
**Dr. Charles L. LeGrow Health Centre
Electrical Upgrade
Newfoundland and Labrador**

Issued for Tender Section 26 05 00 – Common Works Requirements - Electrical

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PART 1 **General**

1.1 **GENERAL**

- .1 This Section covers items common to Sections of Division 26. This section supplements requirements of Division 1 and Division 23.

1.2 **ELECTRICAL PERFORMANCE SPECIFICATIONS**

- .1 The Electrical specification enclosed (Division 26-Electrical), in combination with the contract drawings generates a performance specification that must be achieved by the named approved manufacturers. It is the responsibility of each Contractor and/or Subcontractor to ensure in advance of tender closing that the products they select and carry in their tender price includes for products that;
 - .1 Are by the named approved manufacturers outlined in the specification.
 - .2 Meet or exceed the requirements stipulated in the electrical performance specifications.
 - .3 No change in contract price will be provided to the Subcontractor post tender close should it be determined that a product submitted by a named manufacture not meet the electrical performance specifications.
 - .4 No change in contract price will be provided post tender close for modifications resulting from the IFC design documents to accommodate differences required to use the alternate equipment, such as adaptors, re-routing of services, etc.

1.3 **REFERENCES**

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.
 - .2 CAN/CSA-22.3 No. 1, Overhead Systems.
 - .3 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

1.4 **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.
- .2 Reference to codes and standards pertain to the latest edition in force at time of tender.

1.5 **DESIGN REQUIREMENTS**

- .1 Operating voltages: to CAN3-C235

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- .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 SUBMITTALS

- .1 Submittals: 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 Newfoundland and Labrador, Canada., as required.
 - .2 Submit drawings stamped and signed by contractor.
 - .3 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 coordinated installation.
 - .4 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
 - .5 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
- .3 Quality Control: in accordance with Section 01 45 00 - Quality Control.
 - .1 Provide CSA certified equipment and material. Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for approval before delivery to site.
 - .2 Submit test results of installed electrical systems and instrumentation.
 - .3 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Department's Representative.
- .4 Manufacturer's Field Reports: submit to Department's Representative within 7 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.7 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 or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial Act respecting manpower vocational training and qualification.
- .3 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.

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

.5 Site Meetings:

.1 Site Meetings: as part of Manufacturer's Field Services described in Part 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.

.2 Once during progress of Work prior to installation of wall and ceiling finishes.

.3 Upon completion of Work, after cleaning is carried out.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Department's Representative with a schedule within 2 weeks after award of Contract.

.2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.9 PERMITS, FEES AND INSPECTION

.1 Submit to Electrical Inspection Division and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Pay associated fees.

.3 Department's Representative will provide drawings and specifications required by Electrical Inspection Division and Supply Authority at no cost.

.4 Notify Department's Representative of changes required by Electrical Inspection Division prior to making changes.

.5 Furnish Certificates of Acceptance from Electrical Inspection Division or authorities having jurisdiction on completion of work to Department's Representative.

1.10 CO-ORDINATION

.1 Co-ordinate work with work of other divisions to avoid conflict.

.2 Locate distribution systems, equipment, and materials to provide minimum interference and maximum usable space.

.3 Where interference occurs, Department's Representative must approve relocation of equipment and materials regardless of installation order.

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- .4 Notwithstanding the review of shop drawings, this division may be required to relocate electrical equipment which interferes with the equipment of other trades, due to lack of co-ordination by this Division. The cost of this relocation shall be the responsibility of this Division. The Department's Representative shall decide the extent of relocation required.

1.11 CUTTING AND PATCHING

- .1 Inform all other divisions in time, concerning required openings. Where this requirement is not met, bear the cost of all cutting. Openings of 200 mm or smaller shall be the responsibility of Division 26. Openings larger than 200 mm shall be the responsibility of Division 1. Obtain written approval of Structural engineer before drilling any beams or floors.

1.12 PROTECTION

- .1 Protect exposed live equipment during construction for personnel safety.
- .2 Shield and mark all live parts "LIVE 120 VOLTS", or with appropriate voltage in English.

1.13 CARE, OPERATION AND START-UP

- .1 Instruct Department's Representative and operating personnel in the operation, care and maintenance of systems, system equipment and components.
- .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 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.

1.14 FIRE RATING OF PENETRATIONS

- .1 Maintain fire ratings around conduits passing through floors, ceilings and fire rated walls.

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- .2 Use 3M brand or equal fire barrier products at each penetration.
- .3 Acceptable products for fire barrier products shall be 3M #CP25 fire barrier caulk, #303 putty, #FS 195 wrap and #CS195 sheet.
- .4 Acceptable manufacturers: Nelson, Fire Stop Systems, 3M or approved equal. Material of same manufacturer to be used throughout project..

1.15 RECORD DRAWINGS

- .1 Obtain and pay for three sets of white prints. As the job progresses, mark these prints to accurately indicate installed work. Have the white prints available for inspection at the site at all times and present for scrutiny at each job meeting.
- .2 Indicate exact location of all services for future work. Show and dimension all work embedded in the structure.
- .3 Submit record drawings within 30 days prior to start of commissioning.

1.16 INSPECTION OF WORK

- .1 The Department's Representative will make periodic visits to the site during construction to ascertain reasonable conformity to plans and specifications but will not execute quality control. The Contractor shall be responsible for the execution of his work in conformity with the construction documents and with the requirements of the inspection authority.

1.17 SCHEDULING OF WORK

- .1 Work shall be scheduled in phases as per other divisions of the architectural specifications.
- .2 Become familiar with the phasing requirements for the work and comply with these conditions.
- .3 No additional monies will be paid for contractor's requirement to comply with work phasing conditions.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

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

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- .2 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Division.
- .3 Factory assemble control panels and component assemblies.

2.2 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, where applicable.
- .2 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in Division 25 and shown on mechanical drawings. Division 25 – EMCS Controls Contractor is responsible for all conduit, wiring and connections below 50V which are related to control systems in Division 25 and shall comply with the requirements of Division 26 for standard of quality.

2.3 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 outdoor electrical equipment "equipment green" finish to EEMAC Y1-1.
 - .2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1.

2.4 WARNING SIGNS

- .1 As specified and to meet requirements of Electrical Inspection Department and Department's Representative.
- .2 Porcelain enamel decal signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

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

2.6 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
 - .1 Nameplates: Lamicoid 3 mm thick plastic engraving sheet, black white face, black white core, mechanically attached with self tapping screws.
 - .2 Sizes as follows:

NAMEPLATE SIZES

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NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

.2 Labels:

.1 Embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates and labels to be approved by Department's Representative prior to manufacture.

.4 Allow for average of twenty-five (25) letters per nameplate and label.

.5 Identification to be English (and French where applicable).

.6 Nameplates for terminal cabinets and junction boxes to indicate system name and voltage characteristics.

.7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.8 Terminal cabinets and pull boxes: indicate system name and voltage.

2.7 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, Canadian Electrical Code.

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

2.8 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.

Conduit System

up to 250 V

Prime Color

Yellow

Auxiliary Color

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<u>Conduit System</u>	<u>Prime Color</u>	<u>Auxiliary Color</u>
up to 600 V	Yellow	Green
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

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 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .2 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

3.4 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 at following heights unless indicated otherwise.
 - .1 Control Panel: as required by Code or as indicated.

3.5 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.6 FIELD QUALITY CONTROL

- .1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be

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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.

- .2 The work of this division to be carried out by a contractor who holds a valid Code 1 Electrical Contractor License as issued by the Province.
- .3 Perform tests in Accordance with this section as noted and Section 01 91 13 – Commissioning (Cx) Requirements.
- .4 Furnish manufacturer’s certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer’s instructions.
- .5 Insulation resistance testing.
 - .1 Megger and record circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger and record 350 – 600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing and record value.
- .6 Carry out tests in presence of Department’s Representative.
- .7 Provide instruments, meters, equipment and personnel required to conduct tests during and conclusion of project.
- .8 Submit test results for Department’s Representative’s review and include in Commissioning Manuals specified in Section 01 91 13 – Commissioning (Cx) Requirements.

3.7 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 rusting.
- .3 Electrical and telecommunication rooms to be clean vacuumed and painted.
- .4 All electrical equipment to be cleaned vacuumed and free of dust and construction debris.

END OF SECTION

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PART 1 **GENERAL (NOT APPLICABLE)**

1.1 **WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material, in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Engineer.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

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 as required.

PART 3 **EXECUTION**

3.1 **INSTALLATION**

- .1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors or nylon shields.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .5 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.
- .6 Fasten exposed conduit or cables to building construction or support system using straps.

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- .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.
- .4 Strap AC-90 cable at box location plus every 900 mm.

- .7 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.
- .8 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing, wood blocking, plastic strap or perforated strap to support or secure raceways or cables.
- .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Department's Representative.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

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PART 1 **GENERAL**

1.1 **REFERENCES**

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware, a National Standard of Canada.
 - .2 CSA C22.2 No. 45, Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83, Electrical Metallic Tubing.

1.2 **WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 **PRODUCTS**

2.1 **CONDUITS**

- .1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel threaded.
- .2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .3 Flexible metal conduit: to CSA C22.2 No. 56, aluminum liquid-tight flexible metal.

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 specified. Coating: same as conduit.

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- .2 Factory "ells" where 90°, 45 ° or 22.5 ° bends are required for 25 mm and larger conduits.
- .3 Ensure conduit bends other than factory “ells” are made with an approved bender. Making offsets and other bends by cutting and rejoining 90 degree bends are not permitted.
- .4 Connectors and couplings for EMT. Steel set-screw type, size as required.

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 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install all conduit, conduit fittings and accessories in accordance with the latest edition of the Canadian Electrical Code in a manner that does not alter, change or violate any part of the installed system components or the CSA/UL certification of these components.
- .2 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .3 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.
- .4 Surface mount conduits except in finished areas or as indicated.
- .5 Use rigid hot dipped galvanized steel threaded conduit for exposed work below 2.4 m above finished floor.

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- .6 Use electrical metallic tubing (EMT) except in cast concrete and above 2.4 m not subject to mechanical injury, as well as concealed work in masonry construction.
- .7 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .8 Mechanically bend steel conduit over 19 mm dia.
- .9 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .10 Install fish cord in empty conduits.
- .11 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .12 Dry conduits out before installing wire.

3.3 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 suspended 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

3.4 CLEANING

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 On Completion and verification of performance of installation, remove surplus materials, excess materials rubbish, tools and equipment.

END OF SECTION

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Section 26 28 16.01 – Air Circuit Breakers

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PART 1 GENERAL

1.1 GENERAL

- .1 This specification serves to define requirements for a replacement of low voltage air circuit breaker of equal or higher continuous current rating and interrupting capability. Replace the existing air circuit breaker with new air circuit breakers which shall be fully compatible with the existing switchgear cubicles, with identical primary and secondary connections. Circuit breakers (quantity of 4) shall be draw-out type and one (1) fixed type using modular element with electronic trip units.

- .2 CSA recertification of the existing switchgear if modifications are required to the existing switchgear to accommodate the new circuit breakers.

1.2 SECTION INCLUDES

- .1 Materials and installation for air circuit breakers.

1.3 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 91 13 - General Commissioning (Cx) Requirements.
- .3 Section 26 05 00 - Common Work Requirements - Electrical

1.4 REFERENCES

- .1 American National Standards Institute (ANSI) / Institute of Electrical and Electronics Engineers (IEEE)
 - .1 ANSI/IEEE C37.13, Low Voltage AC Power Circuit Breakers Used in Enclosures.
 - .2 ANSI/IEEE C37.59 – Conversion of Power Switchgear Equipment
 - .3 IEEE C37.16 - Preferred Rating, Related Requirement and Application Recommendations for Low Voltage AC (635V and below) and DC (3200V and below) Power Circuit Breakers.
 - .4 ANSI C37.50 - Low Voltage AC Power Circuit Breakers used in Enclosures – Test Procedures
 - .5 ANSI C37.20.1 Metal Enclosed LV Power Circuit Breaker Switchgear
- .2 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No. 31 – Switchgear Assemblies.
- .3 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA SG-3 - Low Voltage Power Circuit Breakers
- .4 Underwriters Laboratories (UL)

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- .1 UL1066 - Low Voltage AC and DC Power Circuit Breakers used in Enclosures.

1.5 SUBMITTALS

- .1 Include time-current phase protection co- ordination characteristic curves for breakers.

1.6 TESTS AND INSPECTION

- .1 Production tests shall be made in accordance with CSA C22.2 No.31, ANSI C37.50 clause 6.0 and ANSI/IEEE C37.20.1, clause 6.3 and permanently recorded.
- .2 The purchaser shall have the right to inspect at the factory all equipment covered by these specifications, at any time during manufacture and assembly, and shall have the right to be present during any tests made on the equipment.
- .3 The Vendor, upon request, shall furnish the Owner with advance notice of final assembly and testing.

1.7 DESCRIPTIVE MATERIALS AND TEST REPORTS

- .1 Instruction books, certified tests report, complete parts list, and recommended spare parts lists shall be furnished with the direct replacement circuit breaker.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- .1 The replacement circuit breaker shall be suitable for use in the existing circuit breaker cubicle and have been fully tested in accordance with ANSI/IEEE C37.13 and Tables 1& 2 of ANSI C37.16. Only circuit breakers that have passed appropriate ANSI design tests shall be used in the direct replacement.
- .2 The drawout type replacement air circuit breakers shall be Schneider Electric using Masterpack NW Retrofill drawout type breaker, cradle, retrofill kit, neutral CT's, new compartment doors and a MicroLogic 6.0A LSIG trip unit or approved equal.
- .3 The generator air circuit breaker shall be similar to the breaker as specified in Section 2.1.2, except it shall be a fixed type.
- .4 Main current-carrying parts, insulators, supports, and housings of the existing circuit breaker cubicle shall have sufficient mechanical strength to withstand, without incurring damage, the effect of rated short-circuit currents.
- .5 Manufacturer of the new low voltage replacement circuit breaker shall be currently engaged in the design and manufacturing of the LV circuit breakers and electronic trip units.

2.2 AIR CIRCUIT BREAKER

- .1 Air circuit breaker to: to ANSI/IEEE C37.13 and CSA C22.2 No.5.

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Section 26 28 16.01 – Air Circuit Breakers

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- .2 Draw-out type for the switchgear and fixed type for the generator, 600 V class.
 - .1 Continuous current rating: as indicated.
 - .2 Trip rating: as indicated.
 - .3 Interrupting rating: as indicated kA, rms symmetrical.
- .3 Unless otherwise specified, the new circuit breakers shall be rated in accordance with the latest issues of ANSI/IEEE C-37.13 and Tables 1 & 2 of ANSI C37.16.
- .4 The circuit breaker shall utilize stored-energy closing mechanism. The mechanism shall discharge the energy of the closing spring before withdrawing from or inserting into the circuit breaker compartment. The mechanism shall open, and remain in a trip-free state between the test and connected position.
- .5 Interlocks to prevent circuit breaker being withdrawn when in closed position and to prevent closing unless fully engaged or in test position.
- .6 Electrically operated mechanisms shall be designed to match the existing circuit breaker circuits. The electrical accessories including shunt trip, spring release, electrical operator, auxiliary contacts, and trip unit shall be field interchangeable.
- .7 Closing and tripping mechanisms shall operate satisfactorily over the voltage range in accordance with ANSI C37-16, Table 23.
- .8 All primary current paths (bus) shall be silver. Each circuit breaker mechanism shall be equipped with the following:
 - .1 Main contact position indicator
 - .2 Manual tripping and closing devices
 - .3 Spring charged and discharged indicator.
- .9 The circuit breaker shall be equipped with an electrically operated mechanism.
- .10 The circuit breakers shall be design and production tested according to ANSI C37.50, ANSI/IEEE C37.20.1, C37.51 and CSA C22.2 No. 31. Test certificates of the identical circuit breakers may be submitted for acceptance in lieu of performing design tests.
- .11 Circuit Breakers shall be tested following ANSI C37.50.
Following are the mandatory design tests:
 - .1 Dielectric Tests – clause 3.5
 - .2 Rated Continuous Current-Carrying Test - clause 3.6
 - .3 Mechanical Endurance Test – clause 3.8.4
 - .4 Short-time Current Test – clause 3.9.10
 - .5 Momentary Peak Withstand Test – similar to MV test but at the values specified for LVCB
- .12 Certificates of Compliance may be submitted for acceptance in lieu of performing tests 11.1 through 11.5 above only if the vender has performed similar direct replacements on the equipment as indicated in this specification.

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2.3 SOLID-STATE ELECTRONIC TRIP UNITS:

- .1 All trip units shall be removable to allow for field upgrades.
- .2 Trip units shall incorporate “True RMS Sensing”, and have LED long-time pickup indications.
- .3 Trip unit functions shall consist of adjustable long-time pickup and delay, short-time pickup and delay, instantaneous protection and ground-fault pickup and delay.
- .4 Adjustable long-time pickup (I_r) and delay shall be available in an adjustable rating plug that is UL Listed as field-replaceable. Adjustable rating plug shall allow for nine long-time pickup settings from 0.4 to 1 times the sensor plug (I_n). Long-time delay settings shall be adjustable from 0.5–24 seconds at six times I_r .
- .5 Short-time pickup shall allow for nine settings from 1.5 to 10 times I_r . Short-time delay shall be adjustable from 0.1–0.4 I^2t ON or OFF.
- .6 Instantaneous settings on the trip units shall be available with settings from 2 to 15 times I_n . The Instantaneous setting shall also have an optional OFF setting .
- .7 Ground-fault settings for circuit breaker sensor sizes 1200 A or below shall be adjustable from 0.3 to 1.0 times I_n . The ground-fault settings for circuit breakers 1200 A or above shall be adjustable from 500 to 1200 A. Ground fault time delay settings shall be adjustable from 0.1–0.4 seconds I^2t ON or OFF, or 20-500 ms.
- .8 Trip unit shall provide local trip indication and capability to indicate local and remote reason for trip, i.e., overload, short circuit or ground fault.
- .9 Neutral current transformers shall be available for four-wire systems.
- .10 Trip units shall be capable of communicating on **MODBUS**® networks.

2.4 CONTROL AND INDICATING DEVICES

- .1 Control relays, auxiliary contacts, and small mechanisms shall be enclosed, protected and accessible for maintenance.
- .2 All control relays, coils, motors, and mechanisms shall be new equipment.

2.5 ADDITIONAL FEATURES

- .1 Kirk key interlock for the two main breakers.
- .2 Remote close and open station complete with open and closed indicating lights for all breakers.
- .3 Padlocking provision.

2.6 EXISTING CIRCUIT BREAKERS (TO BE REPLACED)

- .1 The following are the nameplate information of the existing circuit breakers installed in the emergency distribution switchgear to be replaced.
 - .1 Feeder Breaker No.1, draw-out type - (PE MCC):
 - .1 Manufacturer: Federal Pioneer

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- .2 Type: 50H-3
- .3 Poles: 3
- .4 Volts: 600
- .5 Frame size: 1600 A
- .6 Relay trip unit: 600 A
- .7 Interrupting capacity: 50 kA
- .8 Contact IC: 50 kA
- .9 Control: 208/120 VAC
- .10 Frequency: 60 Hz
- .11 Serial No.: BH24346-82
- .2 Feeder breaker No. 2 draw-out type – (BE MCC)
 - .1 Manufacturer: Federal Pioneer
 - .2 Type: 50H-3
 - .3 Poles: 3
 - .4 Volts: 600
 - .5 Frame size: 1600 A
 - .6 Relay trip unit: 400 A
 - .7 Interrupting capacity: 50 kA
 - .8 Contact IC: 50 kA
 - .9 Control: 208/120 VAC
 - .10 Frequency: 60 Hz
 - .11 Serial No.: BH24347-82
- .3 Feeder breaker No. 5 draw-out type – (IEDPA)
 - .1 Manufacturer: Federal Pioneer
 - .2 Type: 50H-3
 - .3 Poles: 3
 - .4 Volts: 600
 - .5 Frame size: 1600 A
 - .6 Relay trip unit: 800 A
 - .7 Interrupting capacity: 50 kA
 - .8 Contact IC: 50 kA
 - .9 Control: 120 VAC
 - .10 Frequency: 60 Hz
 - .11 Serial No.: BH24349-82
- .4 Feeder breaker No. 6 draw-out type– (2EDPB)
 - .1 Manufacturer: Federal Pioneer
 - .2 Type: 50H-3
 - .3 Poles: 3
 - .4 Volts: 600
 - .5 Frame size: 1600 A
 - .6 Relay trip unit: 250 A

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- .7 Interrupting capacity: 50 kA
- .8 Contact IC: 50 kA
- .9 Control: 120 VAC
- .10 Frequency: 60 Hz
- .11 Serial No.: BH24348-82
- .5 The following is the nameplate information of the existing switchgear.
 - .1 Manufacturer: Federal Pioneer
 - .2 Amps: 1200
 - .3 Volts: 120/208 V
 - .4 Frequency: 60 Hz
 - .5 Phase: 3 Phase 4 Wire
 - .6 Serial No.: 3119-246
 - .7 Switchgear Unit: LL28157 S-2
- .2 The following is the nameplate information of the existing circuit breakers installed at the emergency generator to be replaced.
 - .1 Feeder breaker Emergency Generator, fixed type
 - .1 Manufacturer: Federal Pioneer
 - .2 Type: 50H-3
 - .3 Poles: 3
 - .4 Volts: 600
 - .5 Frame size: 1600 A
 - .6 Relay trip unit: 1200 A
 - .7 Interrupting capacity: 50 kA
 - .8 Contact IC: 50 kA
 - .9 Control:
 - .10 Frequency: 60 Hz
 - .11 Serial No.: BH26393-83
 - .2 The replacement breaker shall be supplied with a ground fault relay, adjustable from 0.2 to 1.0 times In, and with 120Vac control.
- .3 Contractor to confirm all information on existing equipment prior to manufacture of new breakers.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install air circuit breakers as indicated.
- .2 Only qualified installation technicians shall be engaged for the installation of the new breakers.

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- .3 The switchgear shall be recertified (CSA) by this Contractor if any modifications are required to the existing switchgear to accommodate the new circuit breakers and the remote control station.
- .4 Contractor to co-ordinate installation of the new breakers with the Owner. The installation of new breakers will be during weekend.
- .5 The switchgear will be de-energized for a total of 60 hours maximum in which time the Contractor shall complete all work, ie install all new circuit breakers (shut-down Friday at 6:00 pm and complete all work before 6:00 am Monday morning). The Contractor will have access to site to co-ordinate and install any equipment (ie remote operating station) as required prior to the shut-down of the switchgear when the breakers will be replaced.

3.2 FIELD QUALITY CONTROL

- .1 Perform tests in accordance Section 26 05 00 – Common Work Requirements - Electrical and Section 01 91 13 – General Commissioning (Cx) Requirements.
- .1 Perform as a minimum the following tests:
 - .1 Visual inspection of the connections and installation of the entire assembly;
 - .2 Check correct installation of all devices and components of the circuit breaker cubicle;
 - .3 Inspection of the nameplates and identifications of the circuit breaker cubicle and its components;
 - .4 Check operation and functionality of control devices and indications;
 - .5 Check electrical and mechanical operation of the circuit breaker,
 - .6 Check and test functionality of closing and tripping actions from local and remote modes;
 - .7 Check and test operation of auxiliary contacts of all status, control and alarms devices of the circuit breaker,
 - .8 Verify and test operation of remote interlocks and local interlocks between circuit breaker,
 - .9 Insulation resistance measurement of circuit breaker, disconnect switches and grounding switches;
 - .10 Check factory made connections for mechanical security and electrical continuity,
 - .11 Check trip unit settings to ensure proper co-ordination and protection of circuit breakers.

END OF SECTION