

**Part 1 General**

**Part 2 Related Sections**

- .1 27 05 13 – Communications Services
- .2 27 11 16 – Enclosures

**2.2 GENERAL REQUIREMENTS**

- .1 Cooperate with other contractor(s) and the Departmental Representative and provide start-up and commissioning services for the complete control system and associated field devices and wiring.

**2.3 SUBMITTALS**

- .1 Submittals to include:
  - .1 wiring diagrams,
  - .2 layout,
  - .3 Panel plate with ratings of the control panel (Short circuit current rating, HP, voltage, bear CSA/cUL etc.). The Panel plate shall be affixed onto the front door of the Control panel for easy identification.

**Part 3 Products**

**3.1 PROGRAMMABLE LOGIC CONTROLLERS**

- .1 General:
  - .1 All new PLC equipment;
    - .1 CPU – TBD (Select processor Model and memory based on the specified programming and functionality requirements).
    - .2 Analog Input – Isolated 120 VAC.
    - .3 Analog Output – 4-20 maDC Isolated Differential type.
    - .4 Discrete Input – Isolated 120 VAC.
    - .5 Discrete Output – Isolated 120 VAC.
    - .6 Power Supply – Size the power supply to meet loading requirements of this Section.
    - .7 Rack – TBD (number of slots to accommodate required modules plus two (2) spare slots.
  - .2 PLC cabinet to also include:
    - .1 CSA/NEMA Type 4 (minimum) Control Cabinet, 120 VAC, 1 ph, 12 A breaker. Bracing shall be a minimum of 5kA.
    - .2 PLC with I/O. Provide 20% spare IO.
      - .1 Cards shall be Isolated Relay Output Modules
        - .1 Provide 1 fuse per Output

- .2 Cards shall be Isolated Input Modules
    - .3 Provide 1 fuse per Input
  - .3 Cards shall be Isolated Analog Modules
    - .1 Provide 1 fuse per Analog device
  - .4 IO Reservation:
    - .1 4-20 mA Communication to Respective Instrumentation.
    - .2 Discreet I/O allowance for associated Control.
  - .5 All IO to be wired to terminals
  - .6 IO allowances shall include all IO points shown on the P&ID's
- .3 Provide 1 Breaker per PLC Card.
- .4 Provide 1 Breaker per Component.
- .5 Fiber-Ethernet Communications for Remote Monitoring, Switch shall be managed type.
  - .1 1 Fiber and 1 Ethernet port shall be reserved for communication with the site BMS.
  - .2 1 Port for Gateway
  - .3 1 Port for HMI
  - .4 1 Port for PLC
  - .5 1 Port for programming port mounted onto the PLC door (weatherproof)
  - .6 Fiber ports shall accept SFP modules for the appropriate Fiber and connector type. General contractor to coordinate type of onsite fiber with Integrator.
  - .7 Ethernet switch shall have 2 spare ports.
- .6 Design panel for Top and Bottom Entry.
  - .1 Panel Mounted Ethernet Port and Weatherproof cover.
  - .2 External GFCI Outlet with Weatherproof While-in-Use Cover, label as Laptop Only.
  - .3 Panel Mounted Alarm Horn (30 dB) and Silence Pushbutton on the HMI screen.
  - .4 HMI mounted onto the front door
    - .1 All Controls, Settings and Alarm Indication accessible on HMI screen.
    - .2 HMI Password Protected with Operator and Maintenance Levels.
- .7 Fiber Patch Panel, minimum 6 pairs, DIN rail mountable with pigtail splice kit for fusion splicing.
  - .1 Provide appropriately sized Fiber attenuators for Single mode fiber, if applicable.
- .8 24VDC power supply sized to provide 20% extra power.
  - .1 Panel Mounted 24VDC Control Power Indicating Light.
- .9 Programming
  - .1 Include providing Alarms and statuses to the site's BMS system
  - .2 Include providing Alarms and statuses to the Cloud

- .10 Unless otherwise specified, upgrades and modifications to existing PLC control panels shall utilize hardware components compatible with the existing PLC and programming modifications shall be made using existing installed software
- .11 All new processors are to be adequately sized to provide sufficient memory and processing capacity to handle the I/O, logic, communications, and data requirements for the new lift station based on the defined I/O mix and the process control narrative requirements.
- .12 Communication for the PLC network is Ethernet over copper and broadband radio.
- .13 Provide 20% spare I/O of each type to each panel assembly.
- .14 Provide all necessary racks, power supplies, cables, communication cards, and accessories.
- .15 Provide 10% spare slot capacity for each PLC panel assembly (minimum of two (2) slots).
- .16 Provide 25% spare power supply capacity for each PLC panel assembly.
- .17 Each new PLC panel assembly is to include a constant voltage regulating transformer suitably sized for the panel load and incoming power transient surge suppression. Connect the surge suppressor dry contacts to a PLC input at each panel and notify the control system integrator/programmer.

#### **Part 4 Execution**

##### **4.1 PERFORMANCE – GENERAL**

- .1 Refer to Section 26 05 00
- .2 Refer to P&ID Drawings supplied under this Contract.

##### **4.2 INSTALLATION**

- .1 Provide hardware in accordance with the foregoing requirements in sufficient quantity to satisfy the performance requirements defined in this and other Divisions of the Specification.
- .2 Provide all necessary documentation to define the configuration of the control system including details for all hardware.
- .3 Program the system to provide functionality generally as described in the Process Control Narratives and to Commission and start up the system as defined herein.
- .4 Provide all documentation and training as defined herein.
- .5 Maintain existing plant operation during entire construction period. Refer to the requirements of Division 1.

**END OF SECTION**

<b>INSTRUMENT SPECIFICATION NUMBER:</b>	I-100
<b>DEVICE:</b>	Pressure & Differential Pressure Transmitter
<b>TAG:</b>	Refer to Electrical P&ID Drawings
<b>SERVICE:</b>	Tunnel Ambient Air
<b>PROCESS CONNECTIONS:</b>	1/8" for 3/16" ID tubing, or 5mm for 0.17" ID tubing, as required
<b>RANGE:</b>	As per Electrical P&ID Drawings
<b>INACCURACY:</b>	+/- 1% of span or lower
<b>OUTPUT:</b>	4 to 20mA DC
<b>POWER SUPPLY:</b>	Loop Powered 24VDC
<b>CONSTRUCTION:</b>	316 SST
<b>ELECTRONIC ENCLOSURE:</b>	Refer to Electrical Specifications Section 26 05 00
<b>LOCAL DISPLAY:</b>	Integral LCD Display for provided part numbers
<b>WIRING METHOD:</b>	Circuit and wiring method to comply with the latest edition of the Canadian Electrical Code, Class 2 requirements.
<b>ACCESSORIES:</b>	Bulkheads for pneumatic lines, 90 deg. elbows for vent line at exhaust vent

**INSTRUMENT  
SPECIFICATION NUMBER:**

I-101

**DEVICE:**

Strobe

**TAG**

Refer to Electrical P&ID Drawings

**POWER SUPPLY:**

120VAC

**CONSTRUCTION:**

Pipe Mountable; ½" NPT

**ELECTRONIC ENCLOSURE:**

NEMA 4X

**INSTRUMENT  
SPECIFICATION NUMBER:**

I-102

**DEVICE:**

Temperature Indicating Transmitter with RTD  
Sensor

**TAG:**

Refer to Electrical P&ID Drawings

**SERVICE:**

Tunnel Ambient Air

**RANGE:**

-50°C to 50°C

**INACCURACY:**

plus or minus 0.5% of span or better

**INDICATION:**

N/A

**OUTPUT:**

4-20 mA DC

**POWER SUPPLY:**

Loop powered

**ENCLOSURES:**

NEMA 4X

RTD Probe: 5 mm dia x 100 mm L ambient air  
probe.

**INSTRUMENT  
SPECIFICATION NUMBER:**

I-103

**DEVICE:**

Door Sensor

**SERVICE:**

Tunnels

**PRIMARY SENSORS:**

Provide door release sensors and hatch limit switches in tunnels for: 1. New steel doors; 2. Non-steel doors; 3. Retrofit applications to existing doors.

**CONTROL UNIT:**

Tie into existing.

**POWER SUPPLY:**

24VDC

**OUTPUTS:**

Dry Contacts

**ALARM HORN:**

N/A

**ENCLOSURE:**

N/A

<b>INSTRUMENT SPECIFICATION NUMBER:</b>	I-104
<b>DEVICE:</b>	Smoke Detector
<b>SERVICE:</b>	Tunnels
<b>PRIMARY SENSORS:</b>	Smoke detector for the HVAC control system only.
<b>CONTROL UNIT:</b>	NTBU43+000 Building PLC.
<b>POWER SUPPLY:</b>	120VAC
<b>OUTPUTS:</b>	Standard Features
<b>ALARM HORN:</b>	N/A
<b>ENCLOSURE:</b>	N/A
<b>ADDITIONAL:</b>	Provide two 9VDC batteries for each unit. Provide two relays to be placed inside the PLC panel, (or each tunnel being monitored) for a total of eight relays.

**END OF SECTION**