Part 1   General

1.1   GENERAL

.1   This Section covers items common to Sections of Division 40. This section supplements requirements of Division 1.

1.2   CODES AND STANDARDS

.1   Do complete installation in accordance with CSA C22.1-2015 except where specified otherwise.

.2   Comply with all laws, ordinances, rules, regulations, codes, and orders of all authorities having jurisdiction relating to this Work.

1.3   DRAWINGS AND SPECIFICATIONS

.1   The intent of the Drawings and Specifications is to include all labour, products, and services necessary for complete Work, tested and ready for operation.

.2   These Specifications and the Drawings and Specifications of all other divisions shall be considered as an integral part of the accompanying Drawings. Any item or subject omitted from either the Specifications or the Drawings but which is mentioned or reasonably specified in and by the others, shall be considered as properly and sufficiently specified and shall be provided.

.3   Provide all minor items and Work not shown or specified but which are reasonably necessary to complete the Work.

.4   If discrepancies or omissions in the Drawings or Specifications are found, or if the intent or meaning is not clear, advise the Contract Administrator for clarification before submitting Bid, in accordance with B4.

1.4   CARE, OPERATION AND START-UP

.1   Instruct City maintenance and operating personnel in the operation, care and maintenance of systems, system equipment and components.

.2   Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

1.5   PERMITS, FEES AND INSPECTION

.1   Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2   Pay associated fees.

.3 Notify Contract Administrator of changes required by Electrical Inspection Department prior to making changes.

.4 Furnish a Certificate of Final Inspection and approvals from inspection authority to the Contract Administrator.

1.6 MATERIALS AND EQUIPMENT

.1 Provide materials and equipment in accordance with Section 01 61 00 - Common Product Requirements.

.2 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department.

.3 Minimum enclosure type to be used is NEMA 12 unless otherwise specified.

1.7 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

    .1 Paint indoor switchgear and distribution enclosures light grey to ANSI 61 grey enamel, unless otherwise specified.

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

1.8 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

.2 Nameplates:

    .1 Lamicoid 3 mm thick plastic lamicoid nameplates, white face, black lettering, mechanically attached with self tapping screws.

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters
Size 8	35 x 100 mm	3 lines	5 mm high letters

.3 Wording on nameplates to be approved by Contract Administrator prior to manufacture.

.4 Allow for average of twenty-five (25) letters per nameplate.

.5   Identification to be English.

1.9   WIRING IDENTIFICATION

.1   Identify wiring with permanent indelible identifying markings on both ends of phase conductors of feeders and branch circuit wiring.

    .1   Wire tags to be heat shrink type with black letters on white background.

1.10   SUBMITTALS

.1   Prior to delivery of any Products to job Site and sufficiently in advance of requirements to allow ample time for checking, submit Shop Drawings for review as specified in Division

.2   Submit Shop Drawings (including Product Data) for all equipment as required in each Section of this Specification.

.3   Prior to submitting the Shop Drawings to the Contract Administrator, the Contractor shall review the Shop Drawings to determine that the equipment complies with the requirements of the Specifications and Drawings.

.4   The term "Shop Drawing" means drawings, diagrams, illustrations, schedules, performance characteristics, brochures and other data, which are to be provided by the Contractor to illustrate details of a portion of the Work. Indicate materials, methods of construction and attachment of support wiring, diagrams, connections, recommended installation details, explanatory notes and other information necessary for completion of Work. Where equipment is connected to other equipment, indicate that such items have been coordinated, regardless of the section under which the adjacent items will be supplied and installed. Indicate cross-references to Design Drawings and Specifications. Adjustments made on Shop Drawings by the Contract Administrator are not intended to change the contract price. If adjustments affect the value of the Work state such in writing to the Contract Administrator prior to proceeding with the Work.

.5   Manufacture of Products shall conform to revised Shop Drawings.

1.11   RECORD DRAWINGS

.1   The Contractor shall keep one (1) complete set of white prints at the Site during work, including all addenda, change orders, Site instructions, clarifications, and revisions for the purpose of Record Drawings. As the Work on-site proceeds, the Contractor shall clearly record in Red Pencil all as-built conditions, which deviate from the original Contract Documents. Record Drawings to include circuiting of all devices, conduit and feeder runs (complete with conductor size and number) and locations of all electrical equipment.

1.12   O&M MANUAL

.1   Operations and Maintenance Manuals

    .1   Refer to Section 01 78 00 for general O&M Manual requirements.

    .2   In addition to the general requirements, provide the following information:

.1   Table of Contents – Arrange contents sequentially by systems under Section numbers. Label tabs of dividers between each to match section numbers in the Table of Contents.

.2   Systems Descriptions – A brief synopsis of each system typed and inserted at the beginning of each section. Include sketches and diagrams where appropriate.

.3   Manuals containing all pertinent information, drawings and documents of the Contractor's supply and/or documentation included with the instruments supplied by others, such as:

       .1   Mechanical drawings of the equipment.

       .2   Installation drawings and procedures.

       .3   Instrument model numbers.

       .4   Equipment specifications.

       .5   Detailed utility requirements.

       .6   Replacement parts list with model numbers.

       .7   Recommended preventative maintenance frequency.

       .8   Troubleshooting procedures.

       .9   Procedures for dismantling.

       .10   Procedure to operate the equipment/instruments.

       .11   Recommended cleaning procedure.

       .12   Recommended list of supplies to be used in conjunction with the operation and maintenance of the equipment.

       .13   Recommended spare parts list

.4   A copy of all wiring diagrams complete with wire coding.

.5   Include type and accuracy of instruments used.

.6   Set of final reviewed Shop Drawings.

.7   Testing documentation including:

       .1   Loop Check Report

.2   PLC Software Operation and Maintenance Manual:

.1   Provide a manual that contains, at minimum, all pertinent information, drawings and documents associated with the PLC program and associated integration, including:

       .1   Printout of the entire PLC program.

       .2   Repair instructions for common issues

       .3   Printout of any related design documents, such as interface lists, etc.

       .4   CD in a sleeve containing the latest PLC program including configuration software.

Part 2   Products

2.1   NOT USED

.1   Not Used.

City of Winnipeg
Cockburn Flood and Wastewater Pumping Station
2016 Upgrades
Bid Opportunity 331-2016

Section 40 05 01
COMMON WORK RESULTS - AUTOMATION
Page 5 of 5

Part 3   **Execution**

3.1   **NOT USED**

   .1   Not Used.

END OF SECTION

Part 1   **General**

1.1   **DEFINITIONS**

.1   FAT   Factory Acceptance Test

1.2   **DESIGN REQUIREMENTS**

.1   Develop a demonstration and test procedure, along with test forms, for the FAT.

1.3   **SUBMITTALS**

.1   Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2   Submit the following for review at least 15 Working Days prior to FAT.

.1   Detailed test procedure and test forms for review.

.1   Incorporate all changes to the procedure and test forms requested by the Contract Administrator.

.3   Submit the following, to be received on the date of the FAT:

.1   Detailed listings of all control logic and software utilized to implement the control sequences, for the scenarios demonstrated as part of the FAT. Listings are to be neatly organized, and commented as required. All supporting documents, including variable listings are to be included.

1.4   **CLOSEOUT SUBMITTALS**

.1   Include all FAT documentation and test forms in the O&M manuals.

1.5   **DEMONSTRATION AND TESTING**

.1   The purpose of testing is to ensure all status and alarm signals defined in the Functional Requirements Specification (FRS) within the PLC are conveyed to the City's SCADA HMI system via the cellular communication link. This will be performed in conjunction with the Contract Administrator and/or City of Winnipeg personnel.

.2   The location of the FAT will be in a Contractor supplied facility, within Winnipeg, Manitoba, Canada.

.3   Correct deficiencies and re-test until satisfactory performance is obtained.

.4   Acceptance of tests during the FAT will not relieve Contractor from responsibility for ensuring that complete systems meet every requirement of Contract.

1.6   **COMPLETION OF FAT**

.1   The FAT is considered to be complete only when full approval of the Contract Administrator has been received by the Contractor.

.2   Schedule additional re-tests until approval is obtained.

City of Winnipeg
Cockburn Flood and Wastewater Pumping Station
2016 Upgrades
Bid Opportunity 331-2016

Section 40 80 08
FACTORY ACCEPTANCE TEST
Page 2 of 2

Part 2   **Products**

2.1   **NONE USED.**

.1   None Used.

Part 3   **Execution**

3.1   **DEMONSTRATION SYSTEM**

.1   Setup the complete automation system in the Contractor's facility, in a manner to allow for the complete and expeditious testing of the system and associated programming.

3.2   **PROCEDURES**

.1   All tests shall be documented.

.2   Produce test forms to allow for recording the results of the simulations and tests.

.3   All points to the SCADA system will be tested with the assistance of City personnel.

.4   Advise Contract Administrator of the date of testing. Contract Administrator may, at their discretion, observe factory acceptance testing based on the completeness of the submittal or other factors.

   .1   Demonstration tests to include:

      .1   Complete demonstration of meeting the requirements of the applicable Functional Requirements Specification.

.5   The Contract Administrator may request additional minor tests at the FAT. No additional payment will be made for additional minor tests.

.6   The Contract Administrator will review the system and test results. Incorporate comments and feedback from the Contract Administrator into the system design.

3.3   **Evaluation**

.1   All evaluations will be pass/fail.

.2   The Contractor is expected to ensure that all required demonstrations are fully operable and meet required specifications, prior to the FAT. Upon failure of a required demonstration in the FAT, the Contractor shall provide subsequent re-tests to the satisfaction of the Contract Administrator.

END OF SECTION

Part 1   General

1.1   SUBMITTALS

.1   Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2   Submit commissioning plans and procedures, in writing, at least 20 Working days prior to commissioning.

1.2   CLOSEOUT SUBMITTALS

.1   Final Report:

.1   Include measurements, final settings and certified test results.

.2   Include completed commissioning forms

.3   Bear signature of commissioning technician and supervisor

.4   Revise "as-built" documentation, commissioning reports to reflect changes, adjustments and modifications as set during commissioning and submit to the Contract Administrator in accordance with Section 01 78 00 - Closeout Submittals.

.5   Recommend additional changes and/or modifications deemed advisable in order to improve performance, environmental conditions or energy consumption.

1.3   COMMISSIONING FORMS

.1   The Contract Administrator will provide a base set of standard commissioning forms. Additional forms will be required, and must be prepared by the Contractor.

.2   Supplement the provided forms as required to make a complete commissioning report package. Utilize the specifications, drawings, and Functional Requirements Specification as the basis for preparation of the additional commissioning forms.

1.4   COMMISSIONING

.1   Carry out commissioning under direction of the Contract Administrator and in the presence of representatives of the Contract Administrator and the City.

.2   Inform, and obtain approval from the Contract Administrator in writing at least 14 days prior to commissioning or each test. Indicate:

.1   Location and part of system to be tested or commissioned.

.2   Testing/commissioning procedures, anticipated results.

.3   Names of testing/commissioning personnel.

.3   Correct deficiencies and re-test until satisfactory performance is obtained.

.4   Acceptance of tests will not relieve Contractor from responsibility for ensuring that complete systems meet every requirement of Contract.

.5   Perform tests as required.

1.5   **COMPLETION OF COMMISSIONING**

    .1   Commissioning to be considered as satisfactorily completed when objectives of commissioning have been achieved and reviewed by the Contract Administrator.

Part 2   **Products**

2.1   **NOT USED.**

Part 3   **Execution**

3.1   **STATUS PRIOR TO COMMISIONING**

    .1   Prior to commissioning, ensure that the following is completed:

        .1   Installation of all panels and completion of all wiring connections.

        .2   Testing wiring for continuity from the field device to the control panel.

3.2   **PROCEDURES**

    .1   Provide a minimum of one qualified technician to test and commission the control system.

    .2   Test each I/O point from the instrument to the City's SCADA HMI.

        .1   Tests to be performed in conjunction with City of Winnipeg personnel to verify alarm and status signals on the City's SCADA HMI.

        .2   Test both states of discrete points.

        .3   Test, at minimum, two values for analog points.

    .3   Test each piece of equipment individually for complete functionality.

    .4   Completely test the E-Stop functionality of each piece of equipment, as provided.

    .5   Where software logic is provided in the PLC, all modifications to the software program to bypass interlocks or sensors shall be recorded and documented clearly in a separate document, and in the PLC software.

        .1   Any software bypasses that remain, prior to leaving site, must be authorized by the Contract Administrator or designated representative.

    .6   All deficiencies must be corrected by the Contractor.

    .7   Commission each system using procedures prescribed by the Contract Administrator.

    .8   Optimize operation and performance of systems by fine-tuning control loops and PID values.

3.3   **SYSTEM SOFTWARE**

    .1   Load PLC system with appropriate program and/or configuration as per the included Functional Requirements Specification, fully tested and approved as part of the software FAT.

   .1 Any changes made to the software after the FAT must be submitted for review and approval of the Contract Administrator.

  .2 Any issues identified on site must be communicated to the Contract Administrator. Approval is required prior to making any modifications.

  .3 The Contractor is reminded that this facility is critical to operation of the City's wastewater pumping station.

3.4   CHECKLISTS, FORMS, AND REPORTS

  .1 Complete checklists, forms, and reports for each instrument, loop, and control device.

    .1 Instrument Loop Checklist.

    .2 Discrete Device Checklist

3.5   DEMONSTRATION

  .1 Demonstrate to the Contract Administrator operation of systems including sequence of operations under all potential conditions, start-up, shut-down interlocks and lock-outs.

END OF SECTION

City of Winnipeg
Cockburn Flood and Wastewater Pumping Station
2016 Upgrades
Bid Opportunity 331-2016

Section 40 90 01
AUTOMATION – FIELD PUSHBUTTONS,
SWITCHES AND INDICATORS
Page 1 of 2

Part 1   General

1.1   REFERENCES

       .1   NEMA 250-2003, Enclosures for Electrical Equipment (1000 Volts Maximum).

    .2   Canadian Standards Association (CSA International).

       .1   CSA-C22.1-2009, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

1.2   SUBMITTALS

    .1   Submit product data in accordance with Section 01 33 00 – Submittal Procedures.

Part 2   Products

2.1   GENERAL

    .1   Control devices of each category to be of same type and manufacturer.

    .2   External trim materials to be corrosion resistant.

    .3   Operating conditions: -40 – 55 degrees C with 5 - 95% RH (non-condensing) unless otherwise specified.

2.2   EMERGENCY STOP PUSHBUTTONS – PUSH-PULL/TWIST TO RELEASE

    .1   Supply and install enclosed two-position maintained emergency stop operator stations for the flood pumps P-F01, P-F02, P-F03 and the lift pumps P-L01, P-L02.

    .2   Requirements:

       .1   Ingress Protection: NEMA 4X
       .2   Contact Life: 1,000,000 cycles
       .3   Mechanical Life: 250,000 cycles
       .4   Contact Rating: 10 A
       .5   Contact Configuration: As shown on the drawings
       .6   Illumination: Not required unless otherwise indicated.
       .7   Acceptable for hazardous Class I, Zone 2 location.

    .3   Acceptable Products:

       .1   Schneider Electric Harmony 9001 K Series,
       .2   Allen-Bradley 800H series,
       .3   Or approved equal in accordance with B7.

Part 3   **Execution**

3.1   **INSTALLATION**

    .1   Install field control devices in accordance with manufacturers recommended methods, procedures and instructions.

    .2   Readily accessible to allow for unhindered operation and servicing.

    .3   Wall installation:

        .1   Located as shown on the drawings.
        .2   Securely mounted.

3.2   **IDENTIFICATION**

    .1   Identify field devices with lamacoids. Install in a conspicuous location.

END OF SECTION

City of Winnipeg
Cockburn Flood and Wastewater Pumping Station
2016 Upgrades
Bid Opportunity 331-2016

Section 40 91 00
AUTOMATION – PROCESS
MEASUREMENT DEVICES
Page 1 of 6

Part 1   General

1.1   SUMMARY

     .1   Section Includes:

         .1   Process instrumentation.

1.2   REFERENCES

         .1   NEMA 250-2003, Enclosures for Electrical Equipment (1000 Volts Maximum).

     .2   Canadian Standards Association (CSA International).

         .1   CSA-C22.1-2015, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

1.3   SUBMITTALS

     .1   Submit shop drawings and manufacturer's installation instructions in accordance with Section 01 33 00 – Submittal Procedures.

     .2   Manufacturer's Instructions:

         .1   Include manufacturer's installation instructions for specified equipment and devices in O&M Manuals.

Part 2   Products

2.1   GENERAL

     .1   Control devices of each category to be of same type and manufacturer.

     .2   External trim materials to be corrosion resistant.

     .3   Operating conditions: 0 - 35°C with 5 - 95% RH (non-condensing) unless otherwise specified.

     .4   Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.

2.2   FLOAT SWITCHES

     .1   Requirements:

         .1   Suspended mechanical float switch
         .2   Fluid: Wastewater
         .3   Temperature Range: 0 to 50°C
         .4   Output: Form C dry contact
         .5   Protection: IP68
         .6   Approvals: CSA or equivalent

City of Winnipeg
Cockburn Flood and Wastewater Pumping Station
2016 Upgrades
Bid Opportunity 331-2016

Section 40 91 00
AUTOMATION – PROCESS
MEASUREMENT DEVICES
Page 2 of 6

.2   Acceptable products:

       .1   Flygt ENM-10,

       .2   Or approved equal in accordance with B7.

2.3   HVAC DUCT TEMPERATURE SENSOR, TE-A611

.1   Requirements:

       .1   Sensor: 1097 ohms @ 25°C.

       .2   Insertion: 150 mm duct mount with wiring box.

       .3   Operating Range: -40°C to 121°C

.2   Acceptable Products:

       .1   Honeywell C7031B2005/U,

       .2   Or approved equal in accordance with B7.

2.4   ROOM DIFFERENTIAL PRESSURE TRANSMITTER, PDT-A601

.1   Requirements:

       .1   Pressure Range: 0 to 250 Pa (0 to 1 "H2O)

       .2   Mounting: Wall or Panel

       .3   Integral Display: Included

       .4   Output: 4-20 mA, 0-5 Vdc, or 0-10 Vdc (field selectable)

       .5   Approvals: CSA or equivalent

.2   Acceptable Products:

       .1   Honeywell P7640A1000,

       .2   Or approved equal in accordance with B7.

2.5   FAN FILTER DIFFERENTIAL PRESSURE SWITCH, PDSH-A610

.1   Requirements:

       .1   Type: Electro-mechanical

       .2   Dry Contact: SPDT, rated for at least 0.2 Amps at 24VDC

       .3   Operating Temperature: 0°C to 35°C, minimum

       .4   Set Point: 125 Pa (0.5 "w.c)   (adjustable)

       .5   Pressure Range: As Required

       .6   Enclosure Rating: NEMA 4 or NEMA 4X

       .7   Approvals: CSA or equivalent

       .8   Mounting: Duct or Wall

.2   Acceptable Products:

       .1   United Electric H100K-540,

       .2   Dwyer ADPS-04-1-N,

       .3   Or approved equal in accordance with B7.

City of Winnipeg
Cockburn Flood and Wastewater Pumping Station
2016 Upgrades
Bid Opportunity 331-2016

Section 40 91 00
AUTOMATION – PROCESS
MEASUREMENT DEVICES
Page 3 of 6

2.6   **ROOM TEMPERATURE SWITCHES – DOUBLE POLE, TS-F643 / TS-A653 / TSH-F621**

     .1   Requirements:

         .1   Functionality: Field adjustable switches, independently adjustable

         .2   Outputs: Qty 2, SPDT dry contacts

         .3   Operating Temperature: -10°C to 40°C minimum

         .4   Sensor: Local

         .5   Mounting: Wall

         .6   Enclosure Rating: NEMA 4X

         .7   Approvals: CSA or equivalent

     .2   Acceptable Products:

         .1   United Electric B402-120,

         .2   Or approved equal in accordance with B7.

2.7   **ROOM TEMPERATURE SWITCHES – SINGLE POLE, TSH-A652 / TSL-L525**

     .1   Requirements:

         .1   Functionality: Field adjustable switch

         .2   Output: Qty 1, SPDT dry contact

         .3   Operating Temperature: -10°C to 40°C minimum

         .4   Sensor: Local

         .5   Mounting: Wall

         .6   Enclosure Rating: NEMA Type 4X

         .7   Approvals: CSA or equivalent

     .2   Acceptable Products:

         .1   United Electric B400-120,

         .2   Or approved equal in accordance with B7.

2.8   **SEAL WATER FLOW SWITCHES, FSL-F011 / FSL-F021 / FSL-F031**

     .1   Requirements:

         .1   Application: Flood pump seal water flow (potable water)

         .2   Supply voltage: 24 Vdc

         .3   Output: Qty 1, SPDT dry contact

         .4   Operating Temperature: -10°C to 40°C minimum

         .5   Sensor: Local

         .6   Mounting: Pipe

         .7   Enclosure Rating: NEMA Type 4X

         .8   Accessories:

              .1   Pipe mounting adapter

              .2   Socket M12 connector cable, 5 meter length.

City of Winnipeg
Cockburn Flood and Wastewater Pumping Station
2016 Upgrades
Bid Opportunity 331-2016

Section 40 91 00
AUTOMATION – PROCESS
MEASUREMENT DEVICES
Page 4 of 6

.9 Approvals: CSA or equivalent

.2 Acceptable Products:

 .1 IFM Efector SI5010,
 .2 Or approved equal in accordance with B7.

2.9 **SANITARY LIFT PUMP DISCHARGE FLOW METER, FIT-L101**

.1 Requirements:

 .1 Application: Raw wastewater flow measurement
 .2 Sensor Mounting: External clamp-on
 .3 Pipe external diameter: Approximately 273 mm (field confirm as required)
 .4 Transmitter Power: 120 Vac, 60 Hz
 .5 Transmitter Mounting: Remote, wall
 .6 Transmitter IP Rating: IP65 (NEMA 4X)
 .7 Channels: One (single channel)
 .8 Output: 4-20 mA (not requiring loop power)
 .9 RTDs: None
 .10 Accuracy: 2.0% or better
 .11 Approvals: CSA or equivalent

.2 Acceptable Products:

 .1 Siemens FUS1010
 .2 Or approved equal in accordance with B7.

Part 3 **Execution**

3.1 **INSTALLATION**

.1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.

.2 Install field control devices in accordance with manufacturers recommended methods, procedures and instructions.

.3 Install in a manner to allow easy removal of the transducer and cable assembly for maintenance purposes.

.4 Support field-mounted panels, transmitters and sensors on pipe stands or channel brackets.

.5 Electrical:

 .1 Complete installation in accordance with Section 26 05 01 - Common Work Results - Electrical.
 .2 Provide complete conduit/cable system to link instrumentation and the control panel(s).

.3   Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems.

.4   Maximum conduit fill not to exceed 40%.

.5   Design drawings do not show conduit layout.

3.2   TEMPERATURE SWITCHES AND SENSORS

.1   Stabilize to ensure minimum field adjustments or calibrations.

.2   Mount in readily accessible location to allow for quick easy replacement and servicing without special tools or skills.

.3   Duct installations:

    .1   Do not mount in dead air space.

    .2   Locate within sensor vibration and velocity limits.

    .3   Securely mount extended surface sensor used to sense average temperature.

    .4   Thermally isolate elements from brackets and supports to respond to air temperature only.

    .5   Support sensor element separately from coils, filter racks.

.4   Field adjust setpoint on temperature switches as per the drawings.

.5   Make adjustments as directed by the Contract Administrator.

3.3   PRESSURE SWITCHES AND TRANSMITTERS

.1   Mount in readily accessible location to allow for quick easy replacement and servicing without special tools or skills.

.2   Field adjust setpoint on pressure switches as per the drawings.

.3   Make adjustments as directed by the Contract Administrator.

3.4   SEAL WATER FLOW SWITCHES

.1   Follow manufacturer's installation instructions. Install instrument onto piping at a location with manufacturer specified number of upstream and downstream pipe diameters to ensure laminar flow.

.2   Field adjust setpoint to appropriate value to detect flow/no-flow condition.

.3   Make adjustments as directed by the Contract Administrator.

3.5   SANITARYU LIFT PUMP DISCHARGE FLOW METER

.1   Install sensor in accordance with manufacturer's installation drawings and recommendations.

.2   Install sensor onto piping at the general location shown on the drawings. Field optimize location of sensor as required.

City of Winnipeg
Cockburn Flood and Wastewater Pumping Station
2016 Upgrades
Bid Opportunity 331-2016

Section 40 91 00
AUTOMATION – PROCESS
MEASUREMENT DEVICES
Page 6 of 6

.3   Provide factory-trained service representative to configure, test, and commission the flow sensor and transmitter.

.4   Configure the flow transmitter to display in units of litres/second (l/s).

.5   Make adjustments as directed by the Contract Administrator.

3.6   INSPECTION AND INSTRUCTION

.1   Provide for a factory-trained representative who shall give instructions regarding the installation of the equipment.

.2   The factory-trained representative shall visit the site as required to ensure that the installation work is being performed in a proper and workmanlike manner. Allow for a minimum of one (1) full working day.

.3   The factory-trained representative shall be present to supervise the commissioning, initial operation, and functional testing of the equipment.

3.7   IDENTIFICATION

.1   Identify field devices with lamacoids. Install in a conspicuous location.

3.8   TESTING AND COMMISSIONING

.1   Calibrate and test field devices for accuracy and performance in accordance with Section 40 80 11 - Automation Commissioning.

END OF SECTION

Part 1   General

1.1   SUMMARY

.1   Section Includes:

.1   Process Control Devices including damper actuators.

1.2   REFERENCES

.1   Association (NEMA).

.1   NEMA 250-2003, Enclosures for Electrical Equipment (1000 Volts Maximum).

.2   Canadian Standards Association (CSA International).

.1   CSA-C22.1-2009, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

1.3   SUBMITTALS

.1   Submit shop drawings and manufacturer's installation instructions in accordance with Section 01 33 00 – Submittal Procedures.

.2   Manufacturer's Instructions:

.1   Include manufacturer's installation instructions for specified equipment and devices in O&M Manuals.

Part 2   Products

2.1   GENERAL

.1   Control devices of each category to be of same type and manufacturer.

.2   External trim materials to be corrosion resistant. Internal parts to be assembled in watertight assembly.

.3   Operating conditions: 0 – 32 degrees C with 5 - 95% RH (non-condensing) unless otherwise specified.

.4   Terminations: use standard conduit box with slot screwdriver compression connector block unless otherwise specified.

.5   Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.

2.2   ROOM DIFFERENTIAL PRESSURE CONTROLLER, PDIC-A600

.1   General: digital, stand alone, configurable controller

.2   Power supply: 24 Vac

   .3 Sensor Inputs:

     .1 Two (2) 0-5 Vdc, 0-10 Vdc, 4-20mA

   .4 Discrete Inputs: One (1) 18V, 3.5 mA for monitoring dry contact

   .5 Mounting: Wall

   .6 Enclosure: NEMA Type 1, minimum

   .7 Acceptable products:

     .1 Honeywell T775U2006,
     .2 Or approved equal in accordance with B7.

2.3   **DISCHARGE AIR TEMPERATURE CONTROLLER, TIC-A610**

   .1 General: digital, stand alone, configurable controller

   .2 Power supply: 24 Vac.

   .3 Sensor Inputs:

     .1 Two (2) 1097 Ohms PTC at 25°C.
     .2 Sensed temperature range: -51°C to 132°C.

   .4 Discrete Inputs: One (1) 18V, 3.5 mA for monitoring dry contact

   .5 Mounting: Wall

   .6 Enclosure: NEMA Type 1, minimum

   .7 Acceptable products:

     .1 Honeywell T775U2006,
     .2 Or approved equal in accordance with B7.

2.4   **ELECTRONIC DAMPER ACTUATORS, MODULATING**

   .1 Requirements:

     .1 Direct mount proportional type.
     .2 Spring return type for "fail-safe" in Normally Open or Normally Closed position as indicated.
     .3 Torque as indicated on the drawings.
     .4 Damper actuator to drive damper from full open to full closed in less than 150 seconds.
     .5 Spring return to drive damper from full open to full closed in less than 25 seconds at normal room temperature.
     .6 Angle of Rotation: 90° minimum, adjustable with mechanical stops.
     .7 Direction of Rotation: Field configurable.
     .8 Shaft Diameter: 8.0mm to 16.0mm (3/8" to 5/8").

.9   Electrical Connection: 0.9 meter (3 ft), 18 AWG, plenum rated cable.

.10   Overload protection: Required.

.11   Auxiliary Switches: Not required.

.12   Position Feedback: Required, 0-10V output.

.13   Operating range: 0-10 or 2-10 VDC.

.14   Operating Temperature: -30 °C to 50 °C.

.15   Housing: NEMA 2 or IP54 or better.

.16   CSA listing or equivalent.

.17   Acceptable Manufacturer:

    .1   Belimo,

    .2   Johnson Controls,

    .3   Or approved equal in accordance with B7.

2.5   ELECTRONIC DAMPER ACTUATORS, ON/OFF

.1   Requirements:

    .1   Direct mount on-off type.

    .2   Spring return type for "fail-safe" in Normally Closed position.

    .3   Torque as indicated on the drawings.

    .4   Damper actuator to drive damper from full open to full closed in less than 90 seconds.

    .5   Spring return to drive damper from full open to full closed in less than 60 seconds at normal room temperature.

    .6   Angle of Rotation: 90° minimum, adjustable with mechanical stops.

    .7   Direction of Rotation: Field configurable.

    .8   Shaft Diameter: 8.0mm to 16.0mm (3/8" to 5/8").

    .9   Electrical Connection: 0.9 meter (3 ft), 18 AWG, plenum rated cable.

    .10   Overload protection: Required.

    .11   Auxiliary Switches: One SPDT, adjustable operation between 0 and 95°.

    .12   Power requirements: 120 Vac, 60 Hz.

    .13   Operating Temperature: -30 °C to 50 °C.

    .14   Housing: NEMA 2 or IP54 or better.

    .15   CSA listing or equivalent.

    .16   Acceptable Manufacturer:

        .1   Belimo,

        .2   Johnson Controls,

        .3   Or approved equal in accordance with B7.

2.6   SOLENOID VALVES – 120 VAC, XV-F011 / XV-F021 / XV-F031

.1   Requirements:

    .1   Application: Flood pump seal water control

    .2   Coil voltage: 120 Vac, 60 Hz

.3   Function: 2 way, normally closed

.4   Body Material: Brass

.5   Media: Potable water at 60 PSI pressure

.6   Pipe/port size: Approximately 19 mm - field confirm existing piping diameter.

.7   Approvals: CSA or equivalent

.2   Acceptable Manufacturers:

.1   ASCO,

.2   Or approved equal in accordance with B7.

2.7   UNIT HEATER CONTROLLER

.1   Wall mounted thermostat provided by unit heater manufacturer.

Part 3   Execution

3.1   INSTALLATION

.1   Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.

.2   Install field control devices in accordance with manufacturers recommended methods, procedures and instructions.

.3   Support field-mounted panels, transmitters and sensors on pipe stands or channel brackets.

.4   Electrical:

.1   Complete installation in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2   Install wiring in conduit or utilizing ACIC cabling.

.1   Provide complete conduit /cable system to link control devices with the controlling equipment.

.2   Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems.

.3   Maximum conduit fill not to exceed 40%.

.4   Design drawings do not show conduit layout.

.5   Terminate devices with leads in junction boxes with terminals.

.1   Wire nuts are not permitted.

.2   Protect leads in flexible conduit.

3.2   IDENTIFICATION

.1   Identify devices with lamacoids. Mount in a conspicuous location.

City of Winnipeg
Cockburn Flood and Wastewater Pumping Station
2016 Upgrades
Bid Opportunity 331-2016

Section 40 92 00
AUTOMATION - PRIMARY CONTROL DEVICES
Page 5 of 6

3.3 TESTING AND COMMISSIONING

.1 Calibrate and test control devices for accuracy and performance in accordance with Section 40 80 11 – Automation Commissioning.

3.4 UNIT HEATER CONTROL

.1 Temperature controlled by wall mounted thermostat provided by unit heater manufacturer. Mount thermostat in the location shown on the drawings.

3.5 ELECTRIC DUCT HEATER HCE-L63 CONTROL

.1 Modulating 0-10Vdc signal from Temperature Controller TIC-A600.

3.6 ROOM PRESSURE CONTROLLER, PDIC-A601

.1 Automatic control of outdoor air, mixed air, and exhaust air dampers based on occupied/unoccupied status.

    .1 Occupied

        .1 Digital Input 1: activated via room light switch position (ON).

        .2 MOD 1: 10 V (intake damper FV-A601-2 fully open, return damper FV-A601-3 fully closed).

        .3 MOD 2: modulating 2 - 10 V for exhaust damper FV-A601-1 to maintain 25 Pa pressurization of the main floor with respect to the flood station wetwell.

    .2 Unoccupied

        .1 Digital Input 1: de-activated via room light switch position (OFF).

        .2 MOD 1: 2 V (dampers FV-A601-1 and FV-A601-2 open to yield 25% outdoor air, damper FV-L600-2 open to yield 75% recirculation).

        .3 MOD 2: modulating 2 - 10 V for exhaust damper FV-A601-1 to maintain 25 Pa pressurization of the main floor with respect to the flood station wetwell.

3.7 DISCHARGE AIR TEMPERATURE CONTROLLER, TIC-A610

.1 Automatic control of electric duct heater.

    .1 Occupied:

        .1 Setpoint (discharge air temperature): 21°C (adj.).

        .2 MOD 1: modulating 0 - 10 V for heater HCE-A61 control.

    .2 Unoccupied:

        .1 Setpoint (discharge air temperature): 14°C (adj.).

        .2 MOD 1: modulating 0 - 10 V for heater HCE-A61 control.

3.8 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

END OF SECTION

Part 1 General

1.1   REFERENCES

    .1   Canadian Standards Association (CSA International).

        .1   C22.2 No.205-M1983(R2004), Signal Equipment.

    .2   International Electrotechnical Commission (IEC)

        .1   IEC 61131, Programmable Controllers

1.2   DEFINITIONS

    .1   PLC   Programmable Logic Controller

    .2   RTU   Remote Terminal Unit

1.3   PLC SYSTEM DESCRIPTION

    .1   For the purpose of this specification, the terms RTU and PLC will be deemed to be synonymous.

    .2   The PLC consists of a controller and an I/O expansion module, mounted in control panel CP-A81.

    .3   The City utilizes a remote SCADA system that interfaces with the pumping station control system PLC via cellular and PSTN (telephone) links using the DNP3 protocol.

    .4   The Contractor's responsibility on the SCADA system is limited to:

        .1   Provision of an interface in the PLC for the SCADA system.
        .2   Testing of all status and alarm signals between the PLC and the City's SCADA system via the cellular network during the Factory Acceptance Test. This work will be performed in conjunction with the Contract Administrator and/or the City of Winnipeg.

1.4   SYSTEM ARCHITECTURE

    .1   Single PLC

        .1   Local I/O expansion modules.
        .2   No remote I/O.
        .3   Connected to the following:
            .1   MDM01 – Cellular modem (supplied by the City).
            .2   MDM02 – PSTN (telephone) modem.

1.5   SOFTWARE OWNERSHIP

    .1   The City will fully own all PLC programming logic supplied, and may utilize the software provided for any purpose including:

    .1 Modification and revision.

    .2 Use at other City facilities.

  .2 The City may turn the software over to a 3rd party, for use at any City owned facility.

  .3 Provide source code for all custom software and function blocks, or any other software logic utilized in the application.

    .1 Source code for base function blocks provided by the PLC manufacturer are not required.

1.6 DESIGN REQUIREMENTS

  .1 Design and implement a complete operating PLC system.

  .2 The design is to be based upon the supplied Functional Requirements Specification.

    .1 Utilize a tag naming convention that extends, and does not conflict with the tag scheme utilized in the Functional Requirements Specification.

  .3 The PLC is utilized to control wastewater pumping for a municipal application. The consequences of system failure could be significant, and thus a high level of care, attention to detail, and testing is expected.

  .4 The PLC software design is to be supervised and approved (sealed) by a Professional Engineer licensed to practice in Manitoba.

  .5 Do not assume that the Contractor's internal standards or standard programming methodology will be acceptable for this project. No additional payment will be made for assumptions made regarding standard methods utilized by the Contractor.

  .6 The Contract Administrator will review the overall design. Make changes as requested by the Contract Administrator.

1.7 SUBMITTALS

  .1 All submittals to be in accordance with Section 01 33 00 – Submittal Procedures.

  .2 Stage 1:

    .1 Submit product datasheets

  .3 Stage 2:

    .1 Submit a PLC design criteria prior to initiating programming which includes:
      .1 The general PLC program structure.
      .2 The programming languages (ie. ladder, function block) to be utilized
      .3 A sample section of code.
      .4 SCADA interface map.
      .5 Variable naming methodology.

  .4 Stage 3:

    .1 Submit a 25% complete submittal, including:

     .1   Software logic printout.

   .2   The primary purpose of this submittal is to ensure that the methodology being utilized is as per requirements prior to the bulk portion of the work being completed. At this point, copies of code for similar pieces of equipment should not be completed.

  .5 Stage 4:

   .1   Submit a 99% complete submittal a minimum of 20 Working days prior to the FAT, including:

     .1   Complete software logic printout.

     .2   SCADA interface map.

1.8   O&M MANUALS

  .1 Include the following in the O&M Manuals:

   .1   Product datasheets.

   .2   Hardware and software user manuals.

   .3   Letter stating that the PLC application has been reviewed and approved. The letter is to be signed and sealed by a Professional Engineer licensed to practice in Manitoba.

   .4   SCADA interface map.

   .5   PLC database listing and logic printout.

   .6   CD sleeve with CD containing PLC application program.

Part 2   Products

2.1   PROGRAMMABLE LOGIC CONTROLLER

  .1 Suitable product will be a PLC system produced by a major, international industrial automation vendor.

  .2 Modularity

   .1   The construction of the PLC is to be an integrated processor, power supply, and I/O unit, utilizing additional separated I/O expansion modules that are located adjacent to the main unit on DIN rail.

  .3 Self-Tests, Diagnostics and Failure Modes

   .1   Integrity of controller hardware and software to be constantly monitored by an intrinsic series of continuously running self-tests and diagnostics.

   .2   Immediately report abnormal results as system alarms.

   .3   Have predictable failure mode upon an error. At a minimum, faults are to generate a system alarm.

   .4   Equipment may have the ability to diagnose degradations to performance that may not yet adversely affect operator functions or be a permanent failure. When such conditions are automatically noted, the system is to journal the event in the

Historian and have the capability to report such information selectively, as either a system alarm or a message on the programming workstation.

.4   Processors:

    .1   Qty 1, 32-bit ARM7 microcontroller, 32 MHz clock.

    .2   Qty 2, Microcontroller co-processors, 20 MHz clock.

.5   Memory:

    .1   Flash ROM: 16 MB

    .2   CMOS RAM: 4 MB

    .3   EEPROM: 4 kB

.6   Integrated Ethernet Port:

    .1   Quantity: 1

    .2   Speed: 10/100 Mbps

    .3   Connection: RJ45 connector

    .4   Supported protocols:

        .1   Modbus/TCP

        .2   Modbus RTU in UDP

        .3   Modbus ASCII in UDP

        .4   DNP in TCP

        .5   DNP in UDP

        .6   FTP

.7   Serial Ports:

    .1   Type:

        .1   Qty 1, RS-485, Half duplex.

        .2   Qty 1, RS-232 or RS-485 (jumper configurable), Full or Half duplex

        .3   Qty 1, RS-232, Full or Half duplex.

    .2   Baud Rates: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 11500

    .3   Parity: None, Even, or Odd

    .4   Word Length: 7 or 8 bits

    .5   Stop Bits: 1 Bit

    .6   Supported protocols:

        .1   TeleBUS (compatible with Modbus RTU and Modbus ASCII),

        .2   DF1,

        .3   DNP.

.8   USB Ports:

    .1   Qty 1, USB Peripheral

        .1   Connector: Type B connector

        .2   Standard: USB 1.1

        .3   Speed: 12 Mbps (full speed).

City of Winnipeg   Section 40 94 43
Cockburn Flood and Wastewater Pumping Station PROGRAMMABLE LOGIC CONTROLLERS (PLCs)
2016 Upgrades   Page 5 of 8
Bid Opportunity 331-2016

  .2 Qty 1, USB Host

    .1 Connector: Type A

    .2 Standard: USB 1.1, USB 2.0

    .3 Speed: 12 Mbps (full speed), and 1.5 Mbps (low speed)

    .4 Rating: 5V, 100 mA.

.9 Visual Indicators:

    .1 Power Mode LED,

    .2 Run LED,

    .3 Status LED,

    .4 Forced I/O LED,

    .5 Digital Inputs/Outputs: LED

    .6 Network communication activity

.10 Power Supply:

  .1 Redundancy: Not required.

  .2 Requirements:

    .1 Supply Voltage: 10 to 30V

    .2 Supply Protecting: Integral fuse or breaker.

    .3 Output Voltage: As required.

    .4 Output Current: As required.

    .5 Integrated protection against overloads, short circuits, and overvoltages.

.11 On-board Inputs and Outputs:

  .1 Discrete Inputs (DI):

    .1 Channels: 32

    .2 Voltage: 12/24 Vdc.

    .3 Current sinking.

    .4 Meet IEEE C37.90.1 surge withstand capability.

    .5 Indicating LEDs: Channel status (on/off) for each channel.

  .2 Discrete Outputs (DO):

    .1 Channels: 16

    .2 Type: Form A SPST Relay (dry contact)

    .3 Max switching voltage: 240 Vac

    .4 Isolation:

      .1 Isolated in groups of 4

      .2 Logic to contact: 1500 Vac (1 min.)

      .3 Chassis to contact: 1500 Vac (1 min.)

      .4 Output group to output group: 1500 Vac (1 min.)

    .5 Contact rating:

      .1 3 A, 30 Vdc or 250 Vac (Resistive),

      .2 1000Vac between open contacts,

    .3 12 A maximum per common.

  .6 Max switching load:

    .1 5 A, 30 Vdc (150 W Resistive)

    .2 5 A, 250 Vac (1250 VA Resistive)

  .7 Service Life:

    .1 2×10^7 mechanical

    .2 1×10^5 at 5 A, 30 Vdc or 250 Vac

  .8 Indicating LEDs: Channel status (on/off) for each channel.

.3 Universal Discrete Inputs/Outputs (DIO):

  .1 Voltage: 24 Vdc

  .2 Inputs: Current sourcing.

  .3 Outputs: Current sourcing.

  .4 Channels: 8

  .5 Indicating LEDs: Channel status (on/off) for each channel.

.4 Analog Inputs (AI)

  .1 Channels: 14 external + 2 internal

  .2 Type: Single ended

  .3 4-20mA inputs and one 0-32.768V input for battery voltage monitoring.

  .4 Input impedance:

    .1 20 kΩ for 0-10V inputs,

    .2 60 kΩ for 0-32.768V inputs,

    .3 250 Ω for 0-20mA inputs,

  .5 Resolution:

    .1 15 bits over the 0-10V measurement range

    .2 14 bits over the 0-5V measurement and 0-20mA measurement range.

  .6 Accuracy:

    .1 +/- 0.1% at 25 °C.

    .2 +/- 0.2% over temperature range.

  .7 Response time: 100ms typical for 10% to 90% signal change.

.5 Analog Outputs (AO)

  .1 Channels: 4

  .2 Type: Single ended, 0-20mA

  .3 Maximum load resistance:

    .1 925 Ω with 24Vdc input voltage

    .2 375 Ω with 12Vdc input voltage

    .3 250 Ω with input voltage at power supply turnoff

  .4 Resolution: 12 bits

  .5 Accuracy:

    .1 +/- 0.15% at 25 °C.

    .2 +/- 0.25% over temperature range.

     .6   Response time: 0.5ms to 2ms for 10% to 90% signal change.

  .12 Expansion I/O Modules:

    .1   Discrete Input Module, 24 Vdc, 32 point:

      .1   Channels: 32

      .2   Voltage: 24 Vdc.

      .3   Current sinking.

      .4   Power Requirements: 5V (supplied from controller via ribbon cable)

      .5   Indicating LEDs: Channel status (on/off) for each channel.

      .6   Mounting: 35mm DIN rail

    .2   Discrete Input Module, 24 Vdc, 16 point:

      .1   Channels: 16

      .2   Voltage: 24 Vdc

      .3   Current sinking.

      .4   Power Requirements: 5V (supplied from controller via ribbon cable)

      .5   Indicating LEDs: Channel status (on/off) for each channel.

      .6   Mounting: 35mm DIN rail

  .13 Required Accessories:

    .1   Include all accessories including cables, terminators, backplanes, memory, batteries, and other components required to make the system operable.

  .14 Acceptable Products:

    .1   Controller: Schneider Electric SCADAPack 357E (part no. TBUP-EA55-AB20),

    .2   32 point, 24 Vdc discrete input module: Schneider Electric 5405-24,

    .3   16 point, 24 Vdc discrete input module: Schneider Electric 5414-24.

    .4   No alternates or substitutes will be accepted.

2.2   **PLC PROGRAMMING SOFTWARE**

    .1   Utilize IEC 61131-3 Workbench for programming the PLC.

    .2   Supply of IEC 61131-3 Workbench PLC programming software and licenses are not included.

2.3   **USB MEMORY STICK**

  .1   Provide a minimum 2GB USB memory stick as part of the Commissioning process, with the following:

    .1   Latest application program, with documentation,

    .2   PLC hardware user manuals,

    .3   PLC software user manuals.

  .2   Locate the memory stick in a pocket in the control panel.

Part 3   Execution

3.1   HARDWARE INSTALLATION

    .1   Install the PLC and associated components in Control Panel CP-A81 as per manufacturer instructions and recommendations.

    .2   Update the processor and all updatable modules with the latest firmware.

3.2   PLC PROGRAMMING SERVICES

    .1   General Requirements:

        .1   Where program logic is required, program in a manner to make the program easy to follow and maintain.

        .2   Where ladder logic or function block programming is required, insert comments into the program to clarify all items not readily apparent.

        .3   Utilize commonly accepted good programming practices.

        .4   Where function block programming is specified, utilize function blocks to encapsulate common systems and sections of code.

        .5   Where creation of tags is required, all tagnames are to be named and identified using positive logic. Where required, provide comments to clarify the states.

        .6   Where PID control loops are required, tune PID control loops to provide steady and acceptable equipment operation.

        .7   Where PLC generated alarms are required, configure alarms generated in the PLC into two types:

            .1   Automatic reset alarms clear upon the alarm condition being removed. Provide logic as required to ensure that fast cycling of the alarm does not occur.

            .2   Manual reset alarms require reset via the "Reset" pushbutton on the control panel.

    .2   Provide all required PLC programming as per the Functional Requirements Specification.

    .3   Program and configure the PLC using Schneider Electric SCADAPack IEC 61131-3 Workbench, version 6.3.2 or newer.

3.3   PLC COMMISSIONING SERVICES

    .1   Provide all required PLC commissioning services as per Section 40 80 11.

    .2   Upon completion of commissioning, load latest software onto USB stick.

END OF SECTION

City of Winnipeg
Cockburn Flood and Wastewater Pumping Station
2016 Upgrades
Bid Opportunity 331-2016

Section 40 95 13
CONTROL PANELS
Page 1 of 8

Part 1 General

1.1   GENERAL REQUIREMENTS

.1   All Control Panels shall be built by a CSA/cUL-approved manufacturer and shall bear the CSA/cUL seal with the manufacturer's file number.

.2   All Control Panels shall be factory assembled and pre-wired. The Control Panel wiring shall be verified at the manufacturer's factory and completely tested before being shipped to the site.

.3   Supply, install, wire and test all components inside the Control Panels according to the specifications herein and the drawings.

1.2   SUBMITTALS

.1   Prior to construction:

    .1   Submit product datasheets, and wait for approval, prior to construction of the Control Panels.

        .1   AutoCAD drawings of the control panel can be provided to the Contractor if they are required to prepare their own drawing set due to CSA requirements.

    .2   Submit stamped red-line mark-ups of the proposed modifications to the control panels. If significant modifications are proposed/required, AutoCAD drawings will be supplied to the Contractor for revision.

.2   Prior to shipment:

    .1   Submit electronic pictures of enclosure exterior and interior, including door interior.

        .1   Pictures to be of sufficient resolution to read component labels.

    .2   As-built drawings:

        .1   Submit as-built drawings. Minor changes may be made via red-line mark-ups.

        .2   Draft significant changes on AutoCAD drawings.

    .3   Do not ship control panel until approval from Contract Administrator is received.

1.3   INSPECTION

.1   A factory inspection of the control panels will be performed at the discretion of the Contract Administrator based upon the pre-shipment submittals.

.2   If requested, demonstrate and test the control panel in presence of the Contract Administrator designated representative.

City of Winnipeg
Cockburn Flood and Wastewater Pumping Station
2016 Upgrades
Bid Opportunity 331-2016

Section 40 95 13
CONTROL PANELS
Page 2 of 8

Part 2   **Products**

2.1   **GENERAL**

    .1   Construction of the control panels is required, in accordance with the supplied drawings.

    .2   Control devices of each category shall be of same type and manufacturer.

2.2   **ENCLOSURES**

    .1   Install lamacoids as per the control panel layout drawings.

    .2   All indoor control panels shall be NEMA 12 or as shown on drawings.

    .3   All enclosure angles and cut-outs shall be free of dents, gouges or weld marks, and shall present a clean, smooth appearance.

    .4   No screws, fittings or other fastenings shall be used on external panel faces, which must be free of any marks, scratches or defaults.

    .5   The door is to be a minimum fourteen (14) gauge steel plate, full height and flush with adjacent surfaces.

    .6   The exterior of the control panel shall be painted ANSI 61 grey.

    .7   The interior of the control panel shall be painted gloss white.

    .8   All control panel doors shall be 900 mm (36 inches) wide maximum.

    .9   All control panel doors shall open through 180 degrees without restriction.

    .10   Enclosure brand shall be Hoffman or approved equal in accordance with B7.

2.3   **POWER SOURCE**

    .1   Each power source must be protected by a CSA approved circuit breaker or fuse.

    .2   The location of each power source must be clearly shown.

    .3   Panels powered by more than 1 electrical source shall display on their door; "Caution: This panel is electrically powered by more than one source".

2.4   **COMPONENTS**

    .1   Unless written approval for use of unapproved components is received from the owner, all electrical materials (e.g., conduit, fittings, wireways, etc.) shall be CSA or cUL approved.

    .2   Rails (DIN Rails)

        .1   Rails used must be DIN Rail style TS 35mm, slotted.

City of Winnipeg
Cockburn Flood and Wastewater Pumping Station
2016 Upgrades
Bid Opportunity 331-2016

Section 40 95 13
CONTROL PANELS
Page 3 of 8

  .2 When used to mount terminals, rails shall be mounted on straight raisers (Rail support / Mounting feet) so as to raise them to the same height as the highest adjacent wiring duct.

  .3 Raisers (Rail support / Mounting feet) shall not be used when rail hosts heavy components.

.3 Terminals

  .1 Requirements:

    .1 Mounting: TS-35 DIN rail.

    .2 Voltage rating:

      .1 600V for general control circuits.

      .2 600V for power circuits.

    .3 Manufacturer: Phoenix Contact or approved equal in accordance with B7.

  .2 Terminal blocks shall be designed for the size of the wires to be connected to them. Terminal blocks used for analog, digital, and power cables shall be identified and physically separated from each other.

  .3 Each terminal shall bear an identification number on both sides.

  .4 Drawings and templates supplied may not detail all hardware components such as labels, stoppers, rail lifters, end plates, separators, etc. The supplier must supply and install such components when required.

.4 Ground Bus Bar

  .1 Supply ground bus bar(s) in each control panel as indicated on the drawings.

  .2 Requirements:

    .1 Tapped holes with screws.

    .2 Bar to have sufficient connection points for all cables entering the control panel, plus 25% spare.

    .3 Maximum one wire termination per screw.

.5 Pushbutton, Switch and Indicator Light

  .1 When required, all control panel pushbuttons, switches and indicator lights shall be at least NEMA 12 (or better)-type devices.

  .2 Manufacturer to be Schneider Electric or approved equal in accordance with B7.

.6 Programmable Logic Controllers

  .1 As per section 40 94 43.

.7 Annunciator Light Panel

  .1 Lights: LED, Full Voltage, 30x30mm, colour as indicated on the drawings, engraved text as indicated on the drawings,

  .2 Rating: 24 VDC,

  .3 Approvals: CSA,

  .4 Manufacturer: IDEC SLC30 series. No substitutions will be accepted.

City of Winnipeg
Cockburn Flood and Wastewater Pumping Station
2016 Upgrades
Bid Opportunity 331-2016

Section 40 95 13
CONTROL PANELS
Page 4 of 8

.8   General Purpose Relays

      .1   Coil Voltage: As per drawings

      .2   Indication: LED

      .3   Diode: As per drawings

      .4   Contact arrangement: As per drawings

      .5   Contact Rating: 5A (120 VAC), 5A (24 VDC)

      .6   Approvals: CSA

      .7   Manufacturer: Omron or approved equal in accordance with B7

.9   24 VDC Uninterruptible Power Supply

      .1   Input: 100-240 Vac

      .2   Output: 24 Vdc, 5 A (adjustable 22.5-29.5 Vdc)

      .3   Battery: 3.4 Ah

      .4   Monitoring outputs: 24 Vdc, Alarm, Battery Mode, Battery Charge

      .5   Manufacturer: Phoenix Contact TRIO-UPS/1/AC/24DC/5 (2866611) with QUINT-BAT/24DC/3.4Ah (2866349) or approved equal in accordance with B7.

.10   Cellular Modem:

      .1   Supplied by City.

.11   PSTN Modem:

      .1   Type: PSTN modem / Ethernet Switch

      .2   Protocol: PPP (point-to-point)

      .3   Maximum data rate: 56 kbps

      .4   Compatibility: V.90, V.34, V.32, V.32 bis, V.22 bis, V.21

      .5   Ports:

            .1   Ethernet:

                .1   Quantity: 5

                .2   Speed: 10/100 Mbit (automatic negotiation)

                .3   Connector: RJ45

            .2   Telephone:

                .1   Line (input), Phone (output)

                .2   Connector: RJ11

      .6   Supply Voltage: 24 Vdc

      .7   Operating temperature: -40 to +75°C

      .8   Mounting: 35mm DIN Rail

      .9   Approvals: CSA

      .10   Model: Phoenix Contact PSI-DATA/BASIC-MODEM/RS232 (2313067) or approved equal in accordance with B7.

.12   Grounding

.1   All control panel components shall be adequately grounded in accordance with the component manufacturer, especially control system components.

.2   Firmly bond all panel mounted devices on or within the panels to ground. Provide supplementary bonding conductors for back panels and doors. Attach a separate bonding conductor to all devices that are not firmly fastened to the panels with screws for such devices as case mounted instruments, meters, etc.

.3   Where ground bars are installed on to the rear or side wall of the enclosure, seal screw penetrations to maintain enclosure rating.

.13   Wiring

.1   Panel wiring shall be installed in a near and orderly manner.

.2   All conductors shall be securely fastened to terminals at both ends; no splices are allowed inside the panel.

.3   No more than two (2) conductors may be terminated under each terminal screw. All internal panel conductors shall be connected to the same side of a terminal block, and external conductors to the other side. The only exception is for fused terminals which require connection to the field side for internal wiring.

.4   All wires and cables inside the control panels shall be identified on both ends with non-erasable markers.

.5   Identification shall follow the supplied documents, such as wiring diagrams.

.1   Label both ends of each wire.

.2   Utilize machine printed non-slip labels. Wrap-around or self-adhesive markers shall not be permitted.

.3   Wherever possible wire labels shall be positioned to be read from the panel opening without removal of wire duct covers or other wiring.

.6   Individual conductors or wires exiting a cable shall be identified using non-erasable markers.

.7   The routing of all analog, digital, power, and networking wiring and cabling inside control panels shall be segregated as much as possible by the type of signal they are carrying.

.8   All wires shall be physically protected by wiring ducts with covers. The wiring ducts shall be of sufficient size to be filled to a maximum of 50% when all wires are inside.

.9   All analog twisted pair wiring shall be 18 AWG shielded such as Belden No. 8760, or an approved equivalent in accordance with B7. Shield wires exiting the jacket must be covered with a black heat shrink, and the overall cable at the jacket end must also be covered with a heat shrink.

.10   All 24 Vdc or 120 Vac discrete signal wiring shall be 16 AWG TEW stranded conductor.

.11   All 120 Vac power wiring shall be 14 AWG TEW stranded conductor, minimum.

.12   All 24 Vdc and 24 Vac power wiring shall be 12 AWG TEW stranded conductor, minimum.

.13   The sizes and colours of wires shall be in accordance with the CSA and the Canadian Electrical Code.

.14   The panel builder shall group and form wiring into a loop when going from a fixed part of the panel to a door such that there is sufficient slack to minimize strand fatigue and breaking. Each end of the loop shall be properly supported.

.15   Ethernet Patch Cords

.1   Requirements:
.1   Cat-5e.
.2   Jacket colour: Blue.

.16   Wiring Duct

.1   All wires shall be run in narrow slot wiring duct such as such as Panduit or an approved equivalent in accordance with B7.

.2   Wiring Duct shall be installed on both sides of the panel and between the DIN rails.

.3   Wire or cable, connected to internal device or arriving from external device, shall be uncovered by Wiring Duct for a maximum of 10 cm.

.17   Wire ties shall be non-metallic.

.18   Wiring shall be arranged to be readily accessible for inspection and maintenance.

.19   The wiring arrangement shall not interfere with access to panel-mounted devices or spaces for future equipment.

.14   Overcurrent Protection

.1   Panel-mounted devices and all control circuits shall be protected by appropriately sized fuses or circuit breakers.

Part 3   Execution

3.1   COMPONENT INSTALLATION

.1   Components on the front of the panel shall be identified with an individual permanent nameplate installed in an organized manner. The nameplate must identify the component's function.

.2   Each component inside the control panel shall be identified with a nameplate corresponding to the drawings.

.3   All non-DIN rail mountable devices in the control panel shall be mechanically affixed to the back panel with either tapped or self-tapping screws.

.4   All control devices shall be mounted so that any component can be replaced without removing the sub-panel or other components.

.5   Components and/or auxiliary instruments mounted at the rear of the panel shall be readily accessible and their installation shall not be affected by, or interfere with the removal of any panel instrument.

.6   Nameplates shall be made of lamacoid material with a white background and engraved black letters for internal and external components. Nameplates must resist harsh industrial conditions.

.7 Supply and install all required fuses.

.8 Control devices must be spaced adequately to allow for cooling, replacement, servicing, and wiring access.

.9 Control devices shall be grouped according to voltage and function to reduce electrical noise.

.10 Cutouts for instruments shall be within the tolerances specified by the instrument manufacturer.

.11 If cutouts are specified for future instruments, the cutouts shall be covered by removable steel plates 3 mm (1/8 inch) thick. The cover plates shall be finished and painted with the same paint as applied to the front panel.

.12 If any panel-mounted item is not available for installation before the panel is scheduled for shipment, wiring from the terminal block to the panel location for the item shall be completed, wire ends shall be formed exactly to the configurations required, and identifying sleeves shall be applied, ready for connection.

.13 Panel areas designated for future equipment shall be kept clear of stiffening members, rear-mounted equipment, wiring, and all other interferences.

.14 Ample space shall be provided for the entrance of external cables into the panel and for routing the cables to terminating points within the panel.

3.2 IDENTIFICATION

.1 Perform wire and terminal identification using a computerized device. Handwriting is not acceptable.

.2 Label wires and terminals as shown on drawings.

.3 Install label above each terminal block with terminal block name.

3.3 TESTING

.1 Testing of the control panels shall be completed to the greatest extent possible prior to the FAT, and shall include at minimum:

    .1 Provide a signed and dated inspection sheet with all tests performed listed on it.

    .2 The list of the various test procedures described hereunder is not restrictive, and does not relieve the control panel manufacturer of his responsibility to perform any other work that is not mentioned but requested to verify the good operation of the control panels.

    .3 Isolate all instruments and components of the control panels as required to protect them from any damage during tests.

    .4 Provide the services of qualified personnel as well as tools and equipment required to perform all tests and inspection of the control panels.

    .5 Tests to include:

        .1 Power supply functionality

        .2   PLC component functionality

        .3   Point to point tests of all inputs and outputs

        .4   Power terminal voltage verification

        .5   Relays and switches functionality

        .6   Receptacle functionality

        .7   Modem and Ethernet switch functionality

    .6   If the panel is modified after tests have been performed, tests shall be repeated.

3.4   SHIPMENT

    .1   If any panel-mounted item is not available for installation before the panel is scheduled for shipment, wiring from the terminal block to the panel location for the item shall be completed, wire ends shall be formed exactly to the configurations required, and identifying sleeves shall be applied, ready for connection.

    .2   Shipment of any panel having shortages of equipment shall be approved in writing by the owner.

3.5   SPARE COMPONENTS

    .1   Supply two spares of each fuse type and rating. Place in a clear plastic bag and attach to the panel door interior

END OF SECTION

City of Winnipeg
Cockburn Flood and Wastewater Pumping Station
2016 Upgrades
Bid Opportunity 331-2016

Section 40 99 90
MAINTENANCE AND SUPPORT
Page 1 of 2

Part 1   **General**

1.1   **MAINTENANCE SERVICES**

.1   Not required.

1.2   **SUPPORT SERVICES**

.1   Duration:

.1   The duration of support services is to extend during the Warranty period (one year past Total Performance)

.2   Requirements:

.1   Provide telephone support for all products supplied (during regular business hours).

.2   Respond to emergency service calls (during regular business hours).

.3   Telephone Support:

.1   Telephone support to utilize service personnel knowledgeable in the products and have the required troubleshooting skills.

.2   No payment will be made for telephone support during the warranty period.

.4   Emergency Service Calls:

.1   Respond to service calls from the City when the system is not functioning correctly.

.2   Qualified control personnel to be available to provide on-site service upon a critical failure, whenever required.

.1   A critical failure is the inability to operate of any critical system supplied by the Vendor.

.2   Critical systems include, but are not limited to:

.1   Communication networks,

.2   PLC system, and

.3   Instrumentation.

.3   Perform work continuously until system is restored to a reliable operating condition.

.4   Response Time:

.1   The response time to emergency service calls is to be less then four hours.

.5   Record each service call request, when received separately on approved form and include:

.1   Serial number identifying component involved.

.2   Location, date and time call received.

.3   Nature of trouble.

.4   Names of personnel assigned.

.5   Instructions of work to be done.

City of Winnipeg
Cockburn Flood and Wastewater Pumping Station
2016 Upgrades
Bid Opportunity 331-2016

Section 40 99 90
MAINTENANCE AND SUPPORT
Page 2 of 2

.6 Amount and nature of materials used.

.7 Time and date work started.

.8 Time and date of completion.

.6 Costs:

 .1 If the issue is determined to be due to poor workmanship or defect of the Contractor, no payment will be made to the Contractor.

 .2 If the issue is determined to be due to failure of a physical component supplied, and covered under manufacturer's warranty, the Contractor will be paid for the service call.

 .3 If the issue is determined to be due to an issue outside of the Contractor's responsibility, the Contractor will be paid for the service call.

 .4 Payment will be based upon the rates specified in Form B.

 .5 If the service call is subsequent to Total Performance, submit an invoice, based upon the established rates to the City.

Part 2 **Products**

2.1 **NOT APPLICABLE.**

.1 Not applicable.

Part 3 **Execution**

3.1 **NOT APPLICABLE.**

.1 Not applicable.

END OF SECTION