

PART 1 - GENERAL

1.1 REFERENCE

- .1 Section 25 15 00 - Process Configuration.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings of all new control devices, control transmitters, sensors, fabricated control panels, PLC's, I/O modules and control enclosures according to these Specifications and Section 01 33 00 - Submittal Procedure.
- .2 All instruments provided by the Contractor are to be rated for their intended use.

1.3 STANDARDS

- .1 Perform all control system installations to current CSA standards, provincial electrical codes, and PWGSC Standards. Do complete installation in accordance with CSA C22.1, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
- .2 All products and devices, including control enclosure fabrications are to be CSA approved for use.

1.4 OPERATIONS AND MAINTENANCE DATA

- .1 Provide data for each instrument and control device in an operation and maintenance manual. Include copies of original vendor supplied installation, maintenance, and operational information for each instrument and control device in a manual as described in other sections of these specifications.
- .2 Maintain all packaging and manufacturers literature. Maintain product binders.
- .3 Provide all program and system configuration data for the PLC, HMI and remote HMI systems. Provide documented printed copies as well as electronic record files of the PLC ladder reports, PLC cross reference reports, I/O usage reports as well as HMI data base lists and graphic display pages as part of completed maintenance records package. Provide electronic files in printer ready format as well as in native PLC or HMI configuration format.
- .4 Update existing configuration as-built drawings to include added instrumentation. Stamp these drawings with a red stamp stating "As-Built Drawings By:

(Contractor's name), Date: (date of update)". Submit three (3) hard copies of these updated drawings as well as CAD and PDF version of files to DFO.

1.5 DESCRIPTION OF ABSOLUTE PRESSURE INDICATOR TRANSMITTER (PIT)

- .1 The Contractor shall install one (1) PIT in the Degassing Building. PIT shall be installed within 2 m of Degasser Building PLC.
- .2 The purpose of the PIT is to accurately measure the barometric pressure so as to be able to compare it to the gaseous pressure in the Reservoirs. It is by dividing the total dissolved gas pressure by the atmospheric pressure that supersaturation may be calculated. This calculation is described later in this section.
- .3 The PIT shall measure absolute pressure, and shall be configured to measure pressure in units of bar (absolute).
- .4 The PIT shall have a range of 0 to 207 kPa (absolute), and a minimum span of 2.1 kPa (absolute).
- .5 The output of the instrument shall be 4 to 20 mA dc with HART protocol, linear or square root.
- .6 The process connection style shall be 1/2"-14 NPT female.
- .7 The isolating diaphragm shall be of 316L SST, the process connection shall have wetted parts of 316 SST.
- .8 Fluid fill shall be silicone, and the housing material shall be of SST. The conduit entry size shall be 1/2"-14 NPT.
- .9 The PIT shall come with the option of a SST mounting bracket with SST bolts. It shall also have a digital meter with local operator interface.
- .10 The PIT shall be mounted with a PVC pipe facing downward. This is to prevent condensation.
- .11 The PIT shall be connected to the Degasser Building PLC and loop powered. It shall be connected and configured by the contractor so as to measure atmospheric pressure.

1.6 DESCRIPTION OF TOTAL DISSOLVED GAS DETECTORS (TDGD)

- .1 The TDGD probe shall provide measurement of water supersaturation from 0 to 300% atmospheric saturation levels. The measurement of dissolved gas pressure

shall be facilitated by diffusion of gas from water through a semi-permeable membrane to a pressure sensor.

- .2 The probe shall be submersible to depths greater than 100 meters with industry standard 4-pin impulse underwater connector for power and signal transmission. The probe shall be supplied with a semi-permeable membrane that is capable of measurement in both saline and freshwater, in addition to oily and contaminated waters.
- .3 The TDGP probe shall provide a fully temperature compensated signal over the temperature range of -10 to 50 degrees Celsius. The total error band accuracy shall be no more than 0.2% of the pressure range. The probe shall measure gas tension over periods of up to a year with a total signal drift of less than 0.05%.
- .4 The probe output shall be capable of distances greater than 200 meters. There shall be at least two output signal options: namely a 4-20 mA analog output and a digital RS-485 output. The power requirements of the probe shall be a voltage of 8-28 VDC with a maximum current draw of 50 mA.
- .5 The probe shall be no greater in size than five centimeters in diameter and 30 centimeters in length. The housing material of the probe shall be made of Delrin to provide long-term durability and strength. The probe shall not require replacement parts for a minimum period of three years under proper use.
- .6 The signal shall be configured to display total gas supersaturation on the HMI (see this section). However, if the engineer provides a properly described equation to calculate total dissolved nitrogen gas, the Contractor shall configure this equation at no extra cost to the Owner.

1.7 INSTALLATION OF TOTAL DISSOLVED GAS DETECTORS

- .1 Installation of the two TDGPs shall occur in the lower level of the Degassing building. One TDGP shall be installed in each reservoir. See Drawing for more detail.
- .2 All metal materials used in the installation of the TDGPs shall be of 316 stainless steel.
- .3 Installation of the TDGPs shall be coordinated with PWGSC and DFO in order to drain the reservoir beforehand.
- .4 Once reservoir is drained, installation of the TDGP can begin. Once installation is complete the Contractor is to completely clean the reservoir before refilling. The Owner is to sign off on the cleanliness of the reservoir before refilling. The Contractor is to cooperate fully with DFO in ensuring the reservoir is clean and in

all ways ready for refilling.

- .5 Each TDGP shall be suspended from the reservoir ceiling by a chain. Suspension shall be durable, and resistant to wear, tear, and saltwater conditions. The depth of the suspended TDGP shall be at 1m below the overflow weir.
- .6 The TDGP, once installed, shall be within normal reach of the window into the reservoir area for the operator. In this way, the operator shall leave easy and safe access to the chain supporting the TDGP.

1.8 DESCRIPTION OF LEVEL SWITCH TO BE INSTALLED

- .1 One level switch shall be installed in each curbed area of the degassing building. In total, two (2) level switches are to be installed.
- .2 Each level switch shall detect the presence of seawater overflowing from degasser units.
- .3 Each level switch shall be connected to the PLC in such a way as to communicate when the level switch detects the presence of seawater.
- .4 Each level switch shall be installed in a manner that it is normally closed. In this way, if the wire is disconnected by accident, there shall be an alarm from the PLC indicating a problem with the instrument.

1.9 LEVEL SWITCH CHARACTERISTICS

- .1 Level switch to be a full-featured vibrating fork liquid level switch.
- .2 Its function shall be virtually unaffected by flow, bubbles, turbulence, foam, vibration, solids content, coating products, liquid properties, and product variations.
- .3 There shall be no need to calibrate it, and it shall require a minimum of installation.
- .4 It shall have electronic self-checking and calibration.
- .5 It shall have adjustable switching delay for turbulent or splashing applications.
- .6 It shall have a magnetic test point to make functional tests easy.
- .7 It shall have a fast-drip fork to make for quick response time.
- .8 It shall be explosionproof, flameproof, and shall have intrinsically safe options.

- .9 It shall have a heartbeat LED to give an indication of instrument health.
- .10 It shall have polarity insensitivity and short circuit protection.
- .11 It shall have adjustable switching delay from 0.3 to 30 s.
- .12 Construction material shall be 316 SST.
- .13 The process connection shall be 27mm MNPT.
- .14 The electrical specifics shall be compatible with the existing PLC.
- .15 The surface finish shall be standard, and it shall be CSA explosion-proof.
- .16 The housing material shall be painted aluminum, NEMA 4X, 13mm FNPT.
- .17 The fork shall be standard length.
- .18 The level switch shall be generally specified to withstand salt water, and function normally in the conditions described herein.

1.10 LEVEL SWITCH INSTALLATION

- .1 Level switch shall be installed where indicated on drawing, and confirmed by owner.
- .2 Level switch shall be installed in a rugged manner, so as to withstand accidental impact.
- .3 Installation shall be such that removal of the instrument is simple in case of maintenance.
- .4 Installation shall ensure that if there is more than 50 mm of water in the curbed area, the level detector shall signal this to the PLC.

PART 2 - PRODUCTS

2.1 TOTAL DISSOLVED GAS PRESSURE PROBE

- .1 Physical Specifications:
 - .1 Length - 28 cm (add 8 cm for Connector)
 - .2 Diameter - 5 cm OD

- .3 Housing Material
 - .1 Delrin: depth rated to 300 m
- .4 Membrane - Advanced membrane designed for use in contaminated and oily waters, minimal ouling
- .2 Performance Specifications:
 - .1 Pressure Range
 - .1 0-3 Bar (0-300% Saturation)
 - .2 Accuracy - + 0.1% of Full Scale Value (Total Error Band, fully temperature compensated, -10 to 80 degrees celsius)
 - .3 Resolution - 0.002% of Full Scale
 - .4 Sensor Drift - 0.025% of Full Scale per year typical
 - .5 Output
 - .1 Digital RS-485 Standard
 - .2 4-20 mA.
- .3 Electrical Specifications:
 - .1 8-28 VDC Input voltage
 - .2 20 mA Input Current

2.2 PLC COMPONENTS

- .1 The PLC (programmable logic controller) system is existing.
 - .1 Contractor shall ensure the existing PLC in the Degassing building can accept signals via RS-485.
 - .2 Discrete inputs shall provide for both common dry contact and isolated (wet contact) I/O types. I/O modules are to include 24VDC inputs with provision for a minimum of 8 120VAC inputs.
 - .3 Contractor shall ensure all PLC components are installed in order to properly handle RS-485 signals.
- .2 Contractor shall ensure the existing PLC has enough inputs, outputs and modules to read all instrumentation to be installed for the specification. Any required hardware is to be supplied, installed and commissioned by the Contractor.

2.3 LOCAL HMI COMPONENTS

- .1 There exists an HMI and PLC in the degasser building. Please refer to Drawing for approximate location.

2.4 FIELD JUNCTION BOXES

- .1 The field junction boxes are to be nonmetallic wall mounted junction boxes c/w hinged covers. Each field junction box is to be identified with a lamicoid

nameplate. Terminal blocks for connections to field devices shall be installed on the back panel inside the field junction box. General details of each field junction box are provided in drawing. Install sufficient spare space inside field enclosures to add 20% more terminals and field wiring.

2.5 CONTROL DEVICES

- .1 The Controls Contractor is to supply the field control system devices indicated as supplied by Division 25.

2.6 CONDUIT RACEWAYS

- .1 General fixed raceways are to consist of rigid PVC conduit and associated fittings strapped to a wall using wall clamps installed to allow suitable expansion and contraction. Refer to drawing.
- .2 Alternatively Teck cable with, #16 AWG copper 600 volt insulation, interlocked metallic armour and outer PVC jacket may be used in place of conduit and individual conductors.

2.7 COMM. CABLES

- .1 Communications cable between PLCs is existing.

2.8 DISCRETE CONTROL CABLES

- .1 Discrete control devices to field junction box cables are to be minimum 3 wire #16 AWG stranded copper XLPE 600 volt insulated conductors with bond wire and overall inner PVC jacket and interlocked aluminum with black outer PVC jacket.
- .2 Multiple cables or signal wires may be routed in a single conduit.

2.9 CONDUIT RACEWAY

- .1 General fixed raceways are to consist of PVC conduit and associated fittings strapped to wall using wall clamps installed to allow suitable expansion and contraction. Conduits are to be protected with metal sleeve where they penetrate vertically or horizontally through concrete floor or wall. Conduit is also to be protected and sealed against entry of dirt during construction and sealed with duct seal after installation of conductors. All metallic parts, such as screws, clamps, and sleeves to be of 316 SST.

PART 3 - EXECUTION

3.1 COMMISSIONING

- .1 The control system installation contractor is responsible for instrumentation configuration of each control device including initial setup and calibration control devices to operating condition.
- .2 Provide all field input device I/O checks and field output device I/O checks as well as field analog span checks.
- .3 Provide commissioning assistance as specified in other sections of these specifications.
- .4 Maintain for each device any literature and manuals.
- .5 The installation contractor is to work in cooperation with other trades, where cutting and patching, floor or wall penetrations and surface finishes are concerned to complete all sealing patching and repairs after commissioning.