
 - .1 Material and installation of domestic water piping and valves.

I.2 REFERENCES

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME).
 - .1 ANSI/ASME B16.15, Cast Bronze Threaded Fittings, Classes 125 and 250.
 - .2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .4 ANSI/ASME B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.
- .2 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .2 ASTM B88M, Standard Specification for Seamless Copper Water Tube (Metric).
 - .3 ASTM F492, Standard Specification for Propylene and Polypropylene (PP) Plastic-Lined Ferrous Metal Pipe and Fittings.
 - .4 ASTM B32, Standard Specification for Solder Metal.
- .3 American Water Works Association (AWWA).
 - .1 AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .4 Canadian Standards Association (CSA International).
 - .1 CSA B242, Groove and Shoulder Type Mechanical Pipe Couplings.
 - .2 CSA B137.9 Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications.
- .5 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).
- .6 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).

- .1 MSS-SP-67, Butterfly Valves.
- .2 MSS-SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.
- .3 MSS-SP-71, Cast Iron Swing Check Valves, Flanged and Threaded Ends.
- .4 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.
- .7 National Research Council (NRC)/Institute for Research in Construction.
 - .1 NRCC 38728, National Plumbing Code of Canada (NPC).
- .8 Transport Canada (TC).
 - .1 Transportation of Dangerous Goods Act, c. 34 (TDGA).

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

Part 2 Products

2.1 PIPING

- .1 Domestic hot, cold and recirculation systems, within building, all sizes:
 - .1 Above ground: copper tube, hard drawn temper, type L: to ASTM B88M.
 - .2 Buried or embedded:
 - .1 Copper tube, soft annealed, type K: to ASTM B88M, in long lengths with no buried joints.
 - .2 Cross-linked polyethylene piping to Series 160 of CSA B137.9.

2.2 FITTINGS

- .1 Bronze pipe flanges and flanged fittings, Class 150: to ANSI/ASME B16.24.
- .2 Cast bronze threaded fittings, Class 125: to ANSI/ASME B16.15.
- .3 Cast copper, solder type: to ANSI/ASME B16.18.

- .4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.
- .5 NPS 2 and larger: roll grooved to CSA B242.

2.3 JOINTS

- .1 Flanged: ASME B16.21, nonmetallic, flat, asbestos-free, full-face type for Class 150 and 300 cast copper alloy flanges. 1/8-inch maximum thickness, except where thickness or specific material is indicated.
- .2 Teflon tape: for threaded joints.
- .3 Solder: Alloy Sn95 (95% tin, 5% silver) to ASTM B32.
- .4 NPS 2 and over:
 - .1 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM flush seal gasket.
- .5 Dielectric connections between dissimilar metals: dielectric fitting to ASTM F492, complete with thermoplastic liner.

2.4 GATE VALVES

- .1 NPS 2-1/2 and over, in mechanical rooms, flanged:
 - .1 Rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, OS&Y bronze trim.
- .2 NPS 2-1/2 and over, other than mechanical rooms, flanged:
 - .1 Non-rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, bronze trim, bolted bonnet.

2.5 GLOBE VALVES

- .1 NPS2 and under, soldered:
 - .1 To MSS-SP-80, Class 150, 1 MPa, bronze body, renewable PTFE disc, screwed over bonnet, bronze seat.
- .2 NPS 2 and under, screwed:
 - .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, screwed over bonnet, renewable composition disc, bronze seat.

- .3 Provide lockshield handles where valve is used for balancing, such as in recirculation system.

2.6 SWING CHECK VALVES

- .1 NPS 3 and under, soldered:
 - .1 To MSS-SP-80, Class 150, 1 MPa, bronze body, brass swing disc for sizes 19mm and under, bronze swing disc for sizes 25mm and greater, screw in cap.
- .2 NPS 3 and under, screwed:
 - .1 To MSS-SP-80, Class 150, 1 MPa, bronze body, brass swing disc for sizes 19mm and under, bronze swing disc for sizes 25mm and greater, screw in cap.

2.7 BALL VALVES

- .1 NPS 3 and under, screwed:
 - .1 To MSS-SP-110, Class 150, bronze body, chrome plated brass ball, brass stem, PTFE adjustable packing, PTFE seat, steel lever handle.
- .2 NPS 3 and under, soldered:
 - .1 To MSS-SP-110, Class 150, bronze body, chrome plated brass ball, brass stem, PTFE adjustable packing, PTFE seat, steel lever handle.

2.8 BUTTERFLY VALVES

- .1 NPS 2-1/2 and over, grooved ends:
 - .1 Class 300, bubble tight shut-off, bronze body.
 - .2 Operator:
 - .1 NPS 6 and under: lever handles.

Part 3 Execution

3.1 INSTALLATION

- .1 General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.

- .2 Install components having pressure rating equal to or greater than system operating pressure.
- .3 Install piping free of sags, bends, and kinks.
- .4 Install fittings for changes in direction and branch connections in hard drawn copper tube.
- .5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .6 Install drains at low points and in trapped sections, to ensure entire system can be drained.
- .7 Buried tubing:
 - .1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.
 - .2 Bend tubing without crimping or constriction.
 - .3 No buried joints.

3.2 PIPING JOINT CONSTRUCTION

- .1 Join pipe and fittings as follows:
 - .1 Ream ends of pipe and tube and remove burrs to restore full inside diameter.
 - .2 Remove scale, slag, dirt, and debris from inside and outside of pipe, tube, and fittings before assembly.
 - .3 Soldered Joints: Construct joints according to ASTM B 828.
 - .4 Brazed Joints: Construct joints according to ANSI/AWS C3.4.
 - .5 Threaded Joints: Construct in accordance with industry standard practices and manufacturer's recommendations.
 - .6 Flanged Joints: Construct in accordance with industry standard practices and manufacturer's recommendations.
 - .7 Mechanical Joints: Grooved copper tube and grooved-tube fitting joints shall be assembled with coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's standard written procedure. Grooved ends on copper and copper alloy tube shall be roll-formed only using the appropriate roll-groove tool to construct a groove meeting the coupling and fitting manufacturer's written specifications. Cut grooving methods shall not be used on copper and copper alloy tube.

3.3 PIPING CONNECTIONS

- .1 Make piping connections as specified below:
 - .1 Install solder-joint to male-thread adapters, or solder-joint to male-thread unions meeting the requirements of ASME B16.18 or ASME B16.22, adjacent to each threaded valve and threaded equipment connection in a copper tube system.
 - .2 Install ASME B16.24 cast copper alloy pipe flanges adjacent to each flanged valve and flanged equipment connection in a copper tube system.

3.4 VALVES

- .1 Isolate equipment, fixtures and branches with ball valves, unless otherwise indicated.
- .2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.5 PRESSURE TESTS

- .1 Refer to Common Work Results for Plumbing.
- .2 Test pressure: 1.5 times maximum system operating pressure or 860 kPa, whichever is greater.

3.6 FLUSHING, CLEANING AND DISINFECTION

- .1 Flush, clean and disinfect the entire system in accordance with applicable standards, to the requirements of the authority having jurisdiction.
- .2 Upon completion of flushing, cleaning and disinfection, draw off sample from longest run and submit to laboratory for testing. Provide laboratory test reports on water quality for Departmental Representative approval.
- .3 Provide necessary fittings, valves and connections as required to flush, clean and disinfect the system.

END OF SECTION

Part I General

I.1 SUMMARY

.1 Section Includes:

- .1 Materials and installation of metallic drainage waste and vent piping.

I.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).

- .1 ASTM B32, Specification for Solder Metal.
- .2 ASTM B306, Specification for Copper Drainage Tube (DWV).
- .3 ASTM/ASME B16.29, Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings – DWV.
- .4 ASTM B 813, Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
- .5 ASTM B 828, Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings

.2 American Society of Mechanical Engineers (ASME)

- .1 ASME B16.23, Cast Copper Alloy Solder Joint Drainage Fittings: DWV

.3 Canadian Standards Association (CSA International).

- .1 CSA B67, Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
- .2 CAN/CSA-B70, Cast Iron Soil Pipe, Fittings and Means of Joining.
- .3 CAN/CSA-B125, Plumbing Fittings.
- .4 CAN/CSA-B602, Mechanical Couplings for Drain, Waste and Vent Pipe and Sewer.

I.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

I.4 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

Part 2 Products

2.1 COPPER TUBE AND FITTINGS

- .1 Above ground sanitary, and vent: Type DWV to ASTM B306.
 - .1 Fittings.
 - .1 Cast brass: to ASME B16.23.
 - .2 Wrought copper: to ASTM/ASME B16.29.
 - .2 Solder and flux: to ASTM B32, ASTM B 813, ASTM B 828.

2.2 CAST IRON PIPING AND FITTINGS

- .1 Above ground, storm, sanitary and vent: to CAN/CSA-B70.
 - .1 Joints.
 - .1 Mechanical joints to: CAN/CSA-B602.
 - .2 Neoprene or butyl rubber compression gaskets: to ASTM C564 or CAN/CSA-B70.
 - .3 Stainless steel clamps.

Part 3 Execution

3.1 BURIED PIPE

- .1 Install as follows, unless otherwise recommended by the manufacturer or directed by Departmental Representative:
 - .1 Provide 150 mm sand bedding below pipe and 150mm of sand over pipe for initial backfill.
 - .2 Balance of fill and amount of compaction to be the same as specified for the slab above.
 - .3 For sizes under 150 mm minimum grade to be 2%.

3.2 ABOVE GROUND SANITARY, STORM AND VENT: TO CAN/CSA-B70.

- .1 Joints:
 - .1 Hub and spigot:
 - .1 Caulking lead: to CSA B67.
 - .2 Mechanical joints:

- .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

.2

3.3 TESTING

- .1 Pressure test buried systems before backfilling.
- .2 Hydraulically test to verify grades and freedom from obstructions.
- .3 Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - .1 Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - .2 Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - .3 Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 30 kPa (10-ft WC). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 - .4 Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 250 Pa (1-in wg). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 - .5 Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 - .6 Prepare reports for tests and required corrective action.
- .4 Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

- .1 Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- .2 Cap and subject piping to static-water pressure of 345 kPa (50 psig) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- .3 Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
- .4 Prepare reports for tests and required corrective action.

END OF SECTION

Part I General

I.1 REFERENCES

- .1 American National Standards Institute/Canadian Standards Association (ANSI/CSA)
 - .1 ANSI Z21.10.3A-2007/CSA 4.3-2007, Gas Water Heaters - Volume III - Storage Water Heaters, with Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous.

I.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for domestic water heater, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.
 - .2 Indicate:
 - .1 Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.

I.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

I.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

I.5 WARRANTY

- .1 For the Work of this Section 22 30 05 - Domestic Water Heaters, 12 months warranty period prescribed in subsection GC 32.1 of General Conditions "C" is extended to number of years specified for each product.
- .2 Contractor hereby warrants domestic water heaters in accordance with CCDC2, but for number of years specified for each product.

Part 2 Products

- .1 Sustainable Requirements:
 - .1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements.

2.2 ELECTRIC WATER HEATER

- .1 To CAN/CSA E335-1 & E335-2-35.
- .2 To ANSI, ANSI/UL Standard 499.
- .3 Tankless electric water shall be equipped with a bare wire nichrome type heating element housed in fiberglass reinforced high temperature plastic containment.
- .4 The housing of the unit shall be made of high impact polycarbonate plastic.
- .5 The flow switch shall be of mechanical pressure differential type.
- .6 The unit shall be equipped with a safety high-limit switch with manual reset.
- .7 Water connections shall be designed for standard 3/8" O.D. flexible braided stainless steel hose type connectors.
- .8 The unit shall be mounted with water connections facing either top or bottom only.
- .9 The unit shall be provided with a minimum wire size of AWG #10.

2.3 ANCHOR BOLTS AND TEMPLATES

- .1 Supply anchor bolts and templates for installation in[concrete support pad structural steel support in accordance with Section 03 30 00 - Cast-in-Place Concrete 05 50 00 - Metal fabrications.

Part 3 Execution

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 Install in accordance with manufacturer's recommendations and authority having jurisdiction.
- .2 Provide structural steel for instantaneous heaters.

3.3 FIELD QUALITY CONTROL

- .1 Manufacturer's factory trained, certified Engineer to start up and commission DHW heaters.

3.4 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

- .1 The supply and installation of plumbing fixtures and trim.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

- .1 CAN/CSA-B45 Series, Plumbing Fixtures.
- .2 CAN/CSA-B125 Series, Plumbing Fittings.
- .3 CAN/CSA-B65 I, Barrier-Free Design.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to the Departmental Representative a complete brochure of all the new fixtures and accessories for review before placing a firm order.
- .3 Confirm styles, space, and quantities with Architectural drawings before submission.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

Part 2 Products

2.1 MANUFACTURED UNITS

.1 Fixtures:

- .1 Manufacture in accordance with CAN/CSA-B45 series.
- .2 Confirm colour with Architect.
- .3 Free of discoloration and flaws.

- .2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.

- .3 All exposed plumbing brass, metal supplies, traps, escutcheons, pipes, valves, fittings, etc. shall be chrome plated.
- .4 Number, types, locations: architectural drawings to govern.
- .5 Fixtures in any one location to be product of one manufacturer and of same type.
- .6 Trim in any one location to be product of one manufacturer and of same type.
- .7 Fixture piping:
 - .1 Hot and cold water supplies to each fixture:
 - .1 Chrome plated rigid supply pipes each with screwdriver stop, reducers, and escutcheon.
 - .2 Waste:
 - .1 Brass P-trap with clean out on each fixture not having integral trap.
- .8 Sealant: Colour- white, confirm with the Architect.

2.2 BARRIER-FREE PLUMBING FIXTURES

- .1 Provide approved barrier-free fixtures and brass where indicated on mechanical or architectural drawings.
- .2 Provide offset P-traps.
- .3 Leg protection:
 - .1 Lavatories: shroud/knee contact guard, colour – white, unless otherwise specified by the Architect.
 - .2 All exposed piping shall be completely covered, including screwdriver stops.

2.3 PLUMBING FIXTURES

- .1 Refer to Plumbing Fixture Schedule.

2.4 ACCESSIBILITY

- .1 Refer to 22 05 02 Common Work Results for Plumbing.

Part 3 Execution

3.1 GENERAL

- .1 Coordinate wall and floor construction to suit fixture layout.
- .2 Provide all hangers, supports, brackets reinforcement, 1.9 mm steel backup plates, etc., for the proper installation and support of fixtures and their respective supply fittings.
- .3 All connections shall be watertight, including supplies, traps, etc.

3.2 INSTALLATION

- .1 The fixtures shall be set level and square with relation to interior finish, floor, and wall lines. Locate with equal spacing on both sides, unless specifically shown otherwise.
- .2 Mounting heights:
 - .1 Standard: to comply with the manufacturer's recommendations unless otherwise indicated or specified.
 - .2 Physically handicapped: to comply with the most stringent of either NBCC or CAN/CSA B65 I.
- .3 Vanity and counter sinks: ensure location in counter is in accordance with the manufacturer's recommendations and the Architect's requirements.
- .4 Chrome plated piping: use only strap wrenches on chrome plating piping and fittings. Replace any damaged by wrench marks. Joints to be threaded or slip union type.
- .5 Fixtures shall be piped complete in a first class manner.
- .6 Apply sealant to all joints where fixtures come in contact with floors, walls and/or counters. Joints shall be made watertight with a smooth bead of sealant applied in a neat, workmanlike manner.
- .7 After installation, fixtures shall be protected from damage, dirt and paint. Replace damaged materials. Clean only with manufacturer approved non-abrasive cleansers.

3.3 ADJUSTING

- .1 Adjustments:
 - .1 Adjust water flow rate to design flow rates.
 - .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

- .3 Adjust flush valves to suit site conditions.
- .4 Adjust metering valve timing mechanisms.
- .5 Adjust temperature limit and safety controls.
- .6 Adjust brass for easy, drip-free operation.
- .2 Checks:
 - .1 Aerators: operation, cleanliness.
 - .2 Strainers: cleanliness.
 - .3 Vacuum breakers, backflow preventers: operation under all conditions.
- .3 Thermostatic controls:
 - .1 Verify temperature settings, operation of control, limit and safety controls.

3.4 DEMONSTRATION

- .1 Demonstrate all special fixtures to the Departmental Representative, including operation and maintenance.

END OF SECTION

Part I General

I.1 SUMMARY

.1 Section Includes:

- .1 Materials and installation for plumbing specialties and accessories.

I.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM).

- .1 ASTM A126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
- .2 ASTM A536, Specification for Ductile Iron Castings.
- .3 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.

.2 American Water Works Association (AWWA).

- .1 AWWA C116/A21.16, American National Standard for Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service.
- .2 AWWA C700, Cold Water Meters-Displacement Type, Bronze Main Case.

.3 Canadian Standards Association (CSA International).

- .1 CSA-B64 Series, Backflow Preventers and Vacuum Breakers.
- .2 CSA-B79, Floor, Area and Shower Drains, and Cleanouts for Residential Construction.
- .3 CSA-B356, Water Pressure Reducing Valves for Domestic Water Supply Systems.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

- .1 Material Safety Data Sheets (MSDS).

.5 Plumbing and Drainage Institute (PDI).

- .1 PDI-WH 201, Water Hammer Arresters.

I.3 SUBMITTALS

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

- .2 Submit following additional information:
 - .1 Submit a single set of shop drawing for all backflow prevention devices.
 - .2 Indicate the location and type of each backflow preventer.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

Part 2 Products

2.1 DRAIN PUMP

- .1 Refer to Plumbing Fixture Schedule.

2.2 WATER COOLER

- .1 Refer to Plumbing Fixture Schedule.

2.3 WATER FILTRATION

- .1 Refer to Plumbing Fixture Schedule.

2.4 CLEANOUTS

- .1 Cleanouts:
 - .1 Walls: heavy lacquered cast iron body.
 - .2 Floors: heavy lacquered cast iron body with adjustable head suitable for recessed access cover, and neoprene gasket or inside caulk connection. Provide anchor flange with clamping collar for units located in waterproof floors.
 - .3 Plugs: tapered threaded bronze with raised head, gas- and water-tight seal.
- .2 Access Covers:
 - .1 Walls: flush mounted, square, prime-coated, 1.9 mm thick steel construction with concealed hinge, door with rounded corners, and screwdriver-operated cam lock.
 - .2 Floors:
 - .1 Unfinished concrete: nickel bronze, heavy duty, round scoriated top with retaining screws.

- .2 Tile: nickel bronze, square scoriated top with retaining screws.
- .3 Sheet goods: nickel bronze, round scoriated top with retaining screws.
- .4 Carpet: nickel bronze, round scoriated top with carpet marker and retaining screws.

2.5 WATER HAMMER ARRESTERS

- .1 Stainless steel construction, bellows type: tested and certified to PDI-WH 201.

2.6 STRAINERS

- .1 860 kPa (125 psi) maximum working pressure, Y-type with 20 mesh, removable stainless steel screen.
- .2 NPS 2 and under, bronze body, screwed ends, with brass cap.
- .3 NPS 2-1/2 and over, cast iron body, flanged ends, with bolted cap.

Part 3 Execution

3.1 CLEANOUTS

- .1 Size: line size up to NPS 4. Not less than NPS 4 on larger pipes.
- .2 Install cleanouts where easily utilized, at the base of soil and waste stacks, and rainwater leaders, at locations required by local code and authority having jurisdiction, and as indicated.
- .3 Bring cleanouts to wall or finished floor unless serviceable from below floor.
- .4 In finished areas, ensure a neat installation level within the surrounding floor or wall. Beneath vanities located as high as permissible for good access and minimum visibility.

3.2 WATER HAMMER ARRESTERS

- .1 Provide water hammer arresters:
 - .1 At all equipment utilizing quick closing valves such as automatic dishwashers, clothes washers, etc.
 - .2 On branch supplies to fixtures or group of fixtures.
 - .3 Where recommended by Plumbing and Drainage Institute Standard PDI-WH 201 "Water Hammer Arresters".

- .4 Where indicated on the drawings.
- .2 Size in conformance with Plumbing and Drainage Institute Standard PDI-WH 201 "Water Hammer Arresters".

3.3 STRAINERS

- .1 Install with sufficient room to remove screen.
- .2 Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, solenoid valve, and pump.

3.4 TESTING AND ADJUSTING

- .1 Access doors:
 - .1 Verify size and location relative to items to be accessed.
- .2 Cleanouts:
 - .1 Verify covers are gas-tight, secure, yet readily removable.
- .3 Water hammer arresters:
 - .1 Verify proper installation of correct type and size of water hammer arrester.
- .4 Strainers:
 - .1 Clean out repeatedly until clear.
 - .2 Verify accessibility of cleanout plug and basket.
 - .3 Verify that cleanout plug does not leak.

END OF SECTION