

- 1 General
 - 1.1 **SUMMARY**
 - .1 Section Includes
 - .1 Labour, Products, equipment and services necessary to complete the Work of this section.
 - 1.2 **SUBMITTALS**
 - .1 Shop Drawings
 - .1 Submit Shop Drawings in accordance with Section 01 33 00.
 - .2 Operation and Maintenance Data
 - .1 Submit printed operation instructions and maintenance data in accordance with Section 01 33 00.
- 2 Products
 - 2.1 **THERMOMETERS AND PRESSURE GAUGES**
 - .1 General
 - .1 To match existing thermometers and pressure gauges
 - .2 Scale Reading Units
 - .1 Thermometers to read (both Fahrenheit and Celsius) (Fahrenheit) (Celsius) scale.
 - .2 Pressure gauges to read (both psi and kPa) (psi) (kPa) scale.
 - .3 Gauge stems and separable sockets of sufficient length to provide for proper insertion in piping or equipment in which they are installed.
 - .3 Products are identified by model designations from H.O. Trerice Co. and to be used as a guide to establish standard of construction. Comparable Products are acceptable from the following manufacturers:
 - .1 H.O. Trerice Company
 - .2 Dresser Canada Inc. - Ashcroft
 - .3 Weiss
 - .4 Weksler - Baker Instruments
 - .5 Winter's Thermogauges Limited
 - .2 Direct Reading Thermometers
 - .1 Industrial 230 mm scale length, variable angle type, liquid filled, aluminum case
 - .1 H.O. Trerice Company - A400 series

- .2 Bi-metal dial type, 125 mm diameter, variable angle, stainless shell type 300 series case and stem with calibration screw.
- .3 H.O. Trerice Company - B85600 series
- .3 Remote Reading Thermometers
 - .1 115 mm diameter, liquid filled or gas activated type, braided bronze armour over copper capillary, stainless steel bulb and cast aluminum case for surface mounting.
 - .1 H.O. Trerice Company - Series No. L80300 (liquid filled)
- .4 Thermometer Wells
 - .1 Provide wells in pipelines as follows:
 - .1 For copper pipe: Brass.
 - .2 For steel pipe: Brass or stainless steel.
- .5 Conversion Kit
 - .1 Retrofit kit for converting wells of straight liquid filled thermometers to accept bi-metal dial thermometers.
- .6 Direct Reading Pressure Measurement
 - .1 Dial type, 100 mm diameter, glycerine liquid filled
 - .1 Case: Stainless steel type 304
 - .2 Movement: Stainless steel
 - .3 Tube and socket: Stainless steel type 304
 - .4 Adjustable pointer
 - .5 Two-way gauge cock
 - .6 Operating temperature range, glycerine: -17°C to +115°C (0°F to 240°F)
 - .7 Operating temperature range, silicone: -34°C to +115°C (-30°F to 240°F)
 - .8 Accuracy: ASME B40.1 Grade 1A $\pm 1\%$ full scale
 - .9 H.O. Trerice Company - Series 700
- .7 Differential pressure measurement at pumps, refrigeration machines and where shown
 - .1 Same as for direct reading pressure measurement, and:
 - .1 Maximum registering pointer
 - .2 Impulse snubber
 - .3 Three way switching valve

- .8 Sanitary Direct Reading Pressure Measurement
 - .1 Dial type, 100 mm diameter, food grade glycerine liquid filled
 - .1 Case and ring: Polished stainless steel type 316
 - .2 Movement: Stainless steel type 316
 - .3 Capsule and socket: Stainless steel type 316
 - .4 Adjustable pointer
 - .5 Operating temperature range, glycerine: -20°C to +100°C (-4°F to +212°F)
 - .6 Accuracy: ASME B40.1 Grade 1A $\pm 1\%$ full scale
 - .7 Approvals: 3A and USDA
 - .8 H.O. Trerice Company - Series 700TALF
- .9 Test wells. For use with partial immersion laboratory type thermometers.
 - .1 Manufactured from bar stock or forged brass with cap and chain, compatible with thermometers used.
 - .2 Registered with Technical Standards and Safety Association, Boiler and Pressure Vessel Safety Branch, and have C.R.N. Registration number.
 - .1 H.O. Trerice Company

2.2 **STRAINERS AND FILTERS**

- .1 "Y" Pattern Strainers
 - .1 NPS 2 and under:
 - .1 "Y" pattern
 - .2 Class 125 (860 kPa) bronze body
 - .3 Screwed ends and screwed cleanout.
 - .2 NPS 3 and larger:
 - .1 "Y" pattern
 - .2 Class 125 (860 kPa) cast iron body
 - .3 Flanged ends and bolted cleanout cap
 - .4 Blow-off drain connection.
 - .3 Screen material: 20 mesh stainless steel unless otherwise noted
 - .4 Manufacturers:
 - .1 Erwel
 - .2 Spirax Sarco

- .3 Streamflo
 - .4 Brooks – Hart
 - .5 Mueller
 - .2 Basket Strainers
 - .1 NPS 2 to 12, WOG service
 - .1 Single basket
 - .2 Class 150 (1033 kPa) cast iron body with quick release cover
 - .3 Bottom blow down valve
 - .2 NPS 2 to 12, steam service
 - .1 Single basket
 - .2 Class 125 (860 kPa) cast iron body with bolted cover
 - .3 Bottom blow down valve
 - .3 Basket Screens
 - .1 Stainless steel
 - .2 NPS 2 and 3: 1.15 mm perforation mesh
 - .3 NPS 4 and over: 3.2 mm perforation mesh
 - .4 Manufacturers
 - .1 Erwel
 - .2 Spirax Sarco
 - .3 Streamflo
 - .4 Brooks – Hart
 - .5 Mueller

2.3 **FLEX CONNECTIONS AND EXPANSION COMPENSATION**

- .1 Flexible Metal Hose Connections
 - .1 Size Application
 - .1 Steel piping: NPS ½ to NPS 14
 - .2 Construction
 - .1 Corrugated inner hose of bronze or stainless steel.
 - .2 Outer jacket of bronze or stainless steel braided wire mesh.
 - .3 Screwed or female soldered end connections up to NPS 2.

- .4 Forged steel raised face flanged NPS 2½ and above.
 - .5 Selected for 1034 kPa (150 psi) working pressure and 93°C (200°F) working temperature.
 - .6 Designed to absorb 150 mm transverse movement.
 - .7 Flexible length not less than six times nominal size.
 - .3 Manufacturer
 - .1 Senior Flexonics (Canada) Limited
 - .2 Piping Accessories Canada Ltd.
 - .3 SSI Equipment Inc.
 - .4 Anaconda Flexpipe
 - .5 United Flexible Metallic Tubing (Canada) Limited
- .2 Flexible Rubber Expansion Joints
 - .1 Size Application
 - .1 Steel piping: NPS 1½ to NPS 12
 - .2 Construction
 - .1 Double arch, sphere design bellows
 - .2 Composite three layer EPDM or neoprene with nylon reinforcement construction
 - .3 Floating flanges complete with control units.
 - .4 Operating pressure: Minimum 860 kPa (125 psig)
 - .5 Operating temperature: -10°C to +100°C (14°F to 212°F)
 - .3 Manufacturer
 - .1 Senior Flexonics (Canada) Ltd - Style 102
 - .2 SSI - model ATM
 - .3 UniRoyal Rubber - Style 4140
- .3 Expansion Compensators (bellows type)
 - .1 Size Application
 - .1 Steel piping: NPS ¾ to NPS 2
 - .2 Copper piping: NPS ¾ to NPS 3
 - .2 Construction
 - .1 Pressure external to bellows.

- .2 Internal guides, limit stops and anti-torque device.
 - .3 Copper pipe installation: Bronze construction with female solder type ends.
 - .4 Steel pipe installation: Steel construction with stainless steel bellows and screwed ends.
 - .5 Selected for 1035 kPa (150 psi) (1380 kPa (200 psi)) working pressure.
- .3 Manufacturers
 - .1 Senior Flexonics (Canada) Limited
 - .2 Badger
 - .3 Hyspan
- .4 Uncontrolled Type Expansion Joints
 - .1 Size Application
 - .1 Steel piping: NPS 2 to NPS 24
 - .2 Construction
 - .1 Stainless steel bellows
 - .2 Flanged ends
 - .3 Suitable for axial extension and compression, lateral off-set, and angular rotation
 - .4 Temperature rating: -29°F to +426°C (-20°F to +800°F)
 - .5 Selected for 1035 kPa (150 psi) (1380 kPa (200 psi)) steam working pressure.
 - .3 Manufacturers
 - .1 Senior Flexonics (Canada) Limited
 - .2 Adsc Division - Yuba Industries Inc.
 - .3 Hyspan
- .5 Ring Controlled Type Expansion Joints
 - .1 Size Application
 - .1 Steel piping: NPS 3 to NPS 24
 - .2 Construction
 - .1 Stainless steel bellows, limit stops and guides
 - .2 Reinforcing control rings
 - .3 Flanged ends

- .4 Anchor type bases where required
 - .5 Temperature rating: -29°F to +426°C (-20°F to +800°F)
 - .6 Selected for 1035 kPa (150 psi) (1380 kPa (200 psi) 2070 (300 psig)) steam working pressure.
 - .3 Manufacturers
 - .1 Senior Flexonics (Canada) Limited
 - .2 Adsco Division - Yuba Industries Inc.
 - .3 Hyspan
 - .6 Slip Type Expansion Joints
 - .1 Size Application
 - .1 Steel piping: NPS 1½ to NPS 24
 - .2 Construction
 - .1 Packing chamber, limit stops, lubrication fittings, or lubricant impregnated packing rings
 - .2 Adjustable packing gland or fixed packing gland arrangement with a packing injection assembly
 - .3 Slip pipe of hard chrome plated carbon steel to ASTM A53-82
 - .4 Anchor base
 - .3 Manufacturers
 - .1 Senior Flexonics (Canada) Ltd.
 - .2 Rockwell
 - .3 Yarway
 - .4 United Flexible Metallic Tubing (Canada) Limited
 - .5 Adsco
 - .6 Hyspan
- 2.4 **MISCELLANEOUS**
- .1 Pressure Relief Valves
 - .1 ASME rated, selected of relieving flow at 25% above the working pressure.
 - .2 Body construction and trim: To suit specific service.
 - .3 Manufacturers
 - .1 STM Specialty Sales
 - .2 Watts

- .3 Fisher
 - .4 Consolidated
 - .2 Drain Valves
 - .1 NPS ½ brass sediment faucets with hose outlets
 - .2 Manufacturers
 - .1 Emco 10740
 - .2 Cambridge Brass 32W201
- 2.5 **VALVE CONTROL & GAUGE MONITORING SYSTEMS (*FUTURE* BAS INTEGRATION)**
 - .1 Any vendors that are authorized dealers or distributors of the following control systems are acceptable:
 - .1 Delta Controls
 - .2 Reliable Controls
 - .3 Schneider Electric SmartX Series
 - .4 Distech Controls
 - .5 Johnson Controls Facility Explorer
 - .6 Honeywell CIPer series, Spyder Models 5 or 7
 - .2 BAS System Integration:
 - .1 All control systems must be integrated to the City's J2 Innovations Fluid Integration (FIN) serve, including but not limited to the following:
 - .1 Graphical user interface (monitoring and control)
 - .2 Alarming
 - .3 Data Trending
 - .4 Data Archiving
 - .5 Project Haystack naming convention
 - .2 The installer must be licensed by J2 Innovations to sell, install, program and configure Fluid INtegration (FIN).
 - .3 Building Controllers (BC) must be Tridium Niagara JACE with the Haystack module and driver. The installer must be a licensed Tridium system integrator for any Tridium BCs or embedded or edge Niagara Framework products used. Soft JACE is not accepted.
 - .3 Licensing Requirements
 - .1 Licenses shall be provided to and in the name of the City of Toronto
 - .2 Licenses shall be perpetual, transferrable, assignable and royalty free.

.3 Tridium Licenses shall allow all workbench/supervisor brands complete system access and functionality.

.4 Installer and Manufacturer Qualifications

.1 Installer shall have an established working relationship with Control System Manufacturer.

.2 Installer shall have successfully completed control system's control system training. Upon request, installer shall present record of completed training including course outlines.

.3 It is the intent of these specifications to define an open protocol state-of-the-art distributed computerized Building Management and Control System, which is user friendly, has known reliability, is extremely responsive, and which is to be designed, installed, implemented, and supported by a local office of approved bidders.

.4 BAS Contractor provides three locations for successful installations of similar open protocol computer-based systems. Sites provided must consist of more than 150 hardware inputs/outputs. Project sites must be local to the location of this project.

3 Execution

3.1 **INSTALLATION - THERMOMETERS AND PRESSURE GAUGES**

.1 General

.1 Installation height: Not greater than 3 m from floor or platform.

.2 Installation heights exceeding 3 m from floor or platform: Install remote reading thermometers and gauges, with dial mounted at 1500 mm above floor or platform, on steel or aluminum plate.

.2 Thermometers

.1 Install thermometers in wells.

.2 Install wells with extension necks in piping or equipment that is to be insulated.

.3 Provide thermometers at inlet and outlet of:

.1 Domestic hot water tanks

.2 Water heating and cooling coils

.3 Water boilers

.4 and as shown

.4 Thermometer Ranges

SYSTEM	SCALE RANGE
City water	(-5° to 40°C) (25° to 100°F)
Domestic cold water	(-5 °to 40°C) (25°to 100°F)

Domestic hot water	(5° to 120°C) (40° to 180°F)
Hot water heating (scheduled & constant temperature)	(5° to 115°C) (40° to 240°F)

.3 Pressure Gauges

.1 Selection

.1 Normal operating reading: Between one-half and two-thirds of full scale or range and expected maximum and minimum readings are within range.

.2 Provide pressure gauges at inlet and outlet of:

- .1 Domestic water heaters
- .2 Water heating and cooling coils
- .3 Water boilers
- .4 Water filters
- .5 Pressure reducing valves
- .6 Pumps (pressure differential)
- .7 and as shown

.3 For direct pressure measurement, provide for each gauge:

- .1 One-quarter turn bronze ball valve complete with lever handle
- .2 Pressure snubber
- .3 Syphons for gauges in steam service
- .4 Isolation diaphragms where shown for gauges in corrosive service

.4 For differential pressure measurement, provide for each gauge:

- .1 Three-way three position (left-off-right) switching valve with lever handle
- .2 Pressure snubber
- .3 Impulse dampener
- .4 Syphons for gauges in steam service
- .5 Isolation diaphragms where shown for gauges in corrosive service

.4 Test Plugs

.1 Provide test plugs for temporary insertion of thermometers and pressure gauges at locations shown on Drawings.

3.2 **INSTALLATION - STRAINERS AND FILTERS**

.1 "Y" Strainers

.1 Horizontal installation: Install with minimum 300 mm clearance between bottom of strainer and any obstruction.

- .2 Vertical installation: Install with basket drain pointing down, and with minimum 300 mm clearance between bottom of strainer and any obstruction.
 - .3 Provide drain valve complete with chain and cap on NPS 3 and larger strainers.
 - .4 Remove baskets, clean and replace at time of building handover.
 - .2 Basket Strainers
 - .1 Install basket strainers with minimum of 450 mm clearance above strainer.
 - .2 Provide pipe supports on piping immediately adjacent to strainer; do not directly support strainer, or have adjacent piping supported through the strainer.
 - .3 Remove baskets, clean and replace at time of building handover.
 - .3 Automatic Back-Wash Filters
 - .1 Install automatic backwash filters in accordance with manufacturer's recommendations.
 - .2 Provide drain to back-wash drain connection and pipe to floor drain. (Pipe-up domestic cold water connection).
- 3.3 **INSTALLATION - FLEX CONNECTIONS AND EXPANSION COMPENSATION**
 - .1 Selection Criteria
 - .1 Provide manufactured expansion compensation units where shown on Drawings.
 - .2 Provide expansion loops where shown on Drawings.
 - .3 Select expansion joints to compensate for thermal expansion in pipe between anchors with not less than 25% safety factor calculating expansion from -18°C (0°F) ambient up to maximum possible operating fluid temperature, but not less than 93°C (200°F).
 - .2 Provision of expansion joints and flex connections:
 - .1 Flexible Metal Hoses
 - .1 On suction and discharge connections of domestic water booster pumps.
 - .2 On suction and discharge connections of base mounted double suction pumps.
 - .3 On discharge connections of sump and sewage pumps.
 - .4 In steam, hot water, chilled water, or glycol piping connections to coils and humidifiers in air supply units when units, or sections of units to which piping is connected, are supported or suspended by means of springs or isolation pads.
 - .5 On piping connections to domestic hot water tanks.
 - .6 Cooling tower supply and return connections at tower.

- .2 Flexible Rubber Expansion Joint
 - .1 Cooling tower supply and return piping connections at pump.
 - .2 Above ground drainage piping where shown on Drawings.
- .3 Expansion Compensators
 - .1 Domestic hot water supply and recirculation piping up to and including NPS 3.
 - .2 Heating system piping up to and including NPS 2 size.
 - .3 Compressed air, maximum 860 kPa (125 psig).
- .4 Uncontrolled Type Expansion Joints
 - .1 Domestic hot water and recirculating water piping NPS 3½ size and larger.
 - .2 Heating system piping NPS 2½ size and larger.
- .5 Ring Controlled Type Expansion Joints Slip Type
 - .1 High pressure steam piping over 100 kPa (15 psig).
- .6 Slip Joints
 - .1 High temperature hot water over 100°C (212°F).
- .7 Expansion joint installation:
 - .1 Provide pipe guides for each expansion joint using two guides on each side of and adjacent to joint.
 - .2 Refer to Section 15060 for pipe guides.
 - .3 Guide may be omitted between joint and anchor where an anchor is located within 900 mm of expansion joint.
 - .4 Provide anchors consisting of structural steel angles, channels, or plates secured to building structure.
- .8 Flexible metal hose connection installation:
 - .1 Support or guide piping firmly adjacent to flexible connections and prevent pipes from swaying.
 - .2 At steam coils locate hoses between control valve and coil on steam supply side and on main condensate line leaving coil or bank of coils on return side.
 - .3 At chilled and/or hot water coils locate hoses on supply side between strainer and coil and on return side between coil and control valve.

3.4 **INSTALLATION - MISCELLANEOUS**

.1 Pressure Relief Valves

- .1 Install relief valves downstream of pressure reducing valves, and on pressure vessels where shown.
- .2 Provide discharge elbow drain, and pipe drain with NPS $\frac{3}{4}$ pipe to nearest floor drain.
- .3 Terminate relief vent up through roof, at height as follows:
 - .1 900 mm for water systems below 92°C (200°F).
 - .2 1800 mm for water and steam systems above 92°C (200°F).

.2 Drain Valves

- .1 Provide at:
 - .1 Low points of water piping systems in order to completely drain each system.
 - .2 Cooling and heating coils.
 - .3 Reheat coils where detailed on Drawings.
 - .4 Other locations as shown.

End of Section

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