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## PART 1 - GENERAL

- 1.1 Related Sections
- .1 Section 01 00 10 - General Instructions.
  - .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 01 78 00 - Closeout Submittals.
  - .6 Section 01 91 13 - General Commissioning (Cx) Requirements.
  - .7 Section 09 97 19 - Painting Exterior Metal Surfaces.
  - .8 Section 21 05 01 - Common Work Results - Mechanical.
- 1.2 References
- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
    - .1 ASHRAE STD 135-2008, BACnet - Data Communication Protocol for Building Automation and Control Network.
  - .2 Consumer Electronics Association (CEA).
    - .1 CEA-709.1-B-2002, Control Network Protocol Specification.
  - .3 Electrical and Electronic Manufacturers Association (EEMAC).
    - .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.
  - .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
    - .1 Material Safety Data Sheets (MSDS).
- 1.3 Acronyms and Abbreviations
- .1 Acronyms used in EMCS:
    - .1 AEL - Average Effectiveness Level.
    - .2 AI - Analog Input.
    - .3 AIT - Agreement on International Trade.
    - .4 AO - Analog Output.
    - .5 BACnet - Building Automation and Control Network.
    - .6 BAS Building Automation System or EMCS - Energy Monitoring and Control System.
    - .7 BC(s) - Building Controller(s).
    - .8 BECC - Building Environmental Control Center.
    - .9 CAD - Computer Aided Design.
    - .10 CDL - Control Description Logic.
    - .11 CDS - Control Design Schematic.
    - .12 COSV - Change of State or Value.
    - .13 CPU - Central Processing Unit.
    - .14 DI - Digital Input.
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- 1.3 Acronyms and Abbreviations (Cont'd) .1 (Cont'd)
- .15 DO - Digital Output.
  - .16 DP - Differential Pressure.
  - .17 ECU - Equipment Control Unit.
  - .18 EMCS - Energy Monitoring and Control System or BAS Building Automation System .
  - .19 HVAC - Heating, Ventilation, Air Conditioning.
  - .20 IDE - Interface Device Equipment.
  - .21 I/O - Input/Output.
  - .22 ISA - Industry Standard Architecture.
  - .23 LAN - Local Area Network.
  - .24 LCU - Local Control Unit.
  - .25 MCU - Master Control Unit.
  - .26 NAFTA - North American Free Trade Agreement.
  - .27 NC - Normally Closed.
  - .28 NO - Normally Open.
  - .29 OS - Operating System.
  - .30 O&M - Operation and Maintenance.
  - .31 OWS - Operator Work Station.
  - .32 PC - Personal Computer.
  - .33 PCI - Peripheral Control Interface.
  - .34 PCMCIA - Personal Computer Micro-Card Interface Adapter.
  - .35 PID - Proportional, Integral and Derivative.
  - .36 RAM - Random Access Memory.
  - .37 SP - Static Pressure.
  - .38 ROM - Read Only Memory.
  - .39 TCU - Terminal Control Unit.
  - .40 USB - Universal Serial Bus.
  - .41 UPS - Uninterruptible Power Supply.
- 1.4 Definitions .1 Point: may be logical or physical.
- .2 Point Name: composed of two parts, point identifier and point expansion.
- .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.
- 1.5 Submittals .1 Eight copies of shop drawings of the entire control system shall be submitted and shall consist of a complete list of equipment and materials. Shop drawings shall also contain complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will properly function as a system.
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- 1.5 Submittals  
(Cont'd)
- .2 Submittal shall also include a complete point list of all connected points to the DDC system.
  - .3 Upon completion of the work, provide a complete set of `as-built' drawings.

## PART 2 - PRODUCTS

- 2.1 System  
Description
- .1 All Controls work will utilize the existing Building Automation System (BAS)
    - .1 There is an existing Siemens control system installed at L'Esplanade Laurier. All materials must be selected to ensure full compatibility with the existing Siemens control system.
    - .2 Hire and pay all cost for the services of Siemens Building Technologies to complete the work of all EMCS sections.
- 2.2 Operator Work  
Station OWS
- .1 Re-use existing.
    - .1 OWS Control Software
      - .1 Re-use existing. Modify graphics to accomodate new equipment and devices.
- 2.3 Building  
Controllers
- .1 General: Existing Building Controllers to be re-used. They shall combine both network routing functions and control functions into a single unit. BC's shall route communications between the BACnet/IP network, the BACnet 8802.3 network, BACnet PTP network and the BACnet MS/TP network. The BC shall be responsible for monitoring and controlling directly connected HVAC equipment such as large AHU's, Chillers or Boilers.
    - .1 See drawings for points modification in existing BC's.
  - .2 Provide BACnet MS/TP communication control panel to communicate BACnet to 3rd party controller but we will have to add a software option to the front end operator workstation.
- 2.4 Field Control  
Devices
- .1 Control Valves
    - .1 2-way Normally Closed Automatic high pressure close-off control valve suitable for year round outdoor services.
    - .2 Body: Butterfly Valves (on-off flow characteristic) or Globe(for modulating ). Castiron ASTM eA126 Class B.
    - .3 Flow characteristic:
      - .1 For flow control to Cooling Towers: on-off
      - .2 For other control modulating equal percentage.
    - .4 Leakage rate: Class IV, as per Standard ANSI FCI 70-2.
    - .5 Trim Stainless Steel
    - .6 Stem Stainless steel ASTM A582 Type 303
    - .7 Stem Travel: 20 mm (for valves up to 75mm dia )and 40 mm stroke (valves 100mm dia and up)
    - .8 Seat Metal-to-metal
    - .9 Packing: EPDM O-ring
    - .10 Close-off Ratings According to ANSI/FCI 70 -2

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- 2.4 Field Control Devices  
(Cont'd)
- .1 (Cont'd)
    - .11 Controlled Medium Water.
    - .12 Medium Temperature: -7°C to 120°C
    - .13 Maximum Recommended Differential Pressure for Service 345 kPa.
    - .14 50mm dia and under:
      - .1 Screwed National Pipe Thread (NPT) tapered female connections.
      - .2 Valves to ANSI Class 150, valves to bear ANSI mark.
      - .3 Rangeability 100:1 minimum.
    - .15 50mm dia and larger:
      - .1 Flanged connections.
      - .2 Valves to ANSI Class 125 as indicated, valves to bear ANSI mark.
      - .3 Rangeability 100:1 minimum.
  - .2 Electric Valves Actuators.
    - .1 Direct coupled, compatible with control valves in liquid service applications.
    - .2 Requirements:
      - .1 Construction: steel, cast iron, aluminum.
      - .2 Suitable for year round outdoor services.
    - .3 Control signal: 0-10V DC or 4-20 mA DC.
    - .4 Positioning time: to suit application. 90 sec maximum.
    - .5 Fail to normal position as indicated.
    - .6 Scale or dial indication of actual control valve position.
    - .7 Size actuator to meet requirements and performance of control valve specifications.
  - .3 All components
    - .1 Reuse and modify to suit application.
- 2.5 Controls Components  
Identification
- .1 Division 25 to follow requirements and procedures for identification of devices, sensors, wiring tubing, conduit and equipment, for building Energy Monitoring and Control System (EMCS) currently used in the Building. Nameplates materials, colours and lettering sizes to match existing or as per Section 23 05 54 - Mechanical Identification.

### PART 3 - EXECUTION

- 3.1 Installation Requirements
- .1 Provide necessary power as required from local 120 V emergency power branch circuit panels for OWS's and peripheral equipment.
  - .2 Complete all low voltage wiring.
  - .3 All EMCS components to be powered from emergency power. New EMCS controllers to be provided with 'UPS'.
  - .4 Hand over control valves to Division 23 for installation. Supervise and coordinate installation with requirements of this Division.
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- 3.2 Equipment .1 Control Network Protocol and Data Communication Protocol: to CEA 709.1 and ASHRAE STD 135.
- .2 Complete list of equipment and materials to be used on project and forming part of tender documents by adding manufacturer's name, model number and details of materials, and submit for approval.
- 3.3 Adapters .1 Provide adapters between metric and imperial components.
- 3.4 Manufacturer's Recommendations .1 Installation: to manufacturer's recommendations.
- 3.5 Controls Components Identification .1 On existing Panels, correct existing nameplates and legends to reflect changes made during Work.
- .2 Ensure that manufacturer's nameplates, CSA labels and identification nameplates are visible and legible at all times.
- 3.6 Painting .1 Painting: in accordance with Section 09 97 19 - Painting Exterior Metal Surfaces, supplemented 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.
- 3.7 Sequence of Operations .1 Chillers:
- .1 The chiller and circulating pumps controls sequence shall be started via command according to existing time and temperature schedule at the EMCS
- .2 Chiller Condenser Water Pumps to operate continuously when their associated chiller is running. Pumps provide constant flow through the chiller condenser according to the manufacturer's flow recommendations.
- .1 Run, switch-over, status, alarms are controlled and monitored by EMCS.
- .2 Cooling Tower:
- .1 EMCS will integrate to Stand Alone Control System Package provided as integral part of Cooling Towers via BACnet MS/TP, one (1) controller per tower linked with a master control panel.
- .1 Cooling Tower leaving water Condensing Cooling Water Temperature to (CCWT) be measured by temperature sensors. Separate sensors for CCWT measurement at EMCS (by Siemens)
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3.7 Sequence of  
Operations  
(Cont'd)

- .2 Cooling Tower:(Cont'd)
- .1 (Cont'd)
- .1 (Cont'd)  
and connected directly to stand alone cooling tower control panel (by Tower manufacturer).
- .2 When first condensing circulator pump serving the chillers is running the first set of inlet and outlet water motorized valve shall open. When valve position is proven cooling tower shall be energized.
- .3 Upon requirements to increase the flow and starting second or third condensing chiller circulating pumps, second set of valves shall open to allow water flow. When valve position is proven second cooling tower shall be energized.
- .4 The Cooling Tower during the normal cooling season rejects heat from the chillers and returns as cool of water as can be efficiently achieved to the chiller's condenser. A reset schedule is used: ECDWT setpoint equals the outside air wet bulb temperature plus 5 degrees, but not lower than 18C or higher than 28C. All setpoints adjustable.
- .5 The Cooling Tower shall try and maintain the ECDWT setpoint temperature by controlling VFD for speed of the Cooling Tower fans.
- .6 The cooling towers shall operate in alternating lead/lag arrangement.
- .2 Immersion Basin Heater:
- .1 For two Cooling Towers dedicated for winter operation the factory supply Control Panel shall control heater operation.
- .2 The heaters will be physically locked out during non-winter seasons.
- .3 EMCS to control a N.O. cutout relay in each heater to disable the heater based on season; this relay will operate independently of the factory supplied control panel heater operation as an additional safety.
- .4 EMCS to monitor heater status at all times via current sensing relay.
- .3 Chemical Treatment System :
- .1 EMCS shall monitor the following.
- .1 System Status
- .2 Alarms.
- .2 EMCS shall monitor the following
- .1 Status of filter pump.
- .2 Status of solenoid valve for back wash mode.
- .3 Alarms.
- .4 Auto-Dump System:
- .1 EMCS shall control motorized valves on make-up water, chemical treatment and filtering lines in case of power loss.
- .1 Upon power loss NC valves on the piping located indoor shall close.
- .2 Upon power loss NO valves on the piping located outdoor shall open.
- .3 Additional 2 position non-spring return control valves will be installed in series at each auto-dump valve position for non-winter seasonal use; this prevents having NO & NC valves from being continuously powered against their normal position during non-winter operation. NO & NC auto-dump valves will be powered against their normal position during winter operation only as determined by the EMCS.

3.7 Sequence of  
Operations  
(Cont'd)

- .4 Auto-Dump System:(Cont'd)
  - .1 (Cont'd)
    - .4 Auto-dump valves will be operated based on ambient temperature and length of power loss as sensed by the EMCS.
    - .5 Alarm signal shall be recorded.
  - .5 Make-up Water System:
    - .1 EMCS shall control modulating motorized valves on make-up water supply.
      - .1 When water level on any one of the cluster of towers as sensed by new ultrasonic level sensors, one (1) sensor per tower, sense drop below required water level (adjustable), new modulating ball valves on the piping located indoor shall open. When cluster of towers is isolated for maintenance or seasonal shut down, make up water valves shall remain closed and locked out.
      - .2 Status signal shall be recorded.

3.8 Points List

- .1 See table next page:

