PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 This Section includes requirements common to various sections of Division 26, and in addition to general requirements of Division 01.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA C22.1-12, Canadian Electrical Code, Part 1 (latest edition in force at work), Safety Standard for Electrical Installations.

.2 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 Manufacturers Association of Electrical and Electronic Equipment of Canada (EEMAC).

.1 EEMAC 2Y-1, Light Gray Colour for Indoor Switch Gear.

.3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC).

.1 IEEE SP1122, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.3 DEFINITIONS

.1 Electrical and electronic terms: Unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.4 DESIGN REQUIREMENTS

.1 Operating Voltages: To CAN3-C235.

.2 Motors, electric heating, control, and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language Operating Requirements: Provide identification nameplates and labels for control items in English.

1.5 SUBMITTALS

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

.2 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Alberta, Canada.

.2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.

.3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.5 Submit ten copies of drawings of at least 216 mm x 280 mm, and sheets, to the competent authority inspection.

.6 If changes are required, notify Departmental Representative of these changes before they are made.

.3 Quality Control:

.1 Provide CSA certified equipment and material.

.2 Submit test results of installed electrical systems and instrumentation.

.3 Permits and fees: in accordance with General Conditions of Contract.

.4 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.

.5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

.4 Reports of spot checks by the manufacturer: Departmental Representative to submit, not later than three days after execution of inspections and tests the installation and electric instruments prescribed in Article FIELD QUALITY CONTROL PART 3, a written report of the manufacturer showing that Work complies with specified criteria.

1.6 QUALITY ASSURANCE

.1 Quality Assurance: In accordance with Section 01 45 00 - Quality Control.

.2 Qualifications: Electrical work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial Act respecting manpower vocational training and qualification.

.1 Employees registered in provincial apprentices program: Permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.

.2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

.3 Site visits with the Departmental Representative shall be provided. The cost of these visits is an integral part of the Contract.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Material Delivery Schedule: Provide Departmental Representative with schedule within two weeks after award of Contract.

1.8 SYSTEM START-UP

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

.2 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.

.3 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 will aspects of its care and operation.

1.9 OPERATING INSTRUCTIONS

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

.2 Start-up, proper adjustment, operating, lubrication, and shutdown procedures.

.3 Safety precautions.

.4 Procedures to be followed in event of equipment failure.

.5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.4 Post instructions where directed.

.5 The operating instructions should be exposed to the weather-resistant material or shall be placed in a weatherproof enclosure.

.6 Ensure that the operating instructions will not fade when exposed to sunlight.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

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

.2 Control panels and components shall be assembled in the factory. Material and equipment to be CSA certified.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Control wiring and conduit there for must be provided under Division 26, except ducts, wiring, and connections operating at a voltage below 50 V, and related control systems prescribed by the supplier mechanical equipment and included in his drawings.

2.3 WARNING SIGNS

.1 Warning Signs: Complying with the requirements of the Departmental Representative.

2.4 WIRING TERMINATIONS

.1 Ensure lugs, terminals, and screws used for termination of wiring are suitable for copper conductors.

.2 All wiring terminals must be the correct size for compression.

2.5 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates: Lamicoid 3 mm thick plastic engraving sheet, lettering accurately aligned and engraved into core, faced white and black soul mechanically attached with self tapping screws. For devices connected to the emergency, the plates must have a red face and a white soul.

.2 Sizes as follows:

NAMEPLATE SIZES

Size	Dimensions	Number of Lines	Letters (height)
Size 1	10 x 50 mm	1 line	3 mm high
Size 2	12 x 70 mm	1 line	5 mm high
Size 3	12 x 70 mm	2 lines	3 mm high
Size 4	20 x 90 mm	1 line	8 mm high
Size 5	20 x 90 mm	2 lines	5 mm high
Size 6	25 x 100 mm	1 line	12 mm high
Size 7	25 x 100 mm	2 lines	6 mm high

.2 Labels: Embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate.

.5 Nameplates for terminal cabinets, pull boxes, and junction boxes to indicate system and/or voltage characteristics.

.6 Disconnects, Starters and Contactors: Indicate equipment being controlled, the number of the disconnect, starter or contactor, and number of the feeding panels with their respective circuits.

.7 Transformers: Indicate capacity, primary, and secondary voltages.

.8 Identify the receptacles and lighting switches with plastic pressure sensitive label (Brother P-Touch), indicating the number of the feeding panels with their respective circuits. The labels must be white with black letters.

.9 Do the identification of each circuit in the modified panels and new panels in new dactylographic tables. Panel dactylographic tables to be approved by Departmental Representative prior to manufacture and/or installation.

.10 Equipment identification is to match the existing identification, if applicable.

2.6 WIRING IDENTIFICATION

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

.2 Maintain phase sequence and colour coding throughout.

.3 Colour Coding: To CSA C22.1.

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

2.7 CONDUIT AND CABLE IDENTIFICATION

.1 Assign a color code to the ductwork and metal sheathed cables.

.1 Each and every wire leads must wear a band-reference (> = 20 mm wide) color as shown in the table below, except for conduits "Alarms" that are wholly "RED" and "Communication" fully "BLUE" with the movie references required.

.1 Departure and arrival of the duct.

.1 Indicate also the origin (panel, circuit, etc.).

.2 All 15 m.

.3 At each change of direction.

.4 Each input/output, wall, or floor box.

.1 When passing through walls and floors, also include the source (panel, circuit, etc.).

.2 Assign a color code to the boxes:

.1 Paint all sides of the junction boxes by color code, described below, but not the cover. Using a large permanent marker, identified on the cover of the junction box or pull the source (the panel) and number(s) of any circuit wiring through junction boxes and draw, when in a space only or unfinished in a between ceiling.

.2 Indicate also the use of wiring (See table below).

USE OF WIRING IN DUCT	PRIMARY COLOR	SUPPLEMENTARY COLOR
Grounding (Ground)	GREEN	"—"
Electricity - Normal/0 - 250 V	YELLOW	"—"
Electricity - Normal/251 - 600 V	YELLOW	GREEN
Telephone	GREEN	" —"
Emergency Communication	RED	BLUE
Fire Alarm	RED	"—"
Other Security Systems	RED	YELLOW
Other Communication Networks	GREEN	BLUE

2.8 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 switchgear and distribution enclosures light gray to EEMAC 2Y-1.

.2 Clean and touch up the painted surfaces in the workshop have been scratched or damaged during shipment and installation, use a paint harmony to the original painting.

.3 Clean and prime the hooks, brackets, fasteners, and other fasteners apparent, not galvanized to protect against rust.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Do complete installation in accordance with Canadian Electrical Code, CSA C22.10, Part 1 (Effective edition).

3.2 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.3 CONDUIT AND CABLE INSTALLATION

.1 Install conduits and sleeves before the pouring of concrete.

.1 Thimble concrete structures: Steel pipe, schedule 40, in diameter allowing free passage of the conduit and above the concrete surface of 53 mm per side.

.2 When using plastic sleeves for penetrations of walls or floors with a degree of fire resistance, remove them before installing the pipes.

.3 Install cables, pipes and fittings to be embedded or plastered, placing them neatly against the building structure so as to minimize the thickness of fur.

3.4 DRILLING AND CUT

.1 All openings, each opening or cutouts all required wiring and electrical equipment shall be performed by:

.1 The Contractor when they must be made on any finish material or any material appearance of the building. The Electrical Contractor should indicate the location of any opening.

.2 The Electrical Contractor in all other cases.

.2 Any drilling or cutting in any structural member must be under the control of the Structural Engineer must give approval.

.3 Perform any drilling into the concrete using a rotary drill.

.4 When Work is performed in an existing building, take appropriate means to detect the presence of ducts in the slabs. Any damage to existing pipes must be repaired by the Contractor at his expense in accordance with existing finishes.

.5 It must also maintain the fire integrity of the floors, ceilings, and walls, filling the entire wool insulation between the hole in the concrete and pipe, and seal with caulk firewall (HILTI FS-ONE or 3M), the two sides of floors, ceilings, and walls.

3.5 LOAD BALANCING

.1 Measure the current phase distribution panels under normal loads (lights) at the time of final acceptance. Divide the branch circuit connections so as to obtain the best balance of power between the various phases and record changes to the original connections.

.2 Measure phase voltages to the elements and adjust the charges made transformers for voltage is obtained within 2% of the rated voltage of the devices.

.3 On completion, deliver the report to load balancing required under Article DOCUMENTS/SUBMITTALS PART 1. This report should indicate the current system under normal load readings on the phases and neutral distribution panels, transformers and dry motor control centers. Specify the time and date that each drop was measured and the voltage of the circuit at the time of the audit.

3.6 UNIFORMITY

.1 The Contractor shall comply with a perfect homogeneity between the different systems for each specialty.

.2 The Departmental Representative may at any time before the installation, if deemed necessary, to move within 3 m of ancillary devices such as fans, light fixtures, switches, sockets, fuses circuits, transformers, lighting, and without any additional charges if the Notice was given prior to installation. It is incumbent upon the Contractor to coordinate with other trades and contractors, and obtain the necessary approvals from Departmental Representative.

.3 No lighting fixture shall not be placed above the pipes, ducts, or other obstructions.

.4 The pull boxes and junction boxes must be selected according to the requirements of CSA C22.10-07, taking into account the number, and the conductor and conduit in question.

.5 The pull boxes and junction boxes must be located in protected areas and easily accessible. They must remain accessible after installation finishes and appliances.

.6 The Contractor shall note that his plans are provided as a guide and are sometimes reduced to scale and may not have ratings. It must use common sense and ensure that these systems accessories fit well with the structure and architecture of the building.

3.7 COORDINATION OF PROTECTIVE DEVICES

.1 Ensure that the circuit protection devices such as trigger overcurrent relays and fuses are installed, they are of the caliber you want and they are set to required values.

3.8 FIELD QUALITY CONTROL

.1 Before closing the wall, the Contractor shall notify, verbally, and in writing, the Departmental Representative. The Departmental Representative, if desired, will inspect the installations.

.2 The Contractor shall ensure the presence of skilled personnel and availability of measuring devices and testing to perform the tests requested by the Departmental Representative to his satisfaction. In addition, any test requested by the Departmental Representative shall be executed at no additional charge. The Departmental Representative shall be notified verbally and in writing two weeks in advance of the proposed tests and may, if desired, inspect the facility and attend trials.

.3 All tests should take place with the permission of the Departmental Representative and other contractors involved. Any imperfection or defects discovered during testing must be corrected to the satisfaction of the Departmental Representative.

.4 Provide measuring devices, equipment and personnel needed to carry out testing during the installation and completion.

.5 Perform the following tests in accordance with Section 01 45 00 - Quality Control:

.1 Electricity distribution network, including the phase control, voltage, grounding, and load balancing.

.2 Circuits from panels.

.3 Lighting system and controls/regulation.

.4 Motors, heaters and controls/regulation related, including operating controls sequential systems as appropriate.

.5 Fire alarm system and communication network. Obtain a certificate of operation issued by a recognized authority.

.6 Measurement of insulation resistance.

.1 Measure, using a 500 V megger, the value of isolation circuits, cables and distribution equipment with a rated voltage not exceeding 350 V.

.2 Measure, using a megger 1,000 V, the value of isolation circuits, arteries and appliances with a rated voltage between 350 V and 600 V.

.3 Verify the value of earth resistance before powering up.

.7 Check continuity of the grounding.

.6 Perform tests in presence of Departmental Representative.

.7 Provide equipment, gauges, and personnel required for carrying out the tests during the construction work and the completion thereof.

.8 Spot checks by the manufacturer.

.1 Obtain a written report from the manufacturer confirming that the work conforms to the criteria specified in regard to handling, implementation, application products and the protection and cleaning of the book then submit this report pursuant to Article DOCUMENTS/ITEMS TO SUBMIT PART 1.

.2 The manufacturer shall make recommendations regarding the use of the product, and make periodic visits to check if the implementation was carried out according to its recommendations.

.3 Provide site visits in accordance with section QUALITY ASSURANCE PART 1.

.9 Submit test results to the Departmental Representative.

3.9 CLEANING

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

.2 Clean and prime exposed non-galvanized hangers, racks, and fastenings to prevent rust.

.3 Clean the inside and top of the distribution panels, motor starters, and any other electrical enclosures.

END OF SECTION