METROLINX

Switchboards and Panelboards Specification

Specification 26 24 13

Revision 02

September 2025

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Metrolinx,

an Agency of the Government of Ontario

Amendment Record Sheet

Amendment in Clause No.	Date of Amendment	Description of Changes
Cover Page	March 2023	Removed 'Capital Projects Group' to reflect organizational changes.
1.2.3., 1.2.9, 1.3.3	March 2023	Updated design requirements and numbering to Electrical Identification and Nomenclature Specification.
2.2.7, 2.3.20, 2.4	March 2023	Updated switchboard requirements, panelboard requirements and identification requirements.
3.3	March 2023	Updated testing requirements.
Various	September 2025	Updated format, numbering on Electrical Identification and Nomenclature Specification and revised requirements for clarity.

Contents:

1. GENERAL

1.1. SCOPE OF WORK

1.1.1. Labour, products, equipment, and services necessary for switchboards and panelboards in accordance with the Contract Documents.

1.2. DESIGN REQUIREMENTS

1.2.1. The equipment furnished and the equipment installation, wiring methods and materials used shall conform to the latest edition of the Ontario Electrical Safety Code, Electrical Safety Authority (ESA) Bulletins and Supplements issued by the Electrical Safety Authority, and the applicable Metrolinx Standards. In case of any conflicts, the more stringent requirement shall apply.

1.2.2. Design electrical equipment and systems to all applicable standards of CSA, ULC, IEEE, and ESA.

1.2.3. Design electrical equipment and systems to the latest version of the GO DRM.

1.2.4. Design electrical equipment and systems to standards and codes shall be the latest editions adopted by and enforced by local Authorities Having Jurisdiction (AHJ).

1.2.5. Switchboards, panelboards, and panels shall be sprinkler-proof design when indoors.

1.2.6. When panels are installed in weatherproof cabinets or bunker buildings, they shall be treated as indoor type, the cabinets and bunker building design shall:

a) Provide a weather-tight, heated, and cooled environment, such as a standard indoor electrical room;

b) Provide monitoring for high and low temperature alarms, locks, or access control, monitor alarms, door, occupancy, power loss, etc.;

c) Include receptacles and lighting; and

d) Provide metering for KVA, KVAR, PF, Amperage and Voltage.

1.2.7. Floor-mounted switchboards or panelboards shall be mounted on a housekeeping pad, minimum 103mm high, with 53 mm of pad overlap outside the equipment's perimeter.

1.2.8. No panels, panelboards, or switchgear shall be mounted directly to a wall. There shall be a minimum of a U-channel stand-off used as the mounting.

1.2.9. For main incoming service, design shall provide equipped feeder units rated to 100% of the maximum switchboard amperage rating.

1.3. RELATED WORKS

1.3.1. Section 26 05 00 - Electrical General Requirements.

1.3.2. Section 26 05 53 – Electrical Identification and Nomenclature.

1.3.3. Section 26 28 00 - Circuit Breakers and Fuses.

1.4. REFERENCE STANDARDS

1.4.1. Ontario Electrical Safety Code (OESC).

1.4.2. Ontario Building Code (OBC).

1.4.3. Metrolinx Standards, Drawings and Specifications.

1.4.4. GO Design Requirement Manual (DRM).

1.4.5. Metrolinx Electrical Safety Document.

1.4.6. CSA Z462, Workplace Electrical Safety.

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

1.4.8. CAN/CSA-C22.2 No.29, Panelboards and Enclosed Panelboards.

1.4.9. CAN/CSA-C22.2 No.31, Switchgear Assemblies.

1.4.10. CSA C22.1, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

1.4.11. CSA C22.2 No. 0.4, Bonding of Electrical Equipment.

1.4.12. CSA C22.2 No. 5, Moulded Case Circuit Breakers, Molded–Case Switches and Circuit-Breaker Enclosures.

1.4.13. CSA C 22.2 No. 94, Enclosures for electrical equipment, non-environmental considerations.

1.4.14. CSA C22.2 No. 0, General Requirements - Canadian Electrical Code, Part 2.

1.4.15. ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

1.4.16. NFPA 130, National Fire Protection Association Standard for Fixed Guideway Transit and Passenger Rail System.

1.4.17. UL, Underwriters Laboratories.

1.5. SPARE PARTS

1.5.1. See Section 26 05 00.

1.6. TRAINING

1.6.1. Metrolinx personnel shall be trained on transfer switch components, operations, safety, and troubleshooting.

1.6.2. Allow for two separate training sessions to train Metrolinx personnel in all of the equipment provided in the Contract.

1.6.3. The training session shall be conducted by a manufacturer's qualified representative. Training program shall include instructions on the assembly, circuit breaker, protective devices, and other major components.

1.7. WARRANTY

1.7.1. Provide a manufacturer's warranty for the work of this section with a minimum warranty period of two years after acceptance by Metrolinx.

1.8. DELIVERY, STORAGE AND HANDLING

1.8.1. Protect equipment from weather and moisture by covering with heavy plastic or canvas and by maintaining heat within enclosure in accordance with manufacturer's instructions.

1.8.2. Provide energized strip heater in each cell to maintain a dry condition during storage.

1.8.3. Ship the products to site once approval to ship has been given by the Contractor.

1.8.4. Acceptance of the equipment on site is contingent on an inspection of the products for shipping damage. Any products that are damaged or defective shall be returned to the manufacturer at no cost to Metrolinx.

1.9. SUBMITTALS

1.9.1. Product Data Package:

a) Submit manufacturer's Product Data indicating:

1) Electrical characteristics including service type, voltage, continuous current, power (kVA), short circuit rating, interrupting ratings, vertical and horizontal power bus sizes, neutral and ground bus size and arrangements, bracing and devices withstand ratings;

2) Mechanical characteristics including enclosure type, outline, and support point dimensions, mounting arrangements, clearance requirements, feeder's entry provisions for bus duct, cable terminal sizes, size and location of connections, finishes, etc.;

3) Complete bill of materials. Include catalogue numbers for circuit breakers, switches, fuses, transformers, monitoring, control and protection devices, PTs, CTs and other devices as required;

4) All options and accessories furnished;

5) Detailed product data sheets or manuals for review when required to evaluate submittal;

6) Product transportation, storage, handling, and installation requirements; and

7) Product identification.

1.9.2. Shop Drawings Package:

a) Submit manufacturer's Shop Drawings indicating:

1) Wiring diagrams and control schematics;

2) Feeders and conduit entry/exit location. Front view elevation, floor plan, top view, configuration of compartments and layouts with dimensions, weights and anchoring method indicated;

3) Connection details between close-coupled assemblies and composite floor plan of close-coupled assemblies. Nameplate legends;

4) Electrical and control drawings shall be done in electronic file format and submitted in printed and electronic editable format;

5) Identification; and

6) Mimic-bus diagram.

1.9.3. Commissioning Package:

a) Submit the following:

1) Commissioning Plan;

2) Commissioning Procedures;

3) Certificate of Readiness;

4) Performance criteria and maintenance data;

5) Safety precautions;

6) Test Reports: factory test reports;

7) Manufacturer's installation instructions; and

8) Manufacturer's Field Reports: commissioning report on field tests, including test forms and confirming proper installation prior to energization.

1.9.4. Record Documents

a) As-built drawings, including any field modifications;

b) As-built drawings shall be submitted in printed and electronic format in accordance with Metrolinx standards; and

c) Operation and Maintenance Data: As built product data, including any field modifications.

2. PRODUCTS

2.1. GENERAL

2.1.1. The equipment shall be able to withstand the environmental conditions stated in Section 26 05 00 without damage or degradation of operating characteristics.

2.1.2. All switchboards and panelboards require a main meter and a main isolation breaker.

2.1.3. Any switchboards and panelboards used as the main service board shall include spare capacity for future growth. Refer to Section 26 05 00.

2.1.4. All equipment ratings shall be selected from industry standard ratings only.

2.2. SWITCHBOARDS

2.2.1. Factory assembled, dead front, metal enclosed and self-supporting switchboard. Complete with line and load side terminations.

2.2.2. Bus material shall be copper, silver-plated, including connections to circuit breakers and current transformers in switchboard cubicles.

2.2.3. Bus bracing minimum 50 kA rms at 600 VAC.

2.2.4. Enclosure

a) Minimum CSA Type 2, indoor use equipped with arc flash reduction protection;

b) Fabricate indoor switchboard from minimum 2.68 mm (12-gauge) thick sheet metal enclosure, steel-clad, bolted assembly with gasketed top plates, continuous channel-iron floor sills and steel lifting eyes; and

c) Provide three latching points and padlocked handle operating extended bar to latching points at top and bottom.

d) Door to swing 135°.

2.2.5. Control compartments shall be installed on front of the board away from buses.

2.2.6. Future Provisions: equipped spaces for future devices with bussing and bus connections.

2.2.7. Provide 25% spare breakers on new installations. Provide at least one spare breaker with frame and trip unit ratings to match main breaker ratings.

2.2.8. Provide 25% spare space for future additional breakers. Allow space in the room for expansion of the switchboard by one additional cabinet.

2.2.9. Install ground bus in lower part of each switchboard section. Run continuous bare copper bus, minimum 50 x 6 mm, entire length of switchboard. Fabricate breaker compartment with one solderless type ground bus size 2/0 AWG.

2.2.10. Control wiring and terminals

a) Complete internal control wiring and include terminal blocks for external connection;

b) Number wiring at both ends;

c) Make minimum control wire size No. 14 AWG copper except where larger size 12 AWG conductors needed for current-carrying requirements;

d) Make conductors of stranded copper for fixed wiring and extra flexible copper for hinge wiring and rated for 600 volts;

e) Clearly and permanently identify terminals and control wiring terminations; and

f) Make compression-type (solderless) lugs for terminal block point for incoming control and instrument wires.

2.2.11. Main and branch moulded case circuit breakers

a) See Section 26 28 00;

b) The service entrance switchboard shall be provided with main circuit breakers with 100% rated, fixed-mounted dead front breakers of frame and trip rating as indicated on Contract Drawings. The main incoming circuit breaker at the service entrance switchboard shall be rated for maximum voltage and amperage of the service entrance switchboard;

c) All service entrances shall be solidly grounded;

d) All circuits 1000 A and above shall be equipped with ground fault protection downstream to the load overcurrent protection devices for selective protection coordination;

e) Breakers over 1200 A shall be of the draw-out type; and

f) Electrical room clearances shall accommodate for breaker draw-out dimensions wherever draw-out circuit breakers are used.

2.2.12. Metering Compartments

a) Provide metering compartment in accordance with Local Hydro Metering standard and the need for the owner to meter use, harmonics, watts, VAR, KVA, power factor, amperage and voltage per phase and storage capability of the information for a period of 3 years;

b) The owner's meter shall connect to the remote supervisory system for local and remote monitoring; and

c) Coordinate with Local Hydro / ESA for size of compartment, supply of revenue CTs and PTs and installation.

2.2.13. Switchboards for entrance service shall be equipped with surge protective device (SPD) as per manufacturer's recommendations.

2.2.14. Provide dedicated digital monitoring meters system and sub-meters c/w remote communication capability and capable of storing data for minimum 3 years.

2.2.15. For all switchboards with draw-out circuit breakers or switches, provide one circuit breaker lifting device. It shall be portable, floor-supported with a roller base. All four wheels shall be swivelling type to allow the lifting device to move in any direction. Provide one lifting device in each room containing draw-out circuit breakers.

2.3. PANELBOARDS

2.3.1. Panelboards: To CSA C22.2 No. 29 and Canadian Electrical Code requirements, including barriers.

2.3.2. Rated at 120/208 V or 600/347 V, 3-phase, 4-wire, for distribution of normal and emergency power for lighting circuits, control circuits, power circuits and electric heating circuits as shown on Contract Documents and unless noted otherwise. The use of single-phase panelboards requires prior Metrolinx approval.

2.3.3. Panelboard interiors shall be factory assembled, with bolt-on circuit breakers and designed so circuit breakers for replacement without disturbing adjacent devices and without removing main bus connectors.

2.3.4. Panelboard shall not be larger than 48 circuit.

2.3.5. Panelboards shall be provided with tin-plated copper buses, bus bracing minimum 10 kA @ 240 V AC or 22 kA @ 600 V AC unless noted otherwise.

2.3.6. Main bus bars shall be rated for continuous current as indicated on the Contract Documents. Bussing shall meet CSA C22-2 No. 29 standard for temperature rise.

2.3.7. Panelboard shall be copper bus type, with full capacity solid neutral design and sequence style bussing, composed of an assembly of bolted-in-place moulded case circuit breakers (refer to Section 26 28 00). Solidly bonded copper ground bus shall be provided.

2.3.8. All circuit carrying parts shall be insulated from ground and phase-to–phase by high dielectric strength barrier or equivalent.

2.3.9. Main circuit breaker panelboard interior shall be field convertible for top or bottom incoming feed.

2.3.10. The panelboard shall have a meter that shall connect to the remote supervisory system.

2.3.11. All unused space provided, unless otherwise specified, shall be equipped for future devices, including all appropriate connectors and mounting hardware.

2.3.12. Interior trim shall be dead-front construction to shield user from energized parts. Empty spaces shall be provided with blanking plates.

2.3.13. Connections with solderless lugs on main and neutral busbars and at circuit breaker load terminals.

2.3.14. Constructed from galvanized steel sheet, of thickness equal to code gauge for similar steel cabinets, fabricated by "forming up" and having spot-welded seams. Panelboard cabinet assembly to comply with CSA enclosure Type 2.

2.3.15. Panelboards shall not be of the door-in-door type (interior swing door).

2.3.16. Overcurrent devices feeding emergency equipment shall be located only in electrical equipment rooms and fitted with breaker locking devices.

2.3.17. Provide 25% spare breakers in panelboard, totalling 25% in spare ampacity capacity per panelboard.

2.3.18. Panelboards shall be provided with type-written directories indicating loads controlled by each circuit installed in metal-framed, clear acetate cover, affixed to the inside cover of the panelboard. Handwritten directories, or a combination of handwritten and typed directories, shall not be accepted.

2.3.19. Provide panels that shall allow the monitoring and control of each circuit. The CT/PT, transducers, relaying, shall be able to send information by means of a network connection and address system to both a local and remote communication to power monitoring system.

2.3.20. All panelboards shall be equipped with main circuit breaker. The main circuit breaker shall be rated for maximum voltage and amperage of the panelboard.

2.4. IDENTIFICATION

2.4.1. Furnish colour coding in accordance with Metrolinx Electrical Identification and Nomenclature Specification 26 05 53.

2.4.2. Provide identification for equipment and the sub-components in accordance with Metrolinx Electrical Identification and Nomenclature Specification 26 05 53.

2.4.3. Provide continuous mimic bus applied to the front of the switchboard, arranged in a single line diagram format.

2.4.4. Provide nameplates, warning signs and labels as required by the AHJ.

3. EXECUTION

3.1. SWITCHBOARDS

3.1.1. Assemble switchboard into a complete functional operating unit.

3.1.2. Install switchboard in location shown on Contract Drawings, make connections in accordance with codes, standards, and manufacturer's installation instructions.

3.1.3. Level switchboard equipment as shown on reviewed Shop Drawings and fasten to floor pad with bolts.

3.1.4. Drill/Punch through enclosures only for conduits or cables actually required.

3.1.5. A Manufacturer's field engineer is responsible for minor adjustments, test, and commission equipment to the acceptance of Metrolinx. Field engineer shall be supplied without additional cost to Metrolinx by the manufacturer of the switchboard.

3.1.6. Locate switchboard and secure in position. Install floor-mounted switchboards on housekeeping pad.

3.1.7. Connect main incoming feeder to line terminals of main breaker, if applicable.

3.1.8. Connect load terminals of distribution switches or breakers to feeders.

3.1.9. Check factory-made connections for mechanical security and electrical continuity.

3.1.10. Check trip unit settings and fuse sizes against coordination study to ensure proper working and protection of components.

3.2. PANELBOARDS

3.2.1. Panelboards shall be, surface-mounted as per requirements, complete with hinged locking door and flush catch, and finished with corrosion-resistant primer, equipment gray.

3.2.2. Surface-mounted panelboards shall be installed on Unistrut galvanized steel framing channels with minimum 75 mm clearance between back of panelboard and wall.

3.2.3. Where practical, panelboards shall be grouped in proximity.

3.2.4. Install panelboards to support channels in locations shown on Contract Drawings and in accordance with Manufacturer's written instructions. Use a minimum of 4 fasteners for each panelboard.

3.2.5. Where no mounting surface available, install steel supports for mounting of panelboard cabinets.

3.3. TESTING

3.3.1. Contractor to review and test that all wiring has been connected as per the Manufacturer drawings.

3.3.2. Switchboard shall be tested on site per ESA and CSA requirements. Contractor to oversee all testing and correct any deficiencies noted.

3.3.3. Testing for switchboard and panelboard shall be conducted in accordance with the latest edition of ANSI/NETA ATS – Standard for Acceptance Testing for Electrical Power Equipment and Systems.

End of Section