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PART 1   **GENERAL**

1.1   **SUMMARY**

     .1   Section Includes:

          .1   General requirements for building Energy Monitoring and Control System (EMCS) that are common to NMS EMCS Sections.

1.2   **RELATED SECTIONS**

     .1   The contractor is to ensure that all related work is co-ordinated among all specification sections, as well as between other Divisions, and that the tender price includes all related work. The referenced sections below are for guidance only and are not necessarily a complete list of related sections.

     .2   Section 01 33 00 – Submittal Procedures.

     .3   Section 01 35 29.06 – Health and Safety Requirements.

     .4   Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

     .5   Section 09 91 23 - Interior Painting.

     .6   Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.

     .7   Section 25 01 12 - EMCS: Training.

     .8   Section 25 05 02 - EMCS: Submittals and Review Process.

     .9   Section 25 05 03 - EMCS: Project Record Documents.

     .10   Section 25 05 54 - EMCS: Identification.

     .11   Section 25 05 60 - EMCS: Field Installation.

     .12   Section 25 08 20 - EMCS: Warranty and Maintenance.

     .13   Section 25 10 01 - EMCS: Local Area Network (LAN).

     .14   Section 25 10 02 - EMCS: Operator Work Station (OWS).

     .15   Section 25 30 01 - EMCS: Building Controllers

     .16   Section 25 30 02 - EMCS: Field Control Devices.

     .17   Section 25 90 01 - EMCS: Site Requirements, Applications and Systems Sequences of Operation.

1.3   **REFERENCES**

     .1   American National Standards Institute (ANSI)

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

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

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

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.3   American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

       .1   ASHRAE STD 135, BACNET - Data Communication Protocol for Building Automation and Control Network.

.4   Canadian Standards Association (CSA International).

       .1   CAN/CSA-Z234.1, Canadian Metric Practice Guide.

.5   Consumer Electronics Association (CEA).

       .1   CEA-709.1-B, Control Network Protocol Specification.

.6   Department of Justice Canada (Jus).

       .1   Canadian Environmental Assessment Act (CEAA).
       .2   Canadian Environmental Protection Act (CEPA).

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

       .1   Material Safety Data Sheets (MSDS).

.8   Transport Canada (TC).

       .1   Transportation of Dangerous Goods Act (TDGA).

.9   National Electrical Manufacturers Association (NEMA)

1.4   ACRONYMS, ABBREVIATIONS AND DEFINITIONS

.1   Acronyms used in EMCS.

       .1   AEL - Average Effectiveness Level
       .2   AI - Analog Input
       .3   AO - Analog Output
       .4   BACnet - Building Automation and Control Network
       .5   BC(s) - Building Controller(s)
       .6   BECC - Building Environmental Control Centre
       .7   CAB - Canadian Automated Building (CAB) Protocol
       .8   CAD - Computer Aided Design
       .9   CDL - Control Description Logic
       .10   CDS - Control Design Schematic
       .11   COSV - Change of State or Value
       .12   CPU - Central Processing Unit
       .13   DI - Digital Input
       .14   DO - Digital Output
       .15   DP - Differential Pressure

.16 ECU - Equipment Control Unit

.17 EMCS - Energy Monitoring and Control System

.18 HVAC - Heating, Ventilation, Air Conditioning

.19 IDE - Interface Device Equipment

.20 I/O - Input/Output

.21 ISA - Industry Standard Architecture

.22 LAN - Local Area Network

.23 LCU - Local Control Unit

.24 MCU - Master Control Unit

.25 NC - Normally Closed

.26 NO - Normally Open

.27 OS - Operating System

.28 O&M - Operation and Maintenance

.29 OWS - Operator Work Station

.30 PC - Personal Computer

.31 PCI - Peripheral Control Interface

.32 PCMCIA - Personal Computer Micro-Card Interface Adapter

.33 PID - Proportional, Integral and Derivative.

.34 RAM - Random Access Memory

.35 ROM - Read Only Memory

.36 SP - Static Pressure

.37 TCU - Terminal Control Unit

.38 USB - Universal Serial Bus

.39 UPS - Uninterruptible Power Supply

.40 WAN- Wide Area Network

1.5   DEFINITIONS

.1 Point: may be logical or physical.

.1 Logical points: values calculated by system such as setpoints, totals, counts, derived corrections and may include, but not limited to result of and statements in CDL's.

.2 Physical points: inputs or outputs which have hardware wired to controllers which are measuring physical properties, or providing status conditions of contacts or relays which provide interaction which related equipment (stop, start) and value or damper actuators.

.2 Point Name: composed of two parts, point identifier and point expansion.

.1 Point identifier: comprised of three descriptors, "area" descriptor, "system" descriptor and "point" descriptor, for which database to provide 25 character field for each point identifier. "System" is system that point is located on.

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     .1   Area descriptor: building or part of building where point is located.

     .2   System descriptor: system that point is located on.

     .3   Point descriptor: physical logical point description. For point identifier "area", "system" and "point" will be shortforms or acronyms. Database must provide 25 character field for each point identifier.

.2   Point expansion: comprised of three fields, one for each descriptor. Expanded form of shortform or acronym used in "area", "system", and "point" descriptors is placed into appropriate point expansion field. Database must provide 32 character field for each point expansion.

.3   Bilingual systems to include additional point identifier expansion fields of equal capacity for each point name for second language.

     .1   System to support use of numbers and readable characters including blanks, periods or underscores to enhance user readability for each of the above strings.

.3   Point Object Type: points fall into following object types:

     .1   AI (analog input)

     .2   AO (analog output)

     .3   DI (digital input)

     .4   DO (digital output)

     .5   Pulse inputs

.4   Symbols and engineering unit abbreviations utilized in displays: to ANSI/ISA S5.5.

     .1   Printouts: to ANSI/IEEE 260.1.

     .2   Refer also to Section 25 05 54 - EMCS: Identification.

1.6   SYSTEM DESCRIPTION

.1   Refer to control schematics, sequences of operation and related Divisions of specifications for system architecture.

.2   Work covered by sections referred to above consists of fully operational EMCS, including, but not limited to, following:

     .1   Building Controllers.

     .2   Control devices as listed in I/O point summaries and/or shown on the control drawings.

     .3   OWS

     .4   Data communications equipment necessary to affect EMCS data transmission system.

     .5   Field control devices.

.6 Software/Hardware complete with full documentation.

.7 Complete operating and maintenance manuals.

.8 Training of personnel.

.9 Acceptance tests, technical support during commissioning, full documentation.

.10 Wiring interface co-ordination of equipment supplied by others.

.11 Miscellaneous work as specified in these sections and as indicated.

.3 Design Requirements:

.1 Design and provide conduit and wiring linking elements of system.

.2 Supply sufficient programmable controllers of types to meet project requirements. Quantity and points contents as reviewed prior to installation.

.3 Location of controllers as reviewed by Department Representative prior to installation.

.4 Provide utility and emergency power to EMCS.

.5 Metric references: in accordance with CAN/CSA Z234.1.

.4 Language Operating Requirements:

.1 Provide English interface to system through operator selectable access codes.

.2 Use non-linguistic symbols for displays on graphic terminals wherever possible. Other information to be in English.

.3 Operating system executive: provide primary hardware-to-software interface specified as part of hardware purchase with associated documentation to be in English.

.4 System manager software: include in English system definition point database, additions, deletions or modifications, control loop statements, use of high level programming languages, report generator utility and other OS utilities used for maintaining optimal operating efficiency.

.5 Include, in English:

.1 Input and output commands and messages from operator-initiated functions and field related changes and alarms as defined in CDL's or assigned limits (i.e. commands relating to day-to-day operating functions and not related to system modifications, additions, or logic re-definements).

.2 Graphic "display" functions, point commands to turn systems on or off, manually override automatic control of specified hardware points. To be in English at specified OWS. Point name expansions in English.

.3 Reporting function such as trend log, trend graphics, alarm report logs, energy report logs, maintenance generated logs.

.6 The network design to be a fully distributed network, with each primary system having its own locally mounted dedicated controller. Any failure in the network shall **not** in any way affect the control of these primary systems. Connecting hardware points from one system to more than one controller is not acceptable. Any points associated with a

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system are to be connected to one dedicated controller. Each dedicated controller to have a locally mounted control and display device to allow the operator to view and adjust any point on the controller.

.7 All wiring associated with the EMCS communication network as well as all control wiring and conduit associated with the EMCS at 50 volts or less. Wire and conduit above 50 volts by Electrical Division.

.8 BACnet compliance: full compliance to the BACnet standard (ANSA/ASHRAE) 135, BACnet – A Data communication Protocol for Building Automation and Control Networks is mandatory. Down to the field device level, the EMCS system must meet BACnet standards for system architecture and administration, and use open communication protocols and user friendly programming and graphics. Install the EMCS installed to communicate at the supervisory layer to the WAN using the BACnet TCP/IP protocol implemented on Ethernet.

.9 The EMCS system for this facility to be accessible by designated personnel via the WAN for monitoring and programming purposes. The EMCS contractor to provide all the required hardware, software, gateways, etc. needed to permit connection of the EMCS to the WAN. This shall include all hardware, software, programming, start-up and commissioning required. The contractor to supply and install all the required hardware and software on the WAN file server to allow for this remote operation monitoring and programming to take place. The contractor to supply and install all the required hardware and software on the operator workstation(s) located in the Owner's facilities management department. In addition, a remote dial in access directly to the system shall be provided.

1.7   SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures and 25 05 02 - EMCS: Submittals and Review Process.

.2 Submit for review:

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

.3 Quality Control:

    .1 Provide equipment and material from manufacturer's regular production, CSA certified, manufactured to standard quoted plus additional specified requirements.

    .2 Where CSA certified equipment is not available submit such equipment to inspection authorities for special inspection and approval before delivery to site.

    .3 Submit proof of compliance to specified standards with shop drawings and product data in accordance with Section 25 05 02 – EMCS: Submittals and Review Process. Label or listing of specified organization is acceptable evidence.

    .4 In lieu of such evidence, submit certificate from testing organization, approved by third party Engineer registered in Canada, certifying that item was tested in accordance with their test methods and that item conforms to their standard/code.

    .5 For materials whose compliance with organizational standards/codes/

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specifications is not regulated by organization using its own listing or label as proof of compliance, furnish certificate stating that material complies with applicable referenced standard or specification.

.6   Permits and fees: in accordance with general conditions of contract.

.7   Existing devices intended for re-use: submit test report.

1.8   QUALITY ASSURANCE

.1   Have local office for at least 5 years staffed by factory trained personnel capable of installing and providing instruction, routine maintenance and emergency service on systems.

.2   Provide record of successful previous installations submitting tender showing experience with similar installations utilizing computer-based systems.

.3   Have access to local supplies of essential parts and provide 7 year guarantee of availability of spare parts after obsolescence.

.4   Ensure factory qualified supervisory personnel continuously direct and monitor work and attend site meetings.

.5   Be able to provide factory trained personnel on site within 24 hours notice or provide instructions on maintenance and emergency service on system.

.6   BACnet devices to bear BACnet testing laboratories BTL mark and listed on BACnet manufacturers association web site.

1.9   DELIVERY, STORAGE AND HANDLING

.1   Material Delivery Schedule: provide Department Representative with "Materials Delivery Schedule" within 2 weeks after award of contract.

.2   Waste Management and Disposal:

     .1   Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

     .2   Remove from site and dispose of 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   Separate for reuse and recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan.

     .5   Place materials defined as hazardous or toxic in designated containers.

     .6   Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional, Municipal, and Provincial regulations.

     .7   Label location of salvaged material's storage areas and provide barriers and

security devices.

.8 Ensure emptied containers are sealed and stored safely.

.9 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative Owner's Representative.

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

PART 2 PRODUCTS

2.1 PRODUCTS SUPPLIED BY OWNER

.1 The following are a list of products that are supplied by the owner and shall be utilized in this contract:

Material Description	Qty
cp-ipc	1
cp-expio	4
536RV005 Full Perf Pad	1
536RVASY Full Panel	1
D21-P SCR	19
HTESPCGS002 Wall Module	17
RC840/u	15
TR100VA001 100va Transformer	2
TR21/u	3

2.2 ACCEPTABLE SYSTEMS, MANUFACTURERS

.1 Alerton, Delta, Automated Logic, Honeywell, Johnson Controls, Tridium/Distech, Trane.

.2 Proposed system to have communication capability utilizing BACnet Protocol.

.3 Panel to be NEMA rated to suit environmental requirements.

.4 Panels to have hinged doors equipped with standard keyed-alike cabinet locks, keyed to same key.

.5   Wiring within panels to be contained within properly sized rigid PVC slotted wall wire duct. All wiring within the wire duct to be concealed with a non-slip cover.

.6   Terminations for the connection of power wiring, communication wiring and field mounted devices to be at properly identified terminal blocks mounted within the control panel.

.7   All control panels to be provided with an internally mounted 120 volt duplex power receptacle.

.8   All control panels to be identified with permanently mounted Lamecoid tags to identify the control panel and the systems served by the control panel. Submit schedule of labels with shop drawing submission.

.9   Provide low voltage transformers in panels or elsewhere as required.

.10   Provide adaptors between metric and imperial components.

PART 3   EXECUTION

3.1   MANUFACTURER'S RECOMMENDATIONS

.1   Installation to be to manufacturer's recommendations. Provide printed copies of recommendations with shop drawings or product data.

3.2   PAINTING

.1   Painting to be in accordance with NEMA, supplemented as follows:

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

.3   Restore to new condition, finished surfaces which have been damaged too extensively to be primed and touched up to make good.

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

.5   Paint all unfinished equipment installed indoors to NEMA.

END OF SECTION