Part 1 General

1.1 SECTION INCLUDES

.1 General and administrative requirements related to electrical service and equipment.

.2 Electrical component space requirements, including:

- .1 Electrical equipment,
- .2 Communication equipment.

.3 Electrical system testing requirements.

.4 Electrical service - operational and maintenance manual requirements.

.5 Electrical service - demonstration and training requirements.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 26 05 01 – Electrical Demolition.

1.3 REFERENCES

.1 American Society of Mechanical Engineers (ASME)

- .1 ANSI/ASME A13.1-2007, Scheme For The Identification Of Piping Systems.

.2 Canadian Standards Association (CSA International)

- .1 CAN/CSA-B651-2012, Accessible Design for the Built Environment.
- .2 CSA C22.1-12, Canadian Electrical Code Part I (22nd Edition), Safety Standard for Electrical Installations and CE Code Handbook.
- .3 CSA C22.2 No.0-10 General Requirements - Canadian Electrical Code Part II.
- .4 CAN/CSA-C22.3 No.3-98 (R2007), Electrical Co-ordination.
- .5 CAN3 C235-83 (R2006), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.3 Underwriters' Laboratories of Canada (ULC).

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

.1 Design equipment, components, and assemblies to operate satisfactorily at 60 Hz, within normal operating limits established within CAN3 C235.

.2 Provide equipment designed to operate in normal interior operating limits specified in CAN3 C235, without damage to equipment or failure of service.

.3 Barrier-Free Access: Design equipment and components in accordance with CAN/CSA-B651.

1.5 SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit requested documentation to Departmental Representative.

.3 Submit WHMIS MSDS - Material Safety Data Sheets acceptable to Labour Canada and Health Canada for applicable electrical equipment and material. Indicate applicable VOC content.

1.6 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 Submittal Procedures.

.2 Indicate project layout, including wiring schematic diagrams. Indicate dimensions, capacities, weights and performance characteristics.

.3 Indicate product and material data detailing of electrical and electronic equipment.

1.7 SAMPLES

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit samples of equipment and components.

.3 After review and acceptance, samples will be returned for incorporation into work.

1.8 TEST REPORTS

.1 Submit certified test reports and certificates to Departmental Representative from approved independent testing laboratories.

.1 Indicate compliance with specifications for specified performance characteristics and physical properties.

.2 Manufacturer's Field Services. Submit copies of manufacturer's field inspection reports.

1.9 CERTIFICATES

.1 Submit inspection reports and certificates of acceptance from authorities having jurisdiction to Departmental Representative at Substantial Completion.

.2 Obtain and pay for necessary permits, licenses, inspections and fees required.

.3 Certificates: Submit certificates signed by product or component manufacturers, certifying that products comply with specified performance characteristics and physical properties.

1.10 CLOSEOUT SUBMITTALS

.1 Submit operation and maintenance data for incorporation into manual.

.2 Include accurate up to date as-built drawings.

.3 Submit one paper set of as–built drawings and specifications.

.4 Manufacturer's Installation Instructions: Submit instructions for installation and operation of products, components, and assemblies.

.5 Submit operation and maintenance manuals for electrical and electronic equipment. Including details of design elements, component function and maintenance requirements to effectively operate, maintain or repair.

.6 Include technical data, product data, component illustrations, technical descriptions and parts list, wiring and schematic diagrams not considered proprietary, test and verification reports.

1.11 WARRANTY

.1 Warranty Duration: 24 calendar months following Substantial Completion.

.2 Coverage: Warrant against failure to perform to characteristics as specified.

.3 Manufacturer's Warranty: Submit a notarized manufacturer's warranty, for Departmental Representative's acceptance.

1.12 MATERIALS AND EQUIPMENT

.1 Equipment:

.1 CSA approved and ULC certified where applicable.

.2 Where CSA or ULC designation is not available, obtain approval from local authority having jurisdiction.

.2 Ensure labels are visible and legible after equipment is installed.

.3 Factory assemble control panels and component assemblies.

1.13 ACCESSORIES

.1 Lugs, terminals and screws, used for termination of wiring to be suitable for conductor materials used.

.2 Supports. Provide anchors and supports for electrical equipment and components. Provide independent supports including fasteners, devices and hangers capable of supporting the dead load of the equipment and components plus 100 kg. Fibre, wood or plastic inserts are not acceptable.

1.14 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 for fire alarm and communication cables, matched throughout.

1.15 CONDUIT AND CABLE IDENTIFICATION

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

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

.4 Provide identification of equipment, components, and assemblies specified, using materials suitable to withstand the anticipated operating environment.

1.16 FIELD QUALITY CONTROL

.1 Confirm other related Work is complete to receive Work of this and related electrical sections.

.2 Commission electrical systems.

.3 Electrical work to be carried out by qualified, licensed electricians or apprentices as per conditions of Provincial Act respecting manpower vocational training and qualifications. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks - the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.

.4 The work of this Division to be carried out by a contractor who holds a valid Master Electrical contractor licensed as issued by the Province that the work is being constructed.

1.17 INSTALLATION

.1 Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions, MSDS, and product data sheets.

.2 Protect electrical equipment from dust and dirt. Plug or cap openings in conduit, fixtures and equipment during construction with Departmental Representative approved materials.

.3 Conceal conduit in finished areas, unless otherwise authorized. Run exposed conduit neatly parallel to building lines, and maintain maximum headroom.

.4 Install lighting fixtures, outlets, plates and other visible items parallel to building lines. Line up exposed raceways, parallel and at right angles to building walls, partitions, and ceilings.

.5 Set equipment and components plumb and level, accurate to position intended, and position hanger rods plumb.

1.18 LOCATION OF OUTLETS

.1 Do not install outlets back to back in same wall or partition.

.1 Provide minimum 150 mm horizontal separation between boxes.
.2 Relocate outlets at no change in Contract cost.
.3 Locate light switches on latch side of doors.
.4 Locate disconnect devices on latch side of door.

.2 Equipment mounting height, from finished floor to centerline of equipment item:

.1 Local Switches: 1100 mm.
.2 Wall Receptacles, General: 300 mm.
.3 General Telephone, Interphone and Cable TV Outlets: 300 mm.
.4 Wall Mounted Telephone and Interphone: 1100 mm.
.5 Fire Alarm Stations: 1100 mm.
.6 Wall Mounted Fire Alarm Bells, Horns, Wall Mounted Speakers and Clocks: 2100 mm.
.7 Emergency Lighting Battery Units: 2400 mm.
.8 Time Switches: 1100 mm.

.3 Attach electrical equipment, components and devices directly to structure and structural supporting elements.

1.19 MANUFACTURER'S SERVICES

.1 Engage manufacturer's representative to review Work, installation or application of Products, protection required, and final cleaning of their Products.

.1 Submit written reports to Departmental Representative to verify compliance with project requirements.

.2 Provide manufacturer's field services consisting of Product use recommendations and periodic site visits for inspection of Product installation in accordance with manufacturer's instructions.

.3 Schedule manufacturer site visits to review Work, at the following stages as a minimum:

.1 Upon completion of the Work, after cleaning is complete.

.4 Obtain manufacturer's review reports within 3 working days of review, and submit to Departmental Representative.

1.20 VERIFICATION

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

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

.3 At completion of measurements, submit report listing phase and neutral currents on panelboards, dry-type transformers and motor control centres, operating under normal load. Include hour and date on which load was measured, and voltage at time of test.

1.21 FIELD TESTS

.1 Provide advance notice to Departmental Representative of proposed testing schedule.

.2 Perform tests at time of acceptance of Work.

.3 Conduct and pay for field tests:

.1 Power distribution, including phase voltage, grounding and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Lighting and lighting control.

.4 Motors, heaters and associated control equipment, including sequenced operation.

.5 Fire alarm and communications (and their interface) systems.

.4 Perform tests in presence of Departmental Representative.

.1 Provide instruments, meters, equipment and personnel required to conduct all required tests.

.2 Test systems to verify operation as specified.

.5 Conduct di-electric tests, hi-pot tests, insulation resistance tests and ground continuity tests as required by nature of various systems and equipment.

.6 Perform the following tests on completed power systems:

.1 Control and Switching: Test circuits for correct operation of devices, switches and controls.

.2 Polarity Tests: Test circuits for correct operation of devices, switches and controls.

.3 Voltage Tests: Test voltage at last outlet of each circuit; maximum potential drop 2% on 120 V, and 208 V branch circuits, 2% on 208 V feeder circuits, and 5% on 600 V feeder circuits. Correct deficiencies.

.4 Coordinate and carry out motor testing at same time as driven equipment is being tested. In addition to motor loading tests, provide labour and instruments to read and record motor load readings required to supplement tests on driven equipment through various load sequences, as required by driven equipment tests.

.7 General Operations: Energize and operate electrical circuit and item. Repair, alter, replace, test and adjust as necessary for a complete and satisfactory operating electrical system.

.8 Test systems and obtain written confirmation from manufacturers that components have been installed correctly and system functioning as intended. Submit certification for fire alarm, power distribution, communications systems, and to Departmental Representative.

.9 Provide labour, instruments, apparatus and pay expenses required for testing. Departmental Representative reserves the right to demand proof of accuracy of instruments used.

.10 Immediately prior to occupancy, test entire electrical system by performing a loss and return of utility power test. Demonstrate operation of:

.1 High and low voltage service equipment and metering.

.2 Exit and emergency lighting.

.3 Fire and intrusion alarm operation during power outage, including remote monitoring system.

.4 EMCS system shut down and auto restart, including restabilization of systems after power return. Attach report printouts as evidence of expected operation on systems.

.5 User equipment shut-down and auto-restart.

1.22 TEST RESULTS

.1 Submit test results to Departmental Representative for review.

.2 Testing Methods and Test Results: To CSA, CEC and authorities having jurisdiction.

.3 Remove and replace conductors found to be damaged, with new materials.

.4 Provide required labour and tools, if during testing Departmental Representative requests equipment be opened and removed from their housings to examine the equipment, terminations and connections.

1.23 TRAINING

.1 Train operating personnel in the operation, care and maintenance of electrical equipment.

.2 Arrange and pay for manufacturer's factory service engineer to provide training. Ensure operating personnel are conversant with its care and operation.

.3 Obtain and submit written confirmation from operating personnel that satisfactory training has been received.

.4 Provide training session for the following systems.

.1 Door Operators.

1.24 CLEANING

.1 Perform final cleaning of electrical equipment, systems and components.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION