1. **GENERAL**
	1. **Summary**
		1. Water Heaters.
		2. Packaged water heating systems.
		3. Domestic water heat exchangers.
		4. Water storage tanks.
	2. **References and Related BCIT Standards**
		1. American Gas Association (AGA) and Canadian Gas Association (CGA).
		2. American Society of Mechanical Engineers (ASME).
		3. ASME Section 8D - Boilers and Pressure Vessel Codes - Rules for Construction of Pressure Vessels.
		4. BC Building Code, Latest Edition (BCBC).
		5. Canadian Standards Association (CSA).
	3. **Design Requirements**
		1. Water heaters with storage capacity of 180 L or less and heating capacities of 4.5 kW or less should be electric and shall have a drain pan piped to drain.
		2. For larger tanks and heating capacity, natural gas or other service over electric is preferred. The maximum required domestic hot water temperature shall be 60°C. Where hotter domestic water is required it shall be boosted from 60°C.
		3. For tanks heated by campus heating mains and where interruption of domestic hot water service is particularly problematic (e.g. food services, laboratories), provide two (2) brazed plate, double-wall heat exchangers in parallel with isolating valves so one can be removed for cleaning while the other remains in service.
	4. **Submittals**
		1. Submit in accordance with Section 01 33 00 Submittal Procedures.
		2. Product Data: Provide dimension drawings of water heaters indicating components and connections to other equipment and piping. Indicate pump type, capacity, and power requirements. Provide certified pump curves showing pump performance characteristics.
	5. **Quality Assurance**
		1. Conform to AGA, NBBPVI, NFPA 58, NFPA 70, UL 174 requirements for water heaters.
		2. Conform to ASME Section 8D for manufacture of pressure vessels for heat exchangers.
		3. Conform to ASME Section 8D, NFPA 30, NFPA 31 for tanks.
		4. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum five (5) years documented experience.
		5. Provide pumps with manufacturer's name, model number, and rating/capacity identified.
2. **PRODUCT AND DESIGN REQUIREMENTS**
	1. **Commercial Electric Water Heaters**
		1. Type: Factory-assembled and wired, electric, vertical storage type.
		2. Performance: Maximum working pressure; 1000 kPa.
		3. Tank: Glass lined to ASHRAE 90.1, welded steel, ASME labelled; 100 mm diameter inspection port, thermally insulated with minimum 50 mm mineral wool material encased in corrosion resistant steel jacket; baked-on enamel finish.
		4. Accessories: Brass water connections and dip tube, drain valve, magnesium anode, and ASME rated temperature and pressure relief valve.
		5. Controls: Ventilated control cabinet, factory-wired with solid state progressive sequencing step controller, fuses, magnetic contactors, control transformer, pilot lights indicating main power and heating steps, control circuit toggle switch, electronic low-water (probe-type) cut-off, high temperature limit thermostat, flush-mounted temperature and pressure gauges.
	2. **Commercial Gas Fired Water Heaters**
		1. Type: Automatic, natural gas-fired, high efficiency condensing vertical storage.
		2. Performance: Maximum working pressure: 1000 kPa (150 psig).
		3. Tank: Glass lined to ASHRAE 90.1, welded steel, ASME labelled; multiple flue passages, 100mm diameter inspection port, thermally insulated with minimum 50 mm mineral wool material, encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.
		4. Accessories: Brass water connections and dip tube, drain valve, magnesium anode, and ASME rated temperature and pressure relief valve.
		5. Approval: By AGA and CGA as automatic storage water heater and automatic circulating tank water heater for operation at 82°C operation on combustible floors.
	3. **Domestic Water Heat Exchangers**
		1. Tubes: U-tube double wall type with 19 mm diameter seamless copper tubes suitable for 860 kPa working pressure, complete with leak detection and drain provisions.
		2. Heads: Brass, with brass tube sheets, threaded or flanged for piping connections. Provide tube leak detection drain plugs at head for double walled tubes.
		3. Water Chamber and Tube Bundle: Removable for inspection and cleaning.
		4. Shell and Tube Type: Steel shell, with threaded or flanged piping connections and necessary tappings, steel saddle and attaching U-bolts, designed for heating fluid in shell and heated fluid in tubes.
		5. Accessories:
			1. Wells for temperature regulator sensor at heated water outlet.
			2. ASME rated pressure and temperature relief valve on heated water discharge.
			3. Thermometers and pressure gauge tappings on water inlets and outlets.
	4. **Domestic Hot Water Storage Tanks**
		1. Tank: Welded steel, ASME labelled for working pressure of 870 kPa, tappings for accessories, threaded connections of stainless steel, access manhole.
		2. Lining: Glass lining continued into flanged connections to ASHRAE 90.1.
		3. Accessories: Tank drain, water inlet and outlet, thermometer range of 4 to 93°C ASME pressure relief valve suitable for maximum working pressure.
	5. **Diaphragm-Type Compression Tanks**
		1. Construction: Welded steel, tested and stamped to Section 8D of ASME Code, rated for working pressure of 860 kPa with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.
		2. Accessories: Pressure gauge and air-charging fitting, tank drain; pre-charge to 80 kPa.
	6. **DHW Recirc Automatic Flow Valves**
		1. Domestic hot water recirculation valves shall be pressure independent constant flow, factory set, stainless steel. Standard of acceptance: Griswold standard flow cartridge.
		2. Select valves flow settings for minimum flow required to maintain warm water throughout the system and size the recirculation piping and pump accordingly.
	7. **DHW Recirculation**
		1. Design the DHW Recirculation system such that there is a maximum 10 second wait time for hot water at any/all faucets and fixtures.
		2. DHW recirculation pump controls on the DDC with return water temperature sensor point. Consider occupancy based or demand-based recirculation pump control so pump runs only from demand and/or from end of line temperature sensor.
3. **EXECUTION**
	1. **Installation**
		1. Install water heaters to manufacturer's instructions and to AGA, NFPA 54, ULC requirements, including seismic restraints.
		2. Domestic Water Heat Exchangers:
			1. Install shell and tube type domestic water heat exchangers with clearance for tube bundle removal without disturbing other installed equipment or piping.
			2. Support unit on secured floor stand posts with seismic restraint straps/braces.
			3. Pipe relief valves and drains to nearest floor drain.
			4. Brazed plate type heat exchangers may be used, along with easily removable pipe fittings and isolation for servicing and replacement.
		3. Domestic Hot Water Storage Tanks:
			1. Provide steel pipe support, independent of building structural framing members.
			2. Clean and flush after installation. Seal until pipe connections are made.

\*\*\* END OF **DOMESTIC WATER HEATERS** SECTION \*\*\*