DIVISION 25

INTEGRATED AUTOMATION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies the General Provisions for the supply, delivery, installation, calibration and commissioning of the process control and instrumentation system, including all control and graphic panels.

.2 It is the intention of these specifications and drawings, to provide for a complete and fully operating control and instrumentation system, with facilities and services to meet the requirements described herein, and in complete accord with applicable codes and ordinances. The specifications do not purport to cover details entering into the design of the system which shall be the responsibility of the Contractor.

.3 The work to be done shall include the provision of all labour, materials, tools and equipment as well as the application of a competent knowledge of construction, whether or not directly specified or shown on the plans, required for the installation testing and placing into service the complete control and instrumentation system, except when it is specifically mentioned that certain materials and/or labour are not part of the contract.

.4 These specifications shall apply to and govern all trades doing control and instrumentation work and shall be read in conjunction with and form a part of the general specifications of the project.

.5 The Control and Instrumentation work includes but is not limited to the following:

- .1 Control panels.
- .2 Primary Elements for flow, level, pressure, temperature, etc.
- .3 Control Wiring and conduit.
- .4 Starters and controllers.
- .5 Indicators, annunciators, interfaces, HMIs, SCADA, and DCS works.
- .6 Existing DCS system tie-in.

.6 Refer to the Process Narrative in the appendices.

1.2 EQUIPMENT MANUFACTURERS

.1 All equipment shall be manufactured by experienced manufacturers who can demonstrate in-use records for all equipment offered.

.2 Requests for approval of alternative suppliers shall be submitted to the Contract Administrator. Refer to Section 26 05 01 - Common Work Results - Electrical.

.3 The majority of equipment shall be supplied by a single manufacturer, particularly where aesthetics are of concern, such as in panels.

1.3 CODES, PERMITS & FEES

.1 The work shall comply with the requirements of the current edition of the Canadian Electrical Code, Part 1, and the regulations of the Manitoba Government, Department of Labour, Electrical Protection Branch.

.2 Obtain the required construction permits, arrange for inspections and supply the Contract Administrator with approval certificates pertaining thereto including a certificate of final inspection

1.4 REFERENCE STANDARDS

.1 Unless otherwise specified, equipment shall conform to appropriate standards and recommendations of:

.1 The Instrument Society of America, hereinafter referred to as ISA.

.2 The Canadian Standards Association, hereinafter referred to as CSA.

.3 The American Society of Mechanical Engineers, hereinafter referred to as ASME Standards.

.4 City of Winnipeg Water and Waste Department Automation Design Guide.

.2 Works shall comply with City of Winnipeg

.1 Identification Standard, identification practices, and numbering practices.

.2 Electrical Design Guide requirements.

.3 Environmental Preservation and Compliance policy.

.4 Typical practices.

.3 All equipment shall be metric - SI Standard.

1.5 OPERATION MANUALS

.1 Submit operation manuals in accordance with Section 26 05 01 - Common Work Results - Electrical.

1.6 SHOP DRAWINGS

.1 Submit shop drawings in accordance with 01 33 00 – Submittal Procedures and the specifications.

1.7 STANDARDIZATION CONTACTS

.1 Control Systems and Motor Control Equipment - Schneider Electric Canada Inc

Garth Eastman
21 Omands Creek Blvd
Winnipeg, MB, R2R 2V2
204-631-0670
garth.eastman@ca.schneider-electric.com

.2 Electric Valve Actuators - Rotork Controls Canada Ltd.

Mr. Henry Zenteno
#6, 820 - 28th Street North East Street
Calgary, Alberta, T2A 6K1
1-403-813-5850
Henry.Zenteno@rotork.com

.3 Gas Detection Systems - Mine Safety Appliances Company, LLC

Mr. Alan Thomson
Account Manager
5040 12A Street SE
Calgary, AB
T2G 5K9
1-800-992-2364
athomson@cbeng.com

.4 Instrumentation - Trans-West Supply Company Inc.

Greg Troilo
President
126 Bannister Road
Winnipeg, MB, R3R 0S3
gregt@transwest-mb.com

Part 2 Products

2.1 MATERIALS

.1 All materials shall be new and in new condition.

.2 All materials shall bear the approval of the Canadian Standards Association (CSA).

.3 All materials shall be suitable for full operation within specified environments.

2.2 POWER SUPPLIES

.1 Provide all necessary power supplies for controls and instruments.

.2 Power wiring to field devices shall be #12 AWG.

2.3 CONTROL WIRING

.1 Unless specified otherwise, all conductors for control wiring shall be copper with RW90, X-link insulation, 300 volts.

.2 Neutral conductors shall be white, grounding conductors shall be green, DC conductors shall be blue and AC conductors shall be red.

.3 Instrumentation wiring for analog signals shall be individually shielded - multipair cable #16 AWG (7x16) tinned copper.

.4 Control wiring for level and pressure switches shall be #14 THHN Black.

.5 Provide armor for wiring as required when installed near wiring of other systems or other voltages.

.6 provide shielding for signal and communication wiring.

.7 Where dimensional details are required work with the applicable structural and architectural drawings.

.8 The Contractor is responsible for correcting any work completed contrary to the intent of the drawings and specification and shall bear all costs for correcting same..

2.4 CONDUIT, WIRING AND CABLE

.1 Supply and install all conduit, wiring, control and instrumentation cables for the control, instrumentation and low voltage and line voltage control for building services.

.2 Conduit and wiring for power, lighting, miscellaneous electrical systems and power supplies to control instrumentation and building service panels including other components requiring line voltage power supply shall be supplied and installed as specified here and in Division 26.

2.5 HAULED WASTEWATER AND LEACHATE MODIFICATIONS

.1 Lane 1 is configured as, and remains as, a hauled wastewater lane.

.2 Lane 2 is configured as, and remains as, a hauled wastewater lane.

.3 Lane 3 is configured as a leachate lane and shall be converted to operate as a hauled wastewater lane.

- .1 Monitor tank influent flow, tank level, and combustible hydrocarbons.
- .2 Record truck discharge volumes and pass to PC.
- .3 Control the Tank 3 effluent valve.
- .4 Delete leachate pumping and associated valves that presently serve the tank.

.4 Lane 4 becomes a dual use lane for hauled wastewater (via Manhole 7, to Tank 4 in Hauled Wastewater Building 2) or for leachate (via the flex connection hose, to the Leachate Sampling Building). Only one will occur at a time.

- .1 Provide Lane 4 industrial PC.
  - .1 Industrial PC programming by the City.
  - .2 The PC shall record transactions of the hauler trucks.
- .2 Provide lane access and exit control. Interface with Lane 4 PC.
- .3 Hauled wastewater:
  - .1 Monitor tank influent flow, tank level, and combustible hydrocarbons.

.2 Control the Tank 4 effluent valve.

.3 Delete leachate pumping and associated valves that presently serve the tank.

.4 Leachate receiving:

.1 Monitor flow and record truck discharge volumes.

.5 At present, the system programming allows only one tank effluent valve to be open at a given time. This restriction shall be removed.

.6 Upgrade DCS programming to clearly annunciate the status of each Lane:

.1 Indicate occupied lanes on the DCS by highlighting each lane when a truck is present. This indication shall occur when a truck is given access to the lane and shall end after a truck has exited the lane. An occupied lane will be indicated even if the truck is not discharging at the moment.

.2 Indicate when a truck is discharging (when there is flow to a when the influent line flushing valve is closed).

.3 Alarm or Fault condition.

.4 Lane lockout condition (trucks cannot enter lane).

.5 Lane lockdown condition (truck cannot exit lane).

2.6 FLUSHING WATER AUTOMATION FOR TANKS 1, 2, 3, AND 4

.1 All flushing sequences shall be controlled by adjustable setpoints. Flushing water valves shall be modulating type and shall be configured with a "% open" setpoint rather than wide open.

.2 Provide mag flowmeter on the flushing water line in the Sludge Dewatering Building. Connect to Hauled Wastewater Building 1 PLC and integrate into HMI and DCS.

.3 Note that flushing in the Leachate Sampling building is manual, via manual valve.

2.7 SNOW MELT

.1 Provide modifications to the snow melt systems for the pads at the hauled wastewater manholes.

.1 Remove the existing Uponor snow melt control panels and components including outdoor ambient temperature sensors, pad temperature and snow sensors, glycol loop temperature sensors, and glycol loop modulating valves.

.2 Replace components with new components that feature 4-20 mA analog signals, and discrete (contact closure) signals.

.3 Remove or abandon the components in the Lane 1 (manhole 1) pad and install new. Connect to the Hauled Wastewater Building 1 PLC.

.4 Remove or abandon the components in the Lane 2 (manhole 2) pad and install new. Connect to the Hauled Wastewater Building 1 PLC.

.5 Remove or abandon the components in the Lane 3 (manhole 4) pad and install new. Connect to the Hauled Wastewater Building 2 PLC.

.6 Remove or abandon the components in the Lane 3 (manhole 5) pad.

.7 Add new components in the Lane 4 (manhole 7) pad. Connect to the Hauled Wastewater Building 2 PLC.

2.8 OTHER AUTOMATION

.1 Provide H2S monitoring and alarming at each of the three buildings and integrate into the PLC systems.

.1 Annunciate warning via HMI and over the DCS.

.2 Annunciate alarms via HMI, local beacons, and over the DCS.

.2 Provide combustible hydrocarbon monitoring. Integrate two existing and three new sensor systems into the PLC systems.

.1 LEL sensing for Tank 1 and LEL sensing for Tank 2 in Hauled Wastewater Building 1 are new, and will remain. Integrate the equipment into the control system.

.2 LEL sensing for Tank 3 and LEL sensing for Tank 4 in Hauled Wastewater Building 2 shall be provided. The systems shall match those in Building 1.

.3 LEL monitoring for tanks shall integrate with lane control.

.4 LEL monitoring for the Leachate Sampling Building shall monitor the working space of the building, for safety of personnel.

.5 Annunciate warnings via HMI and over the DCS.

.6 Annunciate alarms via HMI, local beacons, and over the DCS.

.3 Provide a new HMI for the existing PLC panel in Hauled Wastewater Building 1 and one for the existing PLC panel in Hauled Wastewater Building 2. Each HMI shall provide comprehensive control and viewing capability of the systems within the associated building or related to the building, e.g. lane access and snow melt.

.4 At present, the hauled wastewater holding tank discharge valves will occasionally remain closed when in a high level alarm condition. Implement the hauled wastewater control modifications and eliminate this unwanted behavior.

.5 At present, the hauled wastewater holding tank discharge valves will occasionally remain open, requiring attendance by the operators to the building to restore automatic service. Implement the hauled wastewater control modifications and eliminate this unwanted behavior.

2.9 DCS

.1 Modify the existing DCS system and the HLW facility area HMI, located in the Sludge Dewatering Plant control room.

.2 Program the DCS to communicate comprehensively with the PLCs controlling the hauled wastewater and leachate sampling systems.

.3 Integrate the systems, to allow viewing and control of processes, statuses, readings, variables, equipment, and alarms on the DCS.

.4 At present, the DCS continuously displays a fault for an exhaust fan in Building 2. Review and modify code to isolate and understand the problem, and implement a solution.

.5 The DCS shall be modified to receive the status of the Hauled Wastewater Buildings' boiler systems.

.6 The as-found and as-left state of the PLC and registers monitored by the DCS will be saved and reviewed with The City to ensure no impacts to operations occurs, both in modifications to logic as well as tagging modifications.

.7 The hydronic pumps Y630 and Y635 in Hauled Wastewater Building 1 require programming modification to implement alternation in their control sequence. Alternation shall be based on a timer. The current implementation does not alternate the pumps when the timer elapses.

.8 The pump status for boiler system pump X640 in Hauled Wastewater Building 2 always indicates that the pump is Off, even when running. Investigate and remediate the problem. Review programming, wiring, and hardware.

.9 Correct the Hauled Wastewater Common Alarm on the DCS. This alarm is on the alarm list but there is not any overtly noticeable annunciation on screen. Implement an alarm light on the DCS.

.10 The DCS counts the number of trucks discharging in a day and displays a trend of the value. The quantity shown is not accurate. Review and revise the programming to get an accurate count. A count based on the entry of a truck to a lane may give a more accurate result.

Part 3 Execution

3.1 INSTALLATION

.1 Install and interconnect all process control system equipment.

.2 Install all equipment in accordance with the manufacturer's recommendations and in a manner that will ensure satisfactory operation upon completion.

.3 Provide all labour and all necessary equipment including timbers, scaffolding, tools and rigging materials for installation of the equipment.

.4 Contractor shall be responsible for coordinating all mechanical, electrical and other works for the equipment being installed.

.5 Installation shall meet the minimum standards set forth by Standards and Practices for Instrumentation.

.6 Use trained personnel to install systems and controls as per approved shop drawings and in accordance with manufacturer's recommendations.

.7 Follow building lines with all piping and electrical wiring runs. Utilize proper separation and wiring techniques.

3.2 COORDINATION OF WORK

.1 Cooperate and coordinate with other trades on the project.

.2 Check drawings and specifications of other trades for conflict and coordination with the control and instrumentation trade. If any conflicts are found, obtain a ruling from the ~~Engineer~~ Contract Administrator before proceeding.

3.3 TESTING

.1 Thoroughly test all control equipment, components, and systems for proper operation and report in writing to the satisfaction of the Contract Administrator.

.2 Tests shall include:

.1 Complete operational test including interlocks, functions, features, options, etc., for all instrumentation, PLC, and computer system control operations.

.2 Operation of alarm initiating devices.

.3 Calibration of all instruments.

.3 Supply all necessary test equipment and personnel to completely test the entire instrumentation and process control system.

3.4 START-UP AND COMMISSIONING

.1 Perform all panel start-up and commissioning in accordance with Section 26 05 01.

.2 Upon completion of the installation, the Contractor shall be responsible for testing to determine correct system operation and sequences as intended in the Contract Documents. Process Instruments such as flow, level, pressure transmitters, etc., shall be checked for operation prior to process start-up, by manipulating operating controls like set points, auto-manual selectors, etc. Status and alarm contacts to be checked by manipulation or jumpering at the sensing element.

.3 Results of tests are to be logged by the Contractor and submitted to the Contract Administrator. Any apparent defects shall be reported and corrected.

.4 When preliminary checks have been completed and process equipment is operating or ready to operate, individual systems shall be calibrated in accordance with the latest ISA recommendation. After calibrations the system shall be placed in operation in conjunction with the Contract Administrator and designated operating personnel.

END OF SECTION

Part 1 General

1.1 QUALITY ASSURANCE

.1 Control equipment to CSA C22.2 No. 14-M1987

1.2 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures. Include:

.1 Panel layout and mounting information.

.2 Schematic wiring diagrams.

.3 Component shop drawings.

.2 Include control panel literature in electrical O&M manuals in accordance with Section 26 05 01 – Common Work Results – Electrical.

1.3 STANDARDIZATION CONTACTS

.1 Control Systems and Motor Control Equipment - Schneider Electric Canada Inc

Garth Eastman
21 Omands Creek Blvd
Winnipeg, MB, R2R 2V2
204-631-0670
garth.eastman@ca.schneider-electric.com

.2 Electric Valve Actuators - Rotork Controls Canada Ltd.

Mr. Henry Zenteno
#6, 820 - 28th Street North East Street
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Henry.Zenteno@rotork.com

.3 Gas Detection Systems - Mine Safety Appliances Company, LLC

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1-800-992-2364
athomson@cbeng.com

.4 Instrumentation - Trans-West Supply Company Inc.

Greg Troilo
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Part 2 Products

2.1 GENERAL

.1 Supply the control panels in accordance with the general arrangement and dimensions indicated on the appropriate drawings. Panels must be complete with all instruments, meters, switches, indication lights, relays, etc., as specified herein or as indicated.

.2 Provide removable lamacoid nameplates having letters not smaller than 6 mm to identify equipment.

2.2 OPERATOR CONTROL STATIONS

.1 All enclosures and devices shall be rated EEMAC 12 in ordinary environments or EEMAC 3R outdoor environments, EEMAC 4X in corrosive environments, unless otherwise noted.

2.3 PUSHBUTTONS

.1 Heavy-duty oiltight, operator flush, black, with 1-NO and 1-NC contacts rated at 10 A, 120 VAC, labels as indicated. Stop pushbuttons coloured red

.2 Acceptable manufacturer shall be Telmecanique, Allen-Bradley.

2.4 INDICATING LIGHTS

.1 Heavy duty, push to test LED type

.2 Lens colours: Red for running, Green for off, Amber for alarm

.3 Supply voltage: 120 V (ac)

.4 Labels as specified in Section 26 05 01 – Common Work Results – Electrical

.5 Acceptable manufacturer shall be Telmecanique, Allen-Bradley.

2.5 SELECTOR SWITCHES

.1 2 or 3 position as required, labelled as indicated heavy duty oiltight, operators as indicated, contact arrangement as indicated, rated 120 V (ac), 10 A.

.2 Acceptable manufacturer shall be Telemecanique, Allen-Bradley

2.6 PROGRAMMABLE LOGIC CONTROLLER

.1 The programmable logic controller (PLC) must comply with the City of Winnipeg Electrical and Instrumentation Standardization Summary (Revision 01, 2015/02/20).

.1 Per RFP 756-2013, and from 2014-11-07 to 2019-06-30, the Installation Contractor will procure PLC equipment from Schneider Electric Canada Inc.

.2 Contact information detailed in Part 1 – Control Systems and Motor Control Equipment.

.2 Leachate Control Panel shall be constructed complete with the site standard PLC, associated I/O modules and Ethernet communication module. Reference design drawings for details.

.3 Existing site PLCs and new PLC to be programmed for required functionality. PLC programming, FAT, SAT and commissioning is the responsibility of the Contractor.

.4 Acceptable programmers will be the manufacturer of the Panel Equipment (listed below).

.5 Prior to programming existing PLCs, Contractor to save an as-found copy of the PLC code and submit to the City for records. Prior to implementing any changes to the existing PLCs, the Contractor will contact the City twenty (20) business days in advance of the work, so the City may review the proposed changes and coordinate any shutdowns that may be required.

2.7 HUMAN MACHINE INTERFACE

.1 The human machine interface (HMI) must comply with the City of Winnipeg Electrical and Instrumentation Standardization Summary (Revision 01, 2015/02/20).

.1 Per RFP 756-2013, and from 2014-11-07 to 2019-06-30, the Installation Contractor will procure industrial HMI hardware equipment from Schneider Electric Canada Inc.

.2 Contact information detailed in Part 1 – Control Systems and Motor Control Equipment.

.2 Existing control panels in Hauled Wastewater Buildings #1 and #2 will require the addition of the site standard 10” HMI in each panel.

.3 Leachate Building Control Panel shall be constructed, complete with the site standard 10” HMI.

.4 HMI to be Schneider Electric Magelis Model HMIGTO5310.

.5 Acceptable programmers will be the manufacturer of the Panel Equipment (listed below). Graphics shall use ‘high performance hmi’ graphic programming techniques (shades of grey, etc).

.6 HMI to be programmed to support local control of primary building process functions, including the following:

.1 Equipment mode (e.g. Hand, Off, Auto, Remote, etc.).

.2 Equipment status (Running, Fault, etc.)

.3 Equipment manual control.
.4 Duty assignments for redundant equipment.
.5 Instrument readings in engineering units.
.6 Process control setpoints and modes.
.7 PID controller setpoint, control variable, and process variable (read-only).
.8 Equipment and plant operating limits, adjacent to real time variables and readings.
.9 Adjustable alarm setpoints.
.10 Overall process screen.
.11 Individual process, equipment, and building system detail screens.
.12 Screen titles.
.13 Screen navigation buttons.
.14 Date and time.
.15 Currently logged-in user.
.16 Mathematical constants page.
.17 Communication heartbeat and status.

2.8 TRANSIENT VOLTAGE SURGE SUPPRESSOR – CONTROL POWER

.1 UL1449 2nd Edition rated using metal oxide varisters.

.2 120 V, 15 A, 2 wire grounded input.

.3 MCOV: 150 V.

.4 Surge Current: 45 kA per phase.

.5 3 modes of protection.

.6 Filtering Bandwidth: 10 kHz to 100 MHz.

.7 Noise Attenuation: Normal Mode 75 dB at 100 kHz, Common mode 50 dB at 5 Mhz.

.8 Let Through voltage: 6 V A3 ringwave, 9.6 V B3 Ringwave, 70 V, B3/C1 impulse.

.9 Manufacturer: Cutler Hammer Aegis, or approved equal in accordance with B7.

2.9 GENERAL PURPOSE RELAYS

.1 DIN rail mounted.

.2 Coil voltage as required.

.3 Contacts rated 5A, 120/240 V AC inductive, with two (2) N/O and (2) N/C contacts minimum.

.4 Operating time to be 20 ms maximum or AC coil and 30 ms maximum for DC coil.

.5 Rated for 100 000 operations at 5A, 120/240 VAC.

.6 With socket, built in LED or neon lamp operation indicator and push to test push button.

.7 Manufacturers: Allen-Bradley relays shall be type 700-HAX2Z24-1-4 with 700-HN125 relay base for 24 VDC coil voltages, and type 700-HAX2A1-1-4 with 700-HN125 relay base for 120 VAC coil voltage.

2.10 INTRINSICALLY SAFE RELAYS

.1 DIN rail mounted.

.2 Coil Voltage as required.

.3 Div 1, hazardous area classification required.

.4 250V:5A:500W resistive loads; reactive loads must be suppressed

.5 'No-Fail' earth fault protection

.6 LED indicator; on when relay energized.

.7 Manufacturers: MTL model MTL2211 switch operated relay or similar.

2.11 DC POWER SUPPLY

.1 DIN rail mounted.

.2 Switched mode type.

.3 Input voltage 85-230 VAC.

.4 Output voltage 24 VDC output adjustable to + 10%.

.5 Power output as required with 25% spare capacity.

.6 Built-in overload protection.

.7 0.5% voltage regulation Minimum-Maximum input voltage.

.8 1.0% voltage regulation 10% to 100% load.

2.12 WIRING

.1 Internal Control Panel Wiring for 120 VAC Power Distribution Circuits

.1 Rated No. 14 AWG, 600V PVC type insulation rated for minus 40 deg. C. to +105 deg. C., CSA rating TR-32, UL Style 1015, tinned, stranded copper conductor, as manufactured by Atlas Wire, Copper Field, Noma Cables, or other ~~Engineer~~ Contract Administrator approved manufacturers.

.2 Internal Control Panel Wiring for PLC 120 VAC Discrete Signals and for PLC 24 VDC Discrete Signals.

.1 Maximum 8 A circuit protection: Rated No. 16 AWG, 600V PVC type insulation rated for minus 40 deg. C. to +105 deg. C., CSA rating TR-32, UL Style 1015, tinned, stranded copper conductor, as manufactured by Atlas Wire, Copper Field, Noma Cables, or other ~~Engineer~~ Contract Administrator approved manufacturers.

.2 Maximum 15 A circuit protection: Rated No. 14 AWG, 600V PVC type insulation rated for minus 40 deg. C. to +105 deg. C., CSA rating TR-32, UL Style 1015, tinned, stranded copper conductor, as manufactured by Atlas Wire, Copper Field, Noma Cables, or other ~~Engineer~~ Contract Administrator approved manufacturers.

.3 Internal Control Panel Wiring for 24VDC Analog Signals.

.1 Stranded No.18 AWG tinned copper conductors, 300V with individual shielded twisted pairs. Use Belden Type 9318 for cables requiring 1 pair of individually shielded twisted pairs, Belden 9368 for cables requiring 2 pairs of individually shielded twisted pairs, and Belden 9388 for cables requiring 4 pairs of individually shielded twisted pairs.

.2 Manufacturers: Belden, Atlas Wire, Copper Field, Noma Cables, or other ~~Engineer~~ Contract Administrator approved manufacturers.

.4 All wiring shall be color coded as follows:

.1 Analog signal pairs.

.1 White: DC positive.

.2 Black: Signal common.

.2 Analog signal triads:

.1 Red: DC supply to device.

.2 White: Analog signal from device.

.3 Black: Signal common.

.3 DC POWER WIRES

.1 Blue: DC positive.

.2 Brown: DC negative/common.

.3 Green: Grounding.

.4 AC POWER WIRES

.1 Black: AC supply/hot.

.2 White: AC neutral.

.3 Green: Grounding.

.5 PLC DISCRETE I/O (AC VOLTS)

.1 Red: AC Input

.2 Orange: AC Output

.6 PLC DISCRETE I/O (DC VOLTS)

.1 Violet: DC Input

.2 Grey: DC Output

2.13 GROUNDING

.1 Provided grounding lug, suitable for termination of 2/0 to 4/0 copper grounding cable.

.2 Separate grounding bars are to be provided for power grounds and instrument control system grounds (signal cable grounding, etc.).

2.14 SPARE PARTS

.1 Provide in accordance with Section 01 78 00 Closeout Submittals, the following spare parts:

.2 30 fuses of each type and rating used.

.3 2 control relays of each type used.

2.15 TERMINAL BLOCKS

.1 Screw connection terminals to be mounted on 35 mm DIN rails.

.1 Fused, 24 V DC shall be CSA approved for 300 V, accepting #12 - #16 AWG wire with blown-fuse indicator lamp. Weidmuller ASK-1 22276-0000 or similar.

.2 Unfused, 24 V DC shall be CSA approved for 300 V, accepting #12 - #16 AWG wire. Terminals shall be Weidmuller SAK 4 feed through type or similar.

.3 Fused, 120 V AC shall be CSA approved for 300 V, accepting #12 - #16 AWG wires, with blown-fuse indicator lamp. Weidmuller ASK-1 22556-0000 or similar.

.4 Unfused, 120 V AC devices shall be CSA approved for 300 V, accepting #12 - #16 AWG wires. Weidmuller SAK 4 feed through type or similar.

.2 Terminals colors shall be as follows:

.1	Ground	GREEN
.2	120V Line	BLACK
.3	120 V Neutral	WHITE
.4	+24 V DC	BLUE
.5	-24 V DC	BROWN

2.16 CONTROLS CIRCUIT PROTECTION

.1 Fuses: size as required, to match terminal blocks.

.2 Internal Control Panel Breakers:

.1 DIN rail mounted.

.2 CSA certified as a branch breaker protecting No.16 wire on load side of breaker.

.3 Size as required, maximum rating to be 80% of load side wire rating.

2.17 WIREWAYS

.1 Plastic wiring raceway with removable covers.

.2 Separate raceways shall be provided as follows:

.1	DC (24 V)	White
.2	AC	Black

.3 IS Blue

.4 Raceway shall be sized for 40% wire fill.

2.18 CONSTRUCTION

.1 Minimum EEMAC 12 construction for all panels unless otherwise specified.

.2 Unless otherwise specified fabricate floor mounted panels, indicated, of high grade, cold rolled smooth sheet metal steel no thinner than 3 mm thick with all doors and edges neatly turned and finished smoothly. Visible welding seams will not be accepted.

.3 Construct rigid panels and racks with an angle iron or channel supporting frame, suitably braced and stiffened to prevent any deformation during shipping or installation, and provide a surface free from dents, warping or other deformation. Provide a four-sided channel iron mounting base with front recess.

.4 Provide flush fitting, gasketted doors hung on piano type hinges with three point latches and locking-type handles (CSA Type 12 construction).

.5 Provide pans and rails for mounting terminal blocks, relays, wiring and other necessary devices.

.6 Use rear connected fittings to hold equipment and instrument cases on the panel, but where not possible; any front fixing required shall be only by means of chrome-plated, brass or stainless steel machine screws.

.7 Panel surfaces shall be thoroughly cleaned and degreased before painting. One primer coat shall be covered by two finished paint coats.

.8 The surface finish shall be free of runs, drops, ridges, waves and laps. The paints shall be applied in such manner as to provide an even film covering corners and crevices. The interior finish shall be white and the exterior finished will be selected after award of the contract.

.9 Panel Accessories: a metal pocket, 250 mm wide x 150 mm high x 25 mm deep, to hold pertinent drawings and manuals on the lower half of the inside door.

2.19 INTERNAL WORKS

.1 Provide an individual switch for disconnection and a fuse for isolation of all panel mounted instruments requiring a 120-volt supply.

.2 Make all wiring connections in the shop from the equipment mounted on the panel to numbered terminal blocks conveniently located in the panel, including the power supply for all instruments. Conductors shall be extra flexible stranded copper of gauges sufficient to carry the required currents, and shall in no case be smaller than #16 AWG extra flexible.

.3 Wire connections to all relays and instruments shall be made using easily removable good quality mechanical clips.

.4 Identify all wiring by means of plastic slip-on type markers. Install all wiring neatly and laced or bunched into cable form using plastic wire clips, and where practical, contained in plastic wiring channels with covers.

.5 Provide Weidmuller terminal blocks #SAK 2.5, T7 Carrier & EK 2.5N Grounding, tubular clamp, 300 V, complete with track. Each terminal shall be clearly indelibly marked with the wire number connection to it. Each field connecting conductor shall be served by one terminal. Provide 20% spare unit terminals, with a minimum of two spare terminals. Provide all necessary terminal block accessories such as manufactured jumpers and marking tape.

.6 Mount all internally mounted equipment on a hinged sub-chassis or mount on a rack and arrange for ease of access and removal when necessary.

.7 Arrange all terminal blocks in the panel in groups such that all low level signals such as 4-20 mA DC are located in one area, followed by contact closure type signals (limit switches, etc.), that do not subsequently energize starters, etc. but are for status indication, and the remainder that contain powered circuits, 120 volt, 60 Hz, are to be arranged in such a manner and location so as to prevent interference into the low level signal.

.8 Submit proposed terminal block layout and identification scheme for review prior to manufacture.

.9 Provide suitable spaces around the terminal blocks for incoming and outgoing conductors or cable assemblies.

.10 Provide plastic cable troughs equal to Panduit complete with snap-on covers for containing the cables. Cables are not to be bunched and tied, but laid in. Wire fill not to exceed 40%.

2.20 LABELLING

.1 Panel. Terminal labels to be black writing on white background.

.2 Wire labels to be PVC material with black writing on white background, securely fastened to prevent movement on wire or cable. Wieland type Z5 or Weidmuller type Z or similar.

.3 Each major component inside and on the face of the control panel to be labeled with a Lamicoid label, white lettering on black background, minimum text size to be 5mm high.

.4 Terminals shall be grouped for clarity and a Lamicoid label or DIN-rail mounted label block provided for each group. For example: Terminals for slot 2 discrete input PLC card may be grouped together with label as follows; TB1 (DI).

.5 Each terminal block in a given group should be numbered with individual snap-in labels such as Weidmuller Dekterm markers or similar.

.6 Label the front of the control panel with engraved Lamicoid nameplates, 20 mm x 75 mm, white lettering on black background.

.7 WRITE ON LABELS ARE NOT ACCEPTABLE.

2.21 PANEL MANUFACTURER

.1 Panel assembly, subcomponents and all internal components shall be CSA approved. Cabinet construction shall be performed by an established panel manufacturer who shall comply with all building codes, factory, and Department of Labour regulations and has CSA approval as manufacturer for all components of the work including control panels, MCCs, service entrance, etc. Local approvals for panel construction including CSA will not be accepted.

.2 Panel manufacturer shall have successfully completed a minimum of five (5) water and / or sewage treatment plant projects of a similar scope and complexity in the past 24 months.

.3 Panel manufacturer shall have full CSA approval as manufacturer for all components of the work (e.g. panels, MCC, service entrance, etc.).

.4 Acceptable panel manufacturer shall be Celco Controls, Manco Control Systems Inc.

2.22 HAULED WASTEWATER BUILDING #1 CONTROL PANEL (NEWPCC)

.1 Hauled Wastewater Building #1 Control Panel shall be modified to include the following I/O:

Tag	Description	Type	Rack	Slot	I/O
AE/AIT Y900	H2S, 4-20mA, Building	AI	1	TBD	TBD
FE/FIT Y114	Flow Meter - Flushing Water (located in separate building, wired to HWB#1)	AI	1	TBD	TBD
QA-Y726	Beacon, 120Vac	DO	1	TBD	TBD
QA-Y727	Beacon, 120Vac	DO	1	TBD	TBD
TV-Y640	Valve, 120Vac	AO	1	TBD	TBD
TE1-Y640	RTD w/ Transmitter for 4-20mA	AI	1	TBD	TBD
TE2-Y640	RTD w/ Transmitter for 4-20mA	AI	1	TBD	TBD
TE3-Y640	RTD w/ Transmitter for 4-20mA	AI	1	TBD	TBD
TE1-Y650	RTD w/ Transmitter for 4-20mA	AI	1	TBD	TBD
HS-Y640	Handswitch, 120Vac	DI	1	TBD	TBD
XV-Y781	Flushing Valve - Primary I/O to include Discrete Output (Open, Close, Hold) and Discrete Input (Open Status, Closed Status). Alternate, use Analog Input for Valve Position, and Analog Output for Valve Control. Coordinate with Valve Supplier.	Various	1	TBD	TBD
XV-Y782	See XV-Y781	Various	1	TBD	TBD
XV-Y783	See XV-Y781	Various	1	TBD	TBD

Tag	Description	Type	Rack	Slot	I/O
XV-Y791	See XV-Y781	Various	1	TBD	TBD
XV-Y792	See XV-Y781	Various	1	TBD	TBD
XV-Y793	See XV-Y781	Various	1	TBD	TBD

.2 If spare I/O is not available, a scope change will be solicited for to add an expansion rack, move and add appropriate I/O cards, wire new I/O cards, and adjust the base programming to accommodate for the new I/O cards. Panel modifications may include new side panels, or providing a separate remote I/O cabinet to house a remote rack and I/O terminations.

.1 Acceptable panel manufacturer shall be as specified above.

2.23 HAULED WASTEWATER Building #2 control panel (Previously Leachate Building Control Panel NEWPCC)

.1 Hauled Wastewater Building #2 Control Panel shall be modified to remove the following I/O:

Tag	Description	Type	Rack	Slot	I/O
X310-YS	Pump 310	DI	1	TBD	TBD
X310-MN	Pump 310	DO	1	TBD	TBD
X310-MM	Pump 310	DI	1	TBD	TBD
X310-QF	Pump 310	DI	1	TBD	TBD
X320-YS	Pump 320	DI	1	TBD	TBD
X320-MN	Pump 320	DO	1	TBD	TBD
X320-MM	Pump 320	DI	1	TBD	TBD
X320-QF	Pump 320	DI	1	TBD	TBD
X231-VB	Valve 231	DO	1	TBD	TBD
X231-VD	Valve 231	DO	1	TBD	TBD
X231-ZB	Valve 231	DI	1	TBD	TBD
X231-ZD	Valve 231	DI	1	TBD	TBD
X232-VB	Valve 232	DO	1	TBD	TBD
X232-VD	Valve 232	DO	1	TBD	TBD
X232-ZB	Valve 232	DI	1	TBD	TBD
X232-ZD	Valve 232	DI	1	TBD	TBD
X233-VB	Valve 233	DO	1	TBD	TBD
X233-VD	Valve 233	DO	1	TBD	TBD
X233-ZB	Valve 233	DI	1	TBD	TBD
X233-ZD	Valve 233	DI	1	TBD	TBD
X234-VB	Valve 234	DO	1	TBD	TBD
X234-VD	Valve 234	DO	1	TBD	TBD
X234-ZB	Valve 234	DI	1	TBD	TBD
X234-ZD	Valve 234	DI	1	TBD	TBD
X235-VB	Valve 235	DO	1	TBD	TBD
X235-VD	Valve 235	DO	1	TBD	TBD
X235-ZB	Valve 235	DI	1	TBD	TBD
X235-ZD	Valve 235	DI	1	TBD	TBD

.2 Hauled Wastewater Building #2 Control Panel shall be modified to include the following I/O:

Tag	Description	Type	Rack	Slot	I/O
AE/AIT Y901	H2S, 4-20mA, Building	AI	1	TBD	TBD
AE/AIT Y133	LEL, 4-20mA, Lane 3	AI	1	TBD	TBD
AE/AIT Y143	LEL, 4-20mA, Lane 4	AI	1	TBD	TBD
QA-Y728	Beacon, 120Vac	DO	1	TBD	TBD
QA-Y729	Beacon, 120Vac	DO	1	TBD	TBD
TV-Y660	Valve, 120Vac	AO	1	TBD	TBD
TE1-Y660	RTD w/ Transmitter for 4-20mA	AI	1	TBD	TBD
TE2-Y660	RTD w/ Transmitter for 4-20mA	AI	1	TBD	TBD
TE3-Y660	RTD w/ Transmitter for 4-20mA	AI	1	TBD	TBD
TE1-Y670	RTD w/ Transmitter for 4-20mA	AI	1	TBD	TBD
HS-Y660	Handswitch, 120Vac	DI	1	TBD	TBD
ZCO-Y820	Lane 4 entrance	DO	1	TBD	TBD
ZSB-Y820	Lane Four entrance Closed Status	DI	1	TBD	TBD
ZSD-Y820	Lane Four entrance Open Status	DI	1	TBD	TBD
ZCO-Y825	Lane 4 exit	DO	1	TBD	TBD
ZSB-Y825	Lane Four exit Closed Status	DI	1	TBD	TBD
ZSD-Y825	Lane Four exit Open Status	DI	1	TBD	TBD
ZX1-Y825	Lane Four exit proximity	DI	1	TBD	TBD
ZL1-Y825	Lane Four Exit Display - Red	DO	1	TBD	TBD
ZL2-Y825	Lane Four Exit Display - Green	DO	1	TBD	TBD
XV-Y784	Flushing Valve - Primary I/O to include Discrete Output (Open, Close, Hold) and Discrete Input (Open Status, Closed Status). Alternate, use Analog Input for Valve Position, and Analog Output for Valve Control. Coordinate with Valve Supplier.	Various	1	TBD	TBD
XV-Y785	See XV-Y784	Various	1	TBD	TBD
XV-Y786	Flushing	Various	1	TBD	TBD
XV-Y794	Flushing	Various	1	TBD	TBD
XV-Y795	Flushing	Various	1	TBD	TBD
XV-Y796	Flushing	Various	1	TBD	TBD

.3 If spare I/O is not available, a scope change will be solicited for to add appropriate I/O cards, wire new I/O cards, and adjust the base programming to accommodate for the new

I/O cards. Panel modifications may include new side panels, or providing a separate remote I/O cabinet to house additional I/O terminations.

.1 Acceptable panel manufacturer shall be as specified within these specifications.

.4 Hauled Wastewater Building #2 Control Panel shall be modified to revise the following field Tags:

Existing Tag	Description	Recommended Tag	Assigned Tag
X112-AIT	LEL Transmitter Lane #4	AE/AIT-Y143	
X122-AIT	LEL Transmitter Lane #3	AE/AIT-Y133	
FE/FIT-X113	Lane #4 Flow Meter	FE/FIT-Y143	
FE/FIT-X123	Lane #3 Flow Meter	FE/FIT-Y133	
X930-S	Lane #3 Sampler (and associated I/O)	S-Y930	
X940-S	Lane #4 Sampler (and associated I/O)	S-Y940	
X911-HV	Manual Valve	HV-Y941	
X912-HV	Manual Valve	HV-Y942	
X913-HV	Manual Valve	HV-Y943	
X211-XV	Control Valve Lane #4	XV-Y241	
X921-HV	Manual Valve	HV-Y931	
X922-HV	Manual Valve	HV-Y932	
X923-HV	Manual Valve	HV-Y933	
X221-XV	Control Valve Lane #3	XV-Y231	
LE/LIT-X121	Lane #3 Holding Tank LIT	LE/LIT-Y131	
X121-LH	Lane #3 Holding Tank LH	LH-Y131	
X121-LL	Lane #3 Holding Tank LL	LL-Y131	
LE/LIT-X111	Lane #4 Holding Tank LIT	LE/LIT-Y141	
X111-LH	Lane #4 Holding Tank LH	LH-Y141	
X111-LL	Lane #4 Holding Tank LL	LL-Y141	
X700-LSHH	Hauled Waste Building #2 Building Flood Switch	LSHH-Y561	
X630-TSL	Hauled Waste Building #2 Building Low Temp.	TSL-Y650	
X715-ZSD	Hauled Waste Building #2 Building Main Door Switch	ZSD-Y725	
X755-XA2	Hauled Waste Building #2 Outdoor Strobe	XA2-Y730	
X800-XZ	Lane #3 Entrance Gate (and associated I/O)	XZ-Y830	
X805-XZ	Lane #3 Exit Gate (and associated I/O)	XZ-Y835	
X815-ZS	Lane #3 Manhole Proximity Sensor	ZS-Y830	
X800-ZS	Lane #3 Barrier Proximity Sensor	ZS-Y835	
X820-XZ	Lane #4 Entrance Gate (and associated I/O)	XZ-Y840	
X825-XZ	Lane #4 Exit Gate (and associated I/O)	XZ-Y845	

Existing Tag	Description	Recommended Tag	Assigned Tag
X610-HV	Manual Valve	HV-Y630	
X640-HV1	Manual Valve	HV1-Y660	
X640-HV2	Manual Valve	HV2-Y660	
X640-HV3	Manual Valve	HV3-Y660	
X640-HV4	Manual Valve	HV4-Y660	
X640-HV5	Manual Valve	HV5-Y660	
X640-HV6	Manual Valve	HV6-Y660	
X640-HV7	Manual Valve	HV7-Y660	
X640-HV8	Manual Valve	HV8-Y660	
X640-HV9	Manual Valve	HV9-Y660	
X640-HV10	Manual Valve	HV10-Y660	
X640-HV11	Manual Valve	HV11-Y660	
X640-P	Heating Pump (and associated I/O)	P-Y660	
X650-PSH1	Prefilter	PSH1-Y670	
X650-PSH2	Return Filter	PSH2-Y670	
X650-HS	Hand Switch for Air to Air Heat Exchanger (and associated I/O)	HS-Y670	
X650-HV1	Manual Valve	HV1-Y670	
X650-HV2	Manual Valve	HV2-Y670	
X650-HV3	Manual Valve	HV3-Y670	
X650-HV4	Manual Valve	HV4-Y670	
X650-HV5	Manual Valve	HV5-Y670	
X650-TV	Control Valve (and associated I/O)	TV-Y670	
X650-TE2	Temperature Transmitter	TE2-Y670	
X650-FSL	Flow Switch	FSL-Y670	
X680-EF	Exhaust Fan (and associated I/O)	EF-Y685	

.1 All equipment listed (and not listed) above, relating to former Leachate Building, now Hauled Wastewater Receiving Building #2, will have their tags revised with appropriate tagging for the area. If a conflict is discovered or additional tags are required, contact the ~~Engineer~~ Contract Administrator or the City for confirmation of the tag.

.2 Tag updating by the contractor will include lamicoids for equipment, cable tags, conductor tags, on site drawings not modified within this construction package (redline only), redlines of drawings within this construction package, PLC tag references within the PLC code, HMI tag references within the HMI code, HMI references within the HMI graphics.

2.24 LEACHATE SAMPLING BUILDING CONTROL PANEL (NEWPCC)

.1 Leachate Sampling Building Control Panel shall be installed as indicated below and in the drawing package, complete with the following features:

.1 EEMAC 12 rated wall mounted enclosure, 12 gauge, hinged lockable doors

.2 20A, 1P, 120V main disconnect switch

.3 Lamacoid identification nameplates on all components

.4 Terminal strips (identified) for all wiring

.5 Panel finish shall be white epoxy paint for interior and ASA 61 light grey enamel for exterior

.6 Acceptable panel manufacturer shall be as specified above.

Part 3 Execution

3.1 INSTALLATION

.1 Install pushbutton stations, control and relay panels, control devices as indicated and interconnect as indicated.

3.2 CONTROL SYSTEM DISRUPTION

.1 Existing control panels and I/O shall not be removed from plant operation for more than one (1) days for purposes of installing additional I/O cards or device termination.

.2 A maximum of one control panel shall be taken out of operation at any given time.

.3 All shutdowns shall be coordinated with operations and maintenance.

.4 Existing Ethernet communication shall remain unaffected to other control panels while upgrading or reconstructing an existing control panel.

3.3 GENERAL

.1 Field measure all back pans and equipment to be relocated. Advise ~~engineer~~ Contract Administrator of changes and submit shop drawings. Modify panel layout to suit.

.2 Install Ethernet taps cabling.

.3 All AC, DC and intrinsically safe wiring shall be run in separate raceways.

.4 Install a maximum of one wire per terminal.

.5 Install terminal cross connects where required. Do not install jumper wires.

.6 Label all terminals and devices.

.7 Label all wire and cables as defined in related sections.

.8 Mount Lamicoids using self-tapping Stainless Steel screws. Do not mount on removable covers.

.9 All devices to be protected with either fuses or breakers.

.10 All I/O to be protected with fuses including relay coils and contacts, discrete inputs and outputs and analog inputs and outputs.

.11 Control panel junctions shall be made using terminal blocks. Wire splices shall not be allowed.

.12 Each terminal shall be uniquely identified and labeled.

.13 Each wire shall be tagged at both ends. The tag shall correspond with labels provided on engineering design drawings. Mark up one set of drawings with added/modified tags for review by ~~Engineer~~Contract Administrator.

3.4 INSPECTION AND TESTING

.1 The ~~Owner's Representative~~Contract Administrator reserves the right to inspect and witness test the control panels.

.2 Inspection:

.1 ~~Owner's Representative~~Contract Administrator shall be notified at least one (1) day prior to the completion of the panel steel work so that arrangements can be made to inspect the panel before commencement of wiring. Provide progress photographs (digital format) to ~~Owner's Representative~~Contract Administrator at this stage. Progress photographs shall be sent via e-mail.

.2 ~~Owner's Representative~~Contract Administrator shall be notified at least seven (7) days prior to the completion of the panel so that arrangements can be made for final inspection and testing. Provide progress photographs (digital format) to ~~Owner's Representative~~Contract Administrator at this stage. Progress photographs shall be sent via e-mail.

.3 The inspection of the panel shall include but not be limited to the following:

.1 General workmanship (including physical dimensions).

.2 Panel painting.

.3 Arrangement of the panel.

.4 Nameplates and tagging of all panel components, instruments, control switches, indicating lights, wires, terminals, relays and auxiliary equipment.

.3 Testing:

.1 Prior to the arrival of the ~~Owner's Representative~~Contract Administrator, the panel shall have been completely tested by the Panel Fabricator as follows:

.1 All electrical circuits checked for continuity, and compliance with the specification.

.2 All symbols and nameplates checked for correct spelling and size of letters.

.3 All lamps tested.

.4 Mechanical features (doors, hinges, latches, etc.) shall be free from defects.

.5 Finished surfaces shall be free from defects.

.6 The Panel Fabricator shall perform all other tests as required to place the panel in operating condition. Completion of these tests shall be submitted to ~~Owner's Representative~~Contract Administrator in writing.

.2 The Contractor shall allocate adequate space, facilities and assistance to permit inspection and testing to the satisfaction of the ~~Owner's Representative~~Contract Administrator. Test instruments and equipment, test leads, temporary wiring, tools, etc., shall be made available, by the Contractor, as required. All the above items are to remain the property of the Contractor.

.3 Provide a technician for two (2) eight (8) hour days to assist the ~~Owner's Representative~~Contract Administrator ~~inspector~~ in testing the panel.

.4 All calibration/test equipment shall have a current certification of calibration. All of the aforementioned facilities, assistance, equipment, materials, and arrangements shall be provided at no additional charge to ~~Owner's Representative~~Contract Administrator.

.5 During functional test, the ~~Owner's Representative~~Contract Administrator shall develop a deficiency list of items to be completed before the panel is accepted and shipped.

.6 The test of the panel shall include but not be limited to the following:

.1 All circuits with timing relays.

.2 All interconnecting circuits with sequencing functions.

.3 AC and DC power distribution.

.4 All auxiliary equipment.

.5 All control switches and indicating lights.

3.5 PACKAGING AND SHIPPING

.1 In accordance with Section 01 33 00 – Submittal Procedures.

.2 The panels shall be prepared for shipment so as to protect it from physical damage. Assemblies shall be packaged in generously padded cartons or containers. Partial shipment shall only be allowed by written approval of the ~~Owner's Representative~~Contract Administrator.

.3 All shelf-mounted instrumentation shall be removed from the panel before shipment, and re-packaged in its original containers for shipment to the job site.

.4 Any other "loose" components shall be taped or tied down, and/or supported with polyurethane foam so as to provide a tight, vibration free shipping unit.

.5 In addition to the ~~Owner's~~ City's company name and the shipping destination, the outside of each crate or carton shall be marked with the Purchase Order and Item Number(s). A label listing contents and a duplicate listing shall be included inside the package.

3.6 TESTS

.1 Thorough testing of the communications system shall be done prior to completion of field installation of equipment. The Contractor shall demonstrate that the DCS, communication and remote PLC components are operational and meet the specifications by means of tests carried out at different points of time.

.2 The complete testing process shall follow this sequence:

.1 Contractor Testing of I/O back to PLC

.2 Contractor will support testing of control system

.3 Site Acceptance Test (SAT)

.4 14-Day Acceptance Period after Commissioning

.3 Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at a time and check out operation of section.

.4 Upon completion of sectional test, undertake group testing.

.5 Check out complete system for operational sequencing.

.6 Submit one copy of test results to the Contract Administrator.

3.7 COMMISSIONING

.1 The Contractor shall be responsible for the commissioning support of the systems during the project.

.2 The Contractor shall perform all panel start-up and commissioning.

.3 PLC and HMI programming is the responsibility of the Contractor. Programming will be based on the work package and operation requirements of the City.

.4 Site Acceptance Test (SAT)

.1 System Test

.1 Test communication links for specified performance

.2 Test all wiring made to existing control panels

.3 Test all manual and automatic controls for complete operation

.4 Test all alarms to DCS for proper operation - contacts to open on alarm

.5 Test DCS-imitated callout system on alarms

.6 Test all discrete PLC inputs for proper operation

.7 Test all analog PLC inputs for proper operation

.8 Force all discrete outputs to test for correct wiring and operation

.9 Test all automated sequences

.5 14-Day Acceptance Period After Commissioning

.1 A 14-Day Acceptance Period after Commissioning shall commence at the discretion of the ~~Engineer and Owner's representative~~Contract Administrator and after successful completion of SAT. During this period, the system will be monitored for proper operation and to ensure compliance with the availability criteria.

.2 In the event of a malfunction or a failure to meet the reliability criteria, the Client will terminate the Site Acceptance Period until the Contractor remedies the deficiency. The Site Acceptance Period shall then begin again and continue for a period of fourteen (14) days. This process shall continue until the system performs satisfactorily for fourteen (14) consecutive days in complete compliance with the specifications.

.6 The City of Winnipeg staff will program the new keypad system. The Contractor will be responsible for installing the keypads, and supporting the City in commissioning the keypads.

END OF SECTION

Part 1 General

1.1 SCOPE

.1 This section specifies the supply installation, field testing, and placing into operation of flow, pressure, temperature, level turbidity, and other instruments of control and instrumentation.

1.2 RELATED WORK

.1 Section 26 05 01 – Common Work Results – Electrical

.2 Section 25 14 00 – Control Panels

1.3 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures. Product data sheets to include:

.1 Component electrical characteristics.

.2 Performance criteria.

.3 Physical size and limitations.

.2 Include instruments literature in electrical O&M manuals in accordance with Section 26 05 01 – Common Work Results – Electrical. Manufacturer's Instructions to indicate special handling criteria, installation sequence, cleaning and maintenance procedures.

1.4 STANDARDIZATION CONTACTS

.1 Control Systems and Motor Control Equipment - Schneider Electric Canada Inc

Garth Eastman
21 Omands Creek Blvd
Winnipeg, MB, R2R 2V2
204-631-0670
garth.eastman@ca.schneider-electric.com

.2 Electric Valve Actuators - Rotork Controls Canada Ltd.

Mr. Henry Zenteno
#6, 820 - 28th Street North East Street
Calgary, Alberta, T2A 6K1
1-403-813-5850
Henry.Zenteno@rotork.com

.3 Gas Detection Systems - Mine Safety Appliances Company, LLC

Mr. Alan Thomson
Account Manager
5040 12A Street SE

Calgary, AB
T2G 5K9
1-800-992-2364
athomson@cbeng.com

.4 Instrumentation - Trans-West Supply Company Inc.

Greg Troilo
President
126 Bannister Road
Winnipeg, MB, R3R 0S3
gregt@transwest-mb.com

1.5

Part 2 Products

2.1 INSTRUMENTS

.1 Provide each instrument with mechanisms that are corrosion resistant.

.2 Provide each instrument with mechanisms enclosed in a dustproof and a moistureproof case.

.3 Provide all indicator and gauge dials finished in permanent white with black graduations and figures.

.4 Potentiomeric signals shall have a "live" zero or positive minimum value in the signal range.

.5 Each component shall be carefully selected and designed for a long lifetime with ample margin to withstand transient and other surge voltages, which may occur in the circuits from any source in the power supply.

.6 Each component and composite instrument shall be suitable for the location and installation position at the attitude designated on the drawings, e.g., horizontal, vertical or sloped position.

.7 The Contractor shall provide all power supplies. Provide each instrument having a 120 volt supply with a receptacle and plug assembly. Receptacles and plug to be of "twist-lok," type.

.8 Provide each instrument with a circuit breaker.

.9 All control panel mounted instruments shall be suitable for flush mounting and shall be furnished with bezel.

.10 Unless otherwise indicated or specified, all signals shall be of the 4-20 mA DC type. This applies to both transmitting and receiving instruments.

.11 All materials shall conform to the standards of the Canadian Standards Association (CSA).

.12 Instrumentation Data Sheets are included in this Section.

.13 A minimum of one paper copy of each unique manual shall be provided.

.14 Where instruments require a hand-held programmer for setting up and calibrating, one of each unique programmer shall be provided.

.15 Instruments of one manufacturer to be used throughout the installation to the extent practical.

2.2 MAGNETIC FLOW METERS

.1 The magnetic flow meter must comply with the City of Winnipeg Electrical and Instrumentation Standardization Summary (latest revision).

.1 Per RFP 449-2014, and from 2015-04-28 to 2019-09-30, the Installation Contractor will procure instrumentation from Trans-West Supply Company (Siemens).

.2 Contact information detailed above and in Section 25 14 00, Part 1 – Instrumentation.

.2 Provide magnetic flow meters suitable for wastewater applications as follows:

.1 Dewatering Building flushing line (1-100mm)

.3 Magmeters to have following characteristics:

.1 CSA Class 1 Div II Groups A, B, C & D certified and F.M. approved
.2 Flanges: Carbon steel, flanged each end
.3 Liner: Polyurethane
.4 Electrodes: 316 stainless steel
.5 Enclosure: EEMAC 4X
.6 Product temperature: -10 to 50°C
.7 Ambient temperature: 10 to 50°C
.8 Power supply: 120 volt AC
.9 Power output: 4-20 mADC signal input to the plant PLC
.10 Operating Range: Confirm all operating ranges with Contract Administrator
.11 Accuracy: 0.2%
.12 Local display: instantaneous flow in litres per minute and totalizer in cubic metres
.13 Programming: via contactless contacts or HART protocol
.14 Capacitance back up for retention of settings and current values
.15 Operating pressure: 0-700 kPa
.16 Test pressure: 1400 kPa
.17 Grounding rings: Mandatory for PVC pipe.

2.3 MAGNETIC FLOW METERS - PARTIALLY FILLED PIPE

.1 The magnetic flow meter must comply with the City of Winnipeg Electrical and Instrumentation Standardization Summary (latest revision).

.1 Per RFP 449-2014, and from 2015-04-28 to 2019-09-30, the Installation Contractor will procure instrumentation from Trans-West Supply Company (Siemens).

.2 Contact information detailed above and in Section 25 14 00, Part 1 – Instrumentation.

.2 Provide magnetic flow meters suitable for wastewater applications as follows:

.1 Leachate Building flow line 1 (1-150mm).

.3 Magmeters to have following characteristics:

.1 CSA Class 1 Div II Groups A, B, C & D certified and F.M. approved

.2 Flanges: Carbon steel, flanged each end

.3 Liner: Polyurethane

.4 Electrodes: 316 stainless steel

.5 Enclosure: EEMAC 4X

.6 Product temperature: -10 to 50°C

.7 Ambient temperature: 10 to 50°C

.8 Power supply: 120 volt AC

.9 Power output: 4-20 mADC signal input to the plant PLC

.10 Operating Range: Confirm all operating ranges with Contract Administrator

.11 Accuracy: 0.2%

.12 Local display: instantaneous flow in litres per minute and totalizer in cubic metres

.13 Programming: via contactless contacts or HART protocol

.14 Capacitance back up for retention of settings and current values

.15 Operating pressure: 0-700 kPa

.16 Test pressure: 1400 kPa

.17 Grounding rings: Mandatory for PVC pipe.

.18 Partially filled pipe performance:

.1 Error <= 1% of full scale range with pipe at least 10% full and velocity >= 1 m/s.

2.4 HYDROCARBON DETECTORS

.1 The gas analyzer must comply with the City of Winnipeg Electrical and Instrumentation Standardization Summary (latest revision).

.1 Per RFP 123-2014, and from 2015-01-23 to 2019-06-30, the Installation Contractor will procure instrumentation from Mine Safety Appliances Company, LLC.

.2 Contact information detailed above and in Section 25 14 00, Part 1 – Gas Detection Systems.

.2 Provide three (3) hydrocarbon detectors suitable for water applications as follows:

.1 Hauled Wastewater Building #2 Tanks 3 and 4 (NEWPCC)

.1 Acceptable manufacturer shall be MSA, model A-ULTIMAX-XP E38C4S20010100

.2 Leachate Building Ambient Detection (NEWPCC)

.1 Acceptable manufacturer shall be MSA, Primax IR Gas Monitor.

.3 For sampling system in Hauled Wastewater Building #2:

.1 Pump will be manufactured by MSA, model Ultima X Sampling Module 10043264.

.2 The sample and detector pair will be assembled in an enclosure, matching that installed in Hauled Wastewater Building #1.

2.5 HYDROGEN SULFIDE DETECTORS

.1 The gas analyzer must comply with the City of Winnipeg Electrical and Instrumentation Standardization Summary (latest revision).

.1 Per RFP 123-2014, and from 2015-01-23 to 2019-06-30, the Installation Contractor will procure instrumentation from Mine Safety Appliances Company, LLC.

.2 Contact information detailed above and in Section 25 14 00, Part 1 – Gas Detection Systems.

.2 Provide three (3) hydrogen sulfide detectors as follows:

.1 Hauled Wastewater Building #1 Ambient Detection (NEWPCC)

.2 Hauled Wastewater Building #2 Ambient Detection (NEWPCC)

.3 Leachate Building Ambient Detection (NEWPCC)

.3 Acceptable manufacturer shall be MSA, model Primax I.

.4 One calibration kit will be provided and left at site.

2.6 BUILDING FLOOD ALARM

.1 The building flood detection transmitter must comply with the City of Winnipeg Electrical and Instrumentation Standardization Summary (latest revision).

.1 Per RFP 449-2014, and from 2015-04-28 to 2019-09-30, the Installation Contractor will procure instrumentation from Trans-West Supply Company (Siemens).

.2 Contact information detailed above and in Section 25 14 00, Part 1 – Instrumentation.

.2 Building flood alarm and Dry Pit flood alarm switch shall be ultrasonic gap type.

2.7 TEMPERATURE SWITCHES

.1 Provide building low temperature switches as indicated. Acceptable manufacturer shall be Siemens Building technologies.

2.8 BEACON

.1 Provide six (6) new beacons as follows:

.1 Hauled Wastewater Building #1 LEL Alarm for Lane 1 and 2 (NEWPCC)
.2 Hauled Wastewater Building #2 LEL Alarm for Lane 3 and 4 (NEWPCC)
.3 Leachate Building H2S Alarm for Building (NEWPCC)
.4 Leachate Building LEL Alarm for Building (NEWPCC)

.2 Provide flashing alarm beacons as follows:

.1 Color red, LED high intensity type.
.2 Operating voltage 120 V AC.
.3 Rated Class 1 Zone 1 when mounted in rated area.
.4 Rated EEMAC 4X when mounted outdoors or in non-rated areas.

.3 Alarm Beacon: Federal Signal, 131ST, 191XL or approved ~~alternate~~equal in accordance with B7.

2.9 SAMPLER SYSTEMS

.1 Provide fluid sampler systems, complete with refrigerators and 24 position carousel, for the defined locations in the work package, including:

.1 Hauled Wastewater Building #1 Tank 2 (replace existing).
.2 Hauled Wastewater Building #2 Tank 3 (replace existing).
.3 Hauled Wastewater Building #2 Tank 4 (replace existing).
.4 NEWPCC Leachate Building (new).

.2 24 plastic sample bottles.

.3 Equipment to be supplied with appropriate I/O extension modules to meet the requirements of the P&IDs.

.4 Acceptable Manufacturer is HACH, Model AS950 with I/O module IO9004.

Part 3 Execution

3.1 INSTALLATION

.1 Coordinate the work of this Section with the installation of the equipment specified in the relevant Sections and as shown on the Mechanical and Electrical drawings.

.2 Perform all work in compliance with the relevant sections of this Section.

.3 Ensure that exit light circuit breaker is locked in on position.

3.2 FIELD INSTRUMENT MOUNTING

.1 "Mounting" shall mean the positioning and fastening with proper brackets in the position required.

.2 All equipment shall be mounted in accordance with manufacturer's recommendations.

.3 Locations of all field instruments are subject to modification by the Contract Administrator who reserves the right to move any item up to 3 meters from the position shown, without change to the contract price, provided notice is given before the related work has commenced.

.4 Exact locations of all field instruments shall be site determined by the Contractor to the satisfaction of the Contract Administrator to ensure proper operation of the device.

.5 Employ any and all means of trade, skill, and workmanship to install all field instruments to the satisfaction of the Contract Administrator.

3.3 COMMISSIONING

.1 Instrument manufacturer’s qualified field service representative shall be onsite as required to perform instrument calibration, testing and commissioning and to instruct City representative in all aspects of instrument operation and maintenance.

.2 Follow all commissioning requirements of these specifications.

.3 The Contractor is responsible for fully commissioning the installed equipment and providing a functional system to the City.

END OF SECTION

CH4 GAS DETECTION DATA SHEET

DATA SHEET No.	1 OF 1
SPEC. No.	25 31 01
Prj No.	111216000
REQ.	P.O.

PLANT : North End Sewage Treatment Plant

LOCATION : Winnipeg, MB

REV	DESCRIPTION	DATE	BY	CHK'D	APPR.
2	Issued for Tender	20160301	SAL	DR	DR
1	Issued for Client Review 95%	20160127	SAL	DR	DR

1	**TAG NO.**		**Y111-AIT**	**Y121-AIT**	
2	**VENDOR**		CB Engineering	CB Engineering	
3	**MANUFACTURER**		MSA	MSA	
4	**SERVICE**		Air	Air	
5	**P&ID NO.**		I-0101Y-A0008-001-00	I-0101Y-A0008-001-00	
			Operating Conditions		
6	**Ambient Temp. (deg. C)**	**Minimum**	-40	-40	
		Maximum	75	75	
7	**Gas Components**		Methane	Methane	
8	**Mol Wt. or Sp. Gr.**		16.04 g/mol	16.04 g/mol	
9	**Distance from Source (m)**		<1m	<1m	
10	**Humidity**		0 to 99% RH	0 to 99% RH	
11	**Vibration**		minimal	minimal	
12	**Location**	**Indoors**	X	X	
		Outdoors			
			Detector		
13	**MODEL:**		A-ULTIMAX-XP E38C4S20010100	A-ULTIMAX-XP E38C4S20010100	
14	**Sensor Type**				
15	**Method**	**Diffusion**			
		Solid State	X	X	
		Electro-Chemical			
16	**Housing Type / Class**		NEMA 4X	NEMA 4X	
			Monitor or Transmitter		
17	**MODEL:**		A-ULTIMAX-XP E38C4S20010100	A-ULTIMAX-XP E38C4S20010100	
18	**Type Monitor**	**Local**	X	X	
		Remote			
19	**Dual Channel / Single Channel**		Single	Single	
20	**Housing Type / Class**		NEMA 4X	NEMA 4X	
21	**Transmitter**	**Integral**	X	X	
		Remote			
22	**Transmitter Output**		4-20 mA	4-20 mA	
23	**Zero Adj.**				
24	**Span**		0-1000ppm	0-1000ppm	
25	**Adjustable Range**	**Alarm**			
		Shutdown			
26	**Meter**				
27	**Power Supply**	**VAC**			
		VDC	24	24	
28	**Running Lights**	**Power**	x	x	
		Alarm	x	x	
		Shutdown	x	x	
29	**Test Switch**		current test jacks	current test jacks	
30	**Sensitivity Adj.**				
31	**Drift 0 - 1%**	**(Zero Drift)**	N/A	N/A	
32	**Response 0 - 2 Sec.**				
33	**Repeatability 0 - 1%**		1%	1%	
			Accessories		
34	**Alarm Relay**	**SPDT / Rating**			
		DPDT / Rating	5A	5A	
35	**Rack**				
36	**Use of Calibration Kit**		Y	Y	
37	**Alarm Reset**		Y	Y	
38	**On / Off Switch**				
39	**CSA Approved**		Class I, Div I	Class I, Div I	

NOTES :

1. Calibration kit w/ tubing to be provided for remote calibration
2. Calibration to scale output form 0-100% LEL on 4-20mA signal
3. Include Sample pump from MSA, model Ultima X Sampling Module 10043264

DOOR SWITCH DATA SHEET

DATA SHEET No.	1 OF 1
SPEC. No.	25 31 01
Prj No.	111216000
REQ.	P.O.

PLANT:
North End Sewage Treatment Plant

LOCATION :
Winnipeg, MB

REV	DESCRIPTION	DATE	BY	CHK'D	APPR.
2	Issued for Tender	20160301	SAL	DR	DR
1	Issued for 95% Review	20160127	SAL	DR	DR

1	**TAG NO.**		**X720-XA**		
2	**VENDOR**		Westburne		
3	**MANUFACTURER**		AB		
4	**SERVICE**		Door Switch, monitoring access to Building		
5	**Line No. & Spec**		N/A		
6	**P&ID NO.**		NA		
			Operating Conditions		
7	**Ambient Temp. (deg. C)**	**Minimum**	-40 degC		
		Maximum	40 degC		
8	**Location**	**Indoors**	Inside of an exterior door		
		Outdoors			
			Equipment Body		
9	**Body Type**				
10					
11					
12					
13					
14					
15					
16					
17					
18					
			Electrical		
19	**Contact Style**		FORM C		
20	**Connection**		1/2" NPT		
21	**Signal**		NC when door is closed		
22					
23					
24					
25					
26					
27					
			Other		
28					
29					
30					
31					
32					
33					
			Service Conditions		
34					
35					
36					
37					
38					
39					
40					
41					
42					
43	**Area Classification** **Class** **Div** **Group**				
44	**CSA Approval**		YES	YES	
45	**Model Number**				

NOTES :

FLOWMETER - MAGNETIC
DATA SHEET

DATA SHEET No. 1 OF 2
SPEC. No. 25 31 01
Prj No. 111216000
REQ. P.O.

PLANT: North End Seqage Treatment Plant
LOCATION : Winnipeg, MB

REV	DESCRIPTION	DATE	BY	CHK'D	APPR.
2	Issued for Tender	20160301	SAL	DR	DR
1	Issued for 95% Review	2E+07	SAL	DR	DR

1 TAG NO. : SEE SHEET 2 — VENDOR :
2 SERVICE : SEE SHEET 2 — MANUFACTURER : Siemens

General

3 Description: [ ] Recorder [ ] Indicator [ ] Blind [ ] Controller [X] Transmitter [ ] Integ Other ____
4 Case: [X] Mfr.Std Nominal Size ____ (mm) Colour: [ ] Mfr.Std Other ____
5 Mounting: [X] Flush [ ] Surface [ ] Yoke Other ____
6 Enclosure Class: [ ] Gen.Purp [ ] Weath.Prf [X] Exp.Proof Class ____ [ ] IS System Other ____
7 Power Supply: [ ] 120V 60Hz [ ] Other [ ] AC [X] DC Volts 24Vdc
8 Chart Type: [ ] Strip [ ] Roll [ ] Fold [ ] 12" Circular [ ] Time Marks Range ____ No. ____
9 Chart Drive: [ ] Spring [ ] Electric [ ] Pneumatic Chart Speed ____
10 Scales: Wind Type ____ Range Power ____ Air Pressure ____ (kPa)
1 ____ 2 ____ 3 ____ 4 ____
11 CSA Approved: [X] Yes [ ] NO

Transmitter

12 Transmitter Output: [X] 4 - 20 mA [ ] 10 - 50 mA [ ] 20 - 100 kPa (3 - 15 psig) Other ____
For Receiver See Spec. Sheet ____

Controller

13 Control Modes: P=Prop (Gain) , I=Integral (Auto Reset) , D=Derivative (Rate) , Sub: S=Slow F=Fast
[ ] P [ ] PI [ ] PD [ ] IF [ ] DF [ ] DS Other ____
14 Action: On Measurement Increase Output: [ ] Increases [ ] Decreases
15 Auto-Man Switch: No. Positions ____ [ ] External [ ] Internal [ ] Integral [ ] Bumpless [ ] Balance Gauge
16 Set Point Adj.: [ ] Manual [ ] Extrnal [ ] Remote Other ____
17 Manual Regulator: [ ] None [ ] Mfr Std Other ____
18 Output: [ ] 4 - 20 mA [ ] 10 - 50 mA [ ] 20 - 100 kPa (3 - 15 psig) Other ____

Differential Unit

19 Service: [X] Flow [ ] Level [ ] Diff. Pressure Other ____
20 Element Type: [ ] Diaphragm [ ] Bellows [ ] Mercury Other ____
21 Material: Body ____ Element ____ Drain/Vent ____
22 Rating: Body Rating ____ (kPa) Overrange ____ (kPa)
23 Diff. Range: [ ] Fixed Adj. Range ____ (kPa) Calibrated Range ____ (kPa)
Elevation ____ Suppresion ____
24 Process Data: Fluid ____ Flow Unit ____ Flow Normal ____ Full Scale ____
Max. Pressure ____ (psig) Max. Temperature ____ (deg. F)
25 Process Conn.: [ ] 1/2" NPT Other ____

Accessories

26 Alarm Switches: Quant. ____ Form ____ Rating ____
27 Function: [ ] Meas.Var. [ ] Deviation On Measurement Increase Contacts: [ ] Open [ ] Close

28 Options:
[ ] Pressure Element Range ____ (kPa) Material ____
[ ] Temp. Element Range ____ (deg. C) Type ____
[ ] Filt.-Reg. [ ] Supply Gauge [ ] Output Gauge [ ] Chart & Inkset
[ ] Valve Manifold [ ] Cond. Pots [ ] Adj. Damper [ ] Integral Sq.Rt. Ext.
[ ] Integrator [ ] Mounting Yoke Other ____

Notes :

FLOWMETER - MAGNETIC
DATA SHEET

DATA SHEET No.	2 OF 2
SPEC. No.	25 31 01
AFE No.	111216000
REQ. 0	P.O. 0

PLANT:
North End Seqage Treatment Plant

LOCATION :
Winnipeg, MB

REV	DESCRIPTION	DATE	BY	CHK'D	APPR.
2	Issued for Tender	20160301	SAL	DR	DR
1	Issued for 95% Review	20160127	SAL	DR	DR

TAG NO. : SEE SHEET 1
SERVICE : SEE SHEET 1
VENDOR : SEE SHEET 1
MANUFACTURER : SEE SHEET 1

Rev.	Tag No.	P&ID No. / Meter Size	Operating Flow (litres/sec) / FLUID	Calibrated Range (litres/sec)	Model No.	SOUR Service	SERVICE	Notes
2	X151-FIT	I-0101X-A0009-001 / 250	Leachate	0-200		Y	Leachate	
2	X113-FIT	I-0101Y-A0001-001 / 100	Water	0-100		N	Water	

NOTES :

SEE SHEET 1

HYDROGEN SULFIDE DETECTION DATA SHEET

DATA SHEET No.	1 OF 1
SPEC. No.	25 31 01
Prj No.	111216000
REQ.	P.O.

PLANT : North End Sewage Treatment Plant

LOCATION : Winnipeg, MB

REV	DESCRIPTION	DATE	BY	CHK'D	APPR.
2	Issued for Tender	20160301	SAL	DR	DR
1	Issued for Client Review 95%	20160127	SAL	DR	DR

			Y900-AIT	Y-901-AIT	X951-AIT
1	TAG NO.				
2	VENDOR		CB Engineering	CB Engineering	CB Engineering
3	MANUFACTURER		MSA	MSA	MSA
4	SERVICE		Air	Air	Air
5	P&ID NO.		I-0101Y-A0002-001	I-0101Y-A0010-001	1-0101X-A0009-001
	Operating Conditions				
6	Ambient Temp. (deg. C)	Minimum	-40	-40	-40
		Maximum	75	75	75
7	Gas Components		Hydrogen Sulfide	Hydrogen Sulfide	Hydrogen Sulfide
8	Mol Wt. or Sp. Gr.				
9	Distance from Source (m)		<1m	<1m	
10	Humidity		15 to 99% RH	15 to 99% RH	15 to 99% RH
11	Vibration		minimal	minimal	minimal
12	Location	Indoors	X	X	X
		Outdoors			
	Detector				
13	MODEL:		PRIMAX I	PRIMAX I	PRIMAX I
14	Sensor Type				
15	Method	Diffusion			
		Solid State			
		Electro-Chemical	X	X	X
16	Housing Type / Class		NEMA 4X	NEMA 4X	NEMA 4
	Monitor or Transmitter				
17	MODEL:		PRIMAX I	PRIMAX I	PRIMAX I
18	Type Monitor	Local	X	X	
		Remote			
19	Dual Channel / Single Channel		Single	Single	Single
20	Housing Type / Class		NEMA 4X	NEMA 4X	NEMA 4X
21	Transmitter	Integral	X	X	X
		Remote			
22	Transmitter Output		4-20 mA	4-20 mA	4-20mA
23	Zero Adj.				
24	Span		0-30 ppm	0-30 ppm	0-30 ppm
25	Adjustable Range	Alarm			
		Shutdown			
26	Meter				
27	Power Supply	VAC			
		VDC	24	24	24
28	Running Lights	Power	x	x	x
		Alarm	x	x	x
		Shutdown	x	x	x
29	Test Switch		current test jacks	current test jacks	current test jacks
30	Sensitivity Adj.				
31	Drift 0 - 1%	(Zero Drift)	N/A	N/A	NA
32	Response 0 - 2 Sec.				
33	Repeatability 0 - 1%		1%	1%	1%
	Accessories				
34	Alarm Relay	SPDT / Rating			
		DPDT / Rating	5A	5A	5A
35	Rack				
36	Use of Calibration Kit		Y	Y	Y
37	Alarm Reset		Y	Y	Y
38	On / Off Switch				
39	CSA Approved		Class I, Div I	Class I, Div I	Class I, Div 1

NOTES :

1. Calibration kit w/ tubing to be provided for remote calibration
2. Calibration to scale output form 0-30 ppm on 4-20mA signal

LEVEL SWITCHES DATA SHEET

DATA SHEET No.	1 OF 1
SPEC. No.	25 31 01
Prj. No.	111216000
REQ.	P.O.

PLANT:
North End Sewage Treatment Plant

LOCATION :
Winnipeg, MB

REV	DESCRIPTION	DATE	BY	CHK'D	APPR.
2	Issued for Tender	20160301	SAL	DR	DR
1	Issued for 95% Review	20160127	SAL	DR	DR

1	**TAG NO.**		X710-LSHH		X570-LSH				
2	**VENDOR**								
3	**MANUFACTURER**								
4	**SERVICE**		Building Flood Detection		Sump Water				
5	**SOUR SERVICE**		Y		Y				
6	**LINE NO. / VESSEL NO.**		NA		Sump Water				
7	**LINE SIZE / SCH. NO.**		NA		NA				
8	**P&ID NO.**		1-0101X-A0009-001		1-0101X-A0009-001				
	Operating Conditions								
9	**Liquid Upper(m)**	**Liquid Lower(m)**							
10	**Sp. Gr. Upper**	**Sp. Gr. Lower**							
11	**Pres. Normal**	**Pres. Max. (kPag)**							
12	**Temp. Normal**	**Temp. Max.(deg. C)**							
13	**Minimum Specific Gravity**	**80°C**							
	Body								
14	**Type**								
15	**Material**								
16	**Top Conn. Location**								
17	**Bottom Conn. Location**								
18	**Conn. Size & Rating**								
19	**Model No.**		2120		2120				
	Float Or Displacer								
20	**Material**		316 SS		316 SS				
21	**Diameter & / or Length (mm)**								
22	**Extension**								
23	**Air Fin**								
24	**Spring Material**								
25	**Sleeve Material**								
26	**Rod Material**		316 SS		316 SS				
27	**Length (mm)**		150		150				
	Switch								
28	**Type**		Vibration or Capacitive Contact		Vibration or Capacitive Contact				
29	**Hermetically Sealed**								
30	**Quantity**								
31	**Form**		A		A				
32	**Enclosure: W.P. , E.P. , G.P.**								
33	**Conduit Conn. Size & Type**								
34	**Rating: Volts**		250Vac		250Vac				
35	**CY or D.C.**								
36	**Amps Watts**								
37	**HP**								
38	**Load Type**								
39	**Minimum Differential**								
40	**Differential**	**Fixed**							
		Adjust.							
41	**Adjustment:**	**Internal**							
		External							
42	**Contacts:**	**Open / Close**	Open		Open				
		On Process Incr/Decr	On Increase		On Increase				
	Accessories								
43	**Breather Vent & Drain**								
44	**CSA Approved**		Y		Y				

NOTES :

1 Building overflow contact to be mounted with sensor 50mm above the floor, and the transmitter 200mm above the floor.
2 Building Sump contact to be mounted with sensor 150mm Below the floor, and the transmitter at floor height.

TEMPERATURE TRANSMITTERS DATA SHEET

DATA SHEET No. 1 OF 2
SPEC. No. 25 31 01
Prj. No. 111216000
REQ. P.O.

PLANT : North End Sewage Treatment Plant
LOCATION : Winnipeg, MB

REV	DESCRIPTION	DATE	BY	CHK'D	APPR.
2	Issued for Tender	20160301	SAL	DR	DR
1	Issued for 95% Review	20160127	SAL	DR	DR

1	**TAG NO. :** SEE SHEET 2		**VENDOR :** SEE SHEET 2				
2	**SERVICE :** SEE SHEET 2		**MFR. & MODEL NO. :** SEE SHEET 2				
	General						
3	**Description:**	[X] Transmitter	[ ] Indicator	[ ] Blind			
4	**Enclosure:**	[ ] General Purpose	[ ] Weatherproof	[X] Explosion-proof			
5	**CSA Approved:**	[X] Yes [ ] No	**Area Class:**	**Class** 1	**Div.** 1	**Groups** B,C,D	
6	**Mounting :**	[X] Flush	[ ] Surface	[ ] Yoke	[ ] Pipe Mount		
7	**Sensor Type:**	[ ] Filled System	[ ] Thermocouple	[X] RTD	[ ] Other		
	Transmitter						
8	**Type :**	[ ] Pneumatic	[X] Electronic	[ ] Smart			
9	**Output :**	[ ] 20 - 100 kPa	[X] 4 - 20 mA	[ ] Others			
	Thermal Element						
10	**Class :**	[ ] 1A	[ ] 11A	[ ] 111A	[ ] VA		
		[ ] 1B	[ ] 11B	[ ] 111C	[ ] VB		
			[ ] 11C	[ ] 11D	[ ]		
		[ ] Thermocouple	[X] RTD PT100	[ ] Others			
11	**Range :** SEE PAGE 2 **Deg. C**	[ ] Overrange Protection					
12	**Bulb :**	[ ] Plain	[ ] Union Conn.	[ ] Sanitary			
13	**Extension :**	[X] Rigid	[ ] Angle	[ ] Bendable	[ ] Other		
14	**Insertion Length:** SEE PG2 **(mm)**	**Material:** 316 SS					
15	**Capillary length :** NA **(mm)**	**Sensitive Length:** NA **(mm)**					
	Thermowell						
16	**Construction:**	[X] Tapered	[ ] Straight	[ ] Drilled	[ ] Built-Up	[ ] Closed End Tube	[ ] Other
17	**Connection Type:**	[X] Screwed	**Size:** 21mm **NPT**	[ ] Flanged	**Size:**	**Class**	**RF**
18	**Material :**	[X] 316 S.S.	[ ] Other				
19	**"U" Dim :** SEE PG 2 **(mm)**	**"T" Dim:** SEE PG 2 **(mm)**					
	Accessories						
20	**Burnout Drive:**	[ ] None	[ ] Upscale	[ ] Downscale			
21	**Filter & Regulator**	**Air Supply Gauge**	**Local Indicator**	**Mounting Yoke**			
22	**Portable Case Features**	**Mounting Accessories for Wet & Dry Bulbs**					

NOTES :
1. Temperature transmitter locations to be confirmed in the field.
2. Insertion Points to be confirmed in the field.

TEMPERATURE TRANSMITTERS DATA SHEET

DATA SHEET No.	2 OF 2
SPEC. No.	25 31 01
prj. No.	111216000
REQ. 0	P.O. 0

PLANT: North End Sewage Treatment Plant

LOCATION : Winnipeg, MB

REV	DESCRIPTION	DATE	BY	CHK'D	APPR.
2	Issued for Tender	20160301	SAL	DR	DR
1	Issued for 95% Review	20160127	SAL	DR	DR

TAG NO. : SEE BELOW
SERVICE : SEE BELOW
VENDOR : TBD
MFR. & MODEL NO. : TBD

Rev.	Tag No.	P&ID No. Line Size	P&ID No. Insul Thick	Calibrated Range Operating (deg. C)	Model No.	Well Dimensions U (mm)	Well Dimensions T (mm)	RTD Or T/C Type	Sour Service	Proc. conn.	Service	Notes
2	Y640-TE1	I-0101Y-A0005-001		-10 to 70 deg C		TBD	TBD	PT100	Y	21mm NPT	Glycol	1,2
		40	TBD	40								
2	Y640-TE2	I-0101Y-A0005-001		-10 to 70 deg C		TBD	TBD	PT100	Y	21mm NPT	Glycol	1,2
		40	TBD	40								
2	Y640-TE3	I-0101Y-A0005-001		-10 to 70 deg C		TBD	TBD	PT100	Y	21mm NPT	Glycol	1,2
		40	TBD	40								
2	Y650-TE	I-0101Y-A0005-001		-75 to 75 deg C		25	25	PT100	N	NA	Ambient Temperature	1,2
		NA		10								
2	Y660-TE1	I-0101Y-A0011-001		-10 to 70 deg C		TBD	TBD	PT100	Y	21mm NPT	Glycol	1,2
		40	TBD	40								
2	Y660-TE2	I-0101Y-A0011-001		-10 to 70 deg C		TBD	TBD	PT100	Y	21mm NPT	Glycol	1,2
		40	TBD	40								
2	Y660-TE3	I-0101Y-A0011-001		-10 to 70 deg C		TBD	TBD	PT100	Y	21mm NPT	Glycol	1,2
		40	TBD	40								
2	Y670-TE	I-0101Y-A0011-001		-75 to 75 deg C		25	25	PT100	N	NA	Ambient Temperature	1,2
		NA		10								

NOTES :

1 **SEE SHEET 1**