General

1.1 SECTION INCLUDES

.1 This Section covers items common to Sections of Electrical Contractor. This section supplements requirements of Division 00 – Procurement and Contracting Requirements, Division 01 – General Requirements, Division 02 – Existing Conditions.

.2 Provide complete and fully operational electrical systems with facilities and services to meet requirements described herein, as shown on the drawings, and in complete accord with applicable codes and ordinances.

.3 Only those items that are specifically indicated as not in contract (N.I.C.) will be omitted.

.4 Contract documents of Divisions 26, 27, and 28 are diagrammatic and approximately to scale, unless detailed otherwise. They establish scope, material and installation quality, and are not detailed installation instructions.

.5 Follow manufacturers' recommended installation details and procedures for equipment supplemented by details given herein and on plans subject to approval of the Consultant.

.6 Examine all drawings to ensure that work under this Division can be properly installed without interference.

.7 Where discrepancies, ambiguities, obvious omissions or errors have been made in drawings and specifications, it shall be the responsibility of the contractor to clarify same prior to tender closing. No allowance will be made after contract award for any expense incurred by him for having to adjust his work to properly conform.

1.2 REFERENCES

.1 The Electrical Contractor shall be bound by industry standards, as interpreted by the Consultant, whether or not specifically referenced in this document. Comply with Electrical Protection Act and rules and regulations made pursuant thereto, including the Canadian Electrical Code. Also, comply with applicable standards of the following:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

.3 CSA C22.1-2012, Canadian Electrical Code, Part 1.

.4 Electrical and Electronic Manufacturers Association of Canada (EEMAC).

.5 National Electrical Manufacturers Association (NEMA).

.6 National Building Code 2010 (NBC 2010)

.7 National Fire Protection Association (NFPA)

.8 Institute of Electrical and Electronic Engineers (IEEE).

.9 Audio Engineering Society (AES).

.10 Other Applicable CSA and UL approvals.

1.3 CODES AND STANDARDS

.1 The electrical installation shall comply with all SaskPower requirements and regulations.

.2 In the event of any inspection authority requesting deviation from the design, notify the Consultant and obtain approval before proceeding with any change.

.3 In no instance, shall the standard established by the drawings and specification be reduced by any code or ordinance. All references to codes and standards shall be to the latest edition.

1.4 CARE, OPERATION AND START-UP

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

.2 Connect to equipment furnished in other Divisions and by Owner including start-up and test.

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

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

1.5 VOLTAGE RATINGS

.1 Operating voltages: to CAN3-C235-83

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.6 PERMITS, FEES AND INSPECTION

.1 Submit to SaskPower necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Pay associated fees.

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

.4 Furnish Certificates of Acceptance from Electrical Inspection Department and authorities having jurisdiction on completion of work to Consultant.

1.7 MATERIALS AND EQUIPMENT

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

.2 All goods and materials shall be new and carry CSA approval seal. Equipment and material shall be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from the Consultant and the Electrical Inspection Department.

.3 All fire alarm equipment shall carry ULC approval seal.

.4 No deviation from specified materials shall be allowed, except where alternative materials have been specifically accepted in writing.

.5 Where materials are not directly specified by catalogue number and manufacturer's name, a high industry specification grade product shall be provided. The Consultant shall be the sole judge of whether this standard is being met.

.6 All references to known standard specifications shall mean and intend the latest edition of such specifications.

.7 Each major component of equipment shall have manufacturer's name, address, catalogue and serial number in a conspicuous place.

.8 Upon request, provide a complete list of all materials and their manufacture. The contractor will be required to use the materials indicated. Changes in manufactures at a future date will not be acceptable.

.9 Factory assemble panels and component assemblies.

1.8 WORKMANSHIP

.1 All work under this Division shall be executed in a workmanlike and substantial manner, neat in its mechanical appearance and arrangement.

.2 A competent representative shall constantly supervise the work of this Division from beginning to completion and final acceptance. So far as possible, the same supervisor and workmen shall be employed throughout the project's duration.

.3 Material and workmanship not meeting the standard intended and required by this specification shall, upon instruction from the Consultant, be properly replaced without further charge or consideration.

1.9 ELECTRICAL DRAWINGS

.1 They indicate the general location and route of conduit and cable to be installed. Conduit shall be installed in coordination with other services. These include both new and existing

services. Prior to excavation anywhere on site, arrange to have all existing services marked. Where space is indicated for future equipment or plant use, leave space clear.

.2 Install equipment generally in locations and routes shown, close to building structure with minimum interference with other services or free space. Remove and replace improperly installed equipment to the satisfaction of the Consultant at no extra cost.

.3 Ceiling and floor outlet symbols are scaled to centre line of symbol; symbol does not indicate the size or shape. Mounting height shall be measured to the lowest point on ceiling mounted equipments, and above finished surface for wall mounted equipment.

.4 Wall outlets are scaled to the perpendicular centre line of the symbol. Mounting heights for all wall mounted outlets shall be measured to the horizontal centre line.

.5 Where outlets are mounted in masonry walls, outlets should be mounted to the nearest coursing line.

1.10 WORK PROVIDED FOR OTHER DIVISIONS

.1 Provide information as to exact size and location of all required concrete bases, housekeeping pads and curbs required for the installation of equipment of Divisions 26, 27, and 28.

.2 Provide information as to the location and exact size of all openings through floors and walls.

.3 Provide information as to the location and exact size of all equipment supports required within walls, and roof support structure.

.4 Provide electrical connections, circuit protection and disconnect devices for all equipment supplied by other Divisions, including the Owners. Provide motor starters, disconnect switches, thermal switches, etc., for motors supplied by mechanical contractor. Special control equipment being supplied by mechanical contractor shall be installed and wired by that contractor.

1.11 WORK PROVIDED BY OTHER DIVISIONS

.1 All concrete bases, housekeeping pads and curbs required for the installation of equipment of Divisions 26, 27, and 28.

.2 Installation and framing of all openings in walls or floors larger than 150 mm diameter, or rectangular, with one dimension greater than 150 mm.

.3 Openings in millwork for electrical outlets and conduits.

.4 Painting of all panelboard and communication panel trims to match colour scheme where exposed in finished areas.

.5 Firestopping shall be the responsibility of the General Contractor.

1.12 WORK NOT PROVIDED BY THIS DIVISION

.1 Control wiring below 50V for Mechanical Contractor equipment beyond terminal section of each motor control centre, unless specifically indicated otherwise.

1.13 COORDINATION WITH OTHER DIVISIONS

.1 Cooperate fully with the Consultant and other trades of electrically operated equipment to ensure proper arrangement of and provision for all electrical equipment.

.2 Where outlets or equipment may affect architectural or site treatment desired, contact Consultant and for instructions or detailed drawings.

.3 Refer to other Divisions including mechanical, millwork, kitchen equipment, owner supplied equipment, etc, for electrical work in connection with these drawings and specifications.

.4 Location of lighting outlets and receptacles in mechanical or equipment rooms and similar areas shall be finalized during construction to give optimum arrangement. The Consultant shall approve final location before installation.

.5 Supply and install all motor connections, including starters and overload protection and disconnecting devices at motors where required. All motor driven equipment shall be provided with a lockable disconnecting device within line of site of the motor to be disconnected.

.6 Supply and install complete wiring requirements for full voltage in-line devices on single phase equipment such as thermostats, multi-speed switches for unit heaters, force flows, cabinet heaters, etc.

.7 Cutting of openings for electrical outlets in millwork and other similar types of custom-made equipment shall be done by the supplier of this equipment.

.8 Check other Divisions to ensure that suitable provisions have been provided for all motors. It is possible that some motors may vary in size, numbers and characteristics, depending on the equipment manufacturer's specific requirements. Any variations in this regard will not constitute cause for further consideration. The mechanical coordination schedule supplied on the drawings shall be updated with nameplate specifications.

.9 Assume full responsibility for layout of this work and for any damage caused the Owner or other Divisions by improper location or carrying out of this work.

.10 Before commencing work, examine the work of other Divisions, and report at once any defects or interference affecting the work under this Division, or the guarantee of same.

.11 Location of lighting outlets and receptacles in mechanical or equipment rooms and similar areas shall be finalized during construction to give optimum arrangement. The Consultant shall approve final location before installation.

.12 Allow for all hoisting and setting of material and equipment.

1.14 OWNER SUPPLIED EQUIPMENT

.1 Connect all electrically operated equipment supplied by the Owner, as designated on the drawings.

.2 Reconnect all existing electrical services from new and existing electrical sources modified by the work of this contract.

1.15 INSPECTION AND TESTING

.1 During construction and up to final acceptance, make accessible any equipment or wiring for inspection purposes.

.2 All electrically operating equipment shall be left as a complete installation in perfect operating condition, and receive final test in the presence of the Consultant.

.3 Ensure that all power circuitry is properly tested and meets the CSA Ground Resistance Requirements. For any 600 volt systems, a 600 volt megger or hi-pot procedures shall be used for all such tests. Provide documentation for each test within maintenance/commissioning manuals.

.4 On the request of the Consultant, a staff supervisor shall be made available to assist in this inspection work.

.5 At the completion of the installation, voltage tests shall be conducted in the presence of the Consultant. Transformer taps shall be adjusted, and any other corrective measures implemented to assure the proper operation of all electrical equipment. Provide documentation for each test within maintenance/commissioning manuals.

.6 Acceptance tests and commissioning shall be conducted for systems and/or equipment where indicated in the specifications and other standards referenced herein. Acceptance tests shall include, but not be limited to, the following Sections.

.1 ES/SOW-0101 Revision 3, April 15, 2004
.2 ES/SOW-0102 Revision 6, May 1, 2008
.3 26 09 24 – Lighting Control Devices - Low Voltage
.4 27 05 14 - Communication Cables Inside Buildings
.5 27 05 28 – Pathways for Communication Systems
.6 27 11 19 - Communications Termination Blocks and Patch Panels
.7 27 51 16 – Public Address System
.8 27 52 00 - Cell Call
.9 27 53 00 - Cell Door and Barrier Control
.10 27 54 00 - Guard Tour System
.11 27 55 00 - Intercom System
.12 28 13 20 - PLC Controls and HMI
.13 28 23 00 - Video Surveillance
.14 28 31 01 - Fire Alarm System

.7 Acceptance tests shall meet requirements as required by manufacturer, as outlined in ANSI – NETA 2007 and additional requirements described on drawings and specified herein. All tests shall be documented as per ANSI – NETA 2007 standards and shall include testing

results, testing date, testing technician and representative present. Refer to ES/SOW-0101 and ES/SOW-0102 for further details on acceptance testing required.

.8 Acceptance tests shall be made up of the following:

.1 Shop Drawing Information Sheets
.2 Static Review Check Sheets
.3 Performance Verifications Sheets
.4 Manufacturer Commissioning and Report
.5 Manufacturer Test Reports, Factory and On Site where required
.6 Test Results not forming part of the Static Review Checks Sheets
.7 Owner / Consultant Demonstration Sheets
.8 Training

.9 Certification of all acceptance tests and commissioning shall be submitted to the Consultant for approval. Tests not conducted to the satisfaction of the Consultant shall be repeated, and no further costs will be considered. Written documentation bearing name and signature of Contractor, Consultant and Owner's personnel present during acceptance tests shall be included in certification reports. Provide for a minimum of twelve (12) hours across three (3) separate meetings with Consultant and Owner for review of acceptance test sheets.

1.16 SHOP DRAWINGS

.1 Submit shop drawings, where specifically called for, or as requested. Shop drawings shall show detailed dimensional and technical information, and shall properly describe each piece of equipment. Where applicable, shop drawings shall include complete schematics and wiring diagrams. These shop drawings shall be sufficiently detailed to permit the Owner's technicians to trouble-shoot and repair the equipment. Equipment shall not be ordered and/or fabricated until shop drawings have been reviewed by the Consultant. Shop Drawings shall include, but not be limited to the following Sections on systems and equipment:

.1 26 05 36 - Cable Trays for Electrical Systems
.2 26 09 24 - Lighting Control Devices - Low Voltage
.3 26 24 13 - Switchboards
.4 26 24 17 - Panelboards Breaker Type
.5 26 27 26 - Wiring Devices
.6 26 28 14 - Fuses - Low Voltage
.7 26 28 21 - Moulded Case Circuit Breakers
.8 26 28 23 - Disconnect Switches - Fused and Non-Fused
.9 26 29 10 - Motor Starters to 600 V
.10 26 50 00 - Lighting
.1 26 09 24 – Lighting Control Devices - Low Voltage
.11 27 05 14 - Communications Cables Inside Buildings
.12 27 05 28 – Pathways for Communication Systems
.13 27 11 19 - Communications Termination Blocks and Patch Panels
.14 27 51 16 - Guard Tour System
.15 27 52 00 - Cell Call
.16 27 53 00 - Cell Door and Barrier Control
.17 27 54 00 - Guard Tour System
.18 27 55 00 - Intercom System

.19 28 13 20 - PLC Controls and HMI
.20 28 23 00 - Video Surveillance
.21 28 31 01 - Fire Alarm System

.2 Review of shop drawings shall be for general design, arrangement and appearance only. This Division shall check and correct, if necessary, all manufacturer's drawings before submitting, and shall so indicate on each copy, along with a dated approval stamp. All shop drawings must bear an approval stamp and be signed by the Contractor. This review does not relieve this Division from the responsibility for the final installation being correct in all detail, and fully acceptable to the Consultant. Refer to each section for further shop drawing information.

.3 Refer to General Conditions of the Contract.

.4 Refer to ES/SOW-0101 Revision 3, April 15, 2004

.5 Refer to ES/SOW-0102 Revision 6, May 1, 2008

.6 Provide nine (9) printed copies and one PDF copy for each Section. Each shop drawing shall be complete with a cover page with the following information:

.1 Specification Section and name
.2 Project name, Owner’s name and address
.3 Number of pages in submittal
.4 Contractor and Supplier’s name and contact information
.5 Approval stamps with room for Consultant’s stamp

.7 Shop drawings for complementary systems and/or equipment shall be submitted at the same time. Partial submittals of related equipment will be rejected or held until all other related shop drawing information has been submitted (i.e. submit all shop drawings for power equipment at the same time). Submittals of shop drawings that are incomplete will be rejected.

1.17 CHANGES

.1 Refer to General and Supplemental Conditions.

.2 Submit complete itemized breakdowns of all extras, deletions, and changes to the Consultant. Breakdown shall include quantities, unit costs and extensions. If requested, support claim by certified copies of supplier's invoices.

.3 The right is reserved to move equipment 3000 mm from location shown without further charge or consideration, provided that such re-location is requested prior to finish being applied.

1.18 CONSULTANT PRICES

.1 Electrical progress claims shall be made on Contractor Progress Report #ES110 provided by the Consultant. A copy of this Progress Report is attached for reference. The Electrical contract price shall be broken down into thirteen (13) parts to facilitate assessment of work done and material supplied. This progress claim shall be submitted simultaneously to the

General Contractor and the Consultant, the latter case in duplicate. Refer to General Conditions.

.2 The breakdown shall indicate labour and material to the nearest dollar. Overhead, profit and job expense shall be apportioned to all parts. The breakdown shall be as follows:

.1 Main services
.2 Distribution/Panels
.3 Conduit and boxes
.4 Wire and cable
.5 Motor control
.6 Wiring devices
.7 Lighting fixtures and lamps
.8 Communications systems
.9 Security Systems
.10 Fire Alarm System
.11 Specials
.12 Miscellaneous - 8% maximum
.13 Extras and credits. (Extras in excess of $1,000 shall be broken down into the above points on a separate ES110 sheet)

1.19 OPERATING INSTRUCTIONS AND SERVICE MANUALS

.1 Upon completion of the installation, provide complete and comprehensive identical sets of operating and maintenance manuals.

.2 The Consultant shall review the operating and maintenance manuals and approve same prior to the manuals being sent to the Owner.

.3 The operating and maintenance manuals shall include but not be limited to the following information when applicable in the project:

.1 Certification reports.
.2 Documentation indicating Owner’s receipt of operating instructions.
.3 Complete list of all materials turned over to the Owner c/w receipts for same.
.4 Shop drawings properly indexed and contained in suitably sized binders.
.5 Schematic drawings for all systems indexed and contained in suitably sized envelopes or attached efficiently in the above binders.
.6 Catalogue brochures for light fixtures, panelboards, switches, receptacles, fuses, etc.
.7 All final settings of equipment that has user adjustable settings.
.8 Overcurrent coordination and arc fault study and documentation of associated tests.
.9 Phase rotation confirmation by the Contractor.
.10 Certificate of Owner’s training.
.11 Acceptance Testing and Commissioning reports.
.12 Listing of any spare devices turned over to Owner

The above information shall be bound in binders as noted in specifications. Incomplete or poorly reproduced manuals will be rejected.

.4 Maintain, on a daily basis, a complete set of marked-up prints as as-built drawings that show in complete detail the final arrangement and location of all electrical components and the interconnecting wiring.

.5 All riser conduits (size and routing), panel feeds (size and routing), conduit runs (size and routing) and main communications (size and routing) shall be marked on plans. These are to be maintained in a neat and substantial manner, so as to properly and fully illustrate the way in which the installation has been completed.

.6 All equipment locations such as fire alarm signal boosters, cable termination boxes, signal amplifiers, network switches, door controllers, etc shall be identified on the drawings as to their location and quantity (if more than one exists at that particular location).

.7 The Consultant will provide AutoCAD 2010 drawing files. The Contractor shall transcribe all information from the as-built prints to AutoCAD 2010 electronic record drawing files. All changes and revisions to the AutoCAD files shall be made on a separate layer so as to be easily identified and shall be of the same quality as the existing AutoCAD drawings.

.8 The submission of electrical record drawing files shall include a CD ROM containing AutoCAD 2010 drawing files, and the contractor marked up as-built drawings. The record drawings files and the contractor marked up as-built drawings will be reviewed by the Consultant.

.9 The cost of producing and plotting the AutoCAD electronic record drawings shall be included in the tender price. If desired by the contractor, the Consultant will update the AutoCAD drawings on a cost recovery basis. Periodic checks on site will be carried out to verify that the Contractor as built drawings are being kept up-to-date.

.10 The Owner's personnel shall be instructed in the operation and maintenance of the following equipment to the satisfaction of the Owner as per the standards referenced herein.

Section No.	Description	Hours
26 09 24	Lighting Control Devices - Low Voltage	1
26 29 10	Motor Starters to 600 V	1
26 50 00	Lighting	1
26 09 24	Lighting Control Devices - Low Voltage	4
27 11 19	Communications Termination Blocks and Patch Panels	4
27 51 16	Guard Tour System	4
27 51 16	Public Address System	8
27 52 00	Cell Call	8
27 53 00	Cell Door and Barrier Control	8
27 54 00	Guard Tour System	4
27 55 00	Intercom System	4
28 13 20	PLC Controls and HMI	6
28 23 00	Video Surveillance	4
28 31 01	Fire Alarm System	4

.11 The above instructions shall be given by personnel experienced in the operation of the particular system or equipment. Each item or type of equipment, and all controls, shall be operated in the presence of the Owner's personnel to ensure their understanding of equipment function and individual working parts. The Owner reserves the right to set the period or periods during which the instruction shall be given. The contractor shall submit a program of instruction for approval by the Owner.

.12 Operating and maintenance manuals shall include written documentation bearing name and signature of Owner's personnel who received the above instructions. Contractor shall allow for all training to be completed in a minimum of two sessions. One session at substantial completion, and one session within three months of turning over the system.

.13 Operating and maintenance manuals, as well as all Owner instructions, shall be complete before substantial completion (as outlined by the Builders' Lien Act) will be considered. Also, preliminary maintenance manuals must be submitted prior to 70% completion. No further progress payments will be permitted until these preliminary maintenance manuals have been submitted and approved.

1.20 STORAGE AND PROTECTION

.1 Maintain and protect all work provided under this Division. Store all materials within a protected enclosure to prevent exposure to weather or construction dirt.

.2 Protect all finished and unfinished work of this and other divisions from damage during the course of construction. Cover floors and other surfaces, if necessary. Any damaged work or finishes shall be repaired or replaced without further charge to the Owner.

1.21 WARRANTY

.1 All materials and workmanship shall be guaranteed for a period of one year from date of substantial completion unless required otherwise within the ES/SOW-0101, ES/SOW-0102.

.2 Properly repair and replace all defective work and other work which becomes defective during the term of warranty.

.3 Service on equipment or systems critical to the Owner's operation shall be provided on an emergency basis which may necessitate overtime and service outside of normal working hours. The contractor shall ensure that all suppliers comply with this requirement.

1.22 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Supplier and installer responsibility is indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.

.2 Control wiring and conduit is provided by the Electrical Contractor except for conduit, wiring and connections below 50 V which are related to control systems specified in Division 15 and shown on mechanical drawings.

1.23 FINISHES

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

.1 Paint indoor switchboards and distribution enclosures light grey ASA 61.

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

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

1.24 ABBREVIATIONS

.1 Abbreviations used in this specification are common to and in general use within the related trades.

1.25 EQUIPMENT IDENTIFICATION

.1 Nameplates shall be provided on each new piece of electrical equipment, including, power panels, distribution panels, lighting panels, transformers, disconnect switches, contactors, telephone panels, miscellaneous systems and panels.

.2 Nameplates for each new electrical panel shall indicate panel designation, mains voltage and panel and circuit number from which this panel is fed.

.3 Nameplates for new disconnects and contactors shall indicate equipment being controlled, and voltage.

.4 Nameplates for new terminal cabinets shall indicate system and voltage and load of area served.

.5 Nameplates for Normal Power Equipment shall be made from black-white-black Lamecoid with bevelled edges and white engraved letters. Nameplates shall be fastened with self tapping metal screws to equipment in a conspicuous location. Flush mounted panels shall have nameplate located on front of panel behind hinged door.

.6 Typical identification standards shall be used for new equipment throughout the project as follows:

.1 Lighting, receptacle and power panels shall each be identified with an engraved Lamecoid plate secured to top interior trim as:

Panel 202	10 mm high lettering
120/208 volts	6 mm high lettering
Fed from	6 mm high lettering

.2 Each panel shall be supplied with a directory card holder welded to inside of door, complete with a neatly typewritten list showing information as follows:

Panelboard name	202
Panel voltage	120/208 volts

Circuit Number	Description	Load
1	Lighting Room 200 (Main Area)	1200W
2	Receptacles Room 200 (Main Area)	6-15A
3	Room 220	1/3 H.P. Fan

Spaces and spares shall be left blank so as to facilitate future description. Also, existing panels where adjustments have been made in the circuitry shall be field checked in their entirety and new directory cards shall be provided.

.3 List shall be covered with a 1 mm thick clear plastic sheet to protect it.

.4 Other cabinets and plywood back boards for low voltage systems, such as signals and communications, shall be identified as panelboards with a directory showing circuit numbers and room locations, plus a blank for "Remarks", as well as a Lamecoid plate designation panel name.
EXAMPLE: if cabinet is for telephone
.....TP - 2nd floor

.5 Equipment not listed above, such as incoming service cables, communicating cables, switchgear, transformers, disconnects, motors, instruments, fire alarm and control panels, shall be identified in a similar manner, showing name and number of the equipment, voltage and load information.

.7 Feeder pull boxes and junction boxes shall be identified with waterproof ink, showing feeder or system concerned. Conduit entering junction boxes for communications systems shall be identified with the room number that each conduit serves.

.8 A small dab of paint shall be applied to inside of each outlet box, pull box and panel as it is installed, using colour code as follows:

Red	-	Fire Alarm System
Blue	-	Intercom, Public Address, Guard Tour, Cell Call Cell Door Control, PLC/HMI, etc.
Yellow	-	Security, Alarm Systems, Card Access
Green	-	Telephone/IT Computer Systems

The outside of the box shall also be identified in this way so as to readily determine the system within the conduit system. The cover of each junction box for branch circuits shall describe the voltage being used by means of a waterproof ink.

.9 No colour code is required for regular lighting and power circuits, but voltage class shall be displayed on all pull boxes and panels.

.10 Junction boxes in furred ceilings shall be colour identified on both inside and outside.

.11 Connections in equipment shall be made Phase 'A', 'B', 'C', from left to right when viewing wiring from front or accessible direction.

.12 Colour coding shall be carried through from incoming utility supply down to and including panels, and shall be as follows:

.1 Incoming utility service lines shall be identified by Red - Phase 'A'; Black - Phase 'B'; Blue - Phase 'C'; with colour coded PVC tape.

.2 Switchgear buswork in each switchboard and unit substation cubicle shall be banded with 3M tape identified in accordance with service lines colour coding. In addition,

where neutral bus is introduced, it shall be banded white. Ground bus shall be banded green.

.3 Feeder and sub-feeder bus or conductors shall be banded as above.

.4 Lighting and power panels shall conform to the Canadian Electrical Code, and shall have main bus banded with tape as follows:

Red	-	Phase 'A'
Black	-	Phase 'B'
Blue	-	Phase 'C'
White	-	Neutral
Green	-	Ground

.13 All plug-in type receptacles on all levels shall be identified by means of a self laminated, self adhesive label. Each cover plate shall be engraved with a label approximately 8 mm x 30 mm, and contain the panel and circuit number in 4 mm high lettering. The cover plates for all receptacles designated on the drawings for housekeeping purposes shall also contain the wording “Housekeeping”. The cover plates for all receptacles fed from the ground fault interrupters shall also contain the wording “G.F.I.”

.14 The circuits controlled by all light switches shall be neatly printed with waterproof ink on the side of the switch outlet box so that the panel and circuit number are clearly legible when the coverplate is removed. It shall not be necessary to remove the switch from the outlet box in order to read the panel or circuit number.

1.26 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour code: to CSA C22.1.

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

.5 All data cables and data jumper cables (minimum 23 gauge), jacks and connector boots installed as part of this project used for Security Systems, whether CAT 6 or fibre optic, shall be BRIGHT GREEN in colour.

.6 All communication and signal cables shall be FT4 rated.

.7 All patch cables are to be stranded cable with RJ45 connectors. RJ45 connectors shall not be attached to solid conductor cable.

.8 All installed runs of CAT6 cable are to be solid conductor cable and terminated into patch panels in equipment racks or faceplates in other locations.

.9 An installed cable is any cable that is run through a conduit, run from one area in a building to another area or any cable that travels farther than the adjacent equipment cabinet in a series of

cabinets. Note: Equipment cabinets must be abutting without side panels to open connection to be considered adjacent.

1.27 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

1.28 WIRING TERMINATIONS

.1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

1.29 MANUFACTURERS AND CSA LABELS

.1 Visible and legible, after equipment is installed.

1.30 WARNING SIGNS

.1 As specified and to meet requirements of Electrical Inspection Department and Owner.

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

1.31 LOCATION OF OUTLETS

.1 Locate outlets in accordance with drawings and specifications.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.4 Locate light switches on latch side of doors. Locate disconnect devices in mechanical and electrical on latch side of door.

1.32 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise or as noted on drawings.

.1 Local switches: 1200 mm.

.2 Wall receptacles:

.1 General: 450 mm.

.2 Above top of counters or counter splash backs: 150 mm.

.3 In mechanical rooms: 1400 mm.

.3 Fire alarm stations: 1200 mm.

.4 Fire alarm horn/strobe: 2100 mm.

1.33 LOAD BALANCE

.1 All lighting panels, distribution centres, motor control centres and main switchboards shall be load balanced such that the maximum variation between the two worst phases does not exceed 5%.

.2 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.3 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.4 Submit, at completion of work, report listing phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

1.34 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: plastic, sized for free passage of conduit, and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

.4 All conduit and tray sealing shall be the responsibility of the Electrical Contractor.

1.35 TEMPORARY AND TRIAL USAGE

.1 Temporary and trial usage by the Owner, or the Contractor, of any of the electrical apparatus or equipment, or any work or materials supplied under this Division before final completion and written acceptance, is not to be construed as evidence of acceptance of same by the Owner.

.2 Temporary and trial usage may be made as soon as this Division deems the work sufficiently advanced for making a complete and thorough test of same, and that no claim may be made for the injury to or the breaking of any part of such work which may be so used, whether caused by weakness or inaccuracy of structural parts, or by defective material or workmanship of any kind.

.3 Lighting shall not be used for temporary or trial usage without prior approval of the owner and consultant sign off. If temporary lighting is required for the duration of the project, only construction lamps marked with a permanent ink on the lamp may be used. Evidence of marking will be requested by the consultant. Any fixtures used for temporary or trail usage shall be relamped and cleaned. Evidence of cleaning and relamping will be required by the consultant.

1.36 EXCAVATION AND BACKFILL

.1 Any excavation and backfilling work that is necessary to accommodate the work under this Division shall be the responsibility of Divisions 26, 27, and 28, in accordance with the requirements of Division 31.

1.37 TEMPORARY LIGHT AND POWER

.1 The General Contractor shall be responsible for all temporary light and power provisions. Refer to General Conditions.

1.38 MATERIAL TO BE TURNED OVER TO THE OWNER

.1 All equipment that is being removed or replaced shall be stockpiled as per Owner's request. The owner may deem that the equipment shall be disposed. All disposal and removal is the responsibility of the contractor.

.2 Materials as indicated in various sections of this specification shall be turned over to the Owner. These materials shall include, but not be limited to the following:

.1 Obtain a signed receipt for each item turned over to the Owner. Include receipts in the operating and maintenance manuals.

.2 One set of three fuses for each fuse type and size for each switchboard distribution centre and motor control centre.

.3 One set of contacts and one holding coil for each size and type of FVNR motor starter.

.4 Spare lighting fixtures.

.5 Spare Fire Alarm Devices.

.6 Data patch cables.

1.39 SITE EXAMINATION

.1 The contractor shall visit the existing site during the tendering period to familiarize himself with the construction conditions and electrical work provided to date. The contractor shall thoroughly satisfy himself that the work contained in these drawings and specifications can be carried out and that all costs have been included in the tender submitted.

1.40 SITE WORK

.1 The electrical contractor shall be responsible for all necessary trenching and backfilling for all exterior work in connection with underground feeders. All trenches shall be a minimum 900 mm deep. Care must be exercised to ensure a proper grade line is used, and that suitable drainage has been provided.

.2 All excavated material shall be removed from the site.

.3 Trenches shall be filled with granular fill and compacted to 95% proctor. Prior to backfilling, all trenches must be inspected by the Consultant.

.4 Supply and install all cable and conduit in trenches, as described herein or detailed on the drawings.

.5 Electrical contractor shall be responsible for all concrete and reinforcing in connection with site lighting and car parking pedestals. All concrete and reinforcing on the project shall be in accordance with the quality required for reinforced concrete and reinforcing as specified under Division 3, and as detailed on the drawings.

1.41 CUTTING AND PATCHING

.1 Should any cutting or repairing of either unfinished or finished work be required, the contractor shall employ the particular trade whose work is involved, to do such cutting and patching, and shall pay for any resulting costs.

.2 All holes within buildings shall be fire stopped when penetrating a fire rated structure.

1.42 PAINTING

.1 All iron or steel structures fabricated and installed by Divisions 26, 27, and 28 for supporting panels, starters, conduit or other equipment, shall be wire brushed and given one coat of lead chromate paint primer before being set into place. After all equipment is installed and piping complete, this iron work shall be given two coats of ASA #61 enamel to match the panel or structure being supported or in the colour specified for the product.

.2 All pull boxes, wireways, gutters, etc., fabricated for Divisions 26, 27, and 28, shall be given a coat of lead chromate primer and two coats of ASA #61 enamel before installation to match equipment finish.

.3 All panels and pull boxes that are set in finished walls or ceilings shall have approved flush covers that shall be prime coated with lead chromate paint, and left for the painting division to paint in with the surrounding wall or ceiling finishes. Panel trims and pull box covers to be painted with the cover removed from the wall so that it can be easily installed or removed without damaging the surrounding paint finish.

.4 All electrical equipment shall be finished with an ASA #61 enamel, the colour of which shall be grey, unless otherwise specified.

.5 When installation is complete, all scratches and defects to the paint finishes shall be properly touched up, and where necessary, entire paint surfaces shall be re-done.

1.43 MATERIAL SAFETY DATA AND HAZARDOUS MATERIALS

.1 The Contractor shall provide material safety data sheets on all materials prior to shipping materials to site. These data sheets shall be submitted in triplicate to the Owner.

.2 The Contractor shall coordinate and provide necessary information for the Owner's "Work Place Hazardous Material Information System".

1.44 SCHEDULING OF WORK AND DEMOLITION

.1 Refer to Division 1 specifications.

.2 The contractor shall make a thorough study of the facility site and the affected electrical systems to ensure the method required to maintain all existing building services during the construction period. All changeovers shall be done during off hours, and coordinated with the general contractor and the owner.

.3 All outages shall be less than eight (8) hours in duration. The contractor shall submit the method and procedure of all changeovers for approval by the Consultant and the Owner a minimum of twenty one (21) working days in advance.

.4 The existing fire alarm system shall be maintained in a fully operational state while modifications and additions to the system are installed.

.5 All fire alarm outages shall be carried out at dates and times approved by the Owner. Provide at least three (3) weeks advance notice to the Owner for approval.

.6 All salvaged materials shall remain the property of the Owner, unless otherwise noted, and shall be stockpiled as per the Owner's instructions.

.7 Refer to the overall project schedule for further scheduling requirements.

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 GENERAL REQUIREMENTS

.1 The General Conditions of Contract, Division 01 General Requirements and all Addenda thereto form an integral part of and must be read in conjunction with the requirements of this Section.

.2 Cooperate and coordinate with the requirements of other units of work specified in other Sections.

1.2 REFERENCES

.1 The Electrical Contractor shall be bound by industry standards, as interpreted by the Consultant, whether or not specifically referenced in this document. Comply with Electrical Protection Act and rules and regulations made pursuant thereto, including the Canadian Electrical Code. Also, comply with applicable standards of the following:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008.

.3 CSA C22.1-2012, Canadian Electrical Code, Part 1.

.4 Electrical and Electronic Manufacturers Association of Canada (EEMAC).

.5 National Electrical Manufacturers Association (NEMA).

.6 National Building Code 2010 (NBC 2010)

.7 National Fire Protection Association (NFPA)

.8 Institute of Electrical and Electronic Engineers (IEEE).

.9 Audio Engineering Society (AES).

.10 Other Applicable CSA and UL approvals.

1.3 EXCEPTIONS OF REFERENCED STANDARDS

.1 The Electrical Contractor shall be bound by the standards referenced herein. The following exceptions shall be noted and used for this project in reference to the following standards:

.1 ES/SOW-0101 Revision 3, April 15, 2004:

.1 1.4 – Quantity of Equipment: Quantity and location of the equipment shall adhere to the requirements as noted in the Tender Drawings and associated specifications.

.2 3.1(c) – maintenance for the system is being handled by the Owner through a separate contracted entity. The Contractor is required to provide warranty services as specified for the specific system.

.3 3.1(h) – Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.4 14.0 – Lightning Protection: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.2 ES/SOW-0102 Revision 6, May 1, 2008:

.1 Wiring / Cabling Methods 3.1.1: The use of rigid steel conduit is not required.

.2 Splicing of existing power cabling due to breaker panel replacement is acceptable.

.3 Enclosures 3.3.2: Enclosures within the facility are not required to be IP64 rated.

.4 Lighting Protection 4.8: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with:

.1 Section 01 33 00 - Submittal Procedures

.2 26 05 01 – Common Work Results

.3 ES/SOW-0101 Revision 3, April 15, 2004

.4 ES/SOW-0102 Revision 6, May 1, 2008

.2 Shop drawings shall include but not be limited to device types, cable types, and special mounting details.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.

.2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors: with current carrying parts of copper sized to fit copper conductors #10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:

.1 Connector body and stud clamp for round copper conductors.

.2 Clamp for round copper conductors.

.3 Stud clamp bolts.

.4 Sized for conductors as indicated.

.4 Clamps or connectors for armoured cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required.

Part 3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.

.2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2No.65.

.3 Install fixture type connectors and tighten. Replace insulating cap.

.4 Install bushing stud connectors in accordance with NEMA.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of Contract, Division 01 General Requirements and all Addenda thereto form an integral part of and must be read in conjunction with the requirements of this Section.

.2 Cooperate and coordinate with the requirements of other units of work specified in other Sections.

1.2 REFERENCES

.1 The Electrical Contractor shall be bound by industry standards, as interpreted by the Consultant, whether or not specifically referenced in this document. Comply with Electrical Protection Act and rules and regulations made pursuant thereto, including the Canadian Electrical Code. Also, comply with applicable standards of the following:

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.9 Audio Engineering Society (AES).

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.2 3.1(c) – maintenance for the system is being handled by the Owner through a separate contracted entity. The Contractor is required to provide warranty services as specified for the specific system.

.3 3.1(h) – Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

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.2 Splicing of existing power cabling due to breaker panel replacement is acceptable.

.3 Enclosures 3.3.2: Enclosures within the facility are not required to be IP64 rated.

.4 Lightning Protection 4.8: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with:

.1 Section 01 33 00 - Submittal Procedures

.2 26 05 01 – Common Work Results

.3 ES/SOW-0101 Revision 3, April 15, 2004

.4 ES/SOW-0102 Revision 6, May 1, 2008

.2 Shop drawings shall include but not be limited to speakers, riser diagram, cable types, and special mounting details.

1.5 PRODUCT APPROVALS

.1 Manufacturers' and model numbers named in these specifications indicate an acceptable technical standard of performance and are not intended to be exclusive. Products submitted as alternates must result in a control system that meets or exceeds all technical performance criteria as described.

.2 Products proposed as alternatives to those specified, shall only be considered if submitted for approval no later than 15 working days before tender close. Submit alternates, for approval, as one complete listing. Provide complete product specification sheets with request for approval.

.3 The Bidder must provide a complete list of primary system products offered with their bid.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.

.2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

Part 2 Products

2.1 BUILDING WIRES

.1 All conductors shall be copper, minimum No. 12 gauge, unless specifically noted otherwise.

.2 All conductors # 12 AWG to # 8 AWG shall be rated for minimum 600V RW-90 XLPE. Conductors # 6 AWG and larger shall be rated for minimum 1000V RW-90 XLPE. All conductor for motor feeds from variable frequency drives, shall be rated for minimum 1000V RW-90 XLPE. Wiring in channel back of fluorescent fixtures shall be 600 volt Type GTF or TEW. Size, grade of insulation, voltage and manufacturer's name shall be marked at regular intervals.

.3 Wiring for major feeders may be NUAL aluminum and shall be installed only where specifically noted on the drawings.

.4 Conductor utilized in conduit run under slab on grade or in conduit underground shall be Type 'RWU-90'.

.5 Wire shall be as manufactured by Nexans, Alcan, Pirelli, BICC General Wire or Superior Essex.

2.2 TECK CABLE

.1 Cable: to CAN/CSA-C22.2 No. 131.

.2 Conductors:

.1 Grounding conductor: copper.

.2 Circuit conductors: copper, size as indicated.

.3 Insulation:

.1 Chemically cross-linked thermosetting polyethylene rated type RW90, 600V to 1000V as noted above.

.4 Fastenings:

.1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.

.2 Channel type supports for two or more cables.

.3 Threaded rods: 6 mm dia. to support suspended channels.

.5 Connectors:

.1 Watertight approved for TECK cable.

Part 3 Execution

3.1 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance information for the Intercom system for incorporation into manual specified in:

.1 Section 01 78 00 - Closeout Submittals

.2 ES/SOW-0101 Revision 3, April 15, 2004

.3 ES/SOW-0102 Revision 6, May 1, 2008

.2 Include:

.1 Manufacture description sheet on each cable type

3.2 INSTALLATION OF BUILDING WIRES

.1 Termination for #8 AWG and larger shall be by means of approved solderless connector lug. For parallel conductors, a common lug with separate termination for each conductor shall be employed.

.2 Conductor splices shall be made in accordance with specifications. Provide sufficient length for joint remake, and no less than 200 mm spare length. On through wiring, leave 300 mm loop.

.3 Wiring in cabinets, pull boxes, panels and junction boxes shall be neatly trained and held with nylon cable ties.

.4 Conductors shall be tag identified where passing through junction boxes.

3.3 INSTALLATION OF TECK CABLE 0 -1000 V

.1 Install cables.

.1 Group cables wherever possible on channels.

.2 Terminate cables in accordance with Section 26 05 20- Wire and Box Connectors - 0-1000V.

.3 All cables shall be terminated and spliced with suitable compression type connectors, as recommended by the cable manufacturer. The connectors shall satisfy the bonding and grounding requirements at the supply end.

.4 All cables shall be single conductor and copper, unless otherwise specified.

.5 All cable shall be rated for 1000 volts, insulated with cross-linked polyethylene and rated for operation at 90 degrees C. Cable shall have a FT4 rated outer jacket.

.6 All cable shall meet the CSA requirements for cold bend and impact testing at minus 40 degrees C.

.7 All cable shall be protected by a corrugated aluminum sheath or by interlocked aluminum armour. PVC jackets shall be required on all metallic sheathed cables.

.8 The jackets shall meet the FT4 flame spread requirements and be identified on the P.V.C. jacket.

.9 All cables shall be installed in accordance with the manufacturers recommendations, in suitable cable tray as specified within the specifications.

.10 The cables shall be terminated at the supply end on a non-ferrous metallic plate and at the load end on a non-metallic rigid fibre board plate. The cable sheaths shall be bonded at the supply end only.

.11 All cable installed in cable tray shall be installed at one diameter spacing.

.12 When single conductor cables are direct earth buried they shall be spaced 150 mm apart.

.13 Cables shall be manufactured by Nexans, Alcan, Superior Essex, General Wire or Pirelli.

3.4 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible.

.2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors 0-1000 V.

.3 Conductors: insulated, copper, size as indicated.

.4 Type: AC90 - Armour: interlocking type fabricated from aluminum strip.

.5 Type: ACWU90 - jacket over armour meeting requirements of Vertical Tray Fire Test of CSA C22.2 No. 0.3 with maximum flame travel of 1.2 m.

.6 Connectors: as required.

.7 Multi conductor cables shall be color coded during manufacture. Single conductor cables shall be color coded with adhesive colour coding tape. The tape shall be applied for a minimum of 75 mm at all terminations. Cables shall not be painted under any condition. Color coding shall be as follows:

Phase 'A' - Red	Neutral - White
Phase 'B' - Black	Ground - Green or Bare
Phase 'C' – Blue	

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of Contract, Division 01 General Requirements and all Addenda thereto form an integral part of and must be read in conjunction with the requirements of this Section.

.2 Cooperate and coordinate with the requirements of other units of work specified in other Sections.

1.2 REFERENCES

.1 The Electrical Contractor shall be bound by industry standards, as interpreted by the Consultant, whether or not specifically referenced in this document. Comply with Electrical Protection Act and rules and regulations made pursuant thereto, including the 2012 Canadian Electrical Code. Also, comply with applicable standards of the following:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

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.4 Electrical and Electronic Manufacturers Association of Canada (EEMAC).

.5 National Electrical Manufacturers Association (NEMA).

.6 National Building Code 2010 (NBC 2010)

.7 National Fire Protection Association (NFPA)

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.9 Audio Engineering Society (AES).

.10 Other Applicable CSA and UL approvals.

1.3 EXCEPTIONS OF REFERENCED STANDARDS

.1 The Electrical Contractor shall be bound by the standards referenced herein. The following exceptions shall be noted and used for this project in reference to the following standards:

.1 ES/SOW-0101 Revision 3, April 15, 2004:

.1 1.4 – Quantity of Equipment: Quantity and location of the equipment shall adhere to the requirements as noted in the Tender Drawings and associated specifications.

.2 3.1(c) – maintenance for the system is being handled by the Owner through a separate contracted entity. The Contractor is required to provide warranty services as specified for the specific system.

.3 3.1(h) – Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.4 14.0 – Lightning Protection: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.2 ES/SOW-0102 Revision 6, May 1, 2008:

.1 Wiring / Cabling Methods 3.1.1: The use of rigid steel conduit is not required.

.2 Splicing of existing power cabling due to breaker panel replacement is acceptable.

.3 Enclosures 3.3.2: Enclosures within the facility are not required to be IP64 rated.

.4 Lightning Protection 4.8: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 26 05 01 – Common Work Results

.3 ES/SOW-0101 Revision 3, April 15, 2004

.4 ES/SOW-0102 Revision 6, May 1, 2008

.2 Shop drawings shall include but not be limited to connectors used, specialty ground bars, etc.

1.5 PRODUCT APPROVALS

.1 Manufacturers' and model numbers named in these specifications indicate an acceptable technical standard of performance and are not intended to be exclusive. Products submitted as alternates must result in a control system that meets or exceeds all technical performance criteria as described.

.2 Products proposed as alternatives to those specified, shall only be considered if submitted for approval no later than 15 working days before tender close. Submit alternates, for approval, as one complete listing. Provide complete product specification sheets with request for approval.

.3 The Bidder must provide a complete list of primary system products offered with their bid.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.

.2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

Part 2 Products

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.

.2 All ground rods shall be 20 mm diameter by 3000 mm long, copper clad.

.3 Grounding conductors: bare stranded copper.

.4 Insulated grounding conductors: green

.5 Ground bus: copper, complete with insulated supports, fastenings, connectors.

.6 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

.1 Grounding and bonding bushings.

.2 Protective type clamps.

.3 Bolted type conductor connectors.

.4 Thermit welded type conductor connectors.

.5 Bonding jumpers, straps.

.6 Pressure wire connectors.

.7 All ground conductors shall be bare or insulated, stranded, medium hard drawn copper wire. All insulated ground wires shall be green.

.8 Exposed copper shall be cleaned to a bright surface, and shall be finished with two coats of clean, insulating varnish.

.9 Connect ground conductor to copper water pipe at least twice (minimum 40 mm diameter), utilizing a Burndy Type GAR pipe clamp. Provide jumper across water meter.

.10 All connections to the ground bus or risers shall be thermowelded, or shall utilize the Burndy Hy-Ground compression connections. Clamp type connections shall only be allowed to individual pieces of equipment.

.11 Where bonds are covered with soil, the conductors are to be coated with anti-corrosion compound "Kopr-Shield" (Thomas & Betts Co.) before compression connector is applied. All bonding shall be done with 'C' tap and lug compression connectors.

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 Electrical equipment and wiring shall be grounded in accordance with the Canadian Electrical Code, and local inspection authority's rules and regulations.

.2 All metallic raceways and conduits for communications, cable and conductors shall be grounded.

.3 All motors with flexible connections shall have separate ground wire run bridging the flexible connections. This ground wire shall be run from the motor back to the nearest junction box or motor control centre where the termination can be readily inspected. Insulation for this wire shall be green.

.4 Lay-in trays and feeder conduits shall be connected to the ground bus.

.5 All panel feeds at 208 volt shall include a building network ground conductor.

.6 All grounding conductors outside the electrical rooms and closets shall be insulated and installed in conduits, unless otherwise noted.

.7 Install connectors in accordance with manufacturer's instructions.

.8 Protect exposed grounding conductors from mechanical injury.

.9 Use mechanical connectors for grounding connections to equipment provided with lugs.

.10 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.11 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.12 Structural steel and metal siding to ground by welding copper to steel.

.13 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections unless indicated otherwise.

.14 Use mechanical connectors for grounding connections to equipment provided with lugs.

.15 Soldered joints not permitted.

.16 Install separate ground conductor to outdoor lighting standards.

.17 Make grounding connections in radial configuration only. Avoid loop connections.

.18 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

3.2 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral of secondary systems.

3.3 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, duct systems, frames of motors, starters, control panels, structure steel work, and distribution panels.

3.4 COMMUNICATION SYSTEMS

.1 Install grounding connections for all communication and security systems as per manufacturer's recommendations

3.5 FIELD QUALITY CONTROL

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

.2 Perform tests before energizing electrical system.

.3 Disconnect ground fault indicator during tests.

.4 All grounding conductors outside the electrical rooms and closets shall be insulated and installed in conduits, unless otherwise noted.

.5 Connections to equipment shall be made with, bronze or copper bolts and connectors.

.6 Equipment grounds shall be connected to the building grounding network. All non-current carrying metallic parts of equipment shall be connected to the ground network.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of Contract, Division 01 General Requirements and all Addenda thereto form an integral part of and must be read in conjunction with the requirements of this Section.

.2 Cooperate and coordinate with the requirements of other units of work specified in other Sections.

1.2 REFERENCES

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.1 Wiring / Cabling Methods 3.1.1: The use of rigid steel conduit is not required.

.2 Splicing of existing power cabling due to breaker panel replacement is acceptable.

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.4 Lightning Protection 4.8: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 26 05 01 – Common Work Results

.3 ES/SOW-0101 Revision 3, April 15, 2004

.4 ES/SOW-0102 Revision 6, May 1, 2008

.2 Shop drawings shall include but not be limited to speakers, riser diagram, cable types, and special mounting details.

1.5 PRODUCT APPROVALS

.1 Manufacturers' and model numbers named in these specifications indicate an acceptable technical standard of performance and are not intended to be exclusive. Products submitted as alternates must result in a control system that meets or exceeds all technical performance criteria as described.

.2 Products proposed as alternatives to those specified, shall only be considered if submitted for approval no later than 15 working days before tender close. Submit alternates, for approval, as one complete listing. Provide complete product specification sheets with request for approval.

.3 The Bidder must provide a complete list of primary system products offered with their bid.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.

.2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

Part 2 Products

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted suspended or set in poured concrete walls and ceilings.

Part 3 Execution

3.1 INSTALLATION

.1 Secure equipment to poured concrete with expandable inserts.

.2 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.3 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.5 Fasten exposed conduit or cables to building construction or support system using straps.

- .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
- .2 Two-hole steel straps for conduits and cables larger than 50 mm.
- .3 Beam clamps to secure conduit to exposed steel work.

.6 Suspended support systems.

- .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
- .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.7 For surface mounting of two or more conduits, use channels spaced as required by C22.1.

.8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.10 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Engineer.

.12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

3.2 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance information for the Intercom system for incorporation into manual specified in:

.1 Section 01 78 00 - Closeout Submittals

.2 ES/SOW-0101 Revision 3, April 15, 2004

.3 ES/SOW-0102 Revision 6, May 1, 2008

.2 Include:

.1 Operation instructions

.2 Description of system operation

.3 Description of each subsystem operation

.4 List specifying each piece of equipment in system or subsystem by its original manufacturer name and model number.

.5 Parts list specifying parts used in equipment by identification numbers that are standard to electronic industry.

3.3 WARRANTY

.1 The contractor must make available to the Owner a local service department of a duly authorized distributor of the equipment manufacturer, which shall stock the manufacturer’s standard parts. The service department shall have at least one factory trained repair technician available to the Owner on 24 hours’ notice.

.2 Provide warranty of installation of equipment installed by this contractor to be free of defects for a period of (1) one year from date of Substantial Completion.

.3 Provide during the warranty period, all service, maintenance, parts, etc., required for normal operation of the systems, such that Owner needs not purchase additional maintenance agreement or contracts. Upon request, the manufacturer and his agent shall provide direct to the Owner the following proposals:

.1 Continuation, after the warranty period, of full maintenance, including all service, labour, parts, etc. required to maintain the systems in a fully operational condition.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of Contract, Division 01 General Requirements and all Addenda thereto form an integral part of and must be read in conjunction with the requirements of this Section.

.2 Cooperate and coordinate with the requirements of other units of work specified in other Sections.

1.2 REFERENCES

.1 The Electrical Contractor shall be bound by industry standards, as interpreted by the Consultant, whether or not specifically referenced in this document. Comply with Electrical Protection Act and rules and regulations made pursuant thereto, including the 2012 Canadian Electrical Code. Also, comply with applicable standards of the following:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

.3 CSA C22.1-2012, Canadian Electrical Code, Part 1.

.4 Electrical and Electronic Manufacturers Association of Canada (EEMAC).

.5 National Electrical Manufacturers Association (NEMA).

.6 National Building Code 2010 (NBC 2010)

.7 National Fire Protection Association (NFPA)

.8 Institute of Electrical and Electronic Engineers (IEEE).

.9 Audio Engineering Society (AES).

.10 Other Applicable CSA and UL approvals.

1.3 EXCEPTIONS OF REFERENCED STANDARDS

.1 The Electrical Contractor shall be bound by the standards referenced herein. The following exceptions shall be noted and used for this project in reference to the following standards:

.1 ES/SOW-0101 Revision 3, April 15, 2004:

.1 1.4 – Quantity of Equipment: Quantity and location of the equipment shall adhere to the requirements as noted in the Tender Drawings and associated specifications.

.2 3.1(c) – maintenance for the system is being handled by the Owner through a separate contracted entity. The Contractor is required to provide warranty services as specified for the specific system.

.3 3.1(h) – Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.4 14.0 – Lightning Protection: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.2 ES/SOW-0102 Revision 6, May 1, 2008:

.1 Wiring / Cabling Methods 3.1.1: The use of rigid steel conduit is not required.

.2 Splicing of existing power cabling due to breaker panel replacement is acceptable.

.3 Enclosures 3.3.2: Enclosures within the facility are not required to be IP64 rated.

.4 Lightning Protection 4.8: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 26 05 01 – Common Work Results

.3 ES/SOW-0101 Revision 3, April 15, 2004

.4 ES/SOW-0102 Revision 6, May 1, 2008

1.5 PRODUCT APPROVALS

.1 Manufacturers' and model numbers named in these specifications indicate an acceptable technical standard of performance and are not intended to be exclusive. Products submitted as alternates must result in a control system that meets or exceeds all technical performance criteria as described.

.2 Products proposed as alternatives to those specified, shall only be considered if submitted for approval no later than 15 working days before tender close. Submit alternates, for approval, as one complete listing. Provide complete product specification sheets with request for approval.

.3 The Bidder must provide a complete list of primary system products offered with their bid.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.

.2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

Part 2 Products

2.1 SPLITTERS

.1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.

.3 At least three spare terminals on each set of lugs in splitters.

2.2 JUNCTION AND PULL BOXES

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

2.3 CABINETS

.1 Sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting.

Part 3 Execution

3.1 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance information for incorporation into manual specified in:

.1 Section 01 78 00 - Closeout Submittals

.2 ES/SOW-0101 Revision 3, April 15, 2004

.3 ES/SOW-0102 Revision 6, May 1, 2008

.2 Include:

.1 List specifying each piece of equipment in system or subsystem by its original manufacturer name and model number.

.2 Parts list specifying parts used in equipment by identification numbers that are standard to electronic industry.

3.2 SPLITTER INSTALLATION

.1 Install splitters and mount plumb, true and square to the building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.3 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor.

.3 Install terminal / bix block where indicated in cabinets.

.4 Only main junction and pull boxes are indicated. Provide others as required by code. Install pull boxes so as not to exceed 30m of conduit run between pull boxes.

3.4 IDENTIFICATION

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

.2 Install size 2 identification labels indicating system name, voltage and phase, Emergency, or Normal power.

3.5 WARRANTY

.1 The contractor must make available to the Owner a local service department of a duly authorized distributor of the equipment manufacturer, which shall stock the manufacturer's standard parts. The service department shall have at least one factory trained repair technician available to the Owner on 24 hours' notice.

.2 Provide warranty of installation of equipment installed by this contractor to be free of defects for a period of (1) one year from date of Substantial Completion.

.3 Provide during the warranty period, all service, maintenance, parts, etc., required for normal operation of the systems, such that Owner needs not purchase additional maintenance agreement or contracts. Upon request, the manufacturer and his agent shall provide direct to the Owner the following proposals:

.1 Continuation, after the warranty period, of full maintenance, including all service, labour, parts, etc. required to maintain the systems in a fully operational condition.

.4 During the warranty period, provide three (3) separate site visits of four (4) hours each on site for owner revisions and additional training.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of Contract, Division 01 General Requirements and all Addenda thereto form an integral part of and must be read in conjunction with the requirements of this Section.

.2 Cooperate and coordinate with the requirements of other units of work specified in other Sections.

1.2 REFERENCES

.1 The Electrical Contractor shall be bound by industry standards, as interpreted by the Consultant, whether or not specifically referenced in this document. Comply with Electrical Protection Act and rules and regulations made pursuant thereto, including the 2012 Canadian Electrical Code. Also, comply with applicable standards of the following:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

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.9 Audio Engineering Society (AES).

.10 Other Applicable CSA and UL approvals.

1.3 EXCEPTIONS OF REFERENCED STANDARDS

.1 The Electrical Contractor shall be bound by the standards referenced herein. The following exceptions shall be noted and used for this project in reference to the following standards:

.1 ES/SOW-0101 Revision 3, April 15, 2004:

.1 1.4 – Quantity of Equipment: Quantity and location of the equipment shall adhere to the requirements as noted in the Tender Drawings and associated specifications.

.2 3.1(c) – maintenance for the system is being handled by the Owner through a separate contracted entity. The Contractor is required to provide warranty services as specified for the specific system.

.3 3.1(h) – Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.4 14.0 – Lightning Protection: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.2 ES/SOW-0102 Revision 6, May 1, 2008:

.1 Wiring / Cabling Methods 3.1.1: The use of rigid steel conduit is not required.

.2 Splicing of existing power cabling due to breaker panel replacement is acceptable.

.3 Enclosures 3.3.2: Enclosures within the facility are not required to be IP64 rated.

.4 Lightning Protection 4.8: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 26 05 01 – Common Work Results

.3 ES/SOW-0101 Revision 3, April 15, 2004

.4 ES/SOW-0102 Revision 6, May 1, 2008

.2 Shop drawings shall include but not be limited to speakers, riser diagram, cable types, and special mounting details.

1.5 PRODUCT APPROVALS

.1 Manufacturers' and model numbers named in these specifications indicate an acceptable technical standard of performance and are not intended to be exclusive. Products submitted as alternates must result in a control system that meets or exceeds all technical performance criteria as described.

.2 Products proposed as alternatives to those specified, shall only be considered if submitted for approval no later than 15 working days before tender close. Submit alternates, for approval, as one complete listing. Provide complete product specification sheets with request for approval.

.3 The Bidder must provide a complete list of primary system products offered with their bid.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.

.2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Provide blank cover plates for boxes without wiring devices.

.5 Provide combination boxes with barriers where outlets for more than one system are grouped.

.6 Each outlet box installed in steel stud and gyproc walls shall be mounted on Caddy #BHA, series SGB or TSGB screw gun brackets. Wood strapping with steel studs shall not be utilized for supporting outlet boxes

.7 Use condulets where 90° turn required on wall mounted conduit. They shall be of the type where cover screws do not enter the wire chamber and covers are left accessible.

.8 Each outlet box installed in acoustic tile ceilings shall be mounted on double Caddy "Tee Bar Hanger" #512 in such a manner that the outlet box will not twist in any direction.

.9 Where boxes are surface mounted in unfinished areas, such as furnace or boiler rooms, stamped galvanized steel 100 mm square box to accept #8300 series raised covers shall be used.

.10 Where surface wiring methods are allowed and approved in finished areas, use Hubbell or Wiremold boxes as per drawings c/w suitable adapter for wireway entrance.

.11 Outdoors or damp locations, boxes shall be cast Feraloy or aluminum type 'FS', with threaded hubs and vapourproof covers.

.12 Indoors, stamped zinc cadmium plated steel boxes shall be provided and set for each fixture, switch, wall receptacle or other types of outlets, adapted to suit its respective location and designed to accept its particular components.

.13 Standard octagon boxes shall be 100 mm diameter, 53 mm deep minimum. Increase depth where area fill requires. Equip each box used for fixture hanging with a fixture stud.

.14 Two gang or larger shall be solid type with raised cover for tile, block or gyproc finish.

.15 Wood strapping with steel studs shall not be utilized for supporting outlet boxes.

.16 Set boxes plumb and level within 6 mm of finished surface. Mats not permitted.

.17 Where required, provide voltage separation barriers.

2.2 SHEET STEEL OUTLET BOXES

.1 Electro-galvanized steel multi-gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.2 Standard octagon boxes shall be 100 mm diameter, 53 mm deep minimum. Increase depth where area fill requires. Equip each box used for fixture hanging with a fixture stud.

.3 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished walls.

.4 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.5 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster walls.

2.3 MASONRY BOXES

.1 Electro-galvanized steel masonry single and multi-gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

.1 Electro-glavanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 CONDUIT BOXES

.1 Outdoors or damp locations, boxes shall be cast Feraloy or aluminum type 'FS', with threaded hubs and vapourproof covers.

.2 Indoors, stamped zinc cadmium plated steel boxes shall be provided and set for each fixture, switch, wall receptacle or other types of outlets, adapted to suit its respective location and designed to accept its particular components.

.3 Standard octagon boxes shall be 100 mm diameter, 53 mm deep minimum. Increase depth where area fill requires. Equip each box used for fixture hanging with a fixture stud.

.4 Two gang or larger shall be solid type with raised cover for tile, block or gyproc finish.

.5 Wood strapping with steel studs shall not be utilized for supporting outlet boxes.

.6 Set boxes plumb and level within 6 mm of finished surface. Mats not permitted.

.7 Where required, provide voltage separation barriers.

2.6 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

.5 Outlet boxes shall be supported independently of conduit capable of supporting weight of fixture or other device. Conduit entering the back of a box shall not enter the centre knockout.

.6 For recessed fixtures in suspended ceilings, outlet box shall be accessible when fixture is removed.

.7 Flexible conduit to fixture shall be minimum 12 mm diameter, and shall not emanate from outlet box cover. Maximum length of flexible conduit from outlet box to fixture shall be 3000 mm. Outlet box for fixture shall not be located above ducts, pipes, etc. Outlet box shall be within 750 mm (vertically) of the fixture.

.8 Provide and set all special communications type back boxes associated with systems specified under Electrical Divisions.

.9 In placing outlets, allow for overhead pipes, ducts, etc., and for variation in wall and ceiling finishes, door and window trim, panelling, etc.

.10 Location of receptacle outlets in equipment rooms shall be finalized during construction to give optimum arrangement. Consultant to approve locations before installation.

.11 Multigang boxes for use with 347 volt switches shall have each gang fully barriered from the next, or multiple single gang boxes may be used, provided they are installed in a neat, orderly fashion. Barriers shall be steel and shall be firmly held in place.

Attention is directed to special outlet box locations for 347 volt switches requiring wider mount spacing rejection feature.

3.2 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance information for incorporation into manual specified in:

.1 Section 01 78 00 - Closeout Submittals

.2 ES/SOW-0101 Revision 3, April 15, 2004

.3 ES/SOW-0102 Revision 6, May 1, 2008

.2 Include:

.1 Operation instructions

.2 Description of system operation

.3 Description of each subsystem operation

.4 List specifying each piece of equipment in system or subsystem by its original manufacturer name and model number.

.5 Parts list specifying parts used in equipment by identification numbers that are standard to electronic industry.

3.3 WARRANTY

.1 The contractor must make available to the Owner a local service department of a duly authorized distributor of the equipment manufacturer, which shall stock the manufacturer's standard parts. The service department shall have at least one factory trained repair technician available to the Owner on 24 hours' notice.

.2 Provide warranty of installation of equipment installed by this contractor to be free of defects for a period of (1) one year from date of Substantial Completion.

.3 Provide during the warranty period, all service, maintenance, parts, etc., required for normal operation of the systems, such that Owner needs not purchase additional maintenance agreement or contracts. Upon request, the manufacturer and his agent shall provide direct to the Owner the following proposals:

.1 Continuation, after the warranty period, of full maintenance, including all service, labour, parts, etc. required to maintain the systems in a fully operational condition.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of Contract, Division 01 General Requirements and all Addenda thereto form an integral part of and must be read in conjunction with the requirements of this Section.

.2 Cooperate and coordinate with the requirements of other units of work specified in other Sections.

1.2 REFERENCES

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.4 Electrical and Electronic Manufacturers Association of Canada (EEMAC).

.5 National Electrical Manufacturers Association (NEMA).

.6 National Building Code 2010 (NBC 2010)

.7 National Fire Protection Association (NFPA)

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.10 Other Applicable CSA and UL approvals.

1.3 EXCEPTIONS OF REFERENCED STANDARDS

.1 The Electrical Contractor shall be bound by the standards referenced herein. The following exceptions shall be noted and used for this project in reference to the following standards:

.1 ES/SOW-0101 Revision 3, April 15, 2004:

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.2 3.1(c) – maintenance for the system is being handled by the Owner through a separate contracted entity. The Contractor is required to provide warranty services as specified for the specific system.

.3 3.1(h) – Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.4 14.0 – Lightning Protection: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.2 ES/SOW-0102 Revision 6, May 1, 2008:

.1 Wiring / Cabling Methods 3.1.1: The use of rigid steel conduit is not required.

.2 Splicing of existing power cabling due to breaker panel replacement is acceptable.

.3 Enclosures 3.3.2: Enclosures within the facility are not required to be IP64 rated.

.4 Lightning Protection 4.8: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 26 05 01 – Common Work Results

.3 ES/SOW-0101 Revision 3, April 15, 2004

.4 ES/SOW-0102 Revision 6, May 1, 2008

.2 Shop drawings shall include but not be limited to speakers, riser diagram, cable types, and special mounting details.

1.5 PRODUCT APPROVALS

.1 Manufacturers' and model numbers named in these specifications indicate an acceptable technical standard of performance and are not intended to be exclusive. Products submitted as alternates must result in a control system that meets or exceeds all technical performance criteria as described.

.2 Products proposed as alternatives to those specified, shall only be considered if submitted for approval no later than 15 working days before tender close. Submit alternates, for approval, as one complete listing. Provide complete product specification sheets with request for approval.

.3 The Bidder must provide a complete list of primary system products offered with their bid.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.

.2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

Part 2 Products

2.1 CONDUITS

.1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.2 Rigid PVC conduit: to CSA C22.2 No. 211.2.

.3 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.

.4 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.3

.5 Conduit for use in corrosive atmospheres shall be rigid PVC or rigid steel with extruded PVC jacketed. Refer to drawings for areas requiring PVC.

.6 Condulets shall be of a type wherein cover screws do not enter the wire chamber.

.7 Flexible conduit connections to all mechanical equipment shall be of 'Sealtite' manufacture.

.8 Flexible conduit connectors shall be of the insulated throat type.

.9 Condulets with suitable covers shall be used where condulets are exposed. Each conduit fitting shall be of a type suitable to its particular use, and of a type which will allow installation of future conduits without blocking covers of existing condulets.

.10 Expansion joints shall be installed with ground jumper.

.11 All conduits shall be terminated with a suitable bushing.

.12 Flexible conduit and Rigid conduit entering boxes or enclosures shall be terminated with nylon insulated steel threaded bushings, grounded type.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 1.5 m oc.

.4 Threaded rods, 6 mm dia., to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings: manufactured for use with conduit / raceway specified. Coating: same as conduit / raceway.

.2 Factory "ells" where 90º bends are required for 25 mm and larger conduits / raceways.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

.1 Polypropylene.

Part 3 Execution

3.1 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conduits and cables shall be supported, at regular intervals, with corrosion resisting clamps. Lead anchors or expansion bolts shall be used to attach clamps to masonry walls.

.3 Conduit and cables shall be installed to avoid proximity to water and heating pipes. They shall not run within 150 mm of such pipes, except where crossings are unavoidable, in which case they shall be kept at least 25 mm from covering of pipe crossed.

.4 Cap ends of all conduits to prevent entrance of foreign matter during construction. Manufactured caps shall be employed.

.5 Conduit shall be installed as close to building structure as possible so that where concealed, necessary furring can be kept to a minimum.

.6 Empty conduits, installed under this Division but in which wiring will be installed by others, shall be swabbed out with "Jet Line" foam packs, and be c/w Polypropylene pull wire or polytwine.

.7 Conduits shall be installed at right angles or parallel to building lines, accurate in line and level.

.8 Conduit shall not be bent over sharp objects. Improperly formed bends and running threads will not be accepted. Bends and fittings shall not be used together. Proper supports of manufactured channels shall be provided where exposed conduits and cable runs are grouped.

.9 Under no condition will EMT be allowed exposed within 1200 mm of floor, outdoors, or in areas where explosive, corrosive or moist atmosphere exists.

.10 Not more than four (4) 90 degree bends or equivalent offsets will be permitted between pull boxes. When maximum number of bends are used, the total run between pull boxes shall not exceed 18000 mm.

.11 PVC conduit shall not pass through a fire partition or floor separation. Where it is necessary for PVC conduits to pass through a fire barrier, a transition to rigid steel conduit shall be provided for 2000 mm on either side of the fire barrier.

.12 Surface mount conduits except where noted otherwise.

.13 Use rigid PVC conduit in corrosive areas or as indicated on plans.

.14 Use flexible metal conduit or Teck90 for connection to motors.

.15 Use liquid tight flexible metal conduit or Teck90 for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.16 Use explosion proof flexible connection for connection to explosion proof motors.

.17 Minimum conduit size for lighting and power circuits: 19 mm.

.18 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter. Mechanically bend steel conduit over 19 mm dia.

.19 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.20 Install pulltwine in all empty conduits / raceways and conduits / raceways that are less than 40% filled.

.21 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.22 Dry conduits out before installing wire.

.23 Conduits/Cabling/raceways are not to be run within concrete floors/ceilings. Any conduits/cabling/raceways required to be run along the concrete slabs shall be surface run and not recessed into the concrete. Any instances where cabling is required to be run vertically within concrete poured walls, coreline may be used as the raceway but it shall be transitioned to EMT or Rigid Steel (where required) with interfacing connectors or junction boxes being provided as required. This specification contains references to cast in place conduits. This is only applicable where specifically called for in certain locations within the documents.

3.2 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on surface channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.3 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

3.4 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

3.5 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance information for incorporation into manual specified in:

.1 Section 01 78 00 - Closeout Submittals

.2 ES/SOW-0101 Revision 3, April 15, 2004

.3 ES/SOW-0102 Revision 6, May 1, 2008

.2 Include:

.1 List specifying each piece of equipment in system or subsystem by its original manufacturer name and model number.

.2 Parts list specifying parts used in equipment by identification numbers that are standard to electronic industry.

3.6 WARRANTY

.1 The contractor must make available to the Owner a local service department of a duly authorized distributor of the equipment manufacturer, which shall stock the manufacturer's standard parts. The service department shall have at least one factory trained repair technician available to the Owner on 24 hours' notice.

.2 Provide warranty of installation of equipment installed by this contractor to be free of defects for a period of (1) one year from date of Substantial Completion.

.3 Provide during the warranty period, all service, maintenance, parts, etc., required for normal operation of the systems, such that Owner needs not purchase additional maintenance agreement or contracts. Upon request, the manufacturer and his agent shall provide direct to the Owner the following proposals:

.1 Continuation, after the warranty period, of full maintenance, including all service, labour, parts, etc. required to maintain the systems in a fully operational condition.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of Contract, Division 01 General Requirements and all Addenda thereto form an integral part of and must be read in conjunction with the requirements of this Section.

.2 Cooperate and coordinate with the requirements of other units of work specified in other Sections.

1.2 REFERENCES

.1 The Electrical Contractor shall be bound by industry standards, as interpreted by the Consultant, whether or not specifically referenced in this document. Comply with Electrical Protection Act and rules and regulations made pursuant thereto, including the 2012 Canadian Electrical Code. Also, comply with applicable standards of the following:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

.3 CSA C22.1-2012, Canadian Electrical Code, Part 1.

.4 CSAC22.2No.26, Construction and Test of Wireways, Auxiliary Gutters and Associated Fittings.

.5 Electrical and Electronic Manufacturers Association of Canada (EEMAC).

.6 National Electrical Manufacturers Association (NEMA).

.7 National Building Code 2010 (NBC 2010)

.8 National Fire Protection Association (NFPA)

.9 Institute of Electrical and Electronic Engineers (IEEE).

.10 Audio Engineering Society (AES).

.11 Other Applicable CSA and UL approvals.

1.3 EXCEPTIONS OF REFERENCED STANDARDS

.1 The Electrical Contractor shall be bound by the standards referenced herein. The following exceptions shall be noted and used for this project in reference to the following standards:

.1 ES/SOW-0101 Revision 3, April 15, 2004:

.1 1.4 – Quantity of Equipment: Quantity and location of the equipment shall adhere to the requirements as noted in the Tender Drawings and associated specifications.

.2 3.1(c) – maintenance for the system is being handled by the Owner through a separate contracted entity. The Contractor is required to provide warranty services as specified for the specific system.

.3 3.1(h) – Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.4 14.0 – Lightning Protection: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.2 ES/SOW-0102 Revision 6, May 1, 2008:

.1 Wiring / Cabling Methods 3.1.1: The use of rigid steel conduit is not required.

.2 Splicing of existing power cabling due to breaker panel replacement is acceptable.

.3 Enclosures 3.3.2: Enclosures within the facility are not required to be IP64 rated.

.4 Lightning Protection 4.8: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 26 05 01 – Common Work Results

.3 ES/SOW-0101 Revision 3, April 15, 2004

.4 ES/SOW-0102 Revision 6, May 1, 2008

1.5 PRODUCT APPROVALS

.1 Manufacturers' and model numbers named in these specifications indicate an acceptable technical standard of performance and are not intended to be exclusive. Products submitted as alternates must result in a control system that meets or exceeds all technical performance criteria as described.

.2 Products proposed as alternatives to those specified, shall only be considered if submitted for approval no later than 15 working days before tender close. Submit alternates, for approval, as one complete listing. Provide complete product specification sheets with request for approval.

.3 The Bidder must provide a complete list of primary system products offered with their bid.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.

.2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

Part 2 Products

2.1 WIREWAYS

.1 Wireways and fittings: to CSA C22No.26.

.2 Sheet steel with hinged cover to give uninterrupted access.

.3 Finish: baked grey enamel.

.4 Elbows, tees, couplings and hanger fittings manufactured as accessories to wireway supplied.

Part 3 Execution

3.1 INSTALLATION

.1 Install wireways and auxiliary gutters.

.2 Keep number of elbows, offsets, connections to minimum.

.3 Install supports, elbows, tees, connectors, fittings.

.4 Install barriers where required.

.5 Install gutter to full length of equipment.

3.2 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance information for incorporation into manual specified in:

.1 Section 01 78 00 - Closeout Submittals

.2 ES/SOW-0101 Revision 3, April 15, 2004

.3 ES/SOW-0102 Revision 6, May 1, 2008

.2 Include:

.1 List specifying each piece of equipment in system or subsystem by its original manufacturer name and model number.

.2 Parts list specifying parts used in equipment by identification numbers that are standard to electronic industry.

3.3 WARRANTY

.1 The contractor must make available to the Owner a local service department of a duly authorized distributor of the equipment manufacturer, which shall stock the manufacturer's standard parts. The service department shall have at least one factory trained repair technician

available to the Owner on 24 hours' notice.

.2 Provide warranty of installation of equipment installed by this contractor to be free of defects for a period of (1) one year from date of Substantial Completion.

.3 Provide during the warranty period, all service, maintenance, parts, etc., required for normal operation of the systems, such that Owner needs not purchase additional maintenance agreement or contracts. Upon request, the manufacturer and his agent shall provide direct to the Owner the following proposals:

.1 Continuation, after the warranty period, of full maintenance, including all service, labour, parts, etc. required to maintain the systems in a fully operational condition.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

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.2 3.1(c) – maintenance for the system is being handled by the Owner through a separate contracted entity. The Contractor is required to provide warranty services as specified for the specific system.

.3 3.1(h) – Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.4 14.0 – Lightning Protection: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

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.1 Wiring / Cabling Methods 3.1.1: The use of rigid steel conduit is not required.

.2 Splicing of existing power cabling due to breaker panel replacement is acceptable.

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1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 26 05 01 – Common Work Results

.3 ES/SOW-0101 Revision 3, April 15, 2004

.4 ES/SOW-0102 Revision 6, May 1, 2008

.2 Shop drawings shall include but not be limited to speakers, riser diagram, cable types, and special mounting details.

1.5 LIGHTING CONTROL APPLICATIONS

.1 Unless relevant provisions of the applicable local Energy Codes are more stringent, provide a minimum application of lighting controls as follows:

.1 Bi-Level Lighting – Provide multi-level controls in spaces as shown on drawings or applications where variable dimming is used.

1.6 SUBMITTALS

.1 Submittals Package: Submit the shop drawings, and the product data specified below at the same time as a package.

.2 Shop Drawings:

.1 Composite wiring and/or schematic diagram of each control circuit as proposed to be installed (standard diagrams will not be accepted).

.2 Scale drawing for each area showing exact location of each sensor, room controller, and digital switch.

.3 Product Data: Catalog sheets, specifications and installation instructions.

.4 Include data for each device which:

.1 Indicates where sensor is proposed to be installed.

.2 Prove that the sensor is suitable for the proposed application.

1.7 QUALITY ASSURANCE

.1 Manufacturer: Minimum [10] years experience in manufacture of lighting controls.

1.8 PROJECT CONDITIONS

.1 Do not install equipment until following conditions can be maintained in spaces to receive equipment:

.1 Ambient temperature: 0° to 40° C (32° to 104° F).

.2 Relative humidity: Maximum 90 percent, non-condensing.

1.9 WARRANTY

.1 Provide a five year limited manufacturer’s warranty on DLM room control devices and HDR relays. Provide a one year limited manufacturer’s warranty on lighting control panels.

1.10 MAINTENANCE

.1 Spare Parts

Part 2 Products

2.1 MANUFACTURERS

.1 Acceptable Manufacturer:

.1 WattStopper

1. System: Digital Lighting Management (DLM)

.2 Basis of design product: WattStopper Digital Lighting Management (DLM) or subject to compliance and prior approval with specified requirements of this section, one of the following:

1. WattStopper Digital Lighting Management (DLM)

2. Or approved equal.

.2 Substitutions:

.1 All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional a minimum of 15 working days prior to the bid date and must be made available to all bidders. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.

.2 By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring. The contractor shall provide complete engineered shop drawings (including power and control wiring) with deviations from the original design highlighted in an alternate color to the engineer for review and approval prior to rough-in.

2.2 DIGITAL WALL SWITCHES

.1 Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5 and 8 button configuration; available in white, light almond, ivory, grey, red and black; compatible with wall plates with decorator opening. Wall switches shall include the following features:

.1 Two-way infrared (IR) transceiver for use with personal and configuration remote controls.

.2 Removable buttons for field replacement with engraved buttos and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.

.3 Red configuration LED on each switch that blinks to indicate data transmission.

.4 Blue Load/Scene Status LED on each switch button with the following characteristics:

1. Bi-level LED

2. Dim locator level indicates power to switch

3. Bright status level indicates that load or scene is active

.5 Dimming switches shall include seven bi-level LEDs to indicate load levels using 14 steps.

.2 Two RJ-45 ports for connection to DLM local network.

.3 Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required to achieve multi-way switching.

.4 The following switch attributes may be changed or selected using a wireless configuration tool:

.1 Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).

.2 Individual button function may be configured to Toggle, On only or Off only.

.3 Individual scenes may be locked to prevent unauthorized change.

.4 Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.

.5 Ramp rate may be adjusted for each dimmer switch.

.6 Switch buttons may be bound to any load on a room controller and are not load type dependant; each button may be bound to multiple loads.

.5 WattStopper product numbers: LMSW-101, LMSW-102, LMSW-103, LMSW-104, LMSW-105, LMSW-108, LMDM-101.

2.3 HANDHELD REMOTE CONTROLS

.1 Battery-operated handheld switches in 1, 2 and 5 button configuration for remote switching or dimming control. Remote controls shall include the following features:

.1 Two-way infrared (IR) transceiver for line of sight communication with DLM local network within up to 30 feet.

.2 Blue LED on each button confirms button press.

.3 Load buttons may be bound to any load on a room controller and are not load type dependant; each button may be bound to multiple loads.

.4 Inactivity timeout to save battery life.

.2 A wall mount holster and mounting hardware shall be included with each remote control

.3 WattStopper part numbers: LMRH-101, LMRH-102, LMRH-105.

2.4 ROOM CONTROLLERS

.1 Room Controllers automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room Controllers shall be provided

to match the room lighting load and control requirements. The controllers will be simple to install and will not have, dip switches, potentiometers or require special configuration. The control units will include the following features:

.1 Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.

.2 Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf unit without requiring any configuration or setup.

.3 Device Status LEDs to indicate:
1. Data transmission
2. Device has power
3. Status for each load
4. Configuration status

.4 Quick installation features including:
1. Standard junction box mounting
2. Quick low voltage connections using standard RJ-45 patch cable

.5 Plenum rated

.6 Manual override and LED indication for each load

.7 Dual voltage (120/277 VAC, 60 Hz), or 347 VAC, 60 Hz (selected models only)

.8 Zero cross circuitry for each load.

.2 On/Off Room Controllers shall include:

.1 One or two relay configuration

.2 Efficient 150 mA switching power supply

.3 Three RJ-45 DLM local network ports

.4 WattStopper product numbers: LMRC-101, LMRC-102,

.3 On/Off/Dimming enhanced Room Controllers shall include:

.1 Real time current monitoring

.2 Multiple relay configurations
1. One, two or three relays (LMRC-21x series)
2. One or two relays (LMRC-22x series)

.3 Efficient 250 mA switching power supply

.4 Four RJ-45 DLM local network ports.

.5 One dimming output per relay
1. Where indicated, one 0-10 volt analog output per relay for control of compatible ballasts and LED drivers. The 0-10 volt output shall automatically open upon loss of power to the Room Controller to assure full light output from the controlled lighting. (LMRC-21x series)
2. Where indicated, one forward phase control line voltage dimming output per relay for control of compatible two-wire or three-wire ballasts, LED drivers, MLV, forward phase compatible ELV, neon/cold cathode and incandescent loads. (LMRC-22x series)

.6 The following dimming attributes may be changed or selected using a wireless configuration tool:
1. Establish preset level for each load from 0-100%
2. Set high and low trim for each load
3. Set lamp burn in time for each load up to 100 hours

.7 WattStopper product numbers: LMRC-211, LRMC-212, LRMC-213, LMRC-221, LMRC-222,.

2.5 ROOM NETWORK (DLM LOCAL NETWORK)

.1 The DLM local network is a free topology lighting control physical connection and communication protocol designed to control a small area of a building. Digital room devices connect to the network using CAT 5e cables with RJ-45 connectors which provide both data and power to room devices. Features of the DLM local network include:

.1 Plug n' Go automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.

.2 Simple replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup.

.3 Push n' Learn configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network.

.4 Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver..

2.6 CONFIGURATIONS TOOLS

.1 A configuration tool facilitates optional customization of DLM local networks, and is used to set up open loop daylighting sensors. A wireless configuration tool features infrared communications, while PC software connects to each local network via a USB interface.

.2 Features and functionality of the wireless configuration tool shall include:

.1 Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet.

.2 High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation.

.3 Read, modify and send parameters for occupancy sensors, daylighting sensors, room controllers and buttons on digital wall switches.

.4 Save up to nine occupancy sensor setting profiles, and apply profiles to selected sensors.

.5 Temporarily adjust light level of any load(s) on the local network, and incorporate those levels in scene setting.

.6 Adjust or fine-tune daylighting settings established during auto-commissioning, and input light level data to complete commissioning of open loop daylighting controls.

.3 WattStopper Product Numbers: LMCT-100, LMCI-100/LMCS-100

2.7 NETWORK BRIDGE

.1 The network bridge module connects a DLM local network to a BACnet-compliant segment network for communication between rooms, panels and a segment manager or BAS. Each local network shall include a network bridge component to provide a connection to the local network room devices. The network bridge shall use industry standard BACnet MS/TP network communication.

.1 The network bridge shall be provided as a separate module connected on the local network through an available RJ-45 port.

.2 Provide Plug n' Go operation to automatically discover room devices connected to the local network and make all device parameters visible to the segment manager via the segment network. No commissioning shall be required for set up of the network bridge on the local network.

.3 The network bridge shall automatically create standard BACnet objects for selected room device parameters to allow any BACnet-compliant BAS to include lighting control and power monitoring features as provided by the DLM room devices on each local network. Standard BACnet objects shall be provided as follows:

1. Read/write the normal or after hours schedule state for the room
2. Read the detection state of the occupancy sensor
3. Read/write the On/Off state of loads
4. Read/write the dimmed light level of loads
5. Read the button states of switches

6. Read total current in amps, and total power in watts through the room controller
7. Read/write occupancy sensor time delay, PIR sensitivity and ultrasonic sensitivity settings
8. Activate a preset scene for the room
9. Read/write daylight sensor fade time and day and night setpoints
10. Read the current light level, in footcandles, from interior and exterior photosensors and photocells
11. Set daylight sensor operating mode
12. Read/write wall switch lock status
13. Read watts per square foot for the entire controlled room
14. Write maximum light level per load for demand response mode
15. Read/write activation of demand response mode for the room
16. Active/restore demand response mode for the room

.4 WattStopper product numbers: LMBC-300

2.8 SEGMENT MANAGER

.1 The Digital Lighting Management system shall include at least one segment manager to manage network communication. It shall be capable of serving up a graphical user interface via a standard web browser. Each segment manager shall have integral support for one, two or three segment networks as indicated. Segment networks may alternately be connected to the segment manger via external routers and switches, using standard Ethernet structured wiring. Each router shall accommodate one segment network. Provide the quantity of routers and switches as shown on the plans.

.2 Operational features of the Segment Manager shall include the following:

.1 Connection to PC or LAN via standard Ethernet TCP/IP.

.2 Easy to learn and use graphical user interface, compatible with Internet Explorer 8, or equal browser.

.3 Log in security capable of restricting some users to view-only or other limited operations.

.4 Automatic discovery of DLM devices and panels on the segment network(s). Commissioning beyond activation of the discovery function shall not be required to provide communication, monitoring or control of all local networks and lighting control panels.

.5 After discovery, all rooms and panels shall be presented in a standard navigation tree format. Selecting a device from the tree will allow the device settings and operational parameters to be viewed and changed by the user.

.6 Ability to view and modify room device operational parameters. It shall be possible to set device parameters independently for normal hours and after hours operation.

.7 Ability to set up schedules for rooms and panels. Schedules shall automatically set controlled zones or areas to either a normal hours or after hours mode of operation.

.8 Ability to group rooms and loads for common control by schedules, switches or network commands.

.9 Ability to monitor connected load current and display power consumption for areas equipped with room controllers incorporating the integral current monitoring feature.

.10 Provide capabilities for integration with a BAS via BACnet protocol. At a minimum, the following points shall be available to the BAS via BACnet IP connection to the segment manager: room occupancy state; individual occupancy sensor state; scene activation; schedule mode; room lighting power; room plug-load power; load ON/OFF state; and load dimming level.

.3 WattStopper Product Numbers: LMSM-201, LMSM-603, NB-ROUTER, NB-SWITCH, NB-SWITCH-8.

2.9 LILM LIGHTING CONTROL PANELS

.1 Provide lighting control panels in the locations and capacities as indicated on the plans and schedules. Each panel shall be of modular construction and consist of the following components:

.1 Enclosure/Tub shall be NEMA 1, sized to accept an interior with 1 - 8 relays, 1 - 24 relays and 6 four-pole contactors, or 1 - 48 relays and 6 four-pole contactors.

.2 Cover shall be configured for surface or flush wall mounting of the panel as indicated on the plans. The panel cover shall have a hinged and lockable door with restricted access to line voltage section of the panel.

.3 Interior assembly shall be supplied as a factory assembled component specifically designed and listed for field installation. The interior construction shall provide total isolation of high voltage (Class 1) wiring from low voltage (Class 2) wiring within the assembled panel. The interior assembly shall include intelligence boards, power supply, DIN rails for mounting optional Class 2 control devices, and individually replaceable latching type relays. The panel interiors shall include the following features:

1. Removable, plug-in terminal blocks with screwless connections for all low voltage terminations.
2. Individual terminal block, override pushbutton, and LED status light for each relay.
3. Direct wired switch inputs associated with each relay and group channel shall support two- or three-wire, momentary or maintained contact switches or 24VDC input from occupancy sensors.
4. Automatic support for occupancy sensor sequence of operation. Direct wired low voltage inputs automatically reconfigure when connected to a WattStopper occupancy sensor head. Occupancy sensor shall switch

lighting on and off during unoccupied periods but shall not turn lighting off during scheduled occupancy periods.

5. Digital inputs (four RJ-45 jacks) shall support 1-, 2-, 3-, 4-, and 8-button digital switches and digital occupancy sensors.
6. Isolated contacts within each relay shall provide true relay state to the electronics. True relay state shall be indicated by the on-board LED and shall be available to external control devices and systems.
7. Automatically sequenced operation of relays to reduce impact on the electrical distribution system when large loads are controlled simultaneously.
8. Group, channel, and pattern control of relays shall be provided through a simple keypad interface within the panel. Any group of relays can be associated with a channel for direct on/off control or pattern (scene) control via a simple programming sequence using the relay and channel override pushbuttons and LED displays.
9. Relay group status for each channel shall be provided through bi-color operation of the LED indicators. Solid red indicates that all relays in the group are on, solid green indicates that the group is in a mixed state, and blinking green indicates that the relays have blink warned and are currently timing out.
10. Each relay and channel terminal block shall provide a 24V pilot light signal. It shall be possible to configure the system for support for any Class 2 pilot light voltage with the use of an auxiliary power supply.
11. Single-pole latching relays with modular plug-in design. Relays shall provide the following ratings and features:
12. Electrical:
    - .1 20amp tungsten at 120V
    - .2 1.5 HP motor at 120V
    - .3 Relays shall be specifically UL listed for control of plug-loads
13. Mechanical:
    - .1 Replaceable, ½" KO mounting with removable Class 2 wire harness.
    - .2 Actuator on relay housing provides manual override and visual status indication, accessible from Class 2 section of panel.
    - .3 Dual line and load terminals each support two #14 - #12 solid or stranded conductors.
    - .4 Tested to 300,000 mechanical on/off cycles.
14. Isolated low voltage contacts provide for true relay status feedback and pilot light indication.

.4 Power supply shall be a multi-voltage transformer assembly with rated power to supply all electronics, occupancy sensors, switches, pilot lights, and photocells as necessary to meet the project requirements. Power supply to have internal over-current protection with automatic reset and metal oxide varistor protection.

1. Lighting control panels shall be WattStopper model LILM8, LILM24 or LILM48 as shown on the plans.

.2 BACnet® BASED DIGITAL COMMUNICATIONS

.1 The lighting control panel shall support digital communications to facilitate the extension of control to include interoperation with building automation systems and other intelligent field devices. Digital communications shall be RS485 master/slave token passing-based using the BACnet® protocol.

1. The panel shall have provision for an individual BACnet device ID. The device ID description property shall be writable via the network to allow unique identification of the lighting control panel on the network.
2. The panel shall support MS/TP MAC addresses in the range of 0 - 127 and baud rates of 9600k, 38400k and 76800k bits per second.
3. Lighting control relays shall be controllable as binary output objects in the instance range of 1 - 48. The state of each relay shall be readable and writable by the BAS via the object present value property.
4. Lighting control relays shall report their true on/off state as binary input objects in the instance range of 1 - 48.
5. The eight channel groups associated with the panel shall be represented by binary value objects in the instance range of 1 - 8. The occupancy state of each channel group shall be readable and writable by the BAS via the object present value property. Commanding 1 to a channel group will put all relays associated with the channel into the normal hours mode. Commanding 0 or NULL shall put the relays into the after hours mode.
6. Setup and commissioning of the panel shall not require manufacturer-specific software or configuration tools of any kind. All configuration of the lighting control panel shall be performed using standard BACnet objects or via the on-board LCD display and user keypad. Provide BACnet objects for panel setup and control as follows:
7. Binary output objects in the instance range of 1 - 48 (one per relay) for on/off control of relays.
8. Binary value objects in the instance range of 1 - 8 (one per channel) for normal hours/after hours schedule control.
9. Binary input objects in the instance range of 1 - 48 (one per relay) for reading true on/off state of the relays.
10. Analog value objects in the instance range of 1 - 48 (one per relay) shall assign relays to channel groups in the range of 1 - 8.
11. Binary value objects in the instance range of 101 - 108 (one per channel group) shall assign the channel to follow auto-on or manual-on mode when transitioning to occupied.
12. Analog value objects in the instance range of 101 - 108 (one per channel group) shall assign a blink warn time value to each channel. A value of 5 shall activate the blink warn feature for the channel and set a 5-minute grace time period. A value of 250 shall activate the sweep feature for the channel and enable the use of sweep type automatic wall switches.
13. Analog value objects in the instance range of 201 - 208 (one per channel) shall assign an after hours time delay value to the channel in the range of 1 - 240 minutes.
14. Multi-state value objects in the instance range of 1 - 8 (one per channel) shall provide the state of the relays assigned to the channel. Valid states shall be ALL ON, MIXED, BLINK, and ALL OFF.

15. The description property for all objects shall be writable via the network and shall be saved in non-volatile memory within the panel.
16. The BO and BV 1 - 8 objects shall support BACnet priority array with a relinquish default of off and after hours respectively.

.3 USER INTERFACE

.1 Each lighting control panel shall be supplied with an integral user interface consisting of a keypad and associated OLED display screen. The user interface shall allow setup, configuration, and diagnostics of the panel without the need for software or connection of a computer. The user interface shall have the following functions as a minimum:

1. Set network parameters including panel device ID, MS/TP MAC address, baud rate and max master range.
2. Interface with owner's PLC control system.
3. Enter meaningful names for the panel, relays, and channels.
4. View normal hours/after hours status of each channel.
5. Override the normal hours/after hours mode for each channel.
6. View the 16 priority array slots for each channel and relay.
7. Program the schedule response for each channel as:
   - .1 Automatic-on or manual-on.
   - .2 Enable/disable blink warn.
   - .3 Enter override time delay as 0 (none) to 240 minutes.

.4 SCHEDULE, GROUP, AND PHOTOCELL CONTROL OF RELAYS

.1 The lighting control panel shall support schedule, group, and photocell control functions via the network as configured in the optional Segment Manager controller or building automation system. The lighting control panel shall be fully compatible with building automation systems that are BACnet compliant. See related specification sections for additional information on interfacing the lighting control panel(s) to the building automation system.

.5 BROWSER-BASED PROGRAMMING AND CONTROL

.1 The digital segment manager shall be a compact controller capable of hosting the schedule, photocell, and group relay control functions for a network of LILM series lighting control panels. The segment manager shall provide the following features:

.2 Provision for 1 to 3 separate network segments to facilitate efficient network wire routing.

.3 Compact housing with screw tab mounts for surface installation and integral DIN rail mounting slot for NEMA 1 installation in the LMSM-ENC1 enclosure.

.4 Web browser-based user interface; shall not require the installation of any lighting control software.

.5 User interface accessible form most smart phone browsers when Internet connected.

.6 Login security access control restricting some users to view-only or other limited operations.

.7 Automatic discovery of the lighting control panels.

.8 Familiar navigation-tree-based browsing to individual lighting control panels.

.9 View/override current status of channels and relays.

.10 Assign relays to channels.

.11 Set channel operating parameters:

1. Automatic-on or manual-on operation.
2. Enable/disable blink warn.
3. Override duration time, 0 (none) to 240 minutes.
4. AS-100 automatic wall switch operation mode.

.12 Create and run schedules:

1. Normal hours/after hours schedules for channels.
2. On/off schedules for relays.
3. Support for a minimum of 100 unique schedules, each with up to four time events per day.
4. Support annual schedules, holiday schedules and unique date-bound schedules.
5. Ethernet connectivity for user access via direct-wired connection, LAN/WAN, or Internet connection.
6. BACnet IP connectivity for connection to building automation systems.
7. Segment manager shall be WattStopper LMSM-201 with one network segment or LMSM-603 with support for three network segments.

2.10 CABLE

.1 Plenum rated cable as per CEC 2012, recommended by the manufacture: GRX-PCBL-46L or equal as stated by the manufacture.

.2 Non-Plenum rated cable as per CEC 2012, recommended by the manufacture: GRX-CBL-346S or equal as stated by the manufacture.

Part 3 Execution

3.1 INSTALLATION

.1 If using wire other than Cat 5e with RJ-45 connectors for connections other than DLM local network, provide detailed point to point wiring diagrams for every termination.

Provide wire specifications and wire colors to simplify contactor termination requirements

.2 Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings.

.1 Adjust time delay so that controlled area remains lighted for 5 minutes after occupant leaves area.

.3 Provide written or computer-generated documentation on the commissioning of the system including room by room description including:

.1 Sensor parameters, time delays, sensitivities, and daylighting setpoints.

.2 Sequence of operation, (e.g. manual ON, Auto OFF. etc.)

.3 Load Parameters (e.g. blink warning, etc.)

.4 The contractor must make available to the Owner, a service department of a duly authorized distributor of the equipment manufacturer, which shall stock the manufacturer's standard parts. The service department shall have at least one factory trained repairman available to the Owner on 24 hours notice. The system shall be guaranteed for a period of one year.

.5 Cable and conduit necessary to make the system operable shall be provided and installed as instructed by the manufacturer of the system. The overall system co-ordination shall be the responsibility of the contractor, and he shall ensure that all of the necessary system components are installed to result in a complete, workable system.

.6 All wiring installed in conduit shall be with a maximum conduit fill of 40%. Increase indicated conduit sizes, if necessary, to accommodate manufacturer's cable requirements.

.7 All Luminaire wiring from the dimmer controller to Luminaires shall have separate neutrals. Sharing of neutrals shall not be permitted.

.8 The system shall be installed in full compliance with the manufacturer's recommendations and these specifications. On completion, a technical representative from the manufacturer shall fully check out and test the system and make necessary adjustments to ensure 100% operation.

.9 The control console SlvM (priority 2), located in the Room 333 shall control each of the lighting zones as indicated on the drawings. This shall be completed through the owner's PLC and the touch screen monitor on the desk. The touch screen control panel ClvT, in Room 348 shall operate as the master control (priority 1) and shall be capable of over-riding the control console located in the Room 333 for simulation purposes.

.10 The push button control console SlvP1 (priority 1), located in the Room 319 shall control each of the lighting zones as indicated on the drawings. This control shall operate as the master control and shall be capable of over-riding the control console SlvP2 (priority 2) located in the Room 316 for simulation purposes.

.11 The push button control console SlvP1 (priority 1), located in the Room 364 shall control each of the lighting zones as indicated on the drawings. This control shall operate as the master control and shall be capable of over-riding the control console SlvP2 (priority 2) located in the Room 363 for simulation purposes.

.12 Digital wall switches ‘Slvxx’ shall be provided at entrances as shown for maintenance and custodial purposes as on/off switches for the lighting zone.

.13 The system shall be checked for:

.1 Verification of color codes with respect to interconnections as recommended by manufacturer

.2 Verification of color codes with respect to drawings and maintenance manuals

.3 Inspection or wiring and methods of termination in junction boxes and back boxes

.4 Designation of junction box covers and references with respect to these boxes on electrical drawings

.14 The system shall be tested for:

.1 Grounds

.2 100 per cent load on each dimming circuit

.3 Operation of system shall be checked step by step as described in user's manual;

.15 Certification of these tests, upon completion, shall be issued in writing to the consultant by the manufacturer's representative.

.16 The Owner's operating personnel shall be instructed in the operation of the system for a minimum period of two (2) hours. Written documentation bearing name and signature of Owner's personnel who received the above instructions shall be included in operating instructions and service manuals.

.17 Provide three (3) copies of operating instructions and service manuals complete with parts list, wiring diagrams and shop drawings.

.18 The contractor must make available to the Owner, a service department of a duly authorized distributor of the equipment manufacturer, which shall stock the manufacturer's standard parts. The service department shall have at least one factory trained repairman available to the Owner on 24 hours notice. The system shall be guaranteed for a period of one year.

3.2 COMMISSIONING AND TESTING

.1 The electrical contractor shall provide both the manufacturer and the electrical engineer with three weeks written notice of the system start up and adjustment date.

.2 Re-commissioning – After 30 days from occupancy re-calibrate all sensor time delays and sensitivities to meet the Owner's Project Requirements. Provide a detailed report to the Architect / Owner of re-commissioning activity.

.3 The Owner's operating and maintenance personnel shall be instructed in the operating and maintenance of the Lighting System. Training and commissioning shall be completed in three parts. Both the supplier and a manufacture representative shall be present during commissioning.

.4 The training and pre-commissioning shall be approximately four hours and shall be completed prior to substantial completion during rough in to ensure the owner understands the system and requirements

.5 The second training and final commissioning session shall be approximately four hours long approximately two month after owner occupancy. Written documentation bearing name and signature of Owner's personnel who received the above instructions shall be included in the operation and service manuals. During this time any scene settings and programming adjustments required by the owner shall be made and confirmed with the owner. The owner shall be confident in his/hers ability to make scene and programming changes.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of Contract, Division 01 General Requirements and all Addenda thereto form an integral part of and must be read in conjunction with the requirements of this Section.

.2 Cooperate and coordinate with the requirements of other units of work specified in other Sections.

1.2 REFERENCES

.1 The Electrical Contractor shall be bound by industry standards, as interpreted by the Consultant, whether or not specifically referenced in this document. Comply with Electrical Protection Act and rules and regulations made pursuant thereto, including the Canadian Electrical Code. Also, comply with applicable standards of the following:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

.3 CSA C22.1-2012, Canadian Electrical Code, Part 1.

.4 CAN/CSA-C22.2 No.31-M89(R2000), Switchboard Assemblies.

.5 Electrical and Electronic Manufacturers Association of Canada (EEMAC).

.6 National Electrical Manufacturers Association (NEMA).

.7 National Building Code 2010 (NBC 2010)

.8 National Fire Protection Association (NFPA)

.9 Institute of Electrical and Electronic Engineers (IEEE).

.10 Audio Engineering Society (AES).

.11 Other Applicable CSA and UL approvals.

1.3 EXCEPTIONS OF REFERENCED STANDARDS

.1 The Electrical Contractor shall be bound by the standards referenced herein. The following exceptions shall be noted and used for this project in reference to the following standards:

.1 ES/SOW-0101 Revision 3, April 15, 2004:

.1 1.4 – Quantity of Equipment: Quantity and location of the equipment shall adhere to the requirements as noted in the Tender Drawings and associated specifications.

.2 3.1(c) – maintenance for the system is being handled by the Owner through a separate contracted entity. The Contractor is required to provide warranty services as specified for the specific system.

.3 3.1(h) – Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.4 14.0 – Lightning Protection: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.2 ES/SOW-0102 Revision 6, May 1, 2008:

.1 Wiring / Cabling Methods 3.1.1: The use of rigid steel conduit is not required.

.2 Splicing of existing power cabling due to breaker panel replacement is acceptable.

.3 Enclosures 3.3.2: Enclosures within the facility are not required to be IP64 rated.

.4 Lightning Protection 4.8: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with:

.1 Section 01 33 00 - Submittal Procedures

.2 26 05 01 – Common Work Results

.3 ES/SOW-0101 Revision 3, April 15, 2004

.4 ES/SOW-0102 Revision 6, May 1, 2008

.2 Shop drawings shall include but not be limited to layout, devices installed, withstand ratings, lug and torque tables, Time-current characteristic curves for circuit breakers and fuses, and special mounting details.

.3 Submit shop drawings for review prior to fabrication of equipment. The following drawings of the switchboard shall be provided prior to commencing manufacture:

.1 Channel base plan

.2 Single line diagrams showing necessary details of electrical components and connections.

.3 Elevation plan and section views with dimensions and all component details.

.4 Weight of complete structure, size and weight of each shipping section, and manufacturer's data sheets of all major components.

.5 Complete wiring schematics.

.4 Include schematic, wiring and interconnection diagrams, which shall include component identification.

.5 Each component shall be identified as to manufacturer, type, description, and catalogue number.

.6 Drawing details show all stations, control modules, cabling and field terminations.

.7 Include a statement of warranty hardware from the manufacturer.

1.5 PRODUCT APPROVALS

.1 Manufacturers' and model numbers named in these specifications indicate an acceptable technical standard of performance and are not intended to be exclusive. Products submitted as alternates must result in a control system that meets or exceeds all technical performance criteria as described.

.2 Products proposed as alternatives to those specified, shall only be considered if submitted for approval no later than 15 working days before tender close. Submit alternates, for approval, as one complete listing. Provide complete product specification sheets with request for approval.

.3 The Bidder must provide a complete list of primary system products offered with their bid.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

.2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

1.7 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for secondary switchboard for incorporation into manual in accordance with Section 01 78 00 - Closeout Submittals.

.2 3 copies maintenance data for complete switchboard assembly including components.

1.8 STORAGE AND PROTECTION

.1 Store switchboard on site in protected, dry location. Cover with plastic to keep off dust.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.

.2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

1.10 EXTRA MATERIALS

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Include:

.1 3 sets of Type L fuses for each type above 600 A.

.2 6 sets of Type J fuses for each type up to and including 600 A.

Part 2 Products

2.1 MATERIALS

.1 Switchboard assembly: to CAN/CSA-C22.2 No.31.

.2 Size, arrangement and extent of equipment shall be as shown on the drawings.

.3 Switchboard construction shall consist of a 3 mm sheet steel enclosure dead front, self-supporting unit.

.4 Phasing shall conform to CSA and CEMA standards. Colour code all three phases on main bus and on the load terminals of all feeders.

.5 Re-arrangement of components will not be permitted. Equipment shall be constructed to fit space allocated and shall be mounted on a concrete pad. Arrangement and space allocation as shown on drawings shall be maintained, unless an alternate method, suggested by the contractor under this Division and the successful manufacturer, is approved in writing by the Consultant.

.6 Equipment shall be designed, factory assembled and tested in accordance with latest applicable CEMA and CSA standards.

.7 Equipment shall be complete with required Arc Flash warning labels as required by CEC and this specification.

.8 All switchboard enclosures including covers and lids shall be made with 3mm. (#12 gauge) steel.

2.2 RATING

.1 Secondary switchboard: indoor, voltage as shown on drawing, ampacity as shown on drawings, 3 phase, 4 wire, 60 hz, minimum short circuit capacity 42 ka (rms symmetrical) for 120/208v.

2.3 ENCLOSURE

.1 Distribution sections to contain:

.1 Fusible disconnects sized as indicated.

.2 Main bus work, extending through every section, shall be tin plated copper rated as shown on the drawings, and shall be full size throughout length of switchboard.

.3 Copper ground bus 6 mm x 50 mm, bolted to the structure and extending the full length of the switchboards. Cable clamps shall be provided at convenient locations for making the station ground connection.

.2 Blanked off spaces for future units.

.3 Switchboard shall be fitted with two permanent channels, minimum 100 mm across the bottom of each section, to permit rolling or jacking of board. A permanent channel or angle shall also be provided across top of each section substantial enough to carry weight of section for hoisting purposes. Two other channels, minimum 150 mm width, shall be provided by switchboard manufacturer along with floor plan, and shall be grouted into floor for levelling purposes. Floor channels shall run full length of board, and shall line up with 100 mm channel on switchboard.

.4 All panelboard enclosures shall be 2300 mm high. All unused panel spaces shall be made available for future switch fuse units.

.5 Provide sprinkler guards on top of all switchboards. All conduit entering top of switchboards shall be c/w water tight connectors. Seal all conduit connectors with silicone based caulking to provide a degree of water tightness in the event of a sprinkler system failure.

.6 The entire enclosure shall be cleaned and phosphated, then painted with one coat of alkyd type primer, and one coat of low gloss light grey (ASA 61) baked on polyester powder coat.

.7 Before leaving the factory, switchboards shall be touched up to present a smooth, even, clean finish inside and outside. Interiors shall be cleaned of debris and dirt. Before shipment, movable components shall be carefully blocked.

.8 The switchboard shall be completely assembled, wired, adjusted and tested at the factory. After assembly, the complete switchboard will be tested for operation under simulated service conditions to ensure the accuracy of the wiring and the functioning of the equipment.

.9 All switchboards shall be manufactured by General Electric, Cutler Hammer or Schneider Electric

2.4 BUSBARS

.1 Three phase and full capacity neutral, insulated busbars, continuous current rating as noted on drawing, self-cooled, extending full width of cubicle(s), suitably supported on insulators.

.2 Main connections between bus and major switching components to have continuous current rating to match major switching components.

.3 Busbars and main connections: Tin Plated Copper

.4 Provision for extension of bus on both sides of unit without need for further drilling or preparation in field.

.5 Tin plated joints, secured with non-corrosive bolts and Belleville washers.

.6 Identify phases of busbars by suitable marking.

.7 Busbar connectors, when switchboard shipped in more than one section.

.8 Bus section shall house interconnecting bus, instrument transformers, connections to incoming feeders and control wiring.

.9 Main bus work, extending through every section, shall be rated as shown on drawings, and shall be full size throughout length of switchboard.

.10 Where space has been provided for future switches or air circuit breakers on the drawings, bus and stationary elements shall be provided to facilitate future additions.

2.5 GROUNDING

.1 Lugs at each end for size #3/0 AWG grounding cable.

.2 Copper ground bus 6 mm x 50 mm shall be provided at bottom, bolted to the structure and extending the full length of the switchboards.

.3 Cable clamps shall be provided at convenient locations for making the station ground connection.

2.6 GROUND FAULT UNIT

.1 Integral to the trip unit of the main breakers.

2.7 FUSIBLE DISCONNECTS AND FUSES

.1 As per Specification Section 26 28 23 Disconnect Switches – Fused and Non Fused

2.8 INSTRUMENTS

.1 Refer to Section 26 09 02 – Metering and Switchboard Instruments.

2.9 FINISHES

.1 The entire enclosure shall be cleaned and phosphated, then painted with one coat of alkyd type primer, and one coat of low gloss light grey (ASA 61) baked on polyester powder coat.

2.10 EQUIPMENT IDENTIFICATION

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

.2 Lamecoid nameplates, approximately 75 mm x 25 mm, shall be provided on front doors of each switch for identification, showing the name and rating. Also, a 150 mm x 50 mm nameplate shall be provided on top portion of switchboard for identification.

.3 Lamecoid nameplates shall be Black with white lettering for Normal Power switchboards.

Part 3 Execution

3.1 INSTALLATION

.1 Locate switchboard assembly as indicated and bolt to floor.

.2 Check factory made connections for mechanical security and electrical continuity.

.3 size and weight of the sections into which the assembly shall be divided for shipment to ensure that they can easily be moved into or out of the electrical room, as shown on the drawings.

.4 The ground bus shall be connected to the ground network. Refer to specifications and the drawings for full grounding requirements.

.5 All switchboards shall carry the required arc flash warning labels.

.6 Service on equipment or systems critical to the Owner's operation shall be provided on an emergency basis which may necessitate overtime and service outside of normal working hours.

.7 Set on 100 mm high concrete housekeeping pad.

3.2 WARRANTY

.1 The contractor must make available to the Owner a local service department of a duly authorized distributor of the equipment manufacturer, which shall stock the manufacturer’s standard parts. The service department shall have at least one factory trained repair technician available to the Owner on 24 hours’ notice.

.2 Provide warranty of installation of equipment installed by this contractor to be free of defects for a period of (1) one year from date of Substantial Completion.

.3 Provide during the warranty period, all service, maintenance, parts, etc., required for normal operation of the systems, such that Owner needs not purchase additional maintenance agreement or contracts. Upon request, the manufacturer and his agent shall provide direct to the Owner the following proposals:

.1 Continuation, after the warranty period, of full maintenance, including all service, labour, parts, etc. required to maintain the systems in a fully operational condition.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of Contract, Division 01 General Requirements and all Addenda thereto form an integral part of and must be read in conjunction with the requirements of this Section.

.2 Cooperate and coordinate with the requirements of other units of work specified in other Sections.

1.2 REFERENCES

.1 The Electrical Contractor shall be bound by industry standards, as interpreted by the Consultant, whether or not specifically referenced in this document. Comply with Electrical Protection Act and rules and regulations made pursuant thereto, including the 2012 Canadian Electrical Code. Also, comply with applicable standards of the following:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

.3 CSA C22.1-2012, Canadian Electrical Code, Part 1.

.4 Electrical and Electronic Manufacturers Association of Canada (EEMAC).

.5 National Electrical Manufacturers Association (NEMA).

.6 National Building Code 2010 (NBC 2010)

.7 National Fire Protection Association (NFPA)

.8 Institute of Electrical and Electronic Engineers (IEEE).

.9 CSA C22.2No.29-M1989(R2000), Panelboards and enclosed Panelboards.

.10 Other Applicable CSA and UL approvals.

1.3 EXCEPTIONS OF REFERENCED STANDARDS

.1 The Electrical Contractor shall be bound by the standards referenced herein. The following exceptions shall be noted and used for this project in reference to the following standards:

.1 ES/SOW-0101 Revision 3, April 15, 2004:

.1 1.4 – Quantity of Equipment: Quantity and location of the equipment shall adhere to the requirements as noted in the Tender Drawings and associated specifications.

.2 3.1(c) – maintenance for the system is being handled by the Owner through a separate contracted entity. The Contractor is required to provide warranty services as specified for the specific system.

.3 3.1(h) – Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.4 14.0 – Lightning Protection: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.2 ES/SOW-0102 Revision 6, May 1, 2008:

.1 Wiring / Cabling Methods 3.1.1: The use of rigid steel conduit is not required.

.2 Splicing of existing power cabling due to breaker panel replacement is acceptable.

.3 Enclosures 3.3.2: Enclosures within the facility are not required to be IP64 rated.

.4 Lightning Protection 4.8: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 26 05 01 – Common Work Results

.3 ES/SOW-0101 Revision 3, April 15, 2004

.4 ES/SOW-0102 Revision 6, May 1, 2008

.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

.3 Include time-current characteristic curves for breakers with ampacity of 50 A and over and with interrupting capacity of 18,000 A symmetrical (rms) or greater.

1.5 PRODUCT APPROVALS

.1 Manufacturers' and model numbers named in these specifications indicate an acceptable technical standard of performance and are not intended to be exclusive. Products submitted as alternates must result in a control system that meets or exceeds all technical performance criteria as described.

.2 Products proposed as alternatives to those specified, shall only be considered if submitted for approval no later than 15 working days before tender close. Submit alternates, for approval, as one complete listing. Provide complete product specification sheets with request for approval.

.3 The Bidder must provide a complete list of primary system products offered with their bid.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.

.2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

Part 2 Products

2.1 PANELBOARDS

.1 All panels shall be of the dead front, molded case circuit breaker type, as shown, sized and located on the drawings.

.2 Panel trim shall be furnished for flush or surface mounting as indicated on the drawings. Panel trim shall be removed for painting, and allowed to dry before final placement.

.3 Surface mounted panels shall have manufacturer's standard trim, and shall be finished with two coats of grey ASA #61.

.4 Panels shall be equipped with a flush type combination lock-latch. Two keys shall be provided for each panel, and all locks shall be keyed alike.

.5 Panels shall have mains of voltage and capacity and shall be complete with branch breakers, spares and spaces, as shown on the drawings. "Spaces" shall be understood to include necessary bus work such that Owners, at a later date, need buy only breakers.

.6 Panelboards: to CSA C22.2No.29 and product of one manufacturer.

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.7 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.8 Each panel shall be complete with a typed directory, which shall be mounted inside the door in a metal frame with clear plastic cover.

.9 Flush panels shall have concealed hinges and flush type combination lock-latch. Doors shall open minimum 135 degrees. Trims shall have fasteners concealed.

.10 Cabinets shall be fabricated of code gauge steel, with ample wiring gutters for all wiring connections.

.11 All panels shall have main bus bar equipped with solderless lug and be capable of accepting any arrangement of single, two or three pole breakers.

.12 Branch circuit breaker shall have quick-make, quick-break toggle mechanism with single, two or three pole common trip thermal magnetic units in ampere ratings as designated on the drawings. Breaker handles shall have three positions: 'on', 'off' and 'tripped'. All circuit breakers and panel bus shall have an interrupting capacity of 10,000 amps symmetrical.

.13 Panels for 120/208 volt, 3 phase, 4 wire systems, shall be complete with bolt-in type breakers, with a minimum nominal width of 20 mm per pole, and a bus of sufficient capacity to feed the number of branch circuit breakers indicated.

.14 Panels for 347/600 volt, 3 phase, 4 wire systems shall be complete with bolt-in type breakers, and a bus of sufficient capacity to feed the number of branch circuit breakers indicated.

.15 All panels shall be specification grade and of the same manufacture. Load centres are not acceptable.

.16 All branch circuit spaces shall be fitted with filler plates.

.17 All panels serving bedrooms shall be equipped with arc fault circuit interrupters where shown on the drawings.

.18 Each panel shall be equipped with a ground bus suitable for terminating one ground conductor per load circuit.

.19 Panels shall be General Electric, Cutler Hammer or Schneider Electric.

.20 Refer to attached breaker panel schematic detail sheets attached at the end of this specification section.

2.2 BREAKERS

.1 Breakers: to Section 26 28 21 - Moulded Case Circuit Breakers.

.2 Lock-on devices for fire alarm circuits.

2.3 EQUIPMENT IDENTIFICATION

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

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

.3 Nameplate for each circuit in distribution panelboards size 2 engraved.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit.

Part 3 Execution

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on painted plywood backboards Where practical, group panelboards on common backboard.

.3 Electrical panels shall, where possible, be mounted with top of trim at uniform height of 2000 mm.

.4 Panels, shown adjacent to other panels, shall have adjacent edges of different panels mounted parallel to each other with a gap of 75 mm.

.5 For panels recessed in a finished wall, provide for every six branch circuit spaces and spares, or fractions thereof, one 20 mm empty conduit up to furred ceiling space, and one (1) 20 mm empty conduit down to ceiling space of floor below, and cap for future wiring.

.6 Connect neutral conductors to common neutral bus.

3.2 WARRANTY

.1 The contractor must make available to the Owner a local service department of a duly authorized distributor of the equipment manufacturer, which shall stock the manufacturer's standard parts. The service department shall have at least one factory trained repair technician available to the Owner on 24 hours' notice.

.2 Provide warranty of installation of equipment installed by this contractor to be free of defects for a period of (1) one year from date of Substantial Completion.

.3 Provide during the warranty period, all service, maintenance, parts, etc., required for normal operation of the systems, such that Owner needs not purchase additional maintenance agreement or contracts. Upon request, the manufacturer and his agent shall provide direct to the Owner the following proposals:

.1 Continuation, after the warranty period, of full maintenance, including all service, labour, parts, etc. required to maintain the systems in a fully operational condition.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of Contract, Division 01 General Requirements and all Addenda thereto form an integral part of and must be read in conjunction with the requirements of this Section.

.2 Cooperate and coordinate with the requirements of other units of work specified in other Sections.

1.2 REFERENCES

.1 The Electrical Contractor shall be bound by industry standards, as interpreted by the Consultant, whether or not specifically referenced in this document. Comply with Electrical Protection Act and rules and regulations made pursuant thereto, including the 2012 Canadian Electrical Code. Also, comply with applicable standards of the following:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

.3 Correctional Service Canada (CSC) – Technical Services Branch – Statement of Technical Requirements (STR) – Installations of CSC Security Electronics Systems at RCMP & CSC Shared Learning Facility, Revision 1, April 2013.

.4 CSA C22.1-2012, Canadian Electrical Code, Part 1.

.5 Electrical and Electronic Manufacturers Association of Canada (EEMAC).

.6 National Electrical Manufacturers Association (NEMA).

.7 National Building Code 2010 (NBC 2010)

.8 National Fire Protection Association (NFPA)

.9 Institute of Electrical and Electronic Engineers (IEEE).

.10 CSA-C22.2 No.42, General Use Receptacles, Attachment Plugs and Similar Devices.

.11 CSA-C22.2 No.42.1, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).

.12 CSA-C22.2 No.55, Special Use Switches.

.13 CSA-C22.2 No.111, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

1.3 EXCEPTIONS OF REFERENCED STANDARDS

.1 The Electrical Contractor shall be bound by the standards referenced herein. The following exceptions shall be noted and used for this project in reference to the following standards:

.1 ES/SOW-0101 Revision 3, April 15, 2004:

.1 1.4 – Quantity of Equipment: Quantity and location of the equipment shall adhere to the requirements as noted in the Tender Drawings and associated specifications.

.2 3.1(c) – maintenance for the system is being handled by the Owner through a separate contracted entity. The Contractor is required to provide warranty services as specified for the specific system.

.3 3.1(h) – Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.4 14.0 – Lightning Protection: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.2 ES/SOW-0102 Revision 6, May 1, 2008:

.1 Wiring / Cabling Methods 3.1.1: The use of rigid steel conduit is not required.

.2 Splicing of existing power cabling due to breaker panel replacement is acceptable.

.3 Enclosures 3.3.2: Enclosures within the facility are not required to be IP64 rated.

.4 Lightning Protection 4.8: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 26 05 01 – Common Work Results

.3 ES/SOW-0101 Revision 3, April 15, 2004

.4 ES/SOW-0102 Revision 6, May 1, 2008

.5 STR: Revision 1, April 2013.

1.5 PRODUCT APPROVALS

.1 Manufacturers' and model numbers named in these specifications indicate an acceptable technical standard of performance and are not intended to be exclusive. Products submitted as alternates must result in a control system that meets or exceeds all technical performance criteria as described.

.2 Products proposed as alternatives to those specified, shall only be considered if submitted for approval no later than 15 working days before tender close. Submit alternates, for approval,

as one complete listing. Provide complete product specification sheets with request for approval.

.3 The Bidder must provide a complete list of primary system products offered with their bid.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.

.2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

Part 2 Products

2.1 SWITCHES

.1 15 A, 120 V, single pole, three-way switches where required on drawings.

.2 Manually-operated general purpose ac switches with following features:

.1 Terminal holes approved for No. 10 AWG wire.
.2 Silver alloy contacts.
.3 Urea or melamine molding for parts subject to carbon tracking.
.4 Suitable for back and side wiring.
.5 Ivory toggle.

.3 Toggle operated fully rated for tungsten filament and fluorescent lamps.

.4 All wiring devices specified shall be of the same manufacture throughout the project.

.5 Switches controlling motors shall be K.W. (H.P.) rated and approved for motor control service.

.6 Set switches flush in all finished areas, or in surface box where conduit or wireway is exposed.

.7 Refer to drawing symbol schedule for further requirements.

.8 Switches and receptacles shall comply with requirements of CSA and NEMA Standards.

.9 Switches shall be specification grade from one of the following manufacturers: Cooper, Leviton, Hubbell or Pass & Seymour.

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, with following features:

.1 Ivory high impact chemical resistant molded nylon or polycarbonate face.
.2 Suitable for No. 10 AWG for back and side wiring.
.3 Break-off links for use as split receptacles.

.4 Eight back wired entrances, four side wiring screws.

.5 Triple wipe contacts and rivetted grounding contacts.

.6 Specification grade from one of the following manufacturers: Cooper, Leviton, Hubbell or Pass & Seymour.

.2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:

.1 Ivory high impact chemical resistant molded nylon or polycarbonate face.

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Four back wired entrances, 2 side wiring screws.

.4 Specification grade from one of the following manufacturers: Cooper, Leviton, Hubbell or Pass & Seymour.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

.5 Set receptacles flush in all finished areas, or in surface box where conduit or wireway is exposed

.6 Provide ten (10) 20 amp and ten (10) 15 amp specification grade receptacles c/w installation, 10 meters of wire and required raceway, etc for each of these receptacles so that they may be installed where required during the construction and commissioning stages of this project. .

2.3 SPECIAL WIRING DEVICES

.1 **Ground Fault Circuit Interrupter -** shall have a nylon face and a thermoplastic backbody. They must have a feed-through capability for protecting receptacles downstream on the same circuit. They must be Class A rated with a 5 milliampere ground fault trip level and a 20 ampere feed through rating. GFCI receptacles shall have ‘Safe Lock’ protection such if critical components are damaged and ground fault protection is lost, power to the receptacle is disconnected. GFCI receptacles shall be equipped with LED trip indicator light, NEMA configuration 5-15R, side wired and one of the following manufacturers: Cooper #XGF15-V, Leviton #8599-I or Pass & Seymour #1594-I, Hubbell ‘Autoguard’ GFR Series

.2 **Pilot Light Switches -** shall be quiet specification grade and rated 15A, 120 volts, back and side wiring with toggle lit red in the "ON" position, accepting up to #10 copper conductor and of one of the following manufacturers: Cooper, Leviton, Hubbell or Pass & Seymour.

.3 **Fractional HP/KW Manual Starters** - to be non-reversing, toggle operated, suitable for mounting in a surface or flush box, single or two pole to suit 120 or 208 volt application, c/w pilot light and thermal overload to adequately protect motor. Flush mount to have stainless steel or ivory cover plates to match other flush mount wiring devices. To be of one of the following manufacturers: Cooper, Leviton, Hubbell or Pass & Seymour.

.4 **Illuminated Switches** - shall be quiet specification grade, 120 volts, back and side wiring with toggle lit in the "OFF" position, accepting up to #10 copper conductor and of one of the following: Cooper, Leviton, Hubbell or Pass & Seymour.

.5 **Fluorescent Dimmer Switches:** Dimmer switches for linear fluorescent and compact fluorescent lighting fixtures equipped with electronic dimming ballasts shall be specification

grade, slide type control, load rated for 1200 VA (900 watts), 120-volt AC, with decora style screwless snap-on wall plate. Run separate neutral for dimmers and keep on one phase. Each dimmer shall be voltage compensated c/w positive RFI filtering. Fluorescent dimmer switches shall be of one of the following:

Leviton #26666-31, for use with Advance Mark X ballasts

Lutron #NF-10-WH, for use with Lutron Hi-Lume or Compact SE ballasts

.6 **Wall Occupancy Sensors, 347-Volt:** Wall occupancy sensors shall be specification grade passive infrared (PIR) or dual technology (PIR/Microphonics) wall sensor switch, white finish. Manual ON/OFF switch with automatic time delay off operation (adjustable from 30 seconds to 30 minutes) after momentary occupancy. Adjustable PIR unit sensitivity from 20% to 100%. Coverage limited to 180° field of view, 900 square feet, rated for minimum 800 watt for ballast load at 347-volt. Wall occupancy sensor switch shall be compatible with all electronic fluorescent non-dimming ballasts and shall mount in a standard single 347-volt single gang switch box. Set delay off to 5 minutes after momentary occupancy. Wall occupancy sensors shall be of one of the following manufacturers:

Hubbell, Leviton, Sensorswitch, Wattstopper, Cooper

.7 **Ceiling Occupancy Sensors, 347-Volt:** Ceiling occupancy sensors for controlling the room lighting shall be multi-technology occupancy sensor switch, passive infrared (PIR/Microphonics) and ultrasonic sensor (40kHz ultrasonic frequency), 360° coverage within a 92.9 square meter area. Occupancy sensors shall be provided with power pack for use with 347-volt operation where required by the manufacturer. Automatic ON/OFF control. For sensors designated 'OC1" in Parkade levels provide a time delay set at 30 minutes. For sensors designated 'OC2' provide a time delay set at 20 minutes. Occupancy sensors shall be of one of the following manufacturers:

Hubbell, Leviton, Sensorswitch, Wattstopper, Cooper

.8 **Ceiling Occupancy Sensors, 120-Volt:** Designated as 'OC3' on drawings - Ceiling occupancy sensors for controlling the room lighting shall be multi-technology occupancy sensor switch, passive infrared (PIR/Microphonics) and ultrasonic sensor (40kHz ultrasonic frequency), 360° coverage within a 92.9 square meter area. Automatic ON/OFF control, with delay off set at 5 minutes after momentary occupancy.

Hubbell, Leviton, Sensorswitch, Wattstopper, Cooper

2.4 COVER PLATES

.1 Cover plates for wiring devices.

.2 Cover plates from one manufacturer throughout project.

.3 Wall plates shall be designed and manufactured in accordance with performance and dimensional requirements of the following industry standards:

CSA Standard C22-2 No. 42

U.S. Federal Specification WP455

NEMA Standard WD-1

.4 Wall plates shall be manufactured by one of the following:

Cooper, Arrow Hart, Eagle, Hubbell, Leviton or Pass & Seymour.

.5 Blank cover plates in finished ceiling areas shall be Columbia Electric #9002 baked white enamel for white ceilings, or painted to match colored finishes.

.6 Unbreakable Nylon wall plates shall be provided for all switches, receptacles, blanks, telephone and special purpose outlets. The wall plates shall be of suitable configuration for the device for which it is to cover with color matched mounting screws. Use ganged plate where more than one device occur at one location. Any specific locations calling for Metal wall plates shall be stainless steel.

.7 Where surface wiring methods need to be employed in a high finish area because of renovations to existing structure, wall plates shall be used in conjunction with Wiremold surface box to suit the device.

.8 Where outlets occur in an unfinished area such as boiler or furnace room and surface conduit and boxes are specified, stamped galvanized steel wall plates shall be used to suit configuration.

.9 Exterior outlets shall be fitted with weatherproof die cast aluminum cover plates to suit wiring device, c/w rubber gasket to provide positive seal. Duplex cover plates shall have two independent flaps. Weatherproof covers shall provide protection in wet and damp locations.

Part 3 Execution

3.1 INSTALLATION

.1 Switches:

.1 Install single throw switches with handle in "UP" position when switch closed.

.2 Install switches in gang type outlet box when more than one switch is required in one location.

.3 Switches shall be as located on the drawings, mounted up 1200 mm, and ganged where more than one occurs in the same location.

.2 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Convenience outlets shall be as located on the drawings, and mounted up 450 mm, unless otherwise noted.

.3 Where split receptacle has one portion switched, mount vertically and switch upper portion.

.4 Outlets over counter tops shall be mounted 150 mm above counter, or immediately above backsplash. Co-ordinate with architectural drawings for location of all counter tops, millwork and feature walls, to ensure proper location and mounting height.

.5 Coordinate with the location of all mechanical convectors and mount convenience outlets up 100 mm above heating convectors.

.6 All convenience outlets shall meet tension tests as per CSA requirements, and will be subjected to 'on site' tests during final inspection.

.3 All plug-in type receptacles shall be identified by means of a Lamecoid label fixed with self tapping screws on the cover plate. Each cover plate shall contain the panel and circuit number. Those receptacles fed from ground fault interrupters shall have 'GFI' labeled adjacent to the panel and circuit number. Those receptacles designated for housekeeping purposes shall have ‘HOUSEKEEPING’ labeled adjacent to the panel and circuit number.

.4 The circuits controlled by all switches on all levels, shall be neatly printed with waterproof ink on the side of the switch outlet box so that the panel and circuit number are clearly legible when the cover plate is removed. It shall not be necessary to remove the switch from the outlet box in order to read the panel or circuit number.

.5 Cover plates:

.1 Protect cover plate finish with paper or plastic film until painting and other work is finished.

.2 Install suitable common cover plates where wiring devices are grouped.

.3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.2 WARRANTY

.1 The contractor must make available to the Owner a local service department of a duly authorized distributor of the equipment manufacturer, which shall stock the manufacturer’s standard parts. The service department shall have at least one factory trained repair technician available to the Owner on 24 hours’ notice.

.2 Provide warranty of installation of equipment installed by this contractor to be free of defects for a period of (1) one year from date of Substantial Completion.

.3 Provide during the warranty period, all service, maintenance, parts, etc., required for normal operation of the systems, such that Owner needs not purchase additional maintenance agreement or contracts. Upon request, the manufacturer and his agent shall provide direct to the Owner the following proposals:

.1 Continuation, after the warranty period, of full maintenance, including all service, labour, parts, etc. required to maintain the systems in a fully operational condition.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of Contract, Division 01 General Requirements and all Addenda thereto form an integral part of and must be read in conjunction with the requirements of this Section.

.2 Cooperate and coordinate with the requirements of other units of work specified in other Sections.

1.2 REFERENCES

.1 The Electrical Contractor shall be bound by industry standards, as interpreted by the Consultant, whether or not specifically referenced in this document. Comply with Electrical Protection Act and rules and regulations made pursuant thereto, including the 2012 Canadian Electrical Code. Also, comply with applicable standards of the following:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

.3 CSA C22.1-2012, Canadian Electrical Code, Part 1.

.4 Electrical and Electronic Manufacturers Association of Canada (EEMAC).

.5 National Electrical Manufacturers Association (NEMA).

.6 National Building Code 2010 (NBC 2010)

.7 National Fire Protection Association (NFPA)

.8 Institute of Electrical and Electronic Engineers (IEEE).

.9 Other Applicable CSA and UL approvals.

1.3 EXCEPTIONS OF REFERENCED STANDARDS

.1 The Electrical Contractor shall be bound by the standards referenced herein. The following exceptions shall be noted and used for this project in reference to the following standards:

.1 ES/SOW-0101 Revision 3, April 15, 2004:

.1 1.4 – Quantity of Equipment: Quantity and location of the equipment shall adhere to the requirements as noted in the Tender Drawings and associated specifications.

.2 3.1(c) – maintenance for the system is being handled by the Owner through a separate contracted entity. The Contractor is required to provide warranty services as specified for the specific system.

.3 3.1(h) – Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.4 14.0 – Lightning Protection: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.2 ES/SOW-0102 Revision 6, May 1, 2008:

.1 Wiring / Cabling Methods 3.1.1: The use of rigid steel conduit is not required.

.2 Splicing of existing power cabling with respect to breaker panel replacement is acceptable.

.3 Enclosures 3.3.2: Enclosures within the facility are not required to be IP64 rated.

.4 Lightning Protection 4.8: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 26 05 01 – Common Work Results

.3 ES/SOW-0101 Revision 3, April 15, 2004

.4 ES/SOW-0102 Revision 6, May 1, 2008

.2 Submit fuse performance data characteristics for each fuse type and size above 50 A. Performance data to include: average melting time-current characteristics.

1.5 PRODUCT APPROVALS

.1 Manufacturers' and model numbers named in these specifications indicate an acceptable technical standard of performance and are not intended to be exclusive. Products submitted as alternates must result in a control system that meets or exceeds all technical performance criteria as described.

.2 Products proposed as alternatives to those specified, shall only be considered if submitted for approval no later than 15 working days before tender close. Submit alternates, for approval, as one complete listing. Provide complete product specification sheets with request for approval.

.3 The Bidder must provide a complete list of primary system products offered with their bid.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.

.2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

1.7 DELIVERY AND STORAGE

.1 Ship fuses in original containers.

.2 Do not ship fuses installed in switchboard.

.3 Provide a typed list of all spare fuses

.4 Provide three (3) spare fuses of each type and size installed.

Part 2 Products

2.1 FUSES GENERAL

.1 Fuses: product of one manufacturer for entire project.

.2 Fuse interrupting rating shall be 200,000 amperes RMS symmetrical, unless otherwise noted.

.3 Time delay fuses shall carry 500% of rated current for a minimum of 10 seconds and shall be labeled "Time Delay" by the manufacturer.

2.2 FUSE TYPES

.1 HRC fuses rated above 600 amperes shall be CSA certified HRC-L fuses and shall be in accordance with CSA Specification C22-2 No. 106-M-1985.

.2 HRC fuses rated 600 amperes and smaller shall be CSA certified HRC1-J time delay and shall be in accordance with CSA Specification C22-2 No. 106-M92. HRC-1 fuse dimensions and current limiting performance shall be in accordance with the UL Standard 198C

Part 3 Execution

3.1 INSTALLATION

.1 Install fuses in mounting devices immediately before energizing circuit.

.2 Ensure correct fuses fitted to physically matched mounting devices.

.3 Ensure correct fuses fitted to assigned electrical circuit.

.4 Application of all fuses shall comply with the Canadian Electrical Code - Part 1 and local inspection authority regulations.

.5 Unless otherwise noted on the drawings, Time Delay fuses for overcurrent protection of motor circuits shall be rated at 150% of full-load current and

.6 Time Delay fuses for overcurrent protection of transformer circuits shall be rated at 125% of full-load current.

.7 All fuses shall be manufactured by Littlefuse, Buss, Ferraz Shawmut**,** or Edison.

3.2 WARRANTY

.1 The contractor must make available to the Owner a local service department of a duly authorized distributor of the equipment manufacturer, which shall stock the manufacturer's standard parts. The service department shall have at least one factory trained repair technician available to the Owner on 24 hours' notice.

.2 Provide warranty of installation of equipment installed by this contractor to be free of defects for a period of (1) one year from date of Substantial Completion.

.3 Provide during the warranty period, all service, maintenance, parts, etc., required for normal operation of the systems, such that Owner needs not purchase additional maintenance agreement or contracts. Upon request, the manufacturer and his agent shall provide direct to the Owner the following proposals:

.1 Continuation, after the warranty period, of full maintenance, including all service, labour, parts, etc. required to maintain the systems in a fully operational condition.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of Contract, Division 01 General Requirements and all Addenda thereto form an integral part of and must be read in conjunction with the requirements of this Section.

.2 Cooperate and coordinate with the requirements of other units of work specified in other Sections.

1.2 REFERENCES

.1 The Electrical Contractor shall be bound by industry standards, as interpreted by the Consultant, whether or not specifically referenced in this document. Comply with Electrical Protection Act and rules and regulations made pursuant thereto, including the 2012 Canadian Electrical Code. Also, comply with applicable standards of the following:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

.3 CSA C22.1-2012, Canadian Electrical Code, Part 1.

.4 Electrical and Electronic Manufacturers Association of Canada (EEMAC).

.5 National Electrical Manufacturers Association (NEMA).

.6 National Building Code 2010 (NBC 2010)

.7 National Fire Protection Association (NFPA)

.8 Institute of Electrical and Electronic Engineers (IEEE).

.9 CSA-C22.2 No. 5-02, Moulded-Case Circuit Breakers, Moulded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

.10 Other Applicable CSA and UL approvals.

1.3 EXCEPTIONS OF REFERENCED STANDARDS

.1 The Electrical Contractor shall be bound by the standards referenced herein. The following exceptions shall be noted and used for this project in reference to the following standards:

.1 ES/SOW-0101 Revision 3, April 15, 2004:

.1 1.4 – Quantity of Equipment: Quantity and location of the equipment shall adhere to the requirements as noted in the Tender Drawings and associated specifications.

.2 3.1(c) – maintenance for the system is being handled by the Owner through a separate contracted entity. The Contractor is required to provide warranty services as specified for the specific system.

.3 3.1(h) – Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.4 14.0 – Lightning Protection: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.2 ES/SOW-0102 Revision 6, May 1, 2008:

.1 Wiring / Cabling Methods 3.1.1: The use of rigid steel conduit is not required.

.2 Splicing of existing power cabling due to breaker panel replacement is acceptable.

.3 Enclosures 3.3.2: Enclosures within the facility are not required to be IP64 rated.

.4 Lightning Protection 4.8: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 26 05 01 – Common Work Results

.3 ES/SOW-0101 Revision 3, April 15, 2004

.4 ES/SOW-0102 Revision 6, May 1, 2008

.2 Include time-current characteristic curves for breakers with ampacity of 50 A and over and with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

1.5 PRODUCT APPROVALS

.1 Manufacturers' and model numbers named in these specifications indicate an acceptable technical standard of performance and are not intended to be exclusive. Products submitted as alternates must result in a control system that meets or exceeds all technical performance criteria as described.

.2 Products proposed as alternatives to those specified, shall only be considered if submitted for approval no later than 15 working days before tender close. Submit alternates, for approval, as one complete listing. Provide complete product specification sheets with request for approval.

.3 The Bidder must provide a complete list of primary system products offered with their bid.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.

.2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

Part 2 Products

2.1 BREAKERS GENERAL

.1 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 deg C ambient.

.2 Common-trip breakers: with single handle for multi-pole applications.

.3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips.

.4 Circuit breakers with interchangeable trips as indicated.

.5 Circuit breakers to have minimum of 10,000 A symmetrical rms interrupting capacity rating in breaker panelboards.

.6 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.1 Trip settings on breakers to have adjustable trips.

2.2 THERMAL MAGNETIC BREAKERS

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.3 SOLID STATE TRIP BREAKERS

.1 Moulded case circuit breaker to operate by means of solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time, short time, instantaneous, tripping for ground fault short circuit protection.

.2 The main service breakers for the fire pump and building main service and all breakers over 400 amps shall have solid state trip units. All other breakers shown shall be thermal magnetic breakers.

Part 3 Execution

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

3.2 WARRANTY

.1 The contractor must make available to the Owner a local service department of a duly authorized distributor of the equipment manufacturer, which shall stock the manufacturer's standard parts. The service department shall have at least one factory trained repair technician available to the Owner on 24 hours' notice.

.2 Provide warranty of installation of equipment installed by this contractor to be free of defects for a period of (1) one year from date of Substantial Completion.

.3 Provide during the warranty period, all service, maintenance, parts, etc., required for normal operation of the systems, such that Owner needs not purchase additional maintenance agreement or contracts. Upon request, the manufacturer and his agent shall provide direct to the Owner the following proposals:

.1 Continuation, after the warranty period, of full maintenance, including all service, labour, parts, etc. required to maintain the systems in a fully operational condition.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of Contract, Division 01 General Requirements and all Addenda thereto form an integral part of and must be read in conjunction with the requirements of this Section.

.2 Cooperate and coordinate with the requirements of other units of work specified in other Sections.

1.2 REFERENCES

.1 The Electrical Contractor shall be bound by industry standards, as interpreted by the Consultant, whether or not specifically referenced in this document. Comply with Electrical Protection Act and rules and regulations made pursuant thereto, including the 2012 Canadian Electrical Code. Also, comply with applicable standards of the following:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

.3 CSA C22.1-2012, Canadian Electrical Code, Part 1.

.4 Electrical and Electronic Manufacturers Association of Canada (EEMAC).

.5 National Electrical Manufacturers Association (NEMA).

.6 National Building Code 2010 (NBC 2010)

.7 National Fire Protection Association (NFPA)

.8 Institute of Electrical and Electronic Engineers (IEEE).

.9 CAN/CSA C22.2 No.4-M89 (R2000), Enclosed Switches.

.10 CSA C22.2 No.39-M89 (R2003), Fuseholder Assemblies.

.11 Other Applicable CSA and UL approvals.

1.3 EXCEPTIONS OF REFERENCED STANDARDS

.1 The Electrical Contractor shall be bound by the standards referenced herein. The following exceptions shall be noted and used for this project in reference to the following standards:

.1 ES/SOW-0101 Revision 3, April 15, 2004:

.1 1.4 – Quantity of Equipment: Quantity and location of the equipment shall adhere to the requirements as noted in the Tender Drawings and associated specifications.

.2 3.1(c) – maintenance for the system is being handled by the Owner through a separate contracted entity. The Contractor is required to provide warranty services as specified for the specific system.

.3 3.1(h) – Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.4 14.0 – Lightning Protection: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.2 ES/SOW-0102 Revision 6, May 1, 2008:

.1 Wiring / Cabling Methods 3.1.1: The use of rigid steel conduit is not required.

.2 Splicing of existing power cabling due to breaker panel replacement is acceptable.

.3 Enclosures 3.3.2: Enclosures within the facility are not required to be IP64 rated.

.4 Lightning Protection 4.8: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 26 05 01 – Common Work Results

.3 ES/SOW-0101 Revision 3, April 15, 2004

.4 ES/SOW-0102 Revision 6, May 1, 2008

.2 Shop drawings shall include but not be limited to speakers, riser diagram, cable types, and special mounting details.

1.5 PRODUCT APPROVALS

.1 Manufacturers' and model numbers named in these specifications indicate an acceptable technical standard of performance and are not intended to be exclusive. Products submitted as alternates must result in a control system that meets or exceeds all technical performance criteria as described.

.2 Products proposed as alternatives to those specified, shall only be considered if submitted for approval no later than 15 working days before tender close. Submit alternates, for approval, as one complete listing. Provide complete product specification sheets with request for approval.

.3 The Bidder must provide a complete list of primary system products offered with their bid.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.

.2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

Part 2 Products

2.1 DISCONNECT SWITCHES

.1 Fusible and non-fusible disconnect switch in CSA Enclosure , size as indicated.

.2 Mechanically interlocked door to prevent opening when handle in ON position.

.3 Fuses: size as indicated, in accordance with Section 26 28 14 - Fuses - Low Voltage. Switch fuse units shall be available in 30 through 1200 amp standard industry sizes. They shall be readily removable and interchangeable without modification to bus work or mounting rails

.4 Fuseholders: suitable without adaptors, for type and size of fuse indicated.

.5 Quick-make, quick-break action.

.6 Fusible switches shall be quick-make, quick-break, visible blades, integral handle mechanism, deionizing arc quenchers, front operation, high pressure fuse clips and recessed live parts.

.7 Operating handles to have provision for padlocking in either 'on' or 'off' position.

.8 Handle to be marked to clearly indicate switch contact positions.

.9 Switch fuse units shall be available in 30 through 1200 amp standard industry sizes.

.10 Shall be readily removable and interchangeable without modification to bus work or mounting rails.

.11 All switches shall be manufactured by General Electric, Cutler Hammer or Schneider Electric.

2.2 EQUIPMENT IDENTIFICATION

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

.2 Lamecoid nameplates, approximately 75 mm x 25 mm, shall be provided on front doors of each switch for identification, showing the name and rating.

Part 3 Execution

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

3.2 WARRANTY

.1 The contractor must make available to the Owner a local service department of a duly authorized distributor of the equipment manufacturer, which shall stock the manufacturer's standard parts. The service department shall have at least one factory trained repair technician available to the Owner on 24 hours' notice.

.2 Provide warranty of installation of equipment installed by this contractor to be free of defects for a period of (1) one year from date of Substantial Completion.

.3 Provide during the warranty period, all service, maintenance, parts, etc., required for normal operation of the systems, such that Owner needs not purchase additional maintenance agreement or contracts. Upon request, the manufacturer and his agent shall provide direct to the Owner the following proposals:

.1 Continuation, after the warranty period, of full maintenance, including all service, labour, parts, etc. required to maintain the systems in a fully operational condition.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of Contract, Division 01 General Requirements and all Addenda thereto form an integral part of and must be read in conjunction with the requirements of this Section.

.2 Cooperate and coordinate with the requirements of other units of work specified in other Sections.

1.2 REFERENCES

.1 The Electrical Contractor shall be bound by industry standards, as interpreted by the Consultant, whether or not specifically referenced in this document. Comply with Electrical Protection Act and rules and regulations made pursuant thereto, including the 2012 Canadian Electrical Code. Also, comply with applicable standards of the following:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

.3 CSA C22.1-2012, Canadian Electrical Code, Part 1.

.4 Electrical and Electronic Manufacturers Association of Canada (EEMAC).

.5 National Electrical Manufacturers Association (NEMA).

.6 National Building Code 2010 (NBC 2010)

.7 National Fire Protection Association (NFPA)

.8 Institute of Electrical and Electronic Engineers (IEEE).

.9 Other Applicable CSA and UL approvals.

1.3 EXCEPTIONS OF REFERENCED STANDARDS

.1 The Electrical Contractor shall be bound by the standards referenced herein. The following exceptions shall be noted and used for this project in reference to the following standards:

.1 ES/SOW-0101 Revision 3, April 15, 2004:

.1 1.4 – Quantity of Equipment: Quantity and location of the equipment shall adhere to the requirements as noted in the Tender Drawings and associated specifications.

.2 3.1(c) – maintenance for the system is being handled by the Owner through a separate contracted entity. The Contractor is required to provide warranty services as specified for the specific system.

.3 3.1(h) – Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.4 14.0 – Lightning Protection: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.2 ES/SOW-0102 Revision 6, May 1, 2008:

.1 Wiring / Cabling Methods 3.1.1: The use of rigid steel conduit is not required.

.2 Splicing of existing power cabling due to breaker panel replacement is acceptable.

.3 Enclosures 3.3.2: Enclosures within the facility are not required to be IP64 rated.

.4 Lightning Protection 4.8: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 26 05 01 – Common Work Results

.3 ES/SOW-0101 Revision 3, April 15, 2004

.4 ES/SOW-0102 Revision 6, May 1, 2008

.2 Indicate:

.1 Mounting method and dimensions.
.2 Starter size and type.
.3 Layout of identified internal and front panel components.
.4 Enclosure types.
.5 Wiring diagram for each type of starter.
.6 Interconnection diagrams.
.7 All Filters for use with VFD’s.
.8 All Fuse types for all starters including VFD’s

1.5 PRODUCT APPROVALS

.1 Manufacturers’ and model numbers named in these specifications indicate an acceptable technical standard of performance and are not intended to be exclusive. Products submitted as alternates must result in a control system that meets or exceeds all technical performance criteria as described.

.2 Products proposed as alternatives to those specified, shall only be considered if submitted for approval no later than 15 working days before tender close. Submit alternates, for approval,

as one complete listing. Provide complete product specification sheets with request for approval.

.3 The Bidder must provide a complete list of primary system products offered with their bid.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.

.2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

1.7 EXTRA MATERIALS

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide listed spare parts for each different size and type of starter:

.1 2 contacts, auxiliary.

.2 1 operating coil.

.3 2 fuses.

Part 2 Products

2.1 MATERIALS

.1 For all motors, provide circuit and thermal protection on all lines except neutral.

.2 For all pumps not controlled by VFD’s, provide hour meters for each visible on the motor control centre doors. All magnetic starters located outside of motor control centres shall contain hour meters.

.3 All contactors shall be NEMA rated contactors.

2.2 MANUAL MOTOR STARTERS

.1 Single or Three phase manual motor starters as shown of size, type, rating, and enclosure type as indicated, with components as follows:

.1 Switching mechanism, quick make and break.

.2 Overload heater(s) for each phase, manual reset, trip indicating handle.

.3 Thermal switches for small fractional KW motors shall be single or 2 pole as required.

.4 In all cases, locate within 9000 mm and in sight of motor

.2 Accessories:

.1 Toggle switch: industrial standard type labelled as indicated.

.2 Indicating light: standard neon type and colour as indicated.

.3 Locking tab to permit padlocking in "ON" or "OFF" position.

.4 thermal relay

2.3 FULL VOLTAGE MAGNETIC STARTERS

.1 Combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:

.1 Contactor solenoid operated, rapid action type.

.2 Motor overload protective device in each phase, manually reset from outside enclosure.

.3 Wiring and schematic diagram inside starter enclosure in visible location.

.4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.

.5 All starters shall be combination starters c/w quick-make, quick-break, switch, fuse and magnetic starter c/w red and green indicator lights

.6 H.O.A. switch operator controls

.7 Provide primary fuse for control transformer.

.8 Starters shall not be equipped with an automatic thermal overload reset.

.9 Tin plated stab on connectors are acceptable.

.2 Combination type starters to include fused disconnect switch with operating lever on outside of enclosure to control disconnect, and provision for:

.1 Locking in "OFF" position with up to 3 padlocks.

.2 Independent locking of enclosure door.

.3 Provision for preventing switching to "ON" position while enclosure door open.

.4 Fusing shall be Form I, NEMA "J", HRC, 200,000 amps current limiting type.

.3 Accessories:

.1 Pushbuttons and Selector switches: standard labelled as indicated.

.2 Indicating lights: standard type and color as indicated.

.3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.

.4 The overload relays shall be the ambient temperature compensated type, and the trip rating of a specific heater element shall be field adjustable over a range of approximately 85% + 115% of its respective rating.

2.4 FULL VOLTAGE REVERSING MAGNETIC STARTERS

.1 Full voltage reversing magnetic starters of size, type, rating and enclosure type as indicated with components as follows:

.1 Contactor solenoid operated, rapid action type.

.2 Motor overload protective device in each phase, manually reset from outside enclosure.

.3 Wiring and schematic diagram inside starter enclosure in visible location.

.4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.

.5 All combination starters shall be quick-make, quick-break, switch, fuse and magnetic starter c/w red and green indicator lights

.6 H.O.A. switch operator controls

.7 Provide primary fuse for control transformer.

.8 Starters shall not be equipped with an automatic thermal overload reset.

.2 Combination type starters to include fused disconnect switch with operating lever on outside of enclosure to control disconnect, and provision for:

.1 Locking in "OFF" position with up to 3 padlocks.

.2 Independent locking of enclosure door.

.3 Provision for preventing switching to "ON" position while enclosure door open.

.4 Fusing shall be Form I, NEMA "J", HRC, 200,000 amps current limiting type. See Section 16475 for further fuse requirements.

.3 Accessories:

.1 Pushbuttons and Selector switches: standard labelled as indicated.

.2 Indicating lights: standard type and color as indicated.

.3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.

.4 The overload relays shall be the ambient temperature compensated type, and the trip rating of a specific heater element shall be field adjustable over a range of approximately 85% + 115% of its respective rating.

2.5 VARIABLE FREQUENCY DRIVES

.1 All VFDs shall be mounted inside motor control centres.

.2 Provide variable frequency drives (VFD) where designated by the motor control schedule and drawings. These drives shall have the following features:

.1 The drives shall be capable of continuously operating any standard squirrel cage induction motor, NEMA design A, B, or C self-ventilated or force ventilated and inverter duty motors. Coordinate final type with Mechanical Contractor.

.2 It is required that the variable speed drive models for the fans be the HVAC applicable type drives that have accessories and functions typical for requirements of motors used in HVAC applications.

.3 It is required that the variable speed drive models for the pumps be the Pump applicable type drives that have accessories and functions typical for requirements of motors used in Pumping applications.

.4 The variable speed drive shall be the pulse width modulated (PWM sinusoidal) output type with programmable adjustable carrier frequencies.

.5 Unless otherwise noted, all horsepower/Kilowatt drive ratings are to be based on a variable torque load and FLA of motor being controlled.

.6 The drive shall maintain a minimum line side power factor of 0.95 throughout the entire speed range and the drive shall be capable of an overload of 115% for 1 minute.

.7 Provide surge arrestors with a minimum 250 Joule (line-ground) rating shall be used to protect the drive from AC line transients. Surge arrestors shall not to be part of the bridge circuit.

.8 Provide separate Input line reactors rated a minimum impedance of 3%. Ensure adequate ventilation is provided for proper heat dissipation.

.9 Provide Passive Harmonic Line Side Filters to mitigate VFD harmonics onto the System Power Supply, to meet IEEE-519 (1992) Certification with the Point of Common Coupling being the Line Side of the VFD with the THD level at 5%.

.10 Provide EMI and RFI filters for all VFD’s. Equipment shall be designed that use of communication equipment adjacent to VFD units is permissible. The VFD shall not be susceptible to interference from communications equipment operated adjacent to it.

.11 The output inverter section shall utilize insulated gate bipolar transistors and diodes to provide a sine coded pulse width modulated output to the motor. The carrier frequency of the pulse width modulation shall be asynchronous to control harmonic distortion in the 3rd to 7th bandwidths to less than 1%. Total voltage harmonic distortion on the input shall be less than 3%.

.12 Control power input terminals shall be separate from the input power terminals to facilitate start-up, trouble-shooting, and diagnostics without power to the DC bus.

.13 The VFD shall not be sensitive to incoming power feeder phase sequence.

.14 Chassis mounted terminal strips shall be removable without disturbing the control wiring and must have a locking system resistant to vibration. Each input and output shall be identified. All plug-in connectors inside the unit shall be identified with permanent labels on each termination.

.15 Operator controls shall consist of:
- .1 "Hand / Off / Auto" selector switch
  - .1 "Hand" for local control of VFDr. VFD is operated by panel mounted keypad pushbuttons, speed controlled by the keypad. LCD Keypad Display. LCD Display to be full English Word.
  - .2 Motor cannot be started or remain running in Off position through Power Removal Function.
  - .3 in "AUTO" position, the VFD operates by remote start/stop command, the speed is controlled by a programmable analogue input selectable isolated input signal 0 to 10 Vdc or 4 to 20 ma from the BMS and Fire Alarm Panel.

.16 The drive shall have the following pilot lights.
- .1 VFD Display operation shall be used to confirm power is present.
- .2 VFD Status: "STOPPED" and "RUN"

.17 Input disconnect switches, fuses, and all accessories shall be mounted in the motor control centre. In the event that the motor protection such as the overloads or thermistor tripping unit senses a motor fault, the starter shall lock out and the motor shall be de-energized.

.18 All control wiring shall be run in separate raceway away from any line voltage or motor feeder power wiring. Motor cables shall be separated from the supply cables at a minimum distance of 600mm and from signal / control cables at a minimum distance of 400mm. The signal / control cables shall be separated from the motor cables at a minimum distance of 900mm. Where signal / control cables must cross power or motor cables, the crossover angle shall be 90 degrees.

.19 The drive shall be designed and constructed to operate at a maximum altitude of 1000 m without derating and an ambient temperature between 0o C and 40o C. The drive shall operate in an environment with a relative humidity up to 90% with no condensation.

.20 The drives shall operate at 690 Volts as applicable plus 10% 60Hz, 3ph. Drives which require isolation transformers or are rated at 575 Volt are not acceptable.

.21 The drive shall have programmable analog signal of 0-10Vdc, 4-20mA, +/- 10Vdc.

.22 All VFD set-up operations and adjustments shall be digital and stored in nonvolatile memory (EEPROM).

.23 The VFD shall have a Power Loss Ride Through capability.

.24 The VFD shall be capable of operating with the VFD output open circuited (no motor connected) with no fault or damage to any part of the drive.

.25 The drive shall have the capability to energize and control a currently 'spinning' load regardless of the direction of rotation of the load.

.26 Provide a bump-less speed transfer from remote control to local control or local control to remote control without setting the motor to zero.

.27 The setting controls shall be accessible from the front of the control board, from a commissioning terminal. Provide Programming Software and accessories for communications between VFD and PC.

.28 The following functions shall be independently field adjustable:
- .1 Acceleration rate
- .2 De-acceleration rate
- .3 Acceleration and deceleration ramps
- .4 Adjustable minimum speed of 0 to maximum speed.
- .5 Adjustable maximum speed of minimum speed to max. frequency.
- .6 Automatic restart.

.29 The following conditions shall result in a drive fault and orderly shutdown. The mode of the fault shall be displayed on the electronic display on the front of the drive.
- .1 Phase failure on the input line
- .2 Under input line voltage
- .3 Over input line voltage
- .4 Drive over temperature
- .5 Motor phase failure

.30 The drive controls shall facilitate the locking of settings in the speed controller. This shall result in the speed controller's terminal and dialogue unit no longer allowing change in the settings. Unlocking of the settings shall be possible by deactivating this feature.

.31 The drive shall include a self-diagnostic system to test all main functions and identify any failed elements.

.32 Provide an Operations and Maintenance manual with the following:
- .1 Design and Operation
- .2 Technical characteristics
- .3 Installation
- .4 Connections
- .5 Troubleshooting charts for all device faults.
- .6 An instruction manual for programming and hardware provided with the equipment at time of shipment.
- .7 A listing of authorized service depots, spare parts lists and recommended spare parts
- .8 Final settings of all parameters
- .9 Input and output filter type and size
- .10 Specified environmental conditions
- .11 Voltage and current wave form printout taken from the motor terminals

.12 Bolt and lug torque schedule for all current carrying buss and cable connections.

.33 Provide a trouble shooting guide with the following features:
- .1 Observation, fault code
- .2 Possible causes
- .3 Checks to be made
- .4 Result
- .5 Remedial action
- .6 Comments

.34 The starter shall be equipped with an automatic start mode that shall restart the motor after a power failure without operator intervention. This option shall be controlled by the internal parameter settings. Drives that lock out in a fault condition due to power outage or transfer from and to emergency power shall not be accepted. The drive shall resume to the last known frequency.

.35 The starter shall be equipped with a programmable automatic reset/restart after any individual trip condition resulting from either overcurrent, over voltage, under voltage, or an over temperature. This parameter shall initially be set to disabled.

.36 The drives are to be set for two (2) only restarts, set for a 30 second delay following the return of essential power to the drive. Failure of the drive to restart the motor following these two (2) restarts will necessitate a manual acknowledgement of the fault at the actual drive control panel.

.37 Prior to any motor control equipment ordering, the Electrical contractor shall coordinate with successful controls contractor and determine the required control, i.e. '2 wire' or '3 wire' control. Equipment shall be ordered as such upon written confirmation from the controls contractor.

.38 Coordinate all control requirements prior to ordering equipment.

.39 Each VFD shall be provided with a minimum of 2 dry contacts assignable to alarm conditions such as a VFD fault. Both contacts shall be wired to the nearest BMS control panel.

.3 The Contractor shall co-ordinate with the VFD manufacturer regarding all motor sizes, motor types and motor feeder lengths. Provide Load dv/dt filters for all motors equipped with VFD's where the feeder distance exceeds the limits for the pulse rise times shown in the following table:

Pulse Rise Time	**Critical Lead Length**
(Microseconds)	(Meters)
1 or greater	45
0.5	20
0.1 and less	Always

All VFD's not requiring an LC or LCR filter shall be equipped with a 5% output load reactor. Load dv/dt filters and load reactors manufactured by MTE Corporation, or T.C.I. are

approved. Coordinate with manufacturer to ensure proper mounting of all output filters (when required).

.4 The manufacturer in co-ordination with the Contractor shall have voltage and current waveforms taken at the time of final commissioning from the motor terminals of each motor controlled to ensure that the waveforms are within the tolerance limit of the motor and drives. The settings of the waveform capture shall be such that the pulse rise time of the waveform shall be visible and easily evaluated for voltage reflection amplification. Any documentation not meeting this requirement shall be rejected and resubmitted until it is satisfactory to the Consultant.

.5 Co-ordinate with the mechanical contractor to ensure the proper filter protection is provided for all motors served by the VFD's. The electrical contractor shall assume full responsibility for ensuring a complete and fully operational system in regards to output and input filtering for the motors and VFD's supplied.

.6 The manufacturer shall provide all necessary assistance, including on-site support, to both mechanical and electrical contractors to determine final drive parameter settings. The VFD manufacturer.

.7 Setting of all drive parameters, commissioning, testing and certification of all VFD's shall be completed by the VFD Manufacturer Certified VFD Service Technicians with 5 years of VFD experience. Third party commissioning agents will not be accepted.

.8 Upon completion of Commissioning and Start-up by VFD Manufacturers Certified Technicians, VFD Units to have a two (2) year Warranty.

.9 Coordinate all control requirements prior to ordering equipment.

.10 All VFDs and ancillary components shall be supplied by one manufacturer in order to assure an integrated system and one point of contact for service. Each manufacturer shall have a local Saskatchewan service capability. All motor control equipment shall be of the same manufacture, and shall be manufactured by one of the following:

Eaton, Schneider Electric, General Electric

2.6 CONTROL TRANSFORMER

.1 Single phase, dry type, control transformer with primary voltage as indicated and 120V secondary, complete with secondary fuse, installed in with starter as indicated.

2.7 FINISHES

.1 Apply finishes to enclosure in accordance with Section 26 05 01 - Common Work Results - Electrical.

2.8 EQUIPMENT IDENTIFICATION

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

.2 Manual starter designation label, white plate, black letters, size 1, engraved as indicated.

.3 The plates shall be attached with two self-tapping metal screws.

Part 3 Execution

3.1 INSTALLATION

.1 Install starters, connect power and control as indicated.

.2 For each motor controlled by a variable frequency drive, provide a grounding conductor from the motor case to the motor central centre internal grounding terminal.

.3 Ensure correct fuses and overload devices elements installed.

.4 Each manufacturer shall have a local Saskatchewan service capability.

.5 All motor control equipment shall be of the same manufacture.

.6 Install starters, connect power and control as indicated.

.7 Ensure correct fuses and overload devices elements installed.

.8 The drives shall be cleared of all ambient construction dust prior to commissioning or the energizing of the drive.

.9 Provide a disconnect for each motor within the room or area that the motor is located. All disconnects shall be sized in accordance with kilowatt ratings of the motor being isolated and shall be quick-make, quick-break type, equipped with lock-off feature.

.10 Within 900 mm of each motor, provide flexible Sealtite conduit. Provide a separate ground wire bridging the flexible connections.

.11 All conduit / cabling entering top of motor starter shall be c/w water tight connectors with silicone based caulking.

.12 Control wiring shall be stranded TEW 105°C (220°F) rise.

.13 Terminal blocks for remote interface shall be Weidmueller SAK6N or approved equal.

.14 Provide wire markers at both ends of all control wires, Electrovert Type Z or approved equal

.15 Provide isolation and voltage surge suppression for contacts used for external monitoring to limit inductive switching surges to less than 200 V peak. Provide DC coils with freewheeling diodes to limit inductive surges to 28V peak.

.16 Use shielded twisted pair (STP) wiring for control and signal wiring that connects externally to the VFD.

.17 Provide separate conduits for VFD control wiring from input and output power wiring.

.18 Provide #6 bare copper ground from each VFD grounding point to the building ground grid. DO NOT loop or series connect multiple VFD ground cables.

3.2 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance information for incorporation into manual specified in:

.1 Section 01 78 00 - Closeout Submittals

.2 ES/SOW-0101 Revision 3, April 15, 2004

.3 ES/SOW-0102 Revision 6, May 1, 2008

.2 Include:

.1 Operation instructions

.2 Description of system operation

.3 Description of each subsystem operation

.4 List specifying each piece of equipment in system or subsystem by its original manufacturer name and model number.

.5 Parts list specifying parts used in equipment by identification numbers that are standard to electronic industry.

.6 Include operation and maintenance data for each type and style of starter.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical and manufacturer's instructions.

.2 Prior to shipment, all VFD units shall be shop tested at the factory or at the VFD OEM/integrator, including, but not limited to, a full load heat run test, all control functions, and bypass functions.

.3 Provide factory certified copies of production test results to the Consultant prior to shipment of the equipment.

.4 Operate switches, contactors to verify correct functioning.

.5 Perform starting and stopping sequences of contactors and relays.

.6 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

.7 Calibrate VFD display values with Building Management System display output. Verify motor RPM values with a calibrated tachometer.

.8 Ensure that voltage waveforms are taken at the motor terminals at a time span that shows the relative rise times of output waveform from drive and that the waveforms are within the tolerance limit of the motor and drives.

3.4 WARRANTY

.1 The contractor must make available to the Owner a local service department of a duly authorized distributor of the equipment manufacturer, which shall stock the manufacturer's standard parts. The service department shall have at least one factory trained repair technician available to the Owner on 24 hours' notice.

.2 Provide warranty of installation of equipment installed by this contractor to be free of defects for a period of (1) one year from date of Substantial Completion.

.3 Provide during the warranty period, all service, maintenance, parts, etc., required for normal operation of the systems, such that Owner needs not purchase additional maintenance agreement or contracts. Upon request, the manufacturer and his agent shall provide direct to the Owner the following proposals:

.1 Continuation, after the warranty period, of full maintenance, including all service, labour, parts, etc. required to maintain the systems in a fully operational condition.

3.5 VERIFICATION

.1 Perform tests in accordance with:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

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

.2 The entire installation shall be performed under the supervision of the manufacturer. Upon completion of the installation, the manufacturer shall check and test the entire system. Certification of all tests shall be submitted in writing to the Consultant and shall certify the following:

.1 That the system is complete in accordance with this specification

.2 That the system is installed in accordance with the manufacturer's best recommendations

.3 During the certification tests, the contractor shall provide one (1) electrician and (1) helper to assist the manufacturer's representative. The contractor shall also provide any required equipment such as ladders, scaffolding, etc.

3.6 TRAINING

.1 Perform training in accordance with:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

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

.2 Written documentation bearing name and signature of Owner's personnel who received the above instructions shall be included in the operating instructions and service manuals.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of Contract, Division 01 General Requirements and all Addenda thereto form an integral part of and must be read in conjunction with the requirements of this Section.

.2 Cooperate and coordinate with the requirements of other units of work specified in other Sections.

1.2 REFERENCES

.1 The Electrical Contractor shall be bound by industry standards, as interpreted by the Consultant, whether or not specifically referenced in this document. Comply with Electrical Protection Act and rules and regulations made pursuant thereto, including the 2012 Canadian Electrical Code. Also, comply with applicable standards of the following:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

.3 CSA C22.1-2012, Canadian Electrical Code, Part 1.

.4 Electrical and Electronic Manufacturers Association of Canada (EEMAC).

.5 National Electrical Manufacturers Association (NEMA).

.6 National Building Code 2010 (NBC 2010)

.7 National Fire Protection Association (NFPA)

.8 Institute of Electrical and Electronic Engineers (IEEE).

.2 American National Standards Institute (ANSI)

.1 ANSI C82.1, Electric Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.

.2 ANSI C82.4, Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps.

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

.4 ANSI/IEEE C62.41, Surge Voltages in Low-Voltage AC Power Circuits.

.5 American Society for Testing and Materials (ASTM)

.6 ASTM F1137, Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.7 United States of America, Federal Communications Commission (FCC)

.8 FCC (CFR47) EM and RF Interference Suppression.

1.3 EXCEPTIONS OF REFERENCED STANDARDS

.1 The Electrical Contractor shall be bound by the standards referenced herein. The following exceptions shall be noted and used for this project in reference to the following standards:

.1 ES/SOW-0101 Revision 3, April 15, 2004:

.1 1.4 – Quantity of Equipment: Quantity and location of the equipment shall adhere to the requirements as noted in the Tender Drawings and associated specifications.

.2 3.1(c) – maintenance for the system is being handled by the Owner through a separate contracted entity. The Contractor is required to provide warranty services as specified for the specific system.

.3 3.1(h) – Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.4 14.0 – Lightning Protection: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.2 ES/SOW-0102 Revision 6, May 1, 2008:

.1 Wiring / Cabling Methods 3.1.1: The use of rigid steel conduit is not required.

.2 Splicing of existing power cabling due to breaker panel replacement is acceptable.

.3 Enclosures 3.3.2: Enclosures within the facility are not required to be IP64 rated.

.4 Lightning Protection 4.8: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 26 05 01 – Common Work Results

.3 ES/SOW-0101 Revision 3, April 15, 2004

.4 ES/SOW-0102 Revision 6, May 1, 2008

.2 Shop drawings for each fixture shall include but not be limited to, lamps, ballasts, fixture cuts, custom colors, and special mounting details. All pertinent information for each fixture shall be stapled separately from other fixtures.

1.5 PRODUCT APPROVALS

.1 Manufacturers' and model numbers named in these specifications indicate an acceptable technical standard of performance and are not intended to be exclusive. Products submitted

as alternates must result in a control system that meets or exceeds all technical performance criteria as described.

.2 Products proposed as alternatives to those specified, shall only be considered if submitted for approval no later than 10 working days before tender close. Submit alternates, for approval, as one complete listing. Provide complete product specification sheets with request for approval.

.3 The Bidder must provide detailed lighting calculation drawings for fixtures that are submitted for approval for classrooms, open office areas, training rooms or as requested by the consultant. These shall be submitted no later than 10 working days before tender close.

.4 The Bidder must provide a complete list of primary system products offered with their bid.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.

.2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

Part 2 Products

2.1 LAMPS

.1 Provide in wattages and types to properly suit the specified fixtures.

.2 T5 Linear Fluorescent Lamps:

.1 Miniature Bi-pin, slim 5/8” diameter for operating with high frequency electronic programmed start ballasts
.2 Colour Rendering Index (CRI) of 85
.3 Colour Temperature: 3500°K
.4 Nominal Life Rating: 20,000 hours

.3 T8 Linear Fluorescent Lamps:

.1 Medium Bi-pin, 1-inch or 25mm diameter for operating with high frequency instant start, programmed start and dimming electronic ballasts
.2 Colour Rendering Index (CRI) of 85
.3 Colour Temperature: 3500°K
.4 Initial Lumens: 2950 @ 25°C
.5 Nominal Life Rating @ 3 hours/start: 36,000 hours
.6 Nominal Life Rating @ 12 hours/start: 42,000 hours

.4 Compact Fluorescent Lamps:

.1 4-pin lamp base for dimming and electronic ballast systems

.2 End-of-Life (EOL) shutdown protection

.3 Flicker free start on electronic ballast systems

.4 Colour Rendering Index (CRI) of 82

.5 Colour Temperature: 3500°K

.6 Nominal Life Rating: 12,000 hours

.5 Incandescent lamps shall be 1,000 hr. nominal rating, I.F., or as otherwise specified on the drawings. This is the only item that a one-year guarantee does not apply to. Guarantee period for incandescent lamps shall be four months from date of final acceptance.

.6 Halogen Lamps:

.1 Halogen PAR lamps

.2 Base: Medium Skirt

.3 Average Life Rating: 4,000 hours

.4 Beam angles as listed with light fixture specification

.7 Lamps for T5, T8 linear fluorescent, compact fluorescent, incandescent and HID lighting fixtures shall be manufactured by Osram-Sylvania or Philips.

2.2 BALLASTS

.1 Ballasts for fluorescent and HID fixtures shall be supplied with the fixtures, pre-wired for operation with the compatible lamps and quantity of lamps specified for the fixture. Provide ballasts in the voltage noted with the fixture specification.

.2 Fluorescent ballast systems shall include:

.1 Operate lamps for maximum efficacy, high lumen output operation and operate for full lamp life

.2 Eliminate lamp flicker

.3 UL Listed Class P, Type 1 Outdoor

.4 CSA Certified

.5 70°C Maximum Case Temperature

.6 FCC 47CFR Part 18 Non-Consumer for EMI and RFI filtering

.7 Class A Sound Rating

.8 ANSI C62.41 Category A Transient Protection

.9 CFCI Compatible

.3 Ballasts for Linear T5 Lamps

.1 Starting Method: Programmed Rapid Start

.2 Stepped Switching Ballast System where indicated bi-level 100% and 50% stepped output

.3 Ballast Factor (BF): 1.00

.4 Circuit Type: Series

.5 Lamp Frequency: >40kHz to reduce potential interference with infrared control systems

.6 Lamp Current Crest Factor (CCF): less than 1.6

.7 Total Harmonic Distortion: <10% THD

.8 Power Factor: >98%

.9 End of Lamp Life Sensing

.10 Manufacturer:

Sylvania 'Quicktronic PROStart T5 Professional Series
Advance 'Optanium Step Dim EL' series, available in 120-volt only

.4 Ballasts for Linear T8 Lamps

.1 Starting Method: Instant Start or Programmed start where specified

.2 Ballast Factor (BF): 0.88 – Normal Ballast Factor

.3 Circuit Type: Parallel

.4 Lamp Frequency: >42kHz to reduce potential interference with infrared control systems

.5 Lamp Current Crest Factor (CCF): less than 1.7

.6 Total Harmonic Distortion: <10% THD

.7 Power Factor: >98%

.8 Manufacturer (Instant Start):

Advance 'ICN' series for 120-volt;

Sylvania 'Quicktronic' T8 Instant Start Professional Series

Universal Lighting Technologies

.9 Manufacturer (Programmed Start):

Advance 'IOP' series
Sylvania 'Quicktronic PROStart'

.5 Dimming Fluorescent Ballasts for T5, T8 and Compact Fluorescent Lamps

.1 Starting Method: Programmed Rapid Start System

.2 Ballast Factor (BF): 1.00 – Normal Ballast Factor

.3 Circuit Type: Series

.4 Lamp Frequency: >40kHz to reduce potential interference with infrared control systems

.5 Lamp Current Crest Factor (CCF): less than 1.7

.6 Total Harmonic Distortion: <10% THD

.7 Power Factor: >98%

.8 Dimming Range: 100 to 10%

.9 1 – 10 Volt Control

.10 Anti-Flash Circuitry turns on in dimmed mode

.11 End of Lamp Life Sensing for T4 and T5 lamps

.12 Compatible with 4-pin compact fluorescent lamp types

.13 Manufacturers (unless noted otherwise):

Lutron 'Hi-Lume' series

Sylvania 'Quicktronic – Powersense' series

Advance Mark 10

.6 Fluorescent ballasts shall have inrush current limiting capability to assure compatibility with all lighting systems controls.

.7 Ballast Warranty: All fluorescent ballasts shall include a written manufacturer's warranty against defects in materials and workmanship for 60 months from date of substantial completion and include a nominal replacement labour allowance.

2.3 LED LIGHTING – LAMP MODULES AND DRIVERS

.1 Solid-State Lighting (LED luminaires) shall comply with ENERGY STAR® SSL test standards for the following qualification requirements:

.1 Testing: SSL testing standards including IES LM-79-2008 and LM-80-2008 as performed by an independent test lab.

.2 Efficacy: The luminaire test data and submitted report shall demonstrate a minimum of 35 lumens per watt and 575 lumens for the least efficient LED for apertures ≥ 4.5" (345 lumens for apertures ≤ 4.5"), lowest efficient optic, and hottest luminaire configuration for the product group submitted for qualification.

.3 Colour: LED luminaire shall demonstrate colour uniformity across the aperture.

.4 Power: The driver/power supply must have a power factor of > 0.90 for all non-residential products, meet FCC requirements, sound rating of A and provide transient protection.

.5 Reliability: The LED luminaire shall demonstrate 70% lumen maintenance at 35,000 hours for non-residential products, as calculated using the DOE's linear extrapolation model.

.2 Tight chromaticity specification and LED colour binning process shall ensure LED colour uniformity, sustainable Colour Rendering Index (CRI) and Correlated Colour Temperature (CCT) consistency over the useful life of the LED. Consistent colour uniformity and tight colour control shall be maintained even during dimming.

.3 LED modules shall be InGaN (Indium Gallium Nitride) semiconductor material, absent of UV and minimal IR wavelengths. The conglomeration of diodes covered with remote phosphor technology shall provide consistent colour uniformity and tight colour control.

.4 LED Light Engine (Driver)

.1 Over-voltage, over-current and short-circuit protected

.2 Thermal management of the LED system shall be designed to yield 70% lumen maintenance after 50,000 hours of operation

.3 Total Harmonic Distortion: < 20% THD

.5 LED fixtures where specified as dimmable, shall have a dimming range of 100% to 10% unless otherwise noted.

.6 Warranty: The light engine and power components of LED luminaires installed for indoor applications shall be free from defects in material and workmanship for a minimum period of three (3) years from date of original purchase. Warranty shall cover only product failure due to defective material or workmanship, and does not include labour to remove or install fixtures. Defective LED's shall be considered if a minimum of 5% of LEDs per luminaire are non-operative in the fixture or module.

2.4 LUMINAIRES

.1 Contractor is responsible for all required mounting details for all lighting fixtures. If mounting of fixture is uncertain, contractor shall confirm prior to finalising pricing.

.2 Lighting fixtures shall be of the makes indicated. Similar types of fixtures shall be by one manufacturer.

.3 Only clean luminaires and lamps will be accepted at time of final inspection.

.4 Recessed fixtures shall generally be supplied complete with trim, plaster frame or ring and mounting brackets where installed in plaster, or without plaster frame in acoustic ceilings.

.5 Fixtures shall bear appropriate CSA labels.

.6 Cooperate with all other trades for the proper installation of all lighting fixtures.

.7 Verify the quantity of fixtures before placing orders.

.8 Verify all ceiling types with architectural drawings and the General Contractor before ordering fixtures.

.9 Fluorescent lighting fixtures shall be so designed that the temperature on the ballast case shall not exceed a maximum of 70°C in an ambient temperature of 25°C.

.10 Co-ordinate with drawings to ensure that all fluorescent fixtures are equipped with ballasts of a suitable voltage to match branch circuitry.

.11 All fluorescent fixtures such as troffers, specified as being equipped with flat acrylic lens, shall be provided with lens not less than 3.175 mm thick, regardless of catalogue numbers specified.

.12 All fluorescent troffers specified as being installed in inverted T-bar ceilings shall be painted on bottom face of fixture to match the T-bar splines unless otherwise noted.

.13 A self adhesive small circular label coloured blue shall be placed on a T-bar spline adjacent to each fixture housing the ballast to facilitate its location.

.14 All fluorescent luminaires installed on branch circuits with voltages exceeding 150 volts-to-ground shall be provided with a disconnecting means integral with the luminaire that simultaneously opens all circuit conductors between the branch circuit conductors and the conductors supplying the ballast(s), and shall be marked in a conspicuous and permanent manner adjacent to the disconnecting means so as to identify the disconnect.

.15 The new light fixture lamps shall not be used during construction. The contractor may use their own temporary lamps during construction at their own expense with the Owner's

approval. The contractor shall replace temporary lamps with new lamps upon completion of work. All fixtures shall be cleaned inside and outside prior to substantial completion.

.16 Provide lighting fixtures of type and quality as specified in the following schedule. Fixtures shall be complete with necessary accessories, lamps and ballasts. The contractor shall advise of any restrictions on providing luminaire, lamp and ballast as specified during tender period.

.17 The lighting fixtures shall be as specified in the following schedule, and the manufacturer's numbers shown shall not reduce or amend the requirements as outlined under the description of each fixture type.

2.5 LUMINAIRE SCHEDULE

.1 Fixture type 'AA' (Maximum / Medium Cell Range)

.1 Luminaire: Recessed fluorescent volumetric fixture suitable for inverted t-bar ceiling or metal panel ceiling, 305 x 1219mm, steel frame and matte white reflector, direct/indirect center diffuser with opal lens, with one dimming ballast per fixture.

.2 Lamps: 2 x 28 watt T5 lamps, 2600 initial lumens per lamp @ 25°C

.3 Ballast: Programmed rapid start electronic dimming ballast, **120-volt**.

.4 Manufacturer:

Stanpro # F3BRA series or approved equal.

.2 Fixture type 'BB' (Maximum/Medium Cells)

.1 Luminaire: Surface corner mounted fluorescent, 305 x 1219mm, steel frame and specular reflector, linear prismatic acrylic len, two ballasts one for T8 lamps and one for compact fluorescent lamp. Mount in architectural frame. Refer to architectural detail.

.2 Lamps: 2 x 32 watt T8 lamps, 2600 initial lumens per lamp @ 25°C and one PL 13 compact fluorescent lamp.

.3 Ballasts: Programmed rapid start electronic ballasts, **120 volt**

.4 Manufacturer:

Metalumen # D4KA series or approved equal.

.3 Fixture type 'CC' (Structured Living / Visitor Security Screening)

.1 Luminaire: Recessed fluorescent volumetric fixture suitable for inverted t-bar ceiling or dropped drywall ceiling, 305 x 1219mm, steel frame and matte white reflector, direct/indirect center diffuser with opal lens, with one ballast per fixture.

.2 Lamps: 2 x 28 watt T5 lamps, 2600 initial lumens per lamp @ 25°C

.3 Ballast: Instant start electronic ballast, **120-volt**.

.4 Manufacturer:

Stanpro #F3BRA series or approved equal.

.4 Fixture type 'DD' (Offices)

.1 Luminaire: Recessed fluorescent fixture suitable for inverted ceiling, 610 x 1219mm, hinged extruded steel flat frame, K12 acrylic diffuser (0.125" nominal).

.2 Lamps: 3 x 28 watt T5 lamps

.3 Ballast: Instant start electronic ballast, **120-volt.**

.4 Manufacturer:

Stanpro # F3TSB series or approved equal.

.5 Fixture type 'EE' (Viewing Corridors)

.1 Luminaire: Recessed fluorescent fixture suitable for inverted ceiling, 305 x 1219mm, hinged extruded steel flat frame, K12 acrylic diffuser (0.125" nominal).

.2 Lamps: 2 x 32 watt T8 lamps

.3 Ballast: Programmed rapid start electronic dimming ballast, **120-volt.**

.4 Manufacturer:

Stanpro # F3TSB series or approved equal.

.6 Fixture type 'FF' (Storage/ Janitor/ IT Rooms)

.1 Luminaire: Surface mounted fluorescent strip light, 1219mm length c/w wire guard. Where suspended, strip light shall be suspended by chain hanger to a minimum height of 2440mm above finished floor. Coordinate final mounting height on site.

.2 Lamps: 2 x 32 watt T8 lamps

.3 Ballast: Instant start electronic ballast, **120-volt**

.4 Manufacturer:

Stanpro # F2SST series or approved equal.

.7 Fixture type 'GG' (Common Corridors)

.1 Luminaire: Recessed fluorescent fixture suitable for inverted ceiling, 305 x 1219mm, hinged extruded steel flat frame, K12 acrylic diffuser (0.125" nominal).

.2 Lamps: 2 x 32 watt T8 lamps

.3 Ballast: Instant start electronic ballast, **120-volt.**

.4 Manufacturer:

Stanpro # F3TSB series or approved equal.

.8 Fixture type 'HH' (Open Office & Offices)

.1 Luminaire: Recessed fluorescent fixture suitable for inverted ceiling, 610 x 610 mm, hinged extruded steel flat frame, K12 acrylic diffuser (0.125" nominal).

.2 Lamps: 3 x 17 watt T8 lamps

.3 Ballast: Instant start electronic ballast, **120-volt.**

.4 Manufacturer:

Stanpro # F3TSB series or approved equal.

.9 Fixture type 'JJ' (Gym)

.1 Luminaire: Surface mounted white fluorescent high bay fixture with (1) three- lamp ballast. Fixture shall be c/w white painted optical system providing wide distribution. Fixture shall be complete with a clear acrylic lens, white wire guard. Gymnasium shall have an average lighting level of 350 lux. Lamps: 4 x 32 watt T8 lamps, 2900 initial lumens per lamp @ 25°C ambient.

.2 Ballast: Programmed rapid start electronic high output ballast; one 4- lamp, **120-volt.**

.3 Manufacturer:
Paco Lighting 'PUGY-48' series or approved equal.

.10 Fixture type 'KK' (Washrooms)

.1 Luminaire: Fluorescent wall bracket, 1219mm long, fixture frame in white finish, smooth opalescent acrylic diffuser. Mount up 2400mm, or 150mm above vanity mirror unless noted otherwise.

.2 Lamps: 2 x 32 watt T8 lamps

.3 Ballast: Instant start electronic ballast, **120-volt**

.4 Manufacturer:

Stanpro # F2CUB series
Cooper Lighting BC232 series
CFI 'C' series

.11 Fixture type 'LL' (Structured Living / Visitor Security Screening)

.1 Luminaire: Recessed fluorescent volumetric fixture suitable for inverted t-bar ceiling or dropped drywall ceiling, 610 x 610mm, steel frame and matte white reflector, direct/indirect center diffuser with opal lens , with one ballast per fixture.

.2 Lamps: 3 x 17 watt T8 lamps

.3 Ballast: Instant start electronic ballast, **120-volt**.

.4 Manufacturer:

Stanpro # F3BRA series or approved equal.

.12 Fixture type 'MM' (Classrooms / Training)

.1 Luminaire: Recessed fluorescent volumetric fixture suitable for inverted t-bar ceiling or dropped drywall ceiling, 610 x 1219mm, steel frame and matte white reflector, direct/indirect center diffuser with opal lens, with one ballast per fixture.

.2 Lamps: 3 x 28 watt T5 lamps, 2600 initial lumens per lamp @ 25°C

.3 Ballast: Instant start electronic ballast, **120-volt**.

.4 Manufacturer:

Stanpro #F3BRA series or approved equal.

.13 Fixture type 'MM2' (Classroom)

.1 Luminaire: Recessed fluorescent volumetric fixture suitable for inverted t-bar ceiling or dropped drywall ceiling, 610 x 1219mm, steel frame and matte white reflector, direct/indirect center diffuser with opal lens, with one ballast per fixture.

.2 Lamps: 2 x 28 watt T5 lamps, 2600 initial lumens per lamp @ 25°C

.3 Ballast: Instant start electronic ballast, **120-volt**.

.4 Manufacturer:

Stanpro #F3BRA series or approved equal.

.14 Fixture type 'OO' (Classrooms / Training)

.1 Luminaire: Recessed fluorescent volumetric fixture suitable for inverted t-bar ceiling or dropped drywall ceiling, 610 x 610mm, steel frame and matte white reflector, direct/indirect center diffuser with opal lens, with one ballast per fixture.

.2 Lamps: 3 x 14 watt T5 lamps, 2600 initial lumens per lamp @ 25°C

.3 Ballast: Instant start electronic ballast, **120-volt**.

.4 Manufacturer:

Stanpro #F3BRA series or approved equal.

.15 Fixture type 'PP' (Elevator Pit)

.1 Luminaire: Ceiling mounted fluorescent fixture suitable for wet locations, impact resistant reinforced polyester fiberglass housing, polycarbonate lens, gasketted, tamper resistant latches. Mount to the underside of exposed beams.

.2 Lamps: 2 x 32 watt T8 lamps

.3 Ballast: Instant start electronic ballast, **120-volt**

.4 Manufacturer:
Cooper Lighting 'FPS' series
CFI 'VTN' series
Or approved equal.

.16 Fixture type 'C' (Shower)

.1 Luminaire: Recessed thin-line LED downlight suitable for mounting in T-bar or drywall ceilings, 6-inch aperture, flat opal white glass diffuser with white trim ring. Internal driver housing with a depth of 64mm,

.2 LED shall be warm white (2900 - 3200°K) and have delivered lumens of at least 610.

.3 Electronic driver, dimmable, **120-volt**

Manufacturer:

Magic Lite # MLL LVLDL-06-WW-WH or approved equal.

Intense # IML6 Series

.17 Fixture type 'D' (Catwalk)

.1 Luminaire: Exterior surface mounted LED wall cube suitable for wet locations, die cast aluminum housing in bronze finish, glass lens c/w vandal resistant one-piece injection molded clear polycarbonate guard. 120 volt LED driver 38 input watts, 2,018 delivered lumens, 4700°K, c/w Photocell. Fixture shall be mounted up as noted on drawings.

.2 Manufacturers:

Stanpro # WPS-L series or approved equal.

.18 Fixture type 'F' (Meeting Room / Vestibule)

.1 Luminaire: Recessed LED downlight suitable for mounting in inverted T-bar or drywall ceiling, 158mm diameter aperture, aluminum reflector with white trim.

.2 Lamps: 28 watt, 1300 lumen LED module, 4000K, 80 CRI, 50000 hours at 70% lumen maintenance.

.3 **Driver: over-voltage, over-current and short-circuit protected, 120-volt, <20% THD, dimmable.**
Manufacturers:

Intense # RP6 Series or approved equal.

.19 Fixture type 'G' (Fence)

.1 Luminaire: Exterior Yard Light surface mounted LED suitable for wet locations, die cast aluminum housing in grey finish, vandal resistant one-piece injection molded clear polycarbonate lens. 120 volt LED driver 42 input watts, 2,167 delivered lumens, 5000°K, c/w Photocell. Fixture shall be c/w 533mm mounting arm and cabtire cable for post top mounting. Refer to site plan drawings and architectural details.

.2 Manufacturers:
Stanpro # YDD-L series or approved equal.

ADDITIONAL MATERIALS

.20 In addition to the materials specified and the quantity of materials as determined on the plans, provide for the supply and installation of the following additional materials, which shall be turned over to the owner if not installed during construction:

Lamps:

32 watt T8 Linear Fluorescent Lamps: 1 x case of 30 lamps

17 watt T8 Linear Fluorescent Lamps: 10 lamps

14 watt T5 Fluorescent Lamps: 10 lamps

28 watt T5 Fluorescent Lamps: 10 lamps

Ballasts:
Instant Start Electronic 2-lamp ballasts for T8 lamps, 120 volt: 3 x ballasts
Dimming Ballasts for T8 lamps, 120 volt: 3 x ballasts

Fixtures:
Fixture type 'DD': 3 x additional fixtures
Fixture type 'HH': 2 x additional fixtures
Fixture type 'OO': 5 x additional fixtures

Part 3 Execution

3.1 INSTALLATION

.1 The contractor under this Division shall be responsible for expediting the delivery and installation of the fixtures to suite the construction schedule and the work of other trades.

.2 Remove packing material and debris from the job site immediately after installation of fixtures and lamps. Debris shall not be allowed to accumulate more than a reasonable amount.

.3 Industrial fixtures where suspended shall have 12 mm conduit hangers and ball aligners, the length and location shall clear equipment ducts and pipes.

.4 Lighting fixture diffusers are not to be installed until the area is completely finished in order to minimize the amount of dirt collection on these units.

.5 Exit signs shall be wired in a separate conduit system.

.6 Conduit installation shall conform to the specifications.

.7 Emergency battery lighting units shall be connected to the room's 120-volt lighting circuit, non-switched leg.

3.2 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance information

.1 Section 01 78 00 - Closeout Submittals
.2 ES/SOW-0101 Revision 3, April 15, 2004
.3 ES/SOW-0102 Revision 6, May 1, 2008

.2 Include:

.1 Operation instructions
.2 Description of system operation
.3 Description of each subsystem operation
.4 List specifying each piece of equipment in system or subsystem by its original manufacturer name and model number.
.5 Parts list specifying parts used in equipment by identification numbers that are standard to electronic industry.

3.3 WIRING

.1 Each fixture shall be fed with a separate flex or AC-90 drop. Looping between fixtures or wiring rows through ballast channel will not be accepted.

3.4 LUMINAIRE SUPPORTS

.1 Lighting fixtures shall be supported independent of plasterboard or acoustic tile. Support from structural members of the building or ceiling.

.2 Fixtures installed in exposed ceilings may require plywood backing behind the acoustical panels. Confirm support requirements with manufacturer.

3.5 LUMINAIRE ALIGNMENT

.1 Luminaires shown in continuous lines or rows shall be carefully aligned so that all rows appear as straight lines.

.2 Fixtures shall be installed accurately in line and level. Any fixtures which are not installed properly shall be taken down and re-installed at no change to the contract sum. Plaster frames and rings required for recessed fixtures shall be supplied under this section, and installed under the lathing and plaster or acoustic ceiling divisions. The work of the electrical division shall include the necessary co-ordination with the above divisions in regard to the correct location and installation of the plaster frame and rings.

3.6 WARRANTY

.1 The contractor must make available to the Owner a local service department of a duly authorized distributor of the equipment manufacturer, which shall stock the manufacturer's standard parts. The service department shall have at least one factory trained repair technician available to the Owner on 24 hours' notice.

.2 Provide warranty of installation of equipment installed by this contractor to be free of defects for a period of (1) one year from date of Substantial Completion.

.3 Provide during the warranty period, all service, maintenance, parts, etc., required for normal operation of the systems, such that Owner needs not purchase additional maintenance agreement or contracts. Upon request, the manufacturer and his agent shall provide direct to the Owner the following proposals:

.1 Continuation, after the warranty period, of full maintenance, including all service, labour, parts, etc. required to maintain the systems in a fully operational condition.

3.7 VERIFICATION

.1 Perform tests in accordance with:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

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

.2 The entire installation shall be performed under the supervision of the manufacturer. Upon completion of the installation, the manufacturer shall check and test the entire system. Certification of all tests shall be submitted in writing to the Consultant and shall certify the following:

.1 That the system is complete in accordance with this specification

.2 That the system is installed in accordance with the manufacturer's best recommendations

.3 During the certification tests, the contractor shall provide one (1) electrician and (1) helper to assist the manufacturer's representative. The contractor shall also provide any required equipment such as ladders, scaffolding, etc.

3.8 TRAINING

.1 Perform training in accordance with:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

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

.2 Written documentation bearing name and signature of Owner's personnel who received the above instructions shall be included in the operating instructions and service manuals.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of Contract, Division 01 General Requirements and all Addenda thereto form an integral part of and must be read in conjunction with the requirements of this Section.

.2 Cooperate and coordinate with the requirements of other units of work specified in other Sections.

1.2 REFERENCES

.1 The Electrical Contractor shall be bound by industry standards, as interpreted by the Consultant, whether or not specifically referenced in this document. Comply with Electrical Protection Act and rules and regulations made pursuant thereto, including the 2012 Canadian Electrical Code. Also, comply with applicable standards of the following:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

.3 CSA C22.1-2012, Canadian Electrical Code, Part 1.

.4 Electrical and Electronic Manufacturers Association of Canada (EEMAC).

.5 National Electrical Manufacturers Association (NEMA).

.6 National Building Code 2010 (NBC 2010)

.7 National Fire Protection Association (NFPA)

.8 Institute of Electrical and Electronic Engineers (IEEE).

.2 American National Standards Institute (ANSI)

.1 ANSI C82.1, Electric Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.

.2 ANSI C82.4, Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps.

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

.4 ANSI/IEEE C62.41, Surge Voltages in Low-Voltage AC Power Circuits.

.5 American Society for Testing and Materials (ASTM)

.6 ASTM F1137, Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.7 United States of America, Federal Communications Commission (FCC)

.8 FCC (CFR47) EM and RF Interference Suppression.

1.3 EXCEPTIONS OF REFERENCED STANDARDS

.1 The Electrical Contractor shall be bound by the standards referenced herein. The following exceptions shall be noted and used for this project in reference to the following standards:

.1 ES/SOW-0101 Revision 3, April 15, 2004:

.1 1.4 – Quantity of Equipment: Quantity and location of the equipment shall adhere to the requirements as noted in the Tender Drawings and associated specifications.

.2 3.1(c) – maintenance for the system is being handled by the Owner through a separate contracted entity. The Contractor is required to provide warranty services as specified for the specific system.

.3 3.1(h) – Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.4 14.0 – Lightning Protection: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.2 ES/SOW-0102 Revision 6, May 1, 2008:

.1 Wiring / Cabling Methods 3.1.1: The use of rigid steel conduit is not required.

.2 Splicing of existing power cabling due to breaker panel replacement is acceptable.

.3 Enclosures 3.3.2: Enclosures within the facility are not required to be IP64 rated.

.4 Lightning Protection 4.8: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 26 05 01 – Common Work Results

.3 ES/SOW-0101 Revision 3, April 15, 2004

.4 ES/SOW-0102 Revision 6, May 1, 2008

.2 Shop drawings for each fixture shall include but not be limited to, lamps, ballasts, fixture cuts, custom colors, and special mounting details. All pertinent information for each fixture shall be stapled separately from other fixtures.

1.5 PRODUCT APPROVALS

.1 Manufacturers' and model numbers named in these specifications indicate an acceptable technical standard of performance and are not intended to be exclusive. Products submitted as alternates must result in a control system that meets or exceeds all technical performance criteria as described.

.2 Products proposed as alternatives to those specified, shall only be considered if submitted for approval no later than 15 working days before tender close. Submit alternates, for approval, as one complete listing. Provide complete product specification sheets with request for approval.

.3 The Bidder must provide a complete list of primary system products offered with their bid.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.

.2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

Part 2 Products

2.1 EMERGENCY BATTERY OPERATED LIGHTING

.1 Emergency lighting units shall be battery contained units 120 volt, with a combination of remote heads interconnected as indicated on drawings, including wiring to a DC terminal block in the exit light fixtures.

.2 All emergency lighting fixtures shall be surface mounted up 2100mm unless otherwise noted. Lighting heads shall be adjusted on site to provide optimum lighting within the area with an emphasis directed at illuminating means of egress towards the exits. Coordinate mounting heights with architectural elevation drawings prior to rough-in.

.3 Emergency lighting units and remote fixtures shall be as specified in the following schedule, and the manufacturer's numbers shown shall not reduce or amend the requirements as outlined under the description of each fixture type.

.4 Battery units shall be labeled with identification numbers to match the owner's existing numbering system. Contractor shall coordinate with the owner.

Fixture type 'EM' Emergency lighting unit shall be a battery contained unit with two integral lighting heads equipped with 2 x 6 watt, **12-volt** MR16 LED lamps. The emergency battery unit shall have a minimum **108 watt** capacity for 60 minutes, sealed long life battery with 10 year life expectancy. Solid state charger and battery protection circuit. Include auto-test self-diagnostic option, 120 volt. Unit shall be Nexus RF compatible.
Emergi-Lite - #NXM series
Ready-Lite - #LDX-NMseries

Fixture type 'EMC' – exit sign running man /emergency combination, emergency lighting unit, cast aluminum back plate and housing in white finish, 2 x 5 watt **12 VOLT** MR16 LED lamps , 50 watt capacity for 60 minutes, sealed long life battery with 10 year life expectancy.

Solid state charger and battery protection circuit. Include auto-test self-diagnostic option, 120 volt. Unit shall be Nexus RF compatible.
Emergi-Lite – EAC series
Ready-Lite – RAC series

Fixture type 'ER2' – Emergency remote light fixture powered from fixture type 'EMA', 'EMB' as indicated, 2 x 20 watt **12 volt** MR16 lamps, fully gasketed cast aluminium back plate in white finish, clear polycarbonate cover. Provide for the supply and installation of (1) additional fixtures not shown on plans.
Emergi-Lite – Survive-All NXM series
Ready-Lite – TUF NM series

Emergency Lighting Monitoring System 'NEXUS RF Series – hard wired/wireless radio frequency communication system capable of activating and testing individual or multiple emergency lights and generating reports. System is 900 MHz mesh networking technology with optimum channel selection, graphical user interface (GUI) accessible on wireless area controller (AC) also stores the master database, operates as a user interface c/w keypad and LCD touch screen, coordinates nodes both through the routers and its own cluster. The area controller router (ACR) can coordinate a cluster of up to 90 nodes and maintains the database independent to the (AC). Unit c/w touch screen, USB ports, Ethernet connection, battery back-up, SD slot for removable memory, CF slot for memory or peripheral devices. Unit is capable of logging test results and generating reports using NEXUS reporting functions. Provide all components and wiring and cables and interface modules for a fully operational system.

RF Area Controller (AC) – head end database system, coordinates up to 90 nodes, 128MB RAM, SD flash memory 2GB, 100-240VAC 50/60Hz, 12VDC @2.1A output, 918 to 925.8 MHz, battery backed, integrated web server, 2 meter Blue Cat5e UTP patch cord, wall bracket c/w security latch, USB ports for connection to keyboard, mouse, printer and PC, 1GB USB flash memory stick, Ethernet port, 50 ohm SMA antenna jack and 75mm stub antenna.

RF Area Controller Router (AR) - coordinates up to 90 nodes, 128MB RAM – 128MB flash, SD flash memory 2GB, 100-240VAC 50/60Hz, 12VDC @2.1A output, 918 to 925.8 MHz, battery backed, integrated web server, 2 meter Blue Cat5e UTP patch cord, wall bracket c/w security latch, USB ports for connection to keyboard, mouse, printer and PC, 1GB USB flash memory stick, Ethernet port, 50 ohm SMA antenna jack and 75mm stub antenna. System shall be compatible with owner's existing NEXUS area controller.

2.2 ADDITIONAL MATERIALS

.1 In addition to the materials specified and the quantity of materials as determined on the plans, provide for the supply and installation of the following additional materials, which shall be turned over to the owner if not installed during construction:

Fixtures:

Fixture type 'ER2': 3 x additional fixtures including supply and installation of wire/ conduit for each additional fixture, 10 meters of 2 #10 RW90 in 16mm conduit.

Part 3 Execution

3.1 INSTALLATION

.1 The contractor under this Division shall be responsible for expediting the delivery and installation of the fixtures to suite the construction schedule and the work of other trades.

.2 Remove packing material and debris from the job site immediately after installation of fixtures and lamps. Debris shall not be allowed to accumulate more than a reasonable amount.

.3 Lighting fixtures installed in any area that is not completely finished shall be cleaned at the end of the construction.

.4 Conduit installation shall conform to the specifications.

.5 Emergency battery lighting units shall be connected to the room's 120-volt lighting circuit, non-switched leg.

3.2 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance information

- .1 Section 01 78 00 - Closeout Submittals
- .2 ES/SOW-0101 Revision 3, April 15, 2004
- .3 ES/SOW-0102 Revision 6, May 1, 2008

.2 Include:

- .1 Operation instructions
- .2 Description of system operation
- .3 Description of each subsystem operation
- .4 List specifying each piece of equipment in system or subsystem by its original manufacturer name and model number.
- .5 Parts list specifying parts used in equipment by identification numbers that are standard to electronic industry.

3.3 WIRING

.1 Each fixture shall be fed with a separate flex or AC-90 drop.

3.4 LUMINAIRE SUPPORTS

.1 Lighting fixtures shall be supported independent of plasterboard or acoustic tile. Support from structural members of the building or ceiling.

.2 Fixtures installed in exposed ceilings may require plywood backing behind the acoustical panels. Confirm support requirements with manufacturer.

3.5 LUMINAIRE ALIGNMENT

.1 Fixtures shall be installed accurately in line and level. Any fixtures which are not installed properly shall be taken down and re-installed at no change to the contract sum.

3.6 VERIFICATION

.1 Perform tests in accordance with:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

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

.2 The entire installation shall be performed under the supervision of the manufacturer. Upon completion of the installation, the manufacturer shall check and test the entire system. Certification of all tests shall be submitted in writing to the Consultant and shall certify the following:

.1 That the system is complete in accordance with this specification

.2 That the system is installed in accordance with the manufacturer’s best recommendations

.3 During the certification tests, the contractor shall provide one (1) electrician and (1) helper to assist the manufacturer’s representative. The contractor shall also provide any required equipment such as ladders, scaffolding, etc.

3.7 TRAINING

.1 Perform training in accordance with:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

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

.2 Written documentation bearing name and signature of Owner's personnel who received the above instructions shall be included in the operating instructions and service manuals.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of Contract, Division 01 General Requirements and all Addenda thereto form an integral part of and must be read in conjunction with the requirements of this Section.

.2 Cooperate and coordinate with the requirements of other units of work specified in other Sections.

1.2 REFERENCES

.1 The Electrical Contractor shall be bound by industry standards, as interpreted by the Consultant, whether or not specifically referenced in this document. Comply with Electrical Protection Act and rules and regulations made pursuant thereto, including the 2012 Canadian Electrical Code. Also, comply with applicable standards of the following:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

.3 CSA C22.1-2012, Canadian Electrical Code, Part 1.

.4 Electrical and Electronic Manufacturers Association of Canada (EEMAC).

.5 National Electrical Manufacturers Association (NEMA).

.6 National Building Code 2010 (NBC 2010)

.7 National Fire Protection Association (NFPA)

.8 Institute of Electrical and Electronic Engineers (IEEE).

.2 American National Standards Institute (ANSI)

.1 ANSI C82.1, Electric Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.

.2 ANSI C82.4, Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps.

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

.4 ANSI/IEEE C62.41, Surge Voltages in Low-Voltage AC Power Circuits.

.5 American Society for Testing and Materials (ASTM)

.6 ASTM F1137, Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.7 United States of America, Federal Communications Commission (FCC)

.8 FCC (CFR47) EM and RF Interference Suppression.

1.3 EXCEPTIONS OF REFERENCED STANDARDS

.1 The Electrical Contractor shall be bound by the standards referenced herein. The following exceptions shall be noted and used for this project in reference to the following standards:

.1 ES/SOW-0101 Revision 3, April 15, 2004:

.1 1.4 – Quantity of Equipment: Quantity and location of the equipment shall adhere to the requirements as noted in the Tender Drawings and associated specifications.

.2 3.1(c) – maintenance for the system is being handled by the Owner through a separate contracted entity. The Contractor is required to provide warranty services as specified for the specific system.

.3 3.1(h) – Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.4 14.0 – Lightning Protection: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

.2 ES/SOW-0102 Revision 6, May 1, 2008:

.1 Wiring / Cabling Methods 3.1.1: The use of rigid steel conduit is not required.

.2 Splicing of existing power cabling due to breaker panel replacement is acceptable.

.3 Enclosures 3.3.2: Enclosures within the facility are not required to be IP64 rated.

.4 Lightning Protection 4.8: Any required lightning protection on the cables entering / leaving the facility shall be as per the tender drawings.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 26 05 01 – Common Work Results

.3 ES/SOW-0101 Revision 3, April 15, 2004

.4 ES/SOW-0102 Revision 6, May 1, 2008

.2 Shop drawings for each fixture shall include but not be limited to, lamps, ballasts, fixture cuts, custom colors, and special mounting details. All pertinent information for each fixture shall be stapled separately from other fixtures.

1.5 PRODUCT APPROVALS

.1 Manufacturers' and model numbers named in these specifications indicate an acceptable technical standard of performance and are not intended to be exclusive. Products submitted as alternates must result in a control system that meets or exceeds all technical performance criteria as described.

.2 Products proposed as alternatives to those specified, shall only be considered if submitted for approval no later than 15 working days before tender close. Submit alternates, for approval, as one complete listing. Provide complete product specification sheets with request for approval.

.3 The Bidder must provide a complete list of primary system products offered with their bid.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.

.2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

Part 2 Products

2.1 STANDARD UNITS

.1 Exit signs: to CSA C22.2 No.141 and CSA C860, packaged in accordance with the Canadian Code for Preferred Packaging guidelines.

.2 Exit sign fixtures shall be LED (Lighting Emitting Diodes), solid state design with high output LED's for a maximum 2 watts per sign, 120 volt.

.3 Aluminum housing in white finish

.4 Acrylic barrier

.5 Three green "Running Man" pictograms for direction selection (straight, left and right)

.6 Universal mounting

.7 Minimum five year warranty.

.8 Exit signs shall be one of the following manufacturers:

Ready-Lite 'RA' Series, Beghelli 'Quadra' #RM series, Emergi-Lite #EA series,

2.2 Fixture Type 'X1'

Exit sign, ceiling mounted, single face, direction indicators as shown on drawings. In addition to those fixtures shown and noted on the drawings, supply and install two (2) additional light fixtures complete with 10 meters of 2 #12 conductors plus insulated ground and 10 meters of

12mm conduit. These fixtures shall be installed as directed on site. Fixtures from this list that have not been installed during construction shall be turned over to the owner.

2.3 Fixture Type 'X2'

Exit sign, ceiling mounted, double face, direction indicators as shown on drawings.

2.4 Fixture Type 'X3'

Exit sign, surface wall mounted, single face, bottom of fixture mounted 100mm above door, direction indicators as shown on drawings.

2.5 ADDITIONAL MATERIALS

.1 In addition to the materials specified and the quantity of materials as determined on the plans, supply and install the following additional exit sign fixtures:

Fixture type 'X2': 2 x additional exit fixtures
Fixture type 'X3': 2 x additional exit fixtures

.2 For each additional exit sign fixture noted, include supply and installation conduit/wire for connection of the additional exit fixtures:

.1 120V : 10 meters of 2 # 12 RW90 plus insulated ground wire in 10 meters of 16mm conduit per fixture

.2 DC Input: 10 meters of 2 # 10 RW90 in 10 meters of 16mm conduit per fixture

.3 Location of the additional exit sign fixtures to be confirmed on site with the Consultant.

Part 3 Execution

3.1 INSTALLATION

.1 The contractor under this Division shall be responsible for expediting the delivery and installation of the exit fixtures to suit the construction schedule and work of other trades.

.2 Install exit signs so as to be visible from the exit approach.

.3 Exit signs shall be wired in a separate conduit system.

.4 Interconnect exit fixtures to the emergency lighting battery unit emergency circuit.

.5 Ensure the exit sign circuit breaker is locked in the 'ON' position.

3.2 WARRANTY

.1 The contractor must make available to the Owner a local service department of a duly authorized distributor of the equipment manufacturer, which shall stock the manufacturer's standard parts. The service department shall have at least one factory trained repair technician available to the Owner on 24 hours' notice.

.2 Provide warranty of installation of equipment installed by this contractor to be free of defects for a period of (1) one year from date of Substantial Completion.

.3 Provide during the warranty period, all service, maintenance, parts, etc., required for normal operation of the systems, such that Owner needs not purchase additional maintenance agreement or contracts. Upon request, the manufacturer and his agent shall provide direct to the Owner the following proposals:

.1 Continuation, after the warranty period, of full maintenance, including all service, labour, parts, etc. required to maintain the systems in a fully operational condition.

3.3 VERIFICATION

.1 Perform tests in accordance with:

.1 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0101 Revision 3, April 15, 2004: Statement of Work for Electronic Systems for Correctional Service Canada Institutions.

.2 Correctional Service Canada (CSC) – Technical Services Branch – ES/SOW-0102 Revision 6, May 1, 2008: Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions.

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.2 The entire installation shall be performed under the supervision of the manufacturer. Upon completion of the installation, the manufacturer shall check and test the entire system. Certification of all tests shall be submitted in writing to the Consultant and shall certify the following:

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.3 During the certification tests, the contractor shall provide one (1) electrician and (1) helper to assist the manufacturer’s representative. The contractor shall also provide any required equipment such as ladders, scaffolding, etc.

3.4 TRAINING

.1 Perform training in accordance with:

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.2 Written documentation bearing name and signature of Owner's personnel who received the above instructions shall be included in the operating instructions and service manuals.

END OF SECTION