

PART 1 - GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A269/A269M-15A, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service, latest edition.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code, latest edition.
- .3 ASME B31.1, Power Piping, latest edition.
- .4 ASME B31.3, Process Piping, latest edition.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.
 - .2 Shop Drawings:
 - .1 Submit shop drawings to indicate project layout including layout, dimensions and extent of piping system.
 - .1 Vertical and horizontal piping locations and elevations and connections details.
 - .3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
 - .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
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| <u>1.3 DELIVERY,
STORAGE AND
HANDLING</u> | .1 | Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling. |
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PART 2 - PRODUCTS

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| <u>2.1 GENERAL</u> | .1 | Proportional relief valves are not required to have Canadian Registration Numbers (CRN). All other high pressure components of this system are to have CRN and conform to ASME B31.3. Documentation shall be provided by Contractor indicating CRN numbers for components as required. |
| | .2 | It is important that fractional, NOT metric, stainless steel tubing, fittings and valves are used to ensure proper sizes and fit. Do not mix materials or fittings from different manufacturers. |

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| <u>2.2 PIPING</u> | .1 | Piping:
.1 316L, Stainless steel tubing. Must be suitable for bending; surface scratches, and imperfections (incomplete weld seams) are not permissible. Size and minimum wall thickness as indicated in Bill of Materials on Drawing 4476681-403. |
| | .2 | Fittings:
.1 316L Stainless steel with O-seal face connectors/adaptors.
.2 316 Stainless steel A-LOK tube fittings with two ferrule design.
.3 316 Stainless steel Autoclave adapter with NPT threads that must be sealed using a high quality PTFE tape and/or PTFE paste product.
.4 Contractor to provide documentation of Canadian Registration Number. |

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| <u>2.3 PIPING SUPPORTS</u> | .1 | Mounting rail with clamp halves, cover plate and hexagon head bolts and hexagon rail nuts, in accordance with Bill of Materials on Drawing 4476681-403. |
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- 2.4 BALL VALVES
- .1 2-Way, 150 psig ball valve: Brass ball valve with 6.35 mm female NPT ports. Maximum working pressure of 150 psig, in accordance with Bill of Materials on Drawing 4476681-403.
 - .2 2-Way, 6,000 psig ball valve: 316 Stainless steel, high pressure ball valve with PCTFE seats and 6.35 mm female NPT ports. Working pressure of 6,000 psig, in accordance with Bill of Materials on Drawing 4476681-403.
 - .3 2-Way, 10,000 psig ball valve: 316 Stainless steel, high pressure ball valve with PEEK seats and 6.35 mm female NPT ports. Working pressure of 10,000 psig, in accordance with Bill of Materials on Drawing 4476681-403.
 - .4 Contractor to provide documentation of Canadian Registration Number.

- 2.5 PNEUMATIC ACTUATED 3-WAY BALL VALVES
- .1 3-Way, 6,000 psig ball valve: 316 Stainless steel, high pressure ball valve with PCTFE seats and 6.35 mm female NPT ports. Working pressure of 6,000 psig, in accordance with Bill of Materials on Drawing 4476681-403.
 - .2 Pneumatic actuator with aluminum alloy body construction with two component polyurethane coating and solenoid valve.
 - .3 Contractor to provide documentation of Canadian Registration Number.

- 2.6 NEEDLE VALVES
- .1 316 Stainless steel, union bonnet design, with PTFE packing and regulating stem for use in throttling application. Working pressure of 6,000 psig.
 - .1 Contractor to provide documentation of Canadian Registration Number.
 - .2 In accordance with Bill of Materials on Drawing 4476681-403.

- 2.7 PNEUMATIC ACTUATED NEEDLE VALVES
- .1 316 Stainless steel design with 6.35 mm female NPT ports. Maximum allowable working pressure of 15,000 psi.

- 2.7 PNEUMATIC ACTUATED NEEDLE VALVES
(Cont'd)
- .2 Pneumatic actuator with maximum allowable air pressure of 100 psi. Spring return with 80 psi operating pressure.
 - .3 Contractor to provide documentation of Canadian Registration Number.
 - .4 In accordance with Bill of Materials on Drawing 4476681-403.
- 2.8 PRESSURE GAUGES
- .1 Analog Gauge: 114 mm dial, 304 Stainless steel with 6.35 mm Male NPT connection and accuracy of 1% full scale. Pressure ranges in accordance with Bill of Materials on Drawing 4476681-403.
 - .2 Digital Gauge: 114 mm fiberglass reinforced thermoplastic case with 6.35 mm Male NPT connection, line powered 24 Vdc and accuracy of .25% full scale. Pressure ranges in accordance with Bill of Materials on Drawing 4476681-403.
 - .3 Documentation shall be provided by Manufacturer that the gauges have been tested to the indicated range.
- 2.9 PRESSURE TRANSMITTER
- .1 Pressure transmitter with stainless steel measuring cell and output signal of 4-20 mA. Pressure ranges from 36.3 psi to 14,500 psi.
- 2.10 DISPLAY
- .1 Remote digital pressure display with red LEDs and 6 digit display and input signal of 4-20 mA.
- 2.11 PRESSURE RELIEF VALVE UP TO 6,000 PSIG
- .1 316 Stainless steel, 6.35 mm relief valve with lock wire feature and captured molded seat design. Proportional relief with a working pressure of 6,000 psig. Cracking pressures in accordance with Bill of Materials on Drawing 4476681-403.
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<u>2.12 PRESSURE RELIEF VALVE GREATER THAN 6,000 PSIG</u>	.1	316 Stainless steel with soft seat design. Proportional relief with a maximum pressure rating of 10,000 psig. Cracking pressure in accordance with Bill of Materials on Drawing 4476681-403.
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<u>2.13 PRESSURE REGULATOR</u>	.1	316L Stainless steel, single stage with low friction adjusting screw and 6.35 mm Female NPT ports. Pressure ranges in accordance with Bill of Materials on Drawing 4476681-403.
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PART 3 - EXECUTION

<u>3.1 MANUFACTURER'S INSTRUCTIONS</u>	.1	Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.
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<u>3.2 COMPRESSED AIR PIPING CONNECTIONS AND INSTALLATION</u>	.1	Install shut-off valves in locations as indicated.
	.2	Grade piping at 1% slope minimum, towards low point drains.
	.3	Tubing bend radius shall be a minimum of 25.4 mm.
	.4	All bends shall be done with a tube bender manufactured for the size and material of tubing to be bent.
	.5	Tubing that has been deformed, scored, kinked, flattened, wrinkled or otherwise marred by bending, shall be replaced at Contractor's expense.
	.6	Flanging method for tubing requires the use of an appropriate forming machine or flat face on the tube end.
	.7	Installation of piping, fittings and components as per manufacturer's instruction and equipment.

- 3.3 PIPING SUPPORTS
- .1 Maximum spacing between supports: 914 mm.
 - .2 Maximum spacing of support to center of bend: 101 mm.
 - .3 Maximum spacing of support to fitting: 50 mm.
 - .4 Minimum distance between adjacent mounting rails: 36 mm.
- 3.4 FIELD QUALITY CONTROL
- .1 Site Tests/Inspection:
 - .1 Testing: pressure test using air to 7500 psig (51,711 kPa), with outlets closed and with pressure gauges isolated from system and hold for 4 hour minimum. Pressure drop not to exceed 10 kPa for 4 hour minimum.
- 3.5 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK
- .1 Advise Departmental Representative 48 hours minimum prior to performance of pressure tests.
 - .2 Pressure test all components to 1 1/2 times the working pressure.
 - .3 Maintain specified test pressure without loss for 4 hours minimum.
 - .4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.
 - .5 Conduct tests in presence of Departmental Representative.
 - .6 Pay costs for repairs or replacement, retesting, and making good. Departmental Representative to determine whether repair or replacement is appropriate.
 - .7 Insulate or conceal work only after approval and certification of tests by Departmental Representative.
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3.6 CLEANING

- .1 Cleaning: Clean with Tri-Sodium Phosphate solution, 0.40 kg per 100L of de-ionized or distilled water. Flush for 15 minutes with de-ionized or distilled water. Purge with dry Nitrogen or clean dry air.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.