SOCIÉTÉ DU MUSÉE CANADIEN DES CIVILISATIONS
CANADIAN MUSEUM OF CIVILIZATION CORPORATION

6 novembre 2013/ November 6, 2013

Document no. : **CMCC-2124**

ADDENDUM NO. 3

AIR CONDITIONING CONDENSERS FOR INFOCOM

Note : The closing date has changed from November 8 to **November 15, 2013 at 2:00 P.M.**, please use the revised Presentation page attached.

Questions and Answers:

1.- The supplier's operations and maintenance manuals are available only in english and not available in French
R.- Noted

2.-Control system : There is no control system is this project
R.- Refer to addendum attached.

3.- There is no automation system intergrated as part of the drawing, the specifications and the units currently in place.
R.- Refer to addendum attached.

4.- There is no automation system intergrated as part of the drawing, the specifications and the units currently in place. According to the equipement's manifacturer of the equipment already in place, there is no intergrated system to execute the action required
R.- Refer to addendum attached.

5.- Would it be possible to validate the thickness of the concrete pad. According to detail 3/M101, it seem to show a mistake in thickness when looking at the 100 mm grass thickness.
R.-The concrete pad is removed from the contract.

6.- Can you please confirm if the walls that the piping passes through above the hallway - are these solid walls or block?
R.- Concrete block walls

7.- Can you please confirm the height of the required enclosure fence around the new transformer
R.- Install the fence at a height of 1500mm.

8.- What is going to start and stop this system?

R.- Refer to addendum attached.

9.- Is there a building Automation system to control this?

R.- The control design has changed from its original intent, refer to addendum attached.

10.- Is there a control drawing?

R.- Refer to addendum attached.

11.- Also I checked with the various suppliers the heated receivers are not insulated they should be. Will we need to insulate them in the field?

R.- The heated receivers should be heated, refer to the addendum attached.

12.- There is a concern that the height of the condensers may be below the indoor unit. No elevation detail was provided on drawings. I have spoken to APC who reiterates the importance of the condenser being above the indoor unit. With the ACRD500 units having a top discharge which only adds to the height variance and not sure if the elevated floor in the server makes the height variance even greater . I am looking for Engineer to provide feedback & recommendations to verify the elevation variance. This should be part of your engineers services

R.- Refer to addendum attached.

13.- The pad detail shows a pad thickness of a little more than 7'. But it also stated a slab thickness of 4"?? Drwg. Seems flawed. Dimensional data on housekeeping pad detail is contradictory. Confirm dimensions on the concrete pad detail, the centre of the slap is shown to be 225mm thick. Is the 2160 bevel necessary around the outer edge of the pad, if so, how thick is it to be, no measurements are shown.

R.- The concrete pad is removed from the contract; refer to addendum attached.

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14.- The concrete pad is shown rather far out from the building on drawing E300, at the job showing it was indicated that it would be located closer to the building. Where it is shown on the drawing, there may be issues with the existing trees, as well as there is a substantial grade decline next to the stairs

R.- The concrete pad is removed from the contract; refer to addendum attached.

15.- The Spec (23 23 00, 3.6.2)sates the ambient temperature must be at least 13 degrees Celsius for at least 12 hours before and during dehydration. With lead time for equipment, I see an issue with adhering to the specifications and properly starting up this equipment and still be complete by Feb.

R.- Testing of the new condenser is required for both winter and summer operations. Contractor to plan accordingly.

16.- Spec say after hours coring, drilling for anchors etc.. During the job showing it was expressed multiple times that the only after hours work requirement is for the electrical tie in. All other work has been priced for daytime work. Only after-hours work for the installation of the new breaker in the existing CDP panel has been allocated. Please confirm, all work can be done during the day

R.- This job can be accomplished during regular hours.

17.- Require spec on the interior fencing around the new electrical equipment and condensers.

R.- Refer to addendum attached.

18.- The firestopping spec is rather extensive, are we required to employ a subcontractor for this, we would typically use approved firestop and install ourselves?

R.- Contractor is responsible for appropriate fire stopping. Hire as appropriate.

19.- Spec calls for air balancing but since we had no involvement with the installation of the ACRD500's and the fact that they have been running for approx.. 1 year, I question why this would be done twice?

R.- Air balancing not required.

20.-The warranty spec (23 81 23, 1.5) states the following: For computer room air conditioning 12 months warranty period is extended to 60 months. Is this 5 years parts only, 5 years compressor part only, or 5 years parts and labour. Please clarify because the warranty from APC is over $20000 and that is just for the 2 year extended parts and labour warranty!. Standard APC warranty is 3 year but APC rep is aware of this job and under the impression that this warranty is what you want.

R.- Warranty will be a 5 years compressor parts only

PAGE DE PRÉSENTATION DU CONCOURS REVISÉE
REVISED PRESENTATION PAGE

Société du Musée canadien
des civilisations

100, rue Laurier
Gatineau (Québec)
K1A 0M8

Canadian Museum of Civilization
Corporation

100 Laurier Street
Gatineau, Quebec
K1A 0M8

_____
Nom de la compagnie/Company Name

Toutes les soumissions doivent porter la date et l'heure à laquelle elles ont été livrées et doivent être acheminées à la boîte à soumissions située au **quai d'expédition/réception de l'édifice de l'administration du Musée canadien des civilisations (porte N-4 accessible par le Parc Jacques-Cartier)**, 100, rue Laurier, Gatineau (Québec), Canada.

All bids are to be delivered and stamped with the date and time of remittance at the bid box located at the **Shipping/Receiving of the Administration Building at the Canadian Museum of Civilization (door N-4 accessed from Jacques-Cartier Park)**, located at 100 Laurier Street, Gatineau, Quebec, Canada.

PROJET NO. CMCC-2124 : AIR CONDITIONING CONDENSERS FOR INFOCOM

PROJECT NO. CMCC-2124 : CONDENSEURS D'AIR CLIMATISE POUR INFOCOM

CLOSING DATE AND TIME: NOVEMBER 15, 2013 AT 2:00 P.M.
DATE ET HEURE DE FERMETURE : LE 15 NOVEMBRE, 2013 À 14:00HRS

Paulo Muleiro
Section des contrats/ Contract Section
Services financiers et administratifs/ Financial & Administrative Services

PAGE D'IDENTIFICATION - IDENTIFICATION PAGE

S.V.P. joindre à votre enveloppe/paquet –
Please affix to your envelope/package

ADDENDUM NO. M1

Project : MCC InfoCOM HACS Air Cooled Cooling System

Description : Additional controls and miscellaneous

Project no. : 7013-004

Division : Mechanical

Prepared By : J. Faubert/L. Pellerin Date : 01-11-2013

1. This addendum is part of the original drawings and specifications and forms part of the contractual documents. Bidders should ensure that the cost of this addendum is included in the bid amount.

2. Documents :

   2.1 Included documents :

      2.1.1 Specifications :

      - Table of Contents;
      - Division 25 (total of 7 sections);
      - Section 32 31 13;
      - Section 23 81 23 Page 3

      2.1.2 Drawings nos. :

      - M101
      - M301
      - M601

3. Description of work:

   3.1 Refer to attached revised table of contents.

   3.2 Refer to drawing M601 and specifications of Division 25 (total of 7 sections). Controls are added for the management and supervision of the HACS units from the existing EMCS.

   3.3 Specification 32 31 13 is added to the design documents for additional information on the required fencing.

   3.4 Design parameters of the condensing unit have been revised. Refer to page 3 of section 23 81 23 for details.

3.5 Delete detail 3-M101. The concrete slab for the condensers is no longer part of the contract. The client will have the concrete pad installed prior to the start of construction.

3.6 Refer to drawing M301 for revised notes and control panel location.

PROJECT : CMCC-12-021: INFOCOM HACS AIR-COOLED COOLING SYSTEM

MECHANICAL

TABLE OF CONTENTS

END OF SECTION

.3 Condensing unit characteristics:

.1 Ambient temp: 35 degrees Celsius.

.2 Air quantity: 4955 L/s or more, 1 single fan.

.3 Sound pressure at 3m: 67db

.4 Capacity: 64.5kW

.5 Connection sizes: NPS 1-3/8.

.6 Voltage: 208-240V, 1ph, 60 Hz.

.7 Supply unit with heated receiver and pressure control valve

.8 Heated receiver: 100W.

.9 Condenser must be compatible and communicate with the existing HACS indoor unit.

.10 Unit to be supplied with factory mounted adjustable legs for elevating unit up to 800mm. Condenser unit to be installed above HACS unit.

2.3 REFRIGERANT PIPING, VALVES, FITTINGS AND ACCESSORIES WITHIN UNIT

.1 To CSA B52.

.2 Include for each refrigerant circuit:

.1 Thermal expansion valve, external equalizing type.

.2 Combination filter-dryer.

.3 Solenoid valves.

.4 Liquid sight glass with moisture indicator.

.5 Suction line insulation: flexible elastomeric unicellar to ASTM C547, 12 mm minimum thickness.

.6 Liquid refrigerant receiver.

2.4 REFRIGERANT CHARGE

.1 Charge refrigerant system at factory, seal and test.

.2 Holding charge of refrigerant applied at factory.

.3 Provide additional refrigerant required for site installation.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for air conditioning components installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Engineer.

.2 Inform Engineer of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Engineer.

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 00 10 – General Instructions.

.2 Section 01 91 13 - General Commissioning (Cx) Requirements.

.3 Section 01 79 00 - Demonstration and Training.

.4 Section 25 05 01 - EMCS: General Requirements.

1.2 DEFINITIONS

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

.2 AEL: ratio between total test period less any system downtime accumulated within that period and test period.

.3 Downtime: results whenever EMCS is unable to fulfill required functions due to malfunction of equipment defined under responsibility of EMCS contractor. Downtime is measured by duration, in time, between time that Contractor is notified of failure and time system is restored to proper operating condition. Downtime not to include following:

.1 Outage of main power supply in excess of back-up power sources provided that:

.1 Automatic initiation of back-up was accomplished.

.2 Automatic shut-down and re-start of components was as specified.

.2 Failure of communications link provided that:

.1 Controller automatically and correctly operated in stand-alone mode.

.2 Failure was not due to failure of any specified EMCS equipment.

.3 Functional failure resulting from individual sensor inputs or output devices provided that:

.1 System recorded said fault.

.2 Equipment defaulted to fail-safe mode.

.3 AEL of total of all input sensors and output devices is at least 99% during test period.

1.3 DESIGN REQUIREMENTS

.1 Confirm with Departmental Representative that Design Criteria and Design Intents are still applicable.

.2 Commissioning personnel to be fully aware of and qualified to interpret Design Criteria and Design Intents.

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 00 10 – General Instructions.

.2 Final Report: submit report to Departmental Representative.

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

.2 Bear signature of commissioning technician and supervisor

.3 Report format to be approved by Departmental Representative before commissioning is started.

.4 Revise "as-built" documentation, commissioning reports to reflect changes, adjustments and modifications to EMCS as set during commissioning and submit to Departmental Representative in accordance with Section 01 00 10 – General Instructions.

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

1.5 CLOSEOUT SUBMITTALS

.1 Provide documentation, O&M Manuals, and training of O&M personnel for review of Departmental Representative before interim acceptance in accordance with Section 01 00 10 – General Instructions.

1.6 COMMISSIONING

.1 Do commissioning in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements.

.2 Carry out commissioning under direction of Departmental Representative and in presence of Departmental Representative.

.3 Inform, and obtain approval from, Departmental Representative 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.

.4 Correct deficiencies, re-test in presence of Departmental Representative until satisfactory performance is obtained.

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

.6 Load system with project software.

.7 Perform tests as required.

1.7 COMPLETION OF COMMISSIONING

.1 Commissioning to be considered as satisfactorily completed when objectives of commissioning have been achieved and reviewed by Departmental Representative.

Part 2 Products

2.1 EQUIPMENT

.1 Instrumentation accuracy tolerances: higher order of magnitude than equipment or system being tested.

.2 Independent testing laboratory to certify test equipment as accurate to within approved tolerances no more than 2 months prior to tests.

.3 Locations to be approved, readily accessible and readable.

.4 Application: to conform to normal industry standards.

Part 3 Execution

3.1 PROCEDURES

.1 Test each system independently and then in unison with other related systems.

.2 Commission integrated systems using procedures prescribed by Departmental Representative.

.3 Debug system software.

.4 Optimize operation and performance of systems by fine-tuning PID values and modifying CDLs as required.

3.2 FIELD QUALITY CONTROL

.1 Completion Testing.

.1 General: test after installation of each part of system and after completion of mechanical and electrical hook-ups, to verify correct installation and functioning.

.2 Include following activities:

.1 Test and calibrate field hardware including stand-alone capability of each controller.

.2 Verify each A-to-D convertor.

.3 Test and calibrate each AI using calibrated digital instruments.

.4 Test each DI to ensure proper settings and switching contacts.

.5 Test each DO to ensure proper operation and lag time.

.6 Test each AO to ensure proper operation of controlled devices. Verify tight closure and signals.

.7 Test operating software.

.8 Test application software and provide samples of logs and commands.

.9 Debug software.

.10 Provide point verification list in table format including point identifier, point identifier expansion, point type and address, low and high limits and engineering units. Include space on commissioning technician and Departmental Representative. This document will be used in final start-up testing.

.3 Final Start-up Testing: Upon satisfactory completion of tests, perform point-by-point test of entire system under direction of Departmental Representative and provide:

.1 Technical personnel capable of re-calibrating field hardware and modifying software.

.2 Detailed daily schedule showing items to be tested and personnel available.

.3 Departmental Representative's acceptance signature to be on executive and applications programs.

.4 Commissioning to commence during final start-up testing.

.5 O&M personnel to assist in commissioning procedures as part of training.

.6 Commissioning to be supervised by qualified supervisory personnel and Departmental Representative.

.7 Commission systems considered as life safety systems before affected parts of the facility are occupied.

.8 Operate systems as long as necessary to commission entire project.

.9 Monitor progress and keep detailed records of activities and results.

.4 Final Operational Testing: to demonstrate that EMCS functions in accordance with contract requirements.

.1 Prior to beginning of 30 day test demonstrate that operating parameters (setpoints, alarm limits, operating control software, sequences of operation, trends, graphics and CDL's) have been implemented to ensure proper operation and operator notification in event of off-normal operation.

.1 Repetitive alarm conditions to be resolved to minimize reporting of nuisance conditions.

.2 Test to last at least 30 consecutive 24 hour days.

.3 Tests to include:

.1 Demonstration of correct operation of monitored and controlled points.

.2 Operation and capabilities of sequences, reports, special control algorithms, diagnostics, software.

.4 System will be accepted when:

.1 EMCS equipment operates to meet overall performance requirements. Downtime as defined in this Section must not exceed allowable time calculated for this site.

.2 Requirements of Contract have been met.

.5 In event of failure to attain specified AEL during test period, extend test period on day-to-day basis until specified AEL is attained for test period.

.6 Correct defects when they occur and before resuming tests.

.5 Departmental Representative to verify reported results.

3.3 ADJUSTING

.1 Final adjusting: upon completion of commissioning as reviewed by Departmental Representative, set and lock devices in final position and permanently mark settings.

3.4 DEMONSTRATION

.1 Demonstrate to Departmental Representative operation of systems including sequence of operations in regular and emergency modes, under normal and emergency conditions, start-up, shut-down interlocks and lock-outs in accordance with Section 01 79 00 - Demonstration and Training.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 00 10 – General Instructions.

.2 Section 01 35 29.06 - Health and Safety Requirements.

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

.4 Section 25 05 54 - EMCS: Identification.

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

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 260.1-2004, 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-Z234.1-00 (R2006), Metric Practice Guide.

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 BC(s) - Building Controller(s).
.7 BECC - Building Environmental Control Center.
.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 NAFTA - North American Free Trade Agreement.
.26 NC - Normally Closed.
.27 NO - Normally Open.
.28 OS - Operating System.
.29 O&M - Operation and Maintenance.
.30 OWS - Operator Work Station.
.31 PC - Personal Computer.
.32 PCI - Peripheral Control Interface.
.33 PCMCIA - Personal Computer Micro-Card Interface Adapter.
.34 PID - Proportional, Integral and Derivative.
.35 RAM - Random Access Memory.
.36 SP - Static Pressure.
.37 ROM - Read Only Memory.
.38 TCU - Terminal Control Unit.
.39 USB - Universal Serial Bus.
.40 UPS - Uninterruptible Power Supply.
.41 VAV - Variable Air Volume.

1.4 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 with related equipment (stop, start) and valve 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.

.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 or 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 5.5.

.1 Printouts: to ANSI/IEEE 260.1.

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

1.5 SYSTEM DESCRIPTION

.1 Refer to control schematics for system architecture.

.2 Provide all labour, material, equipment and software that may or may not be specifically referred to herein or on the drawings, that are required to meet the functional intent of these specifications.

.3 Work covered by sections referred to above consists of modifications to the existing EMCS to monitor/manage the server room HACS (Hot Aisle Containment System) cooling units. Work includes , but is not limited to, the following:

.1 New Building Controllers to support I/O points and systems integration.

.2 Field control devices.

.3 Supply and installation of an Ethernet TCP/IP primary communication network and connection to the existing EMCS network.

.4 Supply and installation of Modbus RS-485 secondary communication network, as shown on Network Architecture diagram.

.5 Integration of four (4) HACS unit via Modbus including the supply and installation of communication interface necessary to effect data transmission.

.6 Complete electrical installation including conduits, cables, junction boxes, etc. required for control systems, automation and EMCS, as shown on drawings and described in these specifications, as well as all electrical connections required to motor control centers and starters, interlocks for fans, pumps or other controls.

.7 Programming and complete database required for DDC controls and the centralized management system, including programming of sequences of operation and graphics for new systems integrated.

.8 Software/Hardware complete with full documentation.

.9 Complete operating and maintenance manuals.

.10 Training of personnel.

.11 Start-up, testing, calibration and technical support during commissioning, full documentation.

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

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

.4 Design Requirements:

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

.2 Supply sufficient programmable controllers of types to meet project requirements. Location of controllers, quantity and points contents as reviewed by Departmental Representative prior to installation.

.3 New controllers, to match or exceed current EMCS controller quality and performance standards.

.4 New EMCS controllers must be compliant with existing EMCS architecture.

.5 Provide power to EMCS components from local UPS panel.

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

.5 Language Operating Requirements:

.1 Provide English or French operator selectable access codes.

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

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

.4 System manager software: include in English or French 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 and French:

.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 French and English at specified OWS and to be able to operate one terminal in English and second in French. Point name expansions in both languages.

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

1.6 SUBMITTALS

.1 Make submittals in accordance with Section 01 00 10 – General Instruction and Section 25 05 02 - EMCS: Submittal and Review Process.

.2 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: Submittal 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 Departmental Representative, 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/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 Submit certificate of acceptance from authority having jurisdiction to Departmental Representative.

1.7 QUALITY ASSURANCE

.1 Have trained personnel capable of providing instruction, routine maintenance and emergency service on systems,

.2 Ensure qualified supervisory personnel continuously direct and monitor Work and attend site meetings.

.3 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Departmental Representative with 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 00 10 – General Instructions.

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

.3 Separate for reuse and recycling and place in designated containers Metal, Plastic waste in accordance with Waste Management Plan.

1.9 EXISTING CONDITIONS - CONTROL COMPONENTS

.1 Submit written request for permission to disconnect controls and to obtain equipment downtime before proceeding with Work.

.2 Assume responsibility for controls to be incorporated into EMCS after written receipt of approval from Departmental Representative.

.1 Be responsible for repair costs due to negligence or abuse of equipment.

.2 Responsibility for existing devices terminates upon final acceptance of EMCS as approved by Departmental Representative.

1.10 ELECTRICAL INSTALLATION

.1 EMCS contractor is responsible for the hiring of a qualified and licensed Electrical contractor for the following work:

.1 Complete electrical installation including all conduits, cables, junction box, etc. required for EMCS and control systems.

.2 120V single phase power source for DDC controls, local control panels, cabinets and transformers provided by this section.

.3 Grounding of complete EMCS installation and associated controls

1.11 EXISTING EQUIPMENT INTEGRATION

.1 Existing HACS units are equipped with integrated controls and have the capability to be integrated to the EMCS through Modbus RS-485.

.2 Provide and install all additional hardware and software required to allow these third party controls systems to be integrated to the EMCS. All equipment and accessories must be compatible with the existing equipment manufacturer. Installation and programming must be done in accordance with manufacturer instructions.

.3 For each HACS unit, allow for the following number of points to be integrated. Points will need to be displayed on the EMCS graphics and may be used as part of the operating sequence in accordance with Section 25 90 01 - EMCS: Site Requirements, Applications and Systems Sequences of Operations.

.1 Each Chilled Water Unit (ACRC-100): (35) control points;

.2 Each DX Unit (ACRD-500): (45) control points;

.4 Coordinate the integration process directly with the unit’s manufacturer – Schneider APC and carry for their on-site assistance, for the Final Operational Testing and as required to conduct a successful integration.

1.12 DESIGNATED CONTRACTOR

.1 Hire the services of Regulvar or its authorized representative to complete the work related in all EMCS sections.

Part 2 Products

2.1 PRIMARY NETWORK

.1 The EMCS primary network will be provided in conformance with:

.1 IEEE Ethernet Standard 802.3

.2 ASHRAE BACnet Standard 135-2001, Annex J with support for Internet Protocol (IP) Addressing and common routers.

2.2 EQUIPMENT

.1 There is an existing DELTA CONTROLS V3 system presently installed in the building. All materials must be selected to ensure full compatibility with the existing DELTA CONTROLS V3 system.

2.3 ADAPTORS

.1 Provide adaptors between metric and imperial components.

Part 3 Execution

3.1 GENERAL

.1 All controls shall be installed and adjusted by specialized technicians, regularly employed by the manufacturer or its authorized distributor. All costs related to adjustments form part of this contract.

.2 All controls components must be easily accessible for maintenance.

.3 Install all field devices in control cabinets (“Unitized Cabinet” type).

3.2 MANUFACTURER'S RECOMMENDATIONS

.1 Installation: to manufacturer's recommendations.

3.3 ELECTRICAL INSTALLATION

.1 Complete installation in accordance with Section 26 05 00 - Common Work Results - Electrical.

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

.3 Provide grounding for the controls and EMCS installation in accordance with Division 26.

.4 Wiring :

.1 Wiring must be continuous without joints.

.2 All wiring for EMCS shall be run in EMT conduit unless specified otherwise.

.3 Maximum conduit fill not to exceed 50%.

.4 Do not run exposed conduits in normally occupied spaces unless otherwise indicated or unless impossible to do otherwise. Consultant to review before starting Work.

.5 Wiring in mechanical rooms, wiring in service rooms and exposed wiring must be in conduit.

.6 Wiring sizes:

.1 120 V: #12AWG minimum.

.2 24 V: #18AWG minimum.

.3 Power loss through conductor shall not exceed 5%.

3.4 PAINTING

.1 Painting:

.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.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 00 10 – General Instructions.

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

.3 Section 25 05 01 - EMCS: General Requirements.

1.2 DEFINITIONS

.1 Acronyms and definitions: refer to Section 25 05 01 - EMCS: General Requirements.

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 00 10 – General Instructions and coordinate with requirements in this Section.

.2 Shop Drawings to consist of 3 hard copies and 1 soft copy of design documents, shop drawings, product data and software.

.3 Hard copy to be completely indexed and coordinated package to assure compliance with contract requirements and arranged in same sequence as specification and cross-referenced to specification section and paragraph number.

.4 Soft copy to be in PDF format, structured using menu format for easy loading and retrieval on OWS.

1.4 DETAIL SHOP DRAWING REVIEW

.1 Submit detailed shop drawings within 15 working days after award of contract and before start of installation and include following:

.1 Specification sheets for each item. To include manufacturer's descriptive literature, manufacturer's installation recommendations, specifications, drawings, diagrams, performance and characteristic curves, catalogue cuts, manufacturer's name, trade name, catalogue or model number, nameplate data, size, layout, dimensions, capacity, other data to establish compliance.

.2 Detailed system architecture showing all points associated with each controller and where new EMCS ties into existing control equipment.

.3 Controller locations.

.4 Auxiliary control cabinet locations.

.5 Wiring diagrams.

.6 Interface wiring diagrams showing termination connections for equipment supplied by others.

.7 Detailed Points List.

.8 Detailed list of programmed alarm limits.

.9 Control schematics, narrative description, CDL's fully showing and describing automatic and manual procedure required to achieve proper operation of project, including under complete failure of EMCS.

.10 Sample of "Operating Instructions Manual" to be used for training purposes.

.11 Outline of proposed start-up and verification procedures. Refer to Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.

1.5 QUALITY ASSURANCE

.1 Preliminary Design Review Meeting: Convene meeting within 30 working days of award of contract to:

.1 Undertake functional review of preliminary design documents, resolve inconsistencies.

.2 Resolve conflicts between contract document requirements and actual items (e.g.: points list inconsistencies).

.3 Review interface requirements of materials supplied by others.

.4 Review "Sequence of Operations".

.2 Contractor's programmer to attend meeting.

.3 Departmental Representative retains right to revise sequence or subsequent CDL prior to software finalization without cost to Departmental Representative.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 00 10 – General Instructions.

.2 Section 25 05 01 - EMCS: General Requirements.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

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

1.3 DEFINITIONS

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

1.4 SYSTEM DESCRIPTION

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

1.5 SUBMITTALS

.1 Submittals in accordance with Section 01 00 10 – General Instructions supplemented and modified by requirements of this Section.

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

Part 2 Products

2.1 NAMEPLATES FOR PANELS

.1 Identify by Plastic laminate, 3 mm thick, black core, square corners, lettering accurately aligned and engraved into core.

.2 Sizes: 25 x 67 mm minimum.

.3 Lettering: minimum 7 mm high, black.

.4 Inscriptions: machine engraved to identify function.

2.2 NAMEPLATES FOR FIELD DEVICES

.1 Identify by plastic encased cards attached by plastic tie.

.2 Sizes: 50 x 100 mm minimum.

.3 Lettering: minimum 5 mm high produced from laser printer in black.

.4 Data to include: point name and point address.

.5 Companion cabinet: identify interior components using plastic enclosed cards with point name and point address.

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 EMCS panel.

2.4 CONDUIT

.1 Colour code EMCS conduit.

.2 Pre-paint box covers and conduit fittings.

.3 Coding: use fluorescent orange paint and confirm colour with Departmental Representative during "Preliminary Design Review".

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 OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

.2 Section 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process.

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

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

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

.2 Institute of Electrical and Electronics Engineers (IEEE).

.1 IEEE C37.90.1-02, Surge Withstand Capabilities (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus.

1.3 DEFINITIONS

.1 Acronyms and definitions: refer to Section 25 05 01 - EMCS: General Requirements.

1.4 SYSTEM DESCRIPTION

.1 General: Network of controllers to be provided as indicated in System Architecture Diagram to support building systems and associated sequence(s) of operations as detailed in these specifications.

.1 Provide sufficient controllers to meet intents and requirements of this section.

.2 Controller quantity, and point contents to be approved by Departmental Representative at time of preliminary design review.

.3 Performance and quality standards of new building controllers must match or exceed current building EMCS controller standards.

.4 New building controllers to be compliant with existing EMCS architecture.

.2 Controllers: stand-alone intelligent Control Units.

.1 Incorporate programmable microprocessor, non-volatile program memory, RAM, power supplies, as required to perform specified functions.

.2 Incorporate communication interface ports for communication to LANs to exchange information with other Controllers.

.3 Capable of interfacing with operator interface device.

.4 Execute its logic and control using primary inputs and outputs connected directly to its onboard input/output field terminations or slave devices, and without need to interact with other controller. Secondary input used for reset such as outdoor air temperature may be located in other Controller(s).

1.5 DESIGN REQUIREMENTS

.1 To include:

.1 Scanning of AI and DI connected inputs for detection of change of value and processing detection of alarm conditions.

.2 Perform On-Off digital control of connected points, including resulting required states generated through programmable logic output.

.3 Perform Analog control using programmable logic, (including PID) with adjustable dead bands and deviation alarms.

.4 Control of systems as described in sequence of operations.

.5 Execution of optimization routines as listed in this section.

.2 Failure of a Control Unit shall not affect the EMCS overall operation and shall only affect the data and functions associated with the system in question.

.3 Allow for a total space capacity of at least 20% of each point type distributed. Furthermore, allow for a minimum of 20% spare memory capacity in each Control Unit for future modifications to the EMCS.

.4 Field Termination and Interface Devices:

.1 To: CSA C22.2 No.205.

.2 Electronically interface sensors and control devices to processor unit.

.3 Include, but not be limited to, following:

.1 Programmed firmware or logic circuits to meet functional and technical requirements.

.2 Power supplies for operation of logics devices and associated field equipment.

.3 Lockable wall cabinet.

.4 Required communications equipment and wiring (if remote units).

.5 Leave controlled system in "fail-safe" mode in event of loss of communication with, or failure of, processor unit.

.6 Input Output interface to accept as minimum AI, AO, DI, DO functions as specified.

.7 Wiring terminations: use conveniently located screw type or spade lug terminals.

.4 AI interface equipment to:

.1 Convert analog signals to digital format with 10 bit analog-to-digital resolution.

.2 Provide for following input signal types and ranges:

.1 4 - 20 mA;

.2 0 - 10 V DC;

.3 100/1000 ohm RTD input;

.3 Meet IEEE C37.90.1 surge withstand capability.

.4 Have common mode signal rejection greater than 60 dB to 60 Hz.

.5 Where required, dropping resistors to be certified precision devices which complement accuracy of sensor and transmitter range specified.

.5 AO interface equipment:

.1 Convert digital data from controller processor to acceptable analog output signals using 8 bit digital-to-analog resolution.

.2 Provide for following output signal types and ranges:

.1 4 - 20 mA.

.2 0 - 10 V DC.

.3 Meet IEEE C37.90.1 surge withstand capability.

.6 DI interface equipment:

.1 Able to reliably detect contact change of sensed field contact and transmit condition to controller.

.2 Meet IEEE C37.90.1 surge withstand capability.

.3 Accept pulsed inputs up to 2 kHz.

.7 DO interface equipment:

.1 Respond to controller processor output, switch respective outputs. Each DO hardware to be capable of switching up to 0.5 amps at 24 V AC.

.2 Switch up to 5 amps at 220 V AC using optional interface relay.

.5 Controllers and associated hardware and software: operate in conditions of 0 degrees C to 44 degrees C and 20 % to 90 % non-condensing RH.

.6 Controllers: mount in wall mounted cabinet with hinged, keyed-alike locked door.

.1 Provide for conduit entrance from top, bottom or sides of panel.

.7 Cabinets to provide protection from water dripping from above, while allowing sufficient airflow to prevent internal overheating.

.8 Provide surge and low voltage protection for interconnecting wiring connections.

1.6 SUBMITTALS

.1 Make submittals in accordance with Section 01 00 10 – General Instructions and Section 25 05 02 - EMCS: Submittals and Review Process.

.1 Submit product data sheets for each product item proposed for this project.

1.7 MAINTENANCE PROCEDURES

.1 Provide manufacturers recommended maintenance procedures.

Part 2 Products

2.1 MASTER CONTROL UNIT (MCU)

.1 General:

.1 Primary function is to provide control functions and supervision of typical HVAC systems, hydronic systems and electrical systems.

.2 Installed in proximity of associated electro-mechanical system.

.3 Points integral to one Building System to be resident on only one controller.

.4 Fully programmable, microprocessor based, stand-alone controller for multi task operation and real-time digital control.

.5 Sufficient memory to ensure system's operation and store database including:

.1 Automation regulation processes.

.2 Energy Management applications.

.3 Points history.

.6 All set points, proportional bands, regulation algorithms and system's programmable parameters are memory-resident in the controller to avoid module re-programming after a power failure.

.2 Description:

.1 The Master Control Unit (MCU) provides regulation control in standalone mode or in network with other MCUs.

.2 Controller includes a power supply, a main module, plug-in electronic circuits for main module, a terminal strip for inputs/outputs connections. Inputs and outputs interface specification as described in this section. Provide for each controller, a connection point for a laptop computer.

.3 Includes a network control module supervising control execution and access on the primary Ethernet TCP/IP network. **Communication protocol** on the primary **Ethernet TCP/IP** network in accordance with the latest **ASHRAE – BACnet standard** (Annex J).

.4 Includes an RS-485 secondary communication port with interface for communication in accordance with the Modbus protocol.

.3 Include uninterruptible clock accurate to plus or minus 5 secs/month, capable of deriving year/month/day/hour/minute/second, with rechargeable batteries for minimum 72 hour operation in event of power failure.

.4 Minimum addressable memory to support at least performance and technical specifications to include but not limited to:

.1 Non-volatile EEPROM to contain operating system, executive, application, sub-routine, other configurations definition software. Tape media not acceptable.

.2 Battery backed (72 hour minimum capacity) RAM (to reduce the need to reload operating data in event of power failure) to contain CDLs, operating data or software that is required to be modifiable from operational standpoint such as schedules, set points, alarm limits, PID constants and CDL and hence modifiable

on-line through a remote operator's interface. RAM to be downline loadable from an OWS.

.5 Supports the connection of an operator's terminal for local command entry, instantaneous and historical data display, programs, additions and modifications.

.6 Provides real-time exchange of data with other controllers on the network architecture to achieve standalone control of complex electro-mechanical systems.

.7 **BTL Listed** as a BACnet-Building Controller (**B-BC**) device.

2.2 SOFTWARE

.1 General.

.1 Include as minimum: operating system executive, communications, application programs, operator interface, and systems sequence of operation - CDL's.

.2 Include "firmware" or instructions which are programmed into ROM, EPROM, EEPROM or other non-volatile memory.

.3 Include initial programming of Controllers, for entire system.

.2 Program and data storage.

.1 Store executive programs and site configuration data in ROM, EEPROM or other non-volatile memory.

.2 Maintain CDL and operating data including setpoints, operating constants, alarm limits in battery-backed RAM or EEPROM for display and modification by operator.

.3 Programming languages.

.1 Program Control Description Logic software (CDL) using English like or graphical, high level, general control language.

.2 Structure software in modular fashion to permit simple restructuring of program modules if future software additions or modifications are required. GO TO constructs not allowed unless approved by Departmental Representative.

.4 Pseudo or calculated points.

.1 Software to provide access to value or status in controller or other networked controller in order to define and calculate pseudo point. When current pseudo point value is derived, normal alarm checks must be performed or value used to totalize.

.2 Inputs and outputs for process: include data from controllers to permit development of network-wide control strategies. Processes also to permit operator to use results of one process as input to number of other processes (e.g. cascading).

.5 Control Description Logic (CDL):

.1 Capable of generating on-line project-specific CDLs which are software based, programmed into RAM or EEPROM and backed up to OWS. Owner must have access to these algorithms for modification or to be able to create new ones and to integrate these into CDLs on BC(s) from OWS.

.2 Write CDL in high level language that allows algorithms and interlocking programs to be written simply and clearly. Use parameters entered into system (e.g. setpoints) to determine operation of algorithm. Operator to be able to alter operating parameters on-line from OWS and BC(s) to tune control loops.

.3 Perform changes to CDL on-line.

.4 Control logic to have access to values or status of points available to controller including global or common values, allowing cascading or inter-locking control.

.5 Power Fail Restart: upon detection of power failure system to verify availability of Emergency Power as determined by emergency power transfer switches and analyze controlled equipment to determine its appropriate status under Emergency power conditions and start or stop equipment as defined by I/O Summary. Upon resumption of normal power as determined by emergency power transfer switches, MCU to analyze status of controlled equipment, compare with normal occupancy scheduling, turn equipment on or off as necessary to resume normal operation.

.6 Event and Alarm management: use management by exception concept for Alarm Reporting. This is system wide requirement. This approach will insure that only principal alarms are reported to OWS. Events which occur as direct result of primary event to be suppressed by system and only events which fail to occur to be reported. Such event sequence to be identified in I/O Summary and sequence of operation. Examples of above are, operational temperature alarms limits which are exceeded when main air handler is stopped, or General Fire condition shuts air handlers down, only Fire alarm status shall be reported. Exception is, when air handler which is supposed to stop or start fails to do so under event condition.

.7 Function/Event Totalization: features to provide predefined reports which show daily, weekly, and monthly accumulating totals and which include high rate (time stamped) and low rate (time stamped) and accumulation to date for month.

.1 MCUs to accumulate and store automatically run-time for binary input and output points.

.2 MCU to automatically count events (number of times pump is cycled off and on) daily, weekly or monthly basis.

.3 Totalization routine to have sampling resolution of 1 min or less for analog inputs.

.4 Totalization to provide calculations and storage of accumulations up to 99,999.9 units (eg. kWH, litres, tonnes, etc.).

.5 Store event totalization records with minimum of 9,999,999 events before reset.

.6 User to be able to define warning limit and generate user-specified messages when limit reached.

2.3 LEVELS OF ADDRESS

.1 Upon operator's request, EMCS to present status of any single 'point', 'system' or point group, entire 'area', or entire network on printer or OWS as selected by operator.

.1 Display analog values digitally to 1 place of decimals with negative sign as required.

.2 Update displayed analog values and status when new values received.

.3 Flag points in alarm by blinking, reverse video, different colour, bracketed or other means to differentiate from points not in alarm.

.4 Updates to be change-of-value (COV) -driven or if polled not exceeding 2 second intervals.

Part 3 Execution

3.1 LOCATION

.1 Location of Controllers to be approved by Departmental Representative.

3.2 INSTALLATION

.1 Install Controllers in secure locking enclosures as indicated or as directed by Departmental Representative.

.2 Provide UPS power from local 120 V branch circuit panel for equipment.

.3 Install tamper locks on breakers of circuit breaker panel.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 00 10 – General Instructions.

.2 Section 25 01 11 - EMCS: Start-Up, Verification and Commissioning.

.3 Section 25 05 01 - EMCS: General Requirements.

.4 Section 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process.

.5 Section 25 05 54 - EMCS: Identification.

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

1.2 REFERENCES

.1 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 - EMCS: General Requirements.

1.4 SUBMITTALS

.1 Submit shop drawings and manufacturer's installation instructions in accordance with Section 25 05 02 - EMCS: Submittals and Review Process.

.2 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 Operating conditions: 0 - 50 degrees C with 10 - 90% RH (non-condensing) unless otherwise specified.

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

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

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

2.2 TRANSFORMER (LOW VOLTAGE)

.1 Single phase transformer, enclosed type complete with fuse holder and fuse. Capacity in VA of each transformer must be at least 20% greater than the rated charge to be connected.

2.3 ELECTROMECHANICAL RELAYS - R

.1 Requirements:

.1 4PDT, plug-in type with termination base and LED status indicators.

.2 Coils: rated for 120V AC or 24V DC.

.3 Contacts: rated at 10 amps at 120 V AC.

.4 In applications where relay is subject to vibration, provide hold-on clips.

2.4 LOCAL CONTROL PANEL - LCP

.1 Unitized Cabinet type, 610 mm x 815 mm x 205 mm complete with key-lockable front door mounted on concealed hinges, easily removable to provide interior access. Installed on rigid support for mounting on wall, floor, ceiling or ductwork.

.2 Locate to provide a minimum clearance of 1000 mm (40") in front of panel.

.3 All controls equipment including relays, switches, fuses, terminal blocks, etc., to be installed inside the panel. Push buttons, pilot lights, selector switches, filter pressure indicators, etc., to be surface mounted on the panel's front door. All wiring shall be inside raceways of adequate size with 40% of free space.

.4 Control panel and all its associated equipment, field devices, wiring and pneumatic tubing must be identified in accordance with Section 25 05 54 – EMCS: Identification.

.5 Supply and install a manual switch inside the panel for the 120V power supply.

.6 Terminal blocks:

.1 All joints and connections inside the panel must be done on screw-type terminal blocks.

.2 Industrial grade modular type terminal blocks, DIN-rail mounted with vibration proof screw connections and color coded labelled terminals and voltage and current separators.

.3 Supply and install on the interior of the panel's front door, a detailed schematic drawing of the system's arrangement, including all wiring and devices identification. Schematic drawing to be sealed in a transparent plastic.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 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 Fire stopping: maintain fire rating integrity.

3.3 PANELS

.1 Arrange for conduit and tubing entry from top, 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.

3.4 IDENTIFICATION

.1 Identify field devices in accordance with Section 25 05 54 - EMCS: Identification.

3.5 TESTING AND COMMISSIONING

.1 Calibrate and test field devices for accuracy and performance in accordance with Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.

END OF SECTION

Part 1 General

1.1 PROGRAMMING

.1 Sequences, procedures and programs described in “Execution” part of the current section represent minimum operation criteria, omitting small details required for system fine tuning. The suppliers for the current section is responsible for programming and must, as an expert in the commissioning of this type of installation, provide all control stratagems, including delays, ramps, readjustments, locking, nesting loop, etc., in order to have a secure operation, simple and efficient systems.

.2 Any modification, addition or required refinements for systems stability or equipment protection by Departmental Representative will have to be executed at no charge.

1.2 CONFIGURATION AND CUSTOMIZATION

.1 System configuration and customization to be executed in collaboration with Departmental Representative in order to allow an easy transfer to operation team.

.2 Messages, descriptions, equipment key-words, etc., have to be submitted for approval. Control contractor must use the same symbols and identifications appearing on existing shop drawings.

.3 Choice of colors, disposition on screen, systems repartition, tree structure (level of intrusion) and graphic configuration is done in coordination with Departmental Representative.

.4 Making of reports, headers, presented information and its disposition, printing frequency and period, etc., are done in coordination with Departmental Representative.

1.3 CRITERIA

.1 Set point, parameters and constants:

1. All set points, rates and compensation limits are adjustable by the operator according to his access level.
2. In the same manner, all the parameters, constants, programmed delays are re-adjustable by the operator having the right access level.

.2 Analog alarms:

1. For each point of analog reading, program high and low-limit alarms.
2. These set points should be resetable and the alarms cancelled if required by the operator.

.3 Critical alarms:

1. When the status is available, program critical alarms for the following points:
   .1 Unauthorized on-off.
   .2 Fault (equipments).

.4 Maintenance alarms:

1. When the status is available, program maintenance alarms for the following points:
   - .1 System stopped.
   - .2 Running time.
   - .3 Filter status.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 SEQUENCES OF OPERATION – HACS

.1 NORMAL OPERATION:

- .1 The chilled water HACS units (AC-CHW-01, AC-CHW-02) are enabled. Units operate in accordance with their integrated controls to meet the HACS system cooling demand.
- .2 The DX HACS units (AC-DX-01, AC-DX-02) are disabled.
- .3 The outdoor condensers (CD-01, CD-02) are shut down.

.2 EMERGENCY SWITCHOVER TO DX SYSTEM:

.1 EMCS VERIFICATION:

The MCU communicates with the EMCS to verify chilled water availability. If one of the following events occurs, the MCU immediately starts the “DX SWICTHOVER SEQUENCE”:

- .1 Loss of power (Normal power status);
- .2 Loss of chiller plant (all chillers in shutdown);
- .3 Chilled water pumping system is not operational;

.2 LOCAL MONITORING:

Locally, the MCU communicates with the chilled water HACS unit at all times via Modbus and monitors equipment and unit faults. If one of the following events occurs, the MCU immediately starts the “DX SWICTHOVER SEQUENCE”:

- .1 Fluid temperature supply is above set point;
- .2 Fluid flow fault;
- .3 Cooling failure alarm;

.3 DX SWITCHOVER SEQUENCE:

.1 The MCU enables the DX HACS units. The units operate in accordance with their integrated controls to meet the HACS system cooling demand.

.2 Each outdoor condenser monitors the refrigerant pressure in their circuit via their integrated pressure sensor. When the refrigerant pressure changes (DX HACS unit in operation), the condenser operates in accordance with its internal controls to regulate the refrigerant pressure back to its DX HACS unit.

.3 The chilled water HACS unit are disabled:

.1 Immediately if the DX switchover sequence was triggered by chilled water unavailability (EMCS Verification);

.2 Immediately if the unit's supply air high temperature alarm is active;

.3 After a 2 minutes delay (adjustable) if the two previous conditions have not yet been triggered.

.3 SWITCHING BACK TO CHILLED-WATER SYSTEM:

.1 To switch back to the chilled water HACS units, the MCU verifies that all the following criteria are met:

.1 EMCS – Normal power active.

.2 EMCS – Chiller plant active (At least one chiller running);

.3 EMCS – Chilled water pumping system is active;

.4 EMCS – Chiller plant supply water temperature is at set point;

.5 HACS unit – Fluid temperature supply is at set point;

.2 Chilled Water Switchover Sequence:

.1 The MCU enables the chilled water HACS unit. Units operate in accordance with their integrated controls to meet the HACS system cooling demand.

.2 The MCU disables the DX HACS unit once the following conditions occur:

.1 Chilled water HACS units have been operational for a 5 minutes delay (adjustable);

.2 A cooling load has been established at the chilled water HACS units (UNIT COOL OUTPUT);

.3 The outdoor condenser stops automatically.

.4 PLANNED SWITCHOVER TO DX SYSTEM:

.1 The EMCS generates a planned DX switchover based on a weekly schedule. Before proceeding, the planned switchover sequence must be acknowledged by the operator. During a planned switchover, the system performs the following:

.1 Switch to DX units, as per "DX SWITCHOVER SEQUENCE".

.2 After a 30 minutes delay (adjustable), the system reverts back to the chilled water HACS units, as per the "Chilled Water Switchover Sequence".

.2 A button on the system's graphic allows the operator to switch between the DX and chilled water system manually.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM International

.1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A90/A90M-11, Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.

.3 ASTM A121-13, Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.

.4 ASTM A123/A123M-12, Standard Specification for Zinc (Hot Dip Galvanized) coatings on Iron and Steel Products.

.5 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-138.1-96, Fabric for Chain Link Fence.

.2 CAN/CGSB-138.2-96, Steel Framework for Chain Link Fence.

.3 CAN/CGSB-138.3-96, Installation of Chain Link Fence.

.4 CAN/CGSB-138.4-96, Gates for Chain Link Fence.

.5 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.3 CSA International

.1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CAN/CSA-A3000-08, Cementitious Materials Compendium.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for concrete mixes, fences, posts and gates and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect fence and gate materials from damage.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Concrete mixes and materials:

.1 Nominal coarse aggregate size: 20-5.

.2 Compressive strength: 20 MPa minimum at 28 days.

.3 Additives: fly ash to CSA A3000.

.2 Chain-link fence fabric: to CAN/CGSB-138.1.

.1 Heavy Grade – Gauge 10-12

.3 Posts, braces and rails: to CAN/CGSB-138.2, galvanized steel pipe. Dimensions for a 1800 mm high fence.

.4 Top and bottom tension wire: to CAN/CGSB-138.2, single strand, galvanized steel wire.

.5 Tie wire fasteners: aluminum wire, aluminum alloy wire.

.6 Tension bar: to ASTM A653/A653M, 3 x 20 mm minimum galvanized steel.

.7 Gates: to CAN/CGSB-138.4.

.8 Gate frames: to ASTM A53/A53M, galvanized steel pipe, standard weight 45 mm outside diameter pipe for outside frame, 35 mm outside diameter pipe for interior bracing.

.1 Fabricate gates as indicated with electrically welded joints, and hot-dip galvanized after welding. Fasten fence fabric to gate with twisted selvage at top.

.2 Furnish single gates with galvanized malleable iron hinges, latch and latch catch with provision for padlock which can be attached and operated from either side of installed gate.

.3 Furnish double gates with chain hook to hold gates open and centre rest with drop bolt for closed position.

.4 Gates must have hasps and staples for high security keyed padlocks, keyed differently.

.5 Furnish single gates with exterior panic set and hydraulic closers complete with galvanized steel plates as required to mount hardware.

.9 Fittings and hardware: to CAN/CGSB-138.2, galvanized steel.

.1 Tension bar bands: 3 x 20 mm minimum galvanized steel or 5 x 20 mm minimum aluminum.

.2 Post caps to provide waterproof fit, to fasten securely over posts and to carry top rail.

.3 Overhang tops to provide waterproof fit, to hold top rails and an outward projection to hold barbed wire overhang.

.4 Include projection with clips or recesses to hold 3 strands of barbed wire spaced 100 mm apart.

.5 Projection of approximately 300 mm long to project from fence at 45 degrees above horizontal.

.6 Turnbuckles to be drop forged.

.10 Grounding rod: 16 mm diameter copperwell rod, 3 m long.

2.2 FINISHES

.1 Galvanizing:

.1 For chain link fabric: to CAN/CGSB-138.1 Grade 2.

.2 For pipe: 550 g/m5minimum to ASTM A90.

.3 For other fittings: to ASTM A123/A123M.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for fence and gate installation in accordance with manufacturer's written instructions.

3.2 PREPARATION

.1 Temporary Erosion and Sedimentation Control:

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

.2 Grading:

.1 Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts.

.1 Provide clearance between bottom of fence and ground surface of 30 mm to 50 mm.

3.3 ERECTION OF FENCE

.1 Erect fence along lines as indicated or as directed by Engineer and to CAN/CGSB-138.3.

.2 Excavate post holes to the required depth or as directed by Engineer.

.3 Space line posts 3 m apart, measured parallel to ground surface.

.4 Install additional straining posts at sharp changes in grade and where directed by Engineer.

.5 Install corner post where change in alignment exceeds 10 degrees.

.6 Install end posts at end of fence and at buildings.

.1 Install gate posts on both sides of gate openings.

.7 Place concrete in post holes then embed posts into concrete to the required depth.

.1 Extend concrete 50 mm above ground level and slope to drain away from posts.

.2 Brace to hold posts in plumb position and true to alignment and elevation until concrete has set.

.8 Install fence fabric after concrete has cured, minimum of 5 days.

.9 Install brace between end and gate posts and nearest line post, placed in centre of panel and parallel to ground surface.

.1 Install braces on both sides of corner and straining posts in similar manner.

.10 Install overhang tops and caps.

.11 Install top rail between posts and fasten securely to posts and secure waterproof caps and overhang tops.

.12 Install bottom tension wire, stretch tightly and fasten securely to end, corner, gate and straining posts with turnbuckles and tension bar bands.

.13 Lay out fence fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 300 mm intervals.

.1 Knuckled selvedge at bottom.

.2 Twisted selvedge at top.

.14 Secure fabric to top rails, line posts and bottom tension wire with tie wires at 450 mm intervals.

.1 Give tie wires minimum two twists.

.15 Install barbed wire strands and clip securely to lugs of each projection.

.16 Install grounding rods as indicated.

.17 For interior installation, supply all appropriate fittings to fasten to concrete slab.

3.4 INSTALLATION OF GATES

.1 Install gates in locations as indicated or where directed by Engineer.

.2 Level ground between gate posts and set gate bottom approximately 40 mm above ground surface.

.3 Determine position of centre gate rest for double gate.

.1 Cast gate rest in concrete as directed.

.2 Dome concrete above ground level to shed water.

.4 Install gate stops as required.

3.5 TOUCH UP

.1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Pre-treat damaged surfaces according to manufacturers' instructions for zinc-rich paint.

3.6 CLEANING

.1 Progress Cleaning:

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

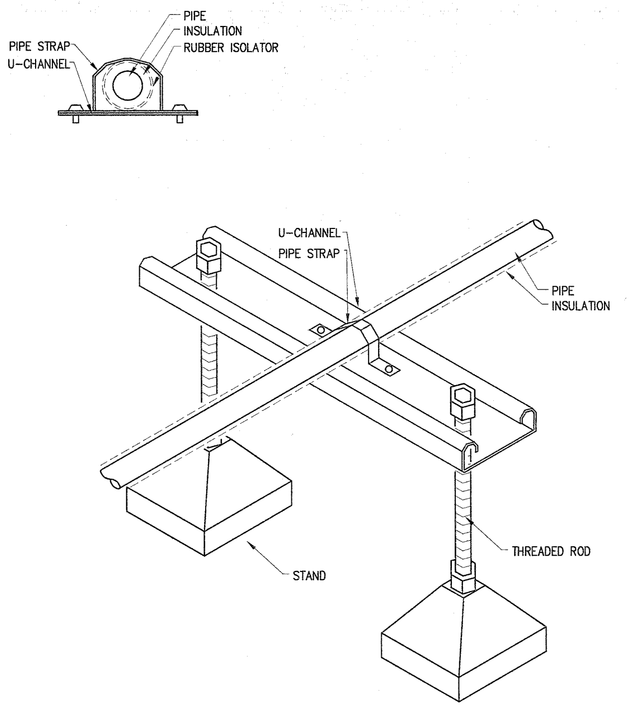
END OF SECTION

DRAWING LIST

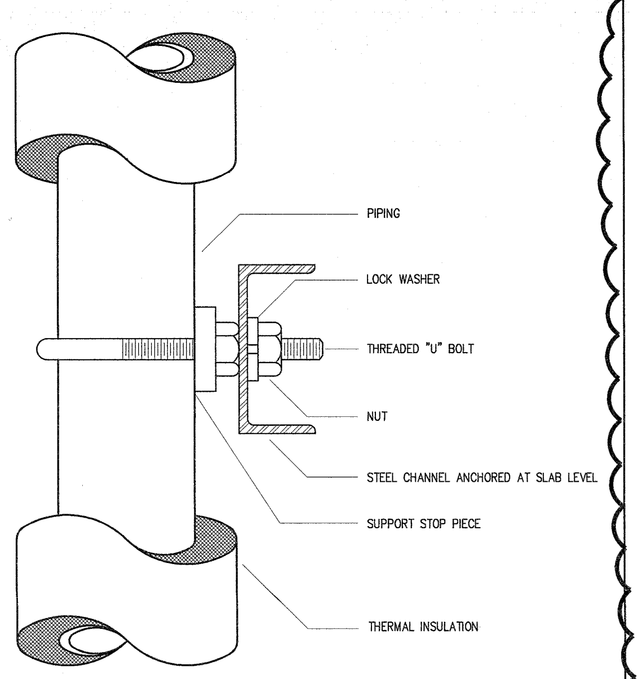
M101	DRAWING LIST, LEGEND, AND DETAILS
M301	MECHANICAL WORK – GROUND FLOOR
M601	CONTROLS

LEGEND

———	PIPE ABOVE SLAB
— —	PIPE BELOW SLAB
— SAN —	SANITARY DRAIN
— RFL —	REFRIGERANT LIQUID
— RFG —	REFRIGERANT GAS
— C —	CONDENSATE
	REVERSED "T"
EN UP	UPWARD
EB DW	DOWNWARD
FD	FLOOR DRAIN
OD	OPEN DRAIN
	UNION TYPE JOINT
	GATE VALVE (OPEN)
	FIXTURE SUPPLIED BY OTHERS



1 M101 PIPE AND CONDUIT FLOOR SUPPORTS
NTS



2 M101 SUPPORT FOR VERTICAL PIPING
NTS

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QUÉBEC
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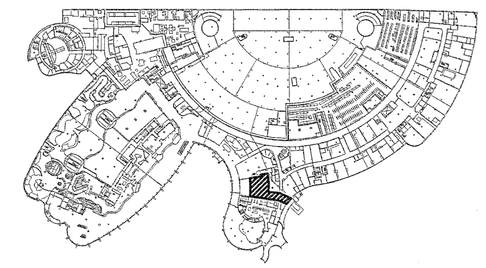
KEY PLAN



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Facility Management and Security Services

ARCHITECT

#	DATE	REVISION	BY	OIQ
1	01-11-2013	ISSUED FOR ADDENDUM M1	GM	143035
0	07-08-2013	ISSUED FOR TENDER	GA	143035

PROJECT
MCC INFOCOM HCAS
AIR COOLED COOLING SYSTEM

DRAWING TITLE
MECHANICAL
DRAWING LIST, LEGEND, AND DETAILS

DRAFTING	DESIGN	VERIFICATION
C.L.M.	J.F.	P.S.O.

BPA PROJECT NUMBER	DRAWING NUMBER
7013-004	M101
SCALE: NTS	

FILE:

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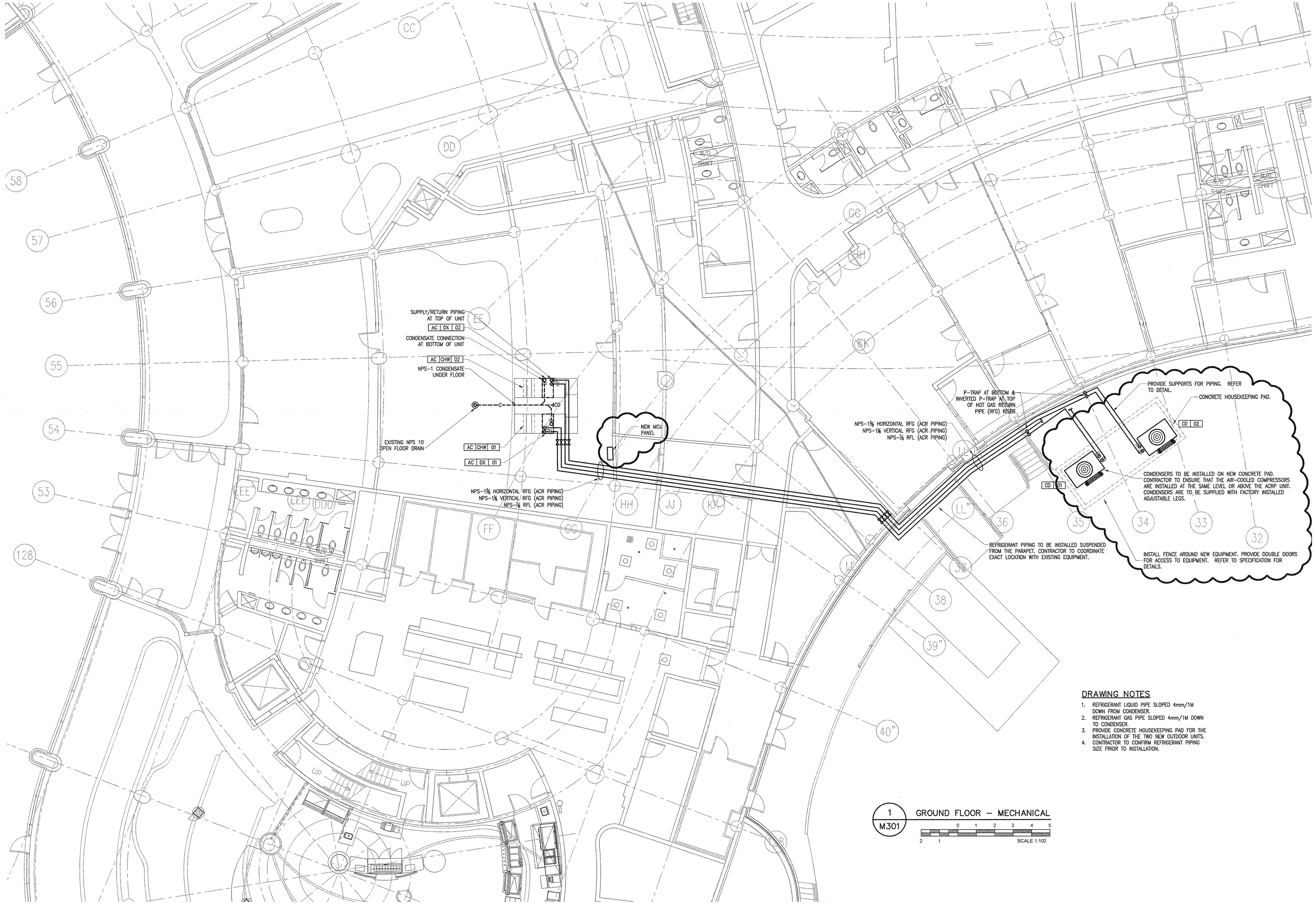

1 / M301 GROUND FLOOR – MECHANICAL

SCALE 1:100

DRAWING NOTES

1. REFRIGERANT LIQUID PIPE SLOPED 4mm/1M DOWN FROM CONDENSER.
2. REFRIGERANT GAS PIPE SLOPED 4mm/1M DOWN TO CONDENSER.
3. PROVIDE CONCRETE HOUSEKEEPING PAD FOR THE INSTALLATION OF THE TWO NEW OUTDOOR UNITS.
4. CONTRACTOR TO CONFIRM REFRIGERANT PIPING SIZE PRIOR TO INSTALLATION.

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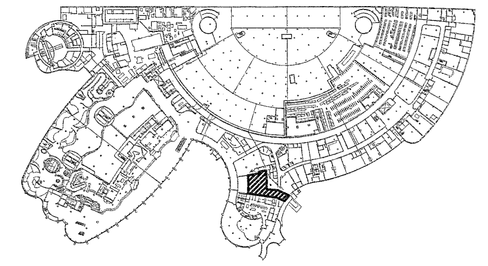
NOV-01-2013

KEY PLAN



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GROUND FLOOR

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C.L.M.	J.F.	P.S.O.

BPA PROJECT NUMBER	DRAWING NUMBER
7013-004	M301
SCALE	
1:100	

FILE:

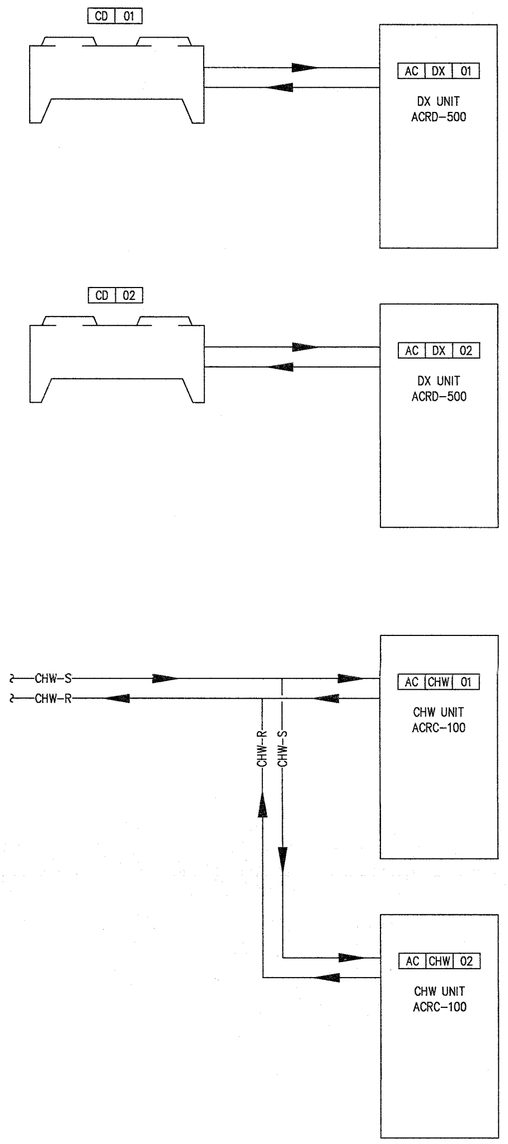
CONTROLS LEGEND

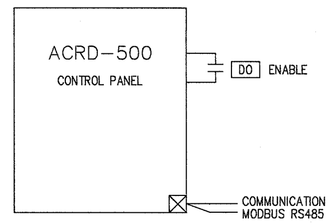
N.C.	NORMALLY CLOSE
N.O.	NORMALLY OPEN
CHW-S	CHILLED WATER – SUPPLY
CHW-R	CHILLED WATER – RETURN
MCU	MASTER CONTROLLER UNIT
COMM.	COMMUNICATION
	NORMALLY OPEN CONTACT
	NORMALLY CLOSED CONTACT
AI	CENTRALIZED POINT (INPUT OR OUTPUT)

AI ANALOG INPUT
AO ANALOG OUTPUT
DI DIGITAL INPUT
DO DIGITAL OUTPUT

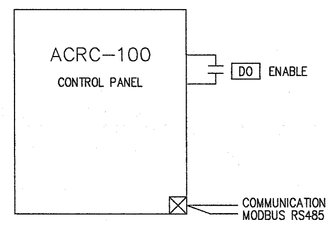
CONDENSER

HACS UNIT – CONTROL SCHEMATICS

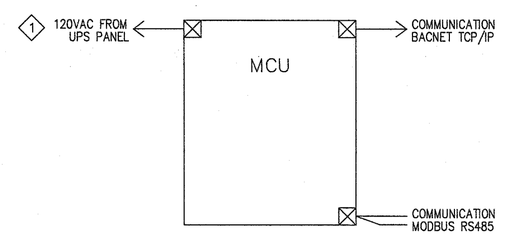




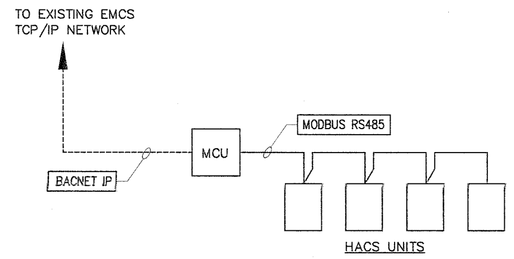
DX HACS UNIT – TYPICAL
AC-DX-01 & AC-DX-02



CHILLED WATER UNITS – TYPICAL
AC-CHW-01 & AC-CHW-02



NEW EMCS PANEL – HACS
LOCATED IN SERVER ROOM



NETWORK ARCHITECTURE

NOTES:

1. PROVIDE POWER TO NEW MASTER CONTROL UNIT (MCU) FROM EXISTING UPS DISTRIBUTION PANEL LOCATED NEAR THE PROPOSED MCU LOCATION.

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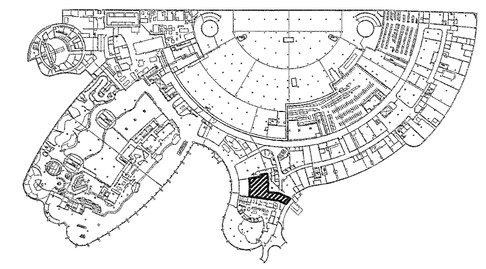
Nov-01-2013

KEY PLAN



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CONTROLS

DRAFTING	DESIGN	VERIFICATION
J.F.	L.P.	G.M.

BPA PROJECT NUMBER: 7013-004
SCALE: 1:100
DRAWING NUMBER: M601
FILE:

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