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

Issued for Review

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 circuit breaker of equal or higher continuous current rating and interrupting capability. The direct replacement circuit breaker also known as RIR (Roll-In-Replacement), shall be fully compatible with the existing switchgear cubicles, with identical primary and secondary connections. Circuit breakers shall be draw-out 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 Acceptable circuit breaker manufacturers are Square D/Schneider Electric or an approved equal.
- .3 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.
- .4 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.
- .2 Drawout type, 600 V class.
 - .1 Continuous current rating: as indicated.
 - .2 Trip rating: as indicated.

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- .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.

2.3

SOLID-STATE ELECTRONIC TRIP UNITS:

- .1 All trip units shall be removable to allow for field upgrades.

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- .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, 1 2 t 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 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.
- .8 Ground-fault protection shall be capable of the following types of protection: residual, source ground return, and modified differential. Ground-fault sensing systems may be changed in the field.
- .9 Ground-fault settings for circuit breaker sensor sizes 1200 A or below shall be adjustable from 0.2 to 1.0 times I_n . The ground-fault settings for circuit breakers above 1200 A shall be adjustable from 500 to 1200 A.
- .10 Neutral current transformers shall be available for four-wire systems.
- .11 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 ACCESSORIES

- .1 A portable floor-supported, roller-based, elevating lift truck for moving circuit breakers in and out of compartments as well as outside the switchgear.

2.7 EXISTING CIRCUIT BREAKERS (TO BE REPLACED)

- .1 The following are the nameplate information of the existing circuit breakers to be replaced.

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- .2 Main breakers (quantity of 2):
 - .1 Manufacturer: Federal Pioneer
 - .2 Type: 100H-3
 - .3 Poles: 3
 - .4 Volts: 600
 - .5 Frame size: 4000 A
 - .6 Relay trip unit: 3000 A
 - .7 Interrupting capacity: 85 kA
 - .8 Contact IC: 85 kA
 - .9 Control: 120 VAC
 - .10 Frequency: 60 Hz
 - .11 Serial No.: BH24342-82 and BH24343-82
 - .12 Complete with kirk key interlock.
- .3 Feeder breaker No. 4 – (INDPA)
 - .1 Manufacturer: Federal Pioneer
 - .2 Type: 50H-3
 - .3 Poles: 3
 - .4 Volts: 600
 - .5 Frame size: 2000 A
 - .6 Relay trip unit: 2000 A
 - .7 Interrupting capacity: 50 kA
 - .8 Contact IC: 50 kA
 - .9 Control: 120 VAC
 - .10 Frequency: 60 Hz
 - .11 Serial No.: BH24341-82
- .4 Feeder breaker No. 3 – (BN MCC)
 - .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: 120/208 VAC
 - .10 Frequency: 60 Hz
 - .11 Serial No.: BH24344-82
- .5 Feeder breaker No. 9 – (TRANSFER SWITCH)

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- .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: 120 VAC
 - .10 Frequency: 60 Hz
 - .11 Serial No.: BH24345-82
- .6 The following is the nameplate information of the existing switchgear.
- .1 Manufacturer: Federal Pioneer
 - .2 Amps: 4000
 - .3 Volts: 120/208 V
 - .4 Frequency: 60 Hz
 - .5 Phase: 3 Phase 4 Wire
 - .6 Serial No.: 3110-246
 - .7 Switchgear Unit: LL28157 S-2
- .7 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.
- .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.

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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