PART 1 - GENERAL

1.1 Summary

.1 Section Includes:

.1 General requirements for Control Systems that are common to NMS Control Sections.

.2 Related Sections:

.1 Section 25 05 54 - Controls: Identification.

.2 The General Conditions for the Supply of Goods (Revision 2008 05 26).

1.2 References

.1 American National Standards Institute (ANSI)/The Instrumentation, Systems and Automation Society (ISA).

.1 ANSI/ISA 5.5-1985, Graphic Symbols for Process Displays.

.2 American National Standards Institute (ANSI)/ Institute of Electrical and Electronics Engineers (IEEE).

.1 ANSI/IEEE 260.1-1993, American National Standard Letter Symbols Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units).

.3 Canadian Standards Association (CSA International).

.1 CAN/CSA-Z234.1-89(R1995), Canadian Metric Practice Guide.

.4 Electrical and Electronic Manufacturers Association (EEMAC).

.1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

1.3 System Description

.1 The controls shall include but not be limited to:

.1 Any electrical monitoring devices or protective relays (ex: Phase Voltage Monitor)

.2 Any PLC or SCADA hardware

1.4 Scope of Control Work

.1 The Contractor shall engage a factory trained representative to supervise the installation, setup, calibrate and operationally verify and commission the following:

.1 Any SCADA RTU systems

.2 The Contactor shall provide a certified instrument technician in order to operate all field devices that are wired to the SCADA in order for City of Winnipeg staff to verify loop is correctly wired to the SCADA.

.3 The Contractor shall submit written reports identifying the commissioning work, together with any parameter settings and final adjustments.

.4 The Contractor is only responsible for termination to the terminals within the SCADA cabinet and internal wiring.

1.5 Submittals

.1 Make submittals in accordance with The General Conditions for the Supply of Goods (Revision 2008 05 26).

.2 Submit for review:

.1 Equipment list and systems manufacturers 10 days after award of contract.

PART 2 - PRODUCTS

.1 Not Used

PART 3 - EXECUTION

3.1 Manufacturer's Recommendations

.1 Installation: to manufacturer's recommendations.

3.2 Painting

.1 Painting: as follows:

.1 Clean and touch up marred or scratched surfaces of factory finished equipment to match original finish.

.2 Restore to new condition, finished surfaces too extensively damaged to be primed and touched up to make good.

.3 Clean and prime exposed hangers, racks, fastenings, and other support components.

.4 Paint unfinished equipment installed indoors to EEMAC 2Y-1.

~End~

PART 1 - GENERAL

1.1 Summary

.1 Section Includes.

.1 Requirements and procedures for identification of devices, sensors, wiring tubing, conduit and equipment, the Control System Work and nameplates materials, colours and lettering sizes.

.2 Related Sections.

.1 Section 25 05 01 - Controls: General Requirements.

.2 Section 26 05 01 - Common Work Results - Electrical.

.3 The General Conditions for the Supply of Goods (Revision 2008 05 26).

1.2 References

.1 Canadian Standards Association (CSA International).

.1 CSA C22.1-06, The Canadian Electrical Code, Part I (20th Edition), Safety Standard for Electrical Installations.

1.3 Definitions

.1 For acronyms and definitions refer to Section 25 05 01 - Controls: General Requirements.

1.4 System Description

.1 Language Operating Requirements: provide identification for control items in English.

1.5 Submittals

.1 Submittals in accordance with The General Conditions for the Supply of Goods (Revision 2008 05 26). supplemented and modified by requirements of this Section.

.2 Submit to Contract Administrator for approval samples of nameplates, identification tags and list of proposed wording.

PART 2 - PRODUCTS

2.1 Nameplates for Panels

.1 Provide panel identification in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Nameplate for each panel size 4 engraved as indicated.

.3 Nameplate for each panel mounted device size 2 engraved as indicated.

2.2 Nameplates for Field Devices

.1 Provide field device identification in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Nameplate for field device size 7 engraved as indicated.

.3 Nameplate shall be attached by chain.

2.3 Wiring

.1 Supply and install numbered tape markings on wiring at panels, junction boxes, splitters, cabinets and outlet boxes.

.2 Colour coding: to CSA C22.1. Use colour coded wiring in communications cables, matched throughout system.

.3 Power wiring: identify circuit breaker panel/circuit breaker number inside each control panel.

PART 3 - EXECUTION

3.1 Nameplates and Labels

.1 Ensure that manufacturer's nameplates, CSA labels and identification nameplates are visible and legible at all times.

3.2 Existing Panels

.1 Correct existing nameplates and legends to reflect changes made during Work.

~End~

PART 1 - GENERAL

1.1 Summary

.1 Section Includes:

.1 Control processors integral to the Control System: SCADA system, displays, HMI interface.

.2 Related Sections:

.1 Section 25 05 01 - Controls: General Requirements.

.2 Section 25 05 54 - Controls: Identification.

.3 Section 26 05 01 - Common Work Results - Electrical.

.4 The General Conditions for the Supply of Goods (Revision 2008 05 26).

1.2 References

.1 American National Standards Institute (ANSI).

.1 ANSI C12.7-1993 (R1999), Requirements for Watthour Meter Sockets.

.2 ANSI/IEEE C57.13-1993, Standard Requirements for Instrument Transformers.

.2 American Society for Testing and Materials International, (ASTM).

.1 ASTM B148-97(03), Standard Specification for Aluminum-Bronze Sand Castings.

.3 National Electrical Manufacturer's Association (NEMA).

.1 NEMA 250-03, Enclosures for Electrical Equipment (1000 Volts Maximum).

.4 Canadian Standards Association (CSA International).

.1 CSA-C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.

1.3 Definitions

.1 Acronyms and Definitions: refer to Section 25 05 01 - Controls: General Requirements.

1.4 Submittals

.1 Submit shop drawings and manufacturer's installation instructions in accordance with The General Conditions for the Supply of Goods (Revision 2008 05 26).

.2 Pre-Installation Tests.

.1 Test all I/O points, components and wiring within the RTU control panel prior to shipment from control panel manufacturer. Replace devices not meeting specified performance.

.3 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions for specified equipment and devices.

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, shockproof, vibration-proof, heat resistant assembly.

.3 Operating conditions: 0 - 32 degrees C with 10 - 90 % RH (non-condensing) unless otherwise specified. Provide control panel environmental controls as required.

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

.5 Control panel equipment to be unaffected by external transmitters including walkie talkies.

.6 Control Panel to be constructed in a CSA approved shop.

2.2 Process Controller

.1 Process Controller Requirements:

- .1 32 bit controller
- .2 32 MHz clock & integrated watchdog timer
- .3 16MB flash ROM, 4MB CMOS RAM, 4kB EEPROM
- .4 Analog inputs - five (5) selectable as 0-10VDC or 0-20mA with removable terminal blocks
- .5 Analog output – none
- .6 Discrete inputs/outputs – 8 user selectable as dry contact inputs or open drain outputs, with removable terminal blocks
- .7 Communication ports:
  - .1 Three (3) RS-232/485 serial ports,
  - .2 One (1) RJ-45 10/100Base-T Ethernet port
  - .3 Two (2) USB 2.0 compliant ports
- .8 Power supply – 11 – 30 VDC, 12W at 24VDC maximum
- .9 Three (3) year warranty

.2 Additional I/O Board:

- .1 Analog inputs - eight (8) selectable as 0-10VDC or 0-20mA with removable terminal blocks
- .2 Analog output – two (2) at 0-20mA with removable terminal blocks
- .3 Discrete inputs – 32 at 12/24VDC, with removable terminal blocks
- .4 Discrete outputs – 16 dry contact relay outputs, with removable terminal blocks
- .5 Additional I/O board as required

Approved Manufacture; Schneider Electric model TBUP357-1-A-2-0-A-B-1-0. No alternates will be accepted.

.3 Programming to be provided by the City. Contractor to coordinate all SCADA communication I/O points with City of Winnipeg.

2.4 HMI Display

.1 Display to provide operator interface to view status and alarms of lift station.

.2 Requirements:

.1 Backlit colour LCD touchscreen panel
.2 Display size 12.1 inch
.3 Analogue touchscreen panel with 65536 colour and 800 x 600 pixels SVGA
.4 Processor frequency 266MHz
.5 Built-in real time clock
.6 Application memory flash EPROM 32 MB
.7 Data backup SRAM 512kB with lithium battery
.8 Communication ports:
  .1 Two (2) USB type A ports
  .2 One (1) RS-232/422/485 through SUB-D 9 port
  .3 One (1) RS-485 through RJ45 port
  .4 One (1) Ethernet TCP/IP through RJ45 port
.9 30W, 24VDC power supply
.10 Flush mounting rated NEMA 12

Approved Manufacturer; Schneider Electric model Magelis Advanced Panel XBTGT6330.

2.5 Ultrasonic transducer Remote controller:

.1 Remote controller for ultrasonic level transducer should be capable of:

  .1 Single or dual point level monitoring,
  .2 Auto false echo suppression for fixed obstruction avoidance,
  .3 Panel mount,
  .4 Differential amplifier transceiver for common mode noise reduction and improve signal to noise ratio,
  .5 Power supply: AC (100 to 230V AC, 60Hz),
  .6 Outputs: 4-20 mA,
  .7 Safety Approvals: FM/CSA Class 1 Div. 2,
  .8 Display Option: Local Operator Interface (LOI)
  .9 Approved product; Siemens Milltronic MultiRanger 100/200.

2.6 Surge Protection Device

.2 Maximum rated surge current – 20kA per phase

.3 Rated applications – ANSI-IEEE C62.41 Location C, B & A

.4 Fail safe design with dual component-level fusing

.5 ET recognized component under UL 1449 3rd Edition as a type 4 SPD

.6 Input frequency - 47 to 64 Hz

.7 Maximum continuous operating current – 15 amps

.8 Modes of protection – L-N, L-G, N-G

.9 Status indicating light

.10 Short circuit rating – 100kAIC short circuit current rating with a 15 amp Class T fuse

.11 Din-Rail mounted or screw down

.12 Acceptable material – Total Protection Solutions model LoadTrack LT-15A

2.7 UPS and Power Supply

.1 Combined power supply unit with UPS power backup

.2 120VAC input

.3 24VDC output, capable of delivering 2 amps for a duration of one hour with utility power failure

.4 Din-Rail mounted

.5 Acceptable material – Phoenix Contact model TRIO-PS/1AC/24DC/5

2.8 Panels

.1 Free-standing or wall mounted enamelled steel cabinets with hinged and key-locked front door.

.2 Multiple panels as required to handle requirements with additional space to accommodate 25% additional capacity as required by Contract Administrator without adding additional cabinets.

.3 Panels to be lockable with same key.

2.9 Level Display

.1 Level display to act as backup to the process controller and provide pump control based on water level.

.2 Requirements:

.1 Dual line 6 digit programmable display and function keys
.2 Front display and keypad to be rated NEMA 4X, IP65
.3 One (1) 4-20mA input
.4 Four (4) relay outputs
.5 12/24VDC input power
.6 Alarm status indicators

Approved Manufacturer; Precision Digital model PD6000-7R4

3.0 Loop Isolators and Splitters

.1 2 Channel Loop Isolator

.1 2 x 4-20 mA input channels
.2 2 x 4-20 mA output channels
.3 Operating power drawn from the loop on the output side (loop powered).
.4 Acceptable material – Moore Industries MiniMoore MIX/2XPRG/2x4-20MA/12-42DC DIN

.2 4 Channel Loop Isolator

.1 4 x 4-20 mA input channels

.2 4 x 4-20 mA output channels

.3 Operating power drawn from the loop on the output side (loop powered).

.4 Acceptable material – Moore Industries MiniMoore MIX/4x4-20MA/4x4-20MA/12-42DC DIN

.3 Loop Splitter

.1 2 x 4-20 mA input channels

.2 4 x 4-20 mA output channels

.3 Power: 24 VDC

.4 Acceptable material – Moore Industries MiniMoore MIT/2XPRG/2x4-20mA/U DIN

PART 3 - EXECUTION

3.1 Manufacturing

.1 Control panel to be manufactured within a CSA approved facility.

.2 Provide terminal blocks and wireways within control panel as required.

.3 Install panel in location as indicated on drawings.

.4 Prepare all field wiring connections to control panel.

.5 Power to be applied to control panel after installation of panel is complete and all field wiring has been terminated and verified.

.6 Provide all configuration for all components as required. Any and all custom objects or applications that have been used in the development of the programs for all devices shall have full source code turned over to the City. There shall be no custom objects that are locked preventing the City from modifying the object and/or application. No intellectual property rights on the programs, objects or applications are permitted. City to have full access to all aspects of programs, objects and applications. Provide a hard copy of all files to be included within the O&M manuals.

3.2 Testing and Commissioning

.1 Calibrate and test control panel devices for accuracy and performance.

.2 Verify control system operates as specified in control narrative.

.3 Contractor shall arrange factory acceptance testing for control panels at panel shop. Contract Administrator will co-ordinate with the City for representatives to be present.

~End~

PART 1 - GENERAL

1.1 Summary

.1 Section Includes:

.1 Instrumentation devices integral to the Control System: transmitters, sensors, controls, meters, switches, dampers, damper operators, valves, valve actuators, and low voltage current transformers.

.2 Related Sections:

.1 Section 25 05 01 - Controls: General Requirements.

.2 Section 25 05 54 - Controls: Identification.

.3 Section 26 05 01 - Common Work Results - Electrical.

.4 The General Conditions for the Supply of Goods (Revision 2008 05 26).

1.2 References

.1 American National Standards Institute (ANSI).

.1 ANSI/IEEE C57.13-1993, Standard Requirements for Instrument Transformers.

.2 American Society for Testing and Materials International, (ASTM).

.1 ASTM B148-97(03), Standard Specification for Aluminum-Bronze Sand Castings.

.3 National Electrical Manufacturer's Association (NEMA).

.1 NEMA 250-03, Enclosures for Electrical Equipment (1000 Volts Maximum).

.4 Canadian Standards Association (CSA International).

.1 CSA-C22.1-06, Canadian Electrical Code, Part 1 (20th Edition), Safety Standard for Electrical Installations.

1.3 Definitions

.1 Acronyms and Definitions: refer to Section 25 05 01 - Controls: General Requirements.

1.4 Submittals

.1 Submit shop drawings and manufacturer's installation instructions in accordance with The General Conditions for the Supply of Goods (Revision 2008 05 26).

.2 Pre-Installation Tests.

.1 Submit samples at random from equipment shipped, as requested by Contract Administrator, for testing before installation. Replace devices not meeting specified performance and accuracy.

.3 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions for specified equipment and devices.

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, shockproof, vibration-proof, heat resistant assembly.

.3 Operating conditions: 0 - 32 degrees C with 10 - 90 % RH (non-condensing) unless otherwise specified.

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

.5 Transmitters and sensors to be unaffected by external transmitters including walkie talkies.

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

.7 Outdoor installations: use weatherproof construction in NEMA 4 enclosures.

2.2 Ultrasonic transducer

1. Contractor to supply and install the Ultrasonic transducer as indicated in the drawing.

2.3 Current Transformers

.1 Requirements:

.1 Current transformer ratio should be as indicated on the drawing.

.2 Current transformers should be in accordance to ANSI/ IEEE C57.13.

2.4 Panels

.1 Free-standing or wall mounted enamelled steel cabinets with hinged and key-locked front door as indicated on drawings.

.2 Multiple panels as required to handle requirements with additional space to accommodate 25% additional capacity as required by Contract Administrator without adding additional cabinets.

.3 Panels to be lockable with same key.

2.5 Wiring

.1 For wiring under 70 volts use FT6 rated wiring where wiring is not run in conduit. Other cases use FT4 wiring.

.2 Wiring must be continuous without joints.

.3 Sizes:

.1 Field wiring to digital device: #14 AWG TECK 90 Cu or RW90 Cu in conduit in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 Analog input and output: shielded #18 minimum stranded twisted pair ACIC Cu.

2.6 Flow Monitors

.1 Contractor to supply ADS FlowShark Pulse modules to be connected to existing flow meters.

PART 3 - EXECUTION

3.1 Installation

.1 Instrument components are not specifically located on drawings, but located on drawings in the general vicinity.

.1 Location of instruments, when shown on the drawings, is only approximate. The Contractor is responsible for actual location of field devices and must avoid interferences between conduit, pipes, equipment and instruments while providing maximum accessibility.

.2 Locate instruments components at eye level and in an easily accessible location.

.3 Instrument components that must be removed for servicing shall be installed with re-usable connectors, unions and flexible conduit.

.4 Electrical connections and terminations for field instruments and other field devices shall be in strict compliance with the manufacturer's instructions and loop drawings. This will include wire, wire termination, labelling, rigid and flexible conduit, fittings, and seals where required.

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

.3 Threaded fastenings for mounting instrument components shall have either lock nuts or double nuts.

.4 Electrical:

.1 Refer to electrical control schematics included as part of control design schematics on drawings. Trace existing control wiring installation and provide updated wiring schematics including additions, deletions to control circuits for review by Contract Administrator before beginning Work.

.2 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.

3.2 Panels

.1 Arrange for conduit and tubing entry from bottom or either side.

.2 Wiring and tubing within panels: locate in trays or individually clipped to back of panel.

.3 Identify wiring and conduit clearly.

3.3 Calibration Tagging

.1 When satisfactorily inspected and calibrated, the item shall have a tag affixed to it in an immediately visible location, which shall indicate that the device has been calibrated, by whom and the date of the calibration. Calibration procedures and records shall be available to the Contract Administrator throughout the course of the project and shall be delivered to the Contract Administrator upon the completion of work.

3.4 Identification

.1 All field-mounted instrument items shall have an approved identification tag permanently attached by the Contractor upon completion of the initial inspection and calibration. This tag shall reflect the device's identification as shown on the appropriate drawing.

.2 The tag will be permanently attached to the instrument with screws, rivets, or stainless steel or Monel wire, as appropriate. If an instrument is inside a protective enclosure or mounted behind a panel, instrument identity tags shall be mounted twice, once on the instrument and again on the enclosure. All instruments mounted on a control panel shall have an identity tag mounted on the instrument body and again on the face of the panel below the instrument face.

.3 Identify field devices in accordance with Section 25 05 54 - Controls: Identification.

3.5 Testing and Commissioning

.1 Calibrate and test field devices for accuracy and performance.

~End~

PART 1 - GENERAL

1.1 Related Sections

.1 This section covers items common to sections of Division 26.

.2 The General Conditions for the Supply of Goods (Revision 2008 05 26).

1.2 References

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-06, Canadian Electrical Code, Part 1 (20th Edition), Safety Standard for Electrical Installations.

.2 CAN3-C235-83 (R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)

.1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.

.2 EEMAC Y1-1-1955, Equipment Green Colour for Outdoor Electrical Equipment.

.3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)

.1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.3 Definitions

.1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.4 Design Requirements

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates and labels for control items in English.

1.5 Submittals

.1 Submittals: in accordance with The General Conditions for the Supply of Goods (Revision 2008 05 26).

.2 Submit for review single line electrical diagrams and locate under plexiglass as indicated.

.1 Electrical distribution system in electrical room.

.3 Shop drawings in accordance with The General Conditions for the Supply of Goods (Revision 2008 05 26).

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Provinces of Manitoba, Canada.

.2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.

.3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.4 Indicate on drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.5 Submit copies of 600 x 600 mm minimum size drawings and product data to authority having jurisdiction.

.6 If changes are required, notify Contract Administrator of these changes before they are made.

.4 Quality Control in accordance with The General Conditions for the Supply of Goods (Revision 2008 05 26).

.1 Provide CSA certified equipment and material. Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for special approval before delivery to site.

.2 Submit test results of installed electrical systems and instrumentation.

.3 Permits and fees: in accordance with General Conditions of contract.

.4 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.

.5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Contract Administrator.

.5 Manufacturer's Field Reports: submit to Contract Administrator manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

.6 Commissioning Plan: Submit to Contract administrator, the proposed plan for testing all new devices and I/O over a period of one complete week with the Contract Administrator and the City. Plan shall include required pre-commissioning tests and forms for verification of products on site.

.7 Protective device and cable length information for Arc-Flash Hazard Analysis. The Contractor shall supply all required details for the lengths of cables and detailed operational information about protective devices for the Contract Administrator to acquire an Arc-Flash Hazard Analysis. This information must be submitted to the Contract Administrator within three weeks of award of contract.

1.6 Quality Assurance

.1 Quality Assurance in accordance with The General Conditions for the Supply of Goods (Revision 2008 05 26).

.2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices as per the conditions of Provincial Act respecting manpower vocational training and qualification.

.1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.

.2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

1.7 Delivery, Storage and Handling

.1 Material Delivery Schedule: provide Contract Administrator with schedule within 2 weeks after award of Contract.

1.8 Waste Management and Disposal

.1 Separate waste materials for reuse and recycling.

.2 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling.

.3 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Contract Administrator.

.4 Fold up metal banding, flatten and place in designated area for recycling.

.5 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.6 Place materials defined as hazardous or toxic waste in designated containers.

.7 Ensure emptied containers are sealed and stored safely for disposal away from children.

.8 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.9 Do not dispose of preservative treated wood through incineration.

.10 Do not dispose of preservative treated wood with other materials destined for recycling or reuse.

.11 Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by Contract Administrator.

1.9 Care, Operation and Start-up

.1 Instruct Contract Administrator in operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 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 aspects of its care and operation.

1.10 Operating and Maintenance Manuals

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

.2 Service instructions: Including a list of spare parts and replacement parts and the names and addresses of all suppliers.

.3 Maintenance instructions: Including start up, proper adjustment, lubrication and shutdown procedures.

.4 Installation instructions.

.5 Operating instructions.

.6 Safety precautions.

.7 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.4 Post instructions where directed.

.5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

PART 2- PRODUCTS

2.1 Materials And Equipment

.1 Provide material and equipment.

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment is not available, obtain special approval from Electrical Inspections Department before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.

.3 Factory assemble control panels and component assemblies.

2.2 Warning Signs

.1 Warning Signs: in accordance with requirements of Electrical Inspection Department and Contract Administrator.

.2 Decal signs, minimum size 175 x 250 mm.

2.3 Wiring Terminations

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.4 Equipment Identification

.1 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates: lamacoid 3 mm thick plastic engraving sheet, matt white finish face, black core, lettering accurately aligned and engraved into core mechanically attached with self tapping screws.

.2 Sizes as follows:

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

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

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

.4 Allow for minimum of twenty-five (25) letters per nameplate and label.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Identify equipment with Size 3 labels engraved with equipment tag.

.7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.8 Terminal cabinets and pull boxes: indicate system and voltage.

.9 Transformers: indicate capacity, primary and secondary voltages.

2.5 Wiring Identification

.1 Identify wiring with permanent indelible identifying markings, using Electrovert Type Z cable markers (or equal in accordance with B7), on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

.5 Use number coded wires in control cables, matched throughout system. Identify conductors with permanent indelible identifying markings, numbered on both ends.

.6 Use number coded pairs in instrument cables, matched throughout system. Pairs shall also be colour coded black and white for polarity indication. Identify conductor pairs with permanent identifying markings at both ends.

2.6 Cable Identification

.1 Identifiable with permanent indelible identifying markings, using Brady PermaSleeves Cable Markers (or equal in accordance with B7).

.2 Cable Tags shall have letter sizes of 4mm or greater and shall be impressed within the cable.

.3 Tags shall be permanently mounted to all cables entering or leaving and enclosure.

.4 Cable tags shall be reviewed with the Contract Administrator prior to purchase and attachment.

2.7 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 outdoor electrical equipment "equipment green" finish to EEMAC Y1-1.

.2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1.

PART 3- EXECUTION

3.1 Installation

.1 Do complete installation in accordance with the current edition of the Canadian Electrical Code, CSA C22.1, except where specified otherwise.

.2 Do overhead and underground systems in accordance with the current edition of CSA C22.3 No.1 except where specified otherwise.

.3 Perform all work in accordance with local codes and bylaws.

3.2 Nameplates and Labels

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.3 Co-ordination of Protective Devices

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.4 Cleaning

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

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

3.5 As-Built Drawings

.1 The Contractor shall maintain As-Built Drawings on site at all times, As-Built Drawings shall be always kept up to date.

.2 The Contractor shall turn over AutoCAD based As-Built Drawings at the end of the project for the Contract Administrator to review in accordance with the City requirements.

3.6 Commissioning

.1 The Contractor shall provide a commissioning plan and assistance during the week of commissioning the plant. Final commissioning will be coordinated with the Contract Administrator.

.2 A factory representative shall be provided for commissioning all reduced voltage starters.

3.7 Training

.1 The Contractor shall provide two one day sessions for each site for orientation and training of City staff members to the new facilities.

~End~

Part 1 General

1.1 RELATED SECTIONS

.1 The General Conditions for the Supply of Goods (Revision 2008 05 26).

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with The General Conditions for the Supply of Goods (Revision 2008 05 26).

Part 2 Products

2.1 MATERIALS

.1 NEMA 4 rated enclosure for all locations except within electrical rooms and control rooms.

.2 NEMA 12 rated enclosures for devices within electrical rooms or control rooms.

.3 Door: minimum 1 m wide, hinged, minimum 3 point latching, with padlocking means.

.4 Door interlocks

Part 3 Execution

3.1 INSTALLATION

.1 Mount equipment in enclosure.

~End~

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for industrial control devices including pushbutton stations, control and relay panels.

1.2 RELATED SECTIONS

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

.2 The General Conditions for the Supply of Goods (Revision 2008 05 26).

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No.14-95(R2001), Industrial Control Equipment.

.2 National Electrical Manufacturers Association (NEMA)

.1 NEMA ICS 1-2001, Industrial Control and Systems: General Requirements.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with The General Conditions for the Supply of Goods (Revision 2008 05 26).

.2 Include schematic, wiring, interconnection diagrams.

1.5 QUALITY ASSURANCE

.1 Submit to Contract Administrator one copy of test results.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Contract Administrator.

Part 2 Products

2.1 AC CONTROL RELAYS

.1 Control Relays: to CSA C22.2 No.14 and NEMA ICS 1.

.2 Convertible contact type: contacts field convertible from NO to NC, electrically held, with poles to suit. Coil rating: 120 VAC. Contact rating: 120 VAC, 2 A minimum or 24 VDC, 2 A minimum as required.

.3 Fixed contact plug-in type: general purpose with poles to suit. Coil rating: 120 V. Contact rating: 120 VAC, 2 A minimum or 24 VDC, 2 A minimum as required.

2.2 RELAY ACCESSORIES

.1 Standard contact cartridges: normally-open - convertible to normally-closed in field.

2.3 SOLID STATE TIMING RELAYS

.1 Construction: AC operated electronic timing relay with solid-state timing circuit to operate output contact. Timing circuit and output contact completely encapsulated to protect against vibration, humidity and atmospheric contaminants.

.2 Operation: programmable On-Delay. Time range must be adjustable from 0.05 seconds to 300 hours.

.3 Supply voltage: 120 VAC, 60 Hz.

.4 Temperature range: minus 20 degrees C to 60 degrees C.

.5 Output contact rating: maximum voltage 300 V AC or DC. Current: NEMA ICS 1.

2.4 OPERATOR CONTROL STATIONS

.1 Enclosure:

.1 In general CSA Type 4X, surface mounting.

.2 In clarifier electrical room with positive pressure CSA Type 1, surface mounting.

2.5 PUSHBUTTONS

.1 Heavy duty Oil tight. Operator extend type. Black, with 1-NO and 1-NC contacts rated at 2 A minimum, AC, labels as indicated. Stop pushbuttons coloured red, labelled as indicated.

2.6 SELECTOR SWITCHES

.1 Maintained, 2 or 3 position as required labelled as indicated heavy duty oil tight, operators standard, contact arrangement as indicated, rated 120 VAC, 2 A minimum or 24 VDC, 2 A minimum as required.

2.7 INDICATING LIGHTS

.1 Heavy duty Oil tight, full voltage, LED type, lens colour: as indicated, supply voltage: 120 VAC, lamp voltage: 120 VAC, labels as indicated.

2.8 CONTROL AND RELAY PANELS

.1 CSA Type 12 sheet steel enclosure with hinged padlockable access door, accommodating relays timers, labels, as indicated, factory installed and wired to identified terminals.

2.9 SMART RTU

.1 32-bit ARM7 controller CPU, 32 MHz clock with integrated watchdog timer.

.2 Memory: 16 MB FlashROM, 4 MB CMOS RAM, 4 kB EEPROM.

.3 Event logging capacity 2000 events.

.4 5 selectable analog inputs.

.5 8 selectable digital I/O.

.6 Input power: 24 VDC.

.7 Ethernet port: RJ45, 10/100 BaseT.

.8 Suitable for Class 1 Div. 2 environment.

.9 Operation range: -40C to 70C.

.10 3 serial ports.

.11 DIN rail mounted.

.12 Acceptable product: Schneider SCADAPack 357E with 5606 I/O expansion module.

2.10 MODEM

.1 2 modems should be provided:

.1 Wireless modem with external antenna (acceptable product: sixnet BT-6801 HSPA), SIM card and MTS account.

.2 Landline modem (acceptable product: part # 2708203 by Phoenix Contact).

2.11 ETHERNET SWITCH

.1 A DIN rail mounted 8 port Ethernet switch should be provided in the RTU panel.

.2 Acceptable product: N-Tron 708TX.

Part 3 Execution

3.1 INSTALLATION

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

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical.

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

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

.4 Check out complete system for operational sequencing.

~End~