

Electrical Receptacles and Plugs Specification

Specification 26 27 26

Revision 02

September 2025

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Publication: August 2018
Revised: March 2023, September 2025
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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, 1.2.6, 1.3.3	March 2023	Updated design requirements and updated numbering on Electrical Identification and Nomenclature Specification.
1.10	March 2023	Updated quality assurance requirements.
2.2, 2.3, 3.1	March 2023	Added requirements for duplex receptacles, single receptacles, and installation requirements.
Various	September 2025	Revised to clarify receptacle requirement and installation. General format updated for clarity.

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1. GENERAL

1.1. SCOPE OF WORK

- 1.1.1. Labour, Products, equipment, and services necessary for Plugs and Receptacles Work.
- 1.1.2. Specification does not generally indicate specific number of items or amounts of material required. Specification is intended to provide product data and installation requirements. Refer to Contract Documents for schedules, drawings, including layouts, riser diagrams, schematics, and details, and Specification to provide correct quantities. Singular may be read as plural and vice versa.

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 equipment and systems to all applicable standards of CSA, CEC, OESC, and ESA.
- 1.2.3. Design equipment and systems to the latest version of the GO DRM.
- 1.2.4. Design equipment and systems to standards and codes to the latest editions adopted by and enforced by local Authorities Having Jurisdiction (AHJ).
- 1.2.5. Receptacles and Plugs shall be designed to meet heavy-duty, industrial-grade requirements. Commercial-grade devices shall not be used.
- 1.2.6. Receptacles and Plugs identification shall be in accordance with Section 26 05 53 - Electrical Identification and Nomenclature.

1.3. RELATED WORKS

- 1.3.1. Section 26 05 00 Electrical General Requirements.
- 1.3.2. Section 26 05 21 - Electrical Conductors and Cables.
- 1.3.3. Section 26 05 53 - Electrical Identification and Nomenclature.

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.

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- 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. NEMA WD 1-10, General Color Requirements for Wiring Devices.
 - 1.4.8. NEMA WD 6-08, Wiring Devices – Dimensional Specifications.
 - 1.4.9. CSA C22.2 No. 0, General Requirements.
 - 1.4.10. CSA C22.2 No. 18.1, Metallic Outlet Boxes.
 - 1.4.11. CSA C22.2 No. 42, General-Use Receptacles, Attachment Plugs and Similar Wiring Devices.
 - 1.4.12. CSA C22.2 No. 42.1, Cover Plates for Flush-Mounted Wiring Devices.
 - 1.4.13. UL231 Power Outlets.
 - 1.4.14. UL467 Grounding and Bonding Equipment.
 - 1.4.15. UL498 Attachment Plugs and Receptacles.
 - 1.4.16. UL943 Ground-Fault Circuit-Interrupters.
 - 1.4.17. IEC/TR 60083, Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC.
 - 1.4.18. UL, Underwriters' Laboratories.
 - 1.4.19. ULC, Underwriters' Laboratories of Canada.
 - 1.5. SPARE PARTS**
 - 1.5.1. Not applicable.
 - 1.6. TRAINING**
 - 1.6.1. Not applicable
 - 1.7. WARRANTY**
 - 1.7.1. 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 damage, weather, and moisture in accordance with manufacturer's instructions.

1.9. SUBMITTALS

1.9.1. Product Data Package

- a) Submit manufacturer's Product data indicating:
- 1) Technical data, supplemented by bulletins, component illustrations, detailed views, technical descriptions of items, and parts lists;
 - 2) Performance criteria, compliance with appropriate reference standards, characteristics, limitations, and troubleshooting protocol;
 - 3) Product transportation, storage, handling, and installation requirements; and
 - 4) Product identification in accordance with Section 26 05 53 - Electrical Identification and Nomenclature.

1.9.2. Shop Drawings Package

- a) Submit manufacturer's Shop Drawings indicating:
- 1) All cables used on Contract;
 - 2) All cable terminations used on Contract;
 - 3) All cable supports used on Contract; and
 - 4) Identification.

1.9.3. Commissioning Closeout Package:

- a) Submit the following:
- 1) Commissioning Plan;
 - 2) Commissioning Procedures;
 - 3) Certificate of Readiness;
 - 4) Performance criteria and maintenance data; and
 - 5) Safety precautions.

1.10. QUALITY ASSURANCE

- 1.10.1. All Quality Assurance submittals listed in this specification shall be provided.
- 1.10.2. All electrical work shall be carried out by licensed electrical contractors who are authorized to practice in Ontario with experience and training in the equipment and systems (certified or manufacturer approval) being installed in Ontario.
- 1.10.3. All electrical work shall be inspected and approved by Metrolinx or its representatives for acceptance. Interim and final inspections shall be performed with Metrolinx or its representatives present.
- 1.10.4. Regulatory Requirements: Furnish products listed and classified by CSA and ULC, as required for application, and shall be stamped accordingly.

2. PRODUCTS

2.1. GENERAL

- 2.1.1. All receptacles and plugs shall comply with CSA, NEMA, and ULC.
- 2.1.2. The equipment shall be able to withstand the environmental conditions stated in Section 26 05 00 without damage or degradation of operating characteristics.
- 2.1.3. Plugs and receptacles installed outdoors shall be able to withstand UV radiation without long-term degradation in performance.
- 2.1.4. Mounting straps shall be plated steel, with break-off plaster ears and shall include a self-grounding feature. Terminal screws shall be brass, brass-plated or a copper alloy metal.
- 2.1.5. Plugs and Receptacles shall have provisions for back wiring with separate metal clamp-type terminals (four minimum) and side wiring from four captively held binding screws.
- 2.1.6. Bodies shall be ivory, white, or black as dictated by Architect in the Contract Documents and Metrolinx.
- 2.1.7. Duplex receptacle shall be located on the site in convenient locations for operations. Receptacles shall typically be located at least the minimum of one at every floor level by the stairways, at access points on roofs, by equipment located on roof (not fed from the equipment), in all service and support rooms, lunch/kitchen rooms, counter areas, meeting rooms, offices, and washrooms.
- 2.1.8. Receptacles shall meet the following requirements:
 - a) Corrosion-resistant receptacles shall be provided in corrosion problem areas, including vehicle service pits, at and around vehicle wash bays, classified areas, and other high-abuse areas. Corrosion-resistant devices shall be made of special materials and/or plated metal parts that are designed to withstand corrosive environments. Corrosion-resistant devices shall pass the ASTM B117-13 five-hundred hours Salt Spray (Fog) Test with no visible corrosion;
 - b) Dust-proof receptacles shall be designed so that dust shall not interfere with their operation. The IP suitability rating describes the degree of protection that a device offers against the ingress of foreign objects (e.g., IP20);
 - c) Power light Electrical receptacles shall include a power light to indicate if they are live. The receptacle shall be illuminated to make connections easier in dim or dark workspaces;

- d) Tamper-resistant- Devices shall be constructed so that access to their energized contacts is limited. Tamper-resistant receptacles are required by the Ontario Electrical Safety Code; and
 - e) Watertight Receptacles shall be constructed so that water cannot enter under specified test conditions. The IP Suitability Rating designates the degree of protection a device offers against the ingress of moisture and water (e.g., IP55/IP44). Some devices shall be approved for moisture-resistant and underwater applications.
- 2.1.9. Switched duplex receptacles shall be wired so that only the top receptacle is switched. The lower receptacle shall be unswitched.
- 2.1.10. Welding and specialty receptacles (rail-specific standard or special application use shall be metal).
- 2.1.11. All outdoor or in moist location receptacles shall be tamper-resistant type, and weather-resistant type receptacles with covers, and shall be rated for outdoor or wet/damp locations.
- 2.2. DUPLEX RECEPTACLES**
- 2.2.1. Extra Heavy-Duty industrial, single-phase, 20 A, 120 V, 2-pole, 3-wire, non-locking grounding type NEMA/CSA 5-20R, with break-off feature for two-circuit operation.
- 2.2.2. Extra heavy-duty, single-phase, 15 A, 125 V duplex ground type (NEMA/CSA configuration 5-15R) shall be provided only with Metrolinx special permission.
- 2.2.3. Receptacles in communications rooms, electrical rooms, and service rooms shall be 20 A 120 V duplex non-locking grounding type (5-20R).
- 2.2.4. Receptacle shall be rated for minimum No. 10 AWG for back and side wiring.
- 2.2.5. Isolated ground receptacles shall only be used for outlets connected to the UPS power supply as indicated on the Contract Drawings.
- 2.2.6. GFCI receptacles indoors and outdoors. Ground Fault Circuit Interrupter (GFCI) Class A Duplex Receptacles
- a) Shall be an integral unit, hospital-grade, mounting in a standard outlet box, with end-of-life indication and provisions to isolate the face due to improper wiring, rated single phase, 20 A, 125 V, 2-pole, 3-wire. Where a specialty control or communication box is installed requiring a duplex GFCI or standard receptacle with equipment, components transformers shall be CSA or ESA approved with stickers;

- b) Ground fault interrupter shall be of a differential current transformer, solid state sensing circuitry and a circuit interrupter switch. Device shall have nominal sensitivity to ground leakage current of 4 to 6 mA and shall function to interrupt the current supply for any value of ground leakage current above five milliamperes (± 1 mA) on the load side of the device. Device shall have a minimum nominal tripping time of 0.025 seconds; and
- c) Shall have an auto-monitoring (self-test) manual test feature and reset switch.

2.2.7. Service Room and Station Building Waiting Area Receptacles shall be:

- a) Extra Heavy-Duty industrial, single-phase, 20 A, 120 V, 2-pole, 3-wire, non-locking grounding type NEMA/CSA 5-20R, with break-off feature for two-circuit operation in Communications and Electrical Rooms; and
- b) Single phase, 20A, 120V, 3-wire grounding type NEMA/CSA 5-20R with integrated USB sockets in station waiting areas and workstation areas in communication and electrical rooms.

2.2.8. Colour coded in service rooms shall be as follows:

- a) Normal Power: White;
- b) Emergency Power: Red; and
- c) UPS Power: Orange.

2.3. SINGLE RECEPTACLE

2.3.1. Extra Heavy-Duty industrial, single-phase, 30 A, 120 V grounding type NEMA/CSA 5-30R shall be provided in Electrical and Communication rooms for emergency cooling.

2.3.2. Rated for minimum No. 6 AWG for back and side wiring.

2.3.3. Other receptacles with ampacity and voltage as indicated.

2.3.4. Colour coded in service rooms shall be as follows:

- a) Normal Power: White;
- b) Emergency Power: Red; and
- c) UPS Power: Orange.

2.4. TWIST LOCK

2.4.1. Receptacles in communications rooms that are ceiling or cable tray mounted shall be 20, 30 or 50 A 120 V locking grounding type (L5-20R, L5-30R or L5-50R).

2.4.2. Receptacles, covers, and boxes other than 20 A 120 V, 2-pole, 3-wire, with higher amperage or voltages, single or 3-phase, the appropriate receptacle and cover shall use the requirements dictated by the type of plug, the environment and required class and codes.

2.4.3. Receptacles in service rooms shall be colour-coded as follows:

- a) Normal Power: White;
- b) Emergency Power: Red; and
- c) UPS Power: Orange.

2.5. WEATHERPROOF RECEPTACLES, BOXES AND COVERS

2.5.1. Duplex receptacle mounted in box shall come complete with a gasketed, weatherproof, cast metal cover plate and cap over each receptacle opening where acceptable by code. Box shall be rated for single-phase, 20 A, 120 V, 2-pole, 3-wire.

2.5.2. Weatherproof covers for one and two-gang boxes shall use Duplex/GFCI cover. ULC & CSA-listed polycarbonate shall be used in Code-required locations outdoors. Self-closing covers – clear polycarbonate lid, vertical or horizontal two screw mounting and in some cases, pad lockable.

2.5.3. The cap shall be permanently attached to the cover plate by a spring-hinged flap. The weatherproof integrity shall not be affected when heavy-duty specification or hospital-grade attachment plug caps are inserted.

2.5.4. Cover plates on outlet boxes mounted flush in the wall shall be gasketed to the wall in a watertight manner.

2.6. RECEPTACLE STRIPS - INDOOR

2.6.1. Receptacles shall be ULC heavy-duty and shall be grounded by a separate green ground conductor. The receptacles shall be spaced and circuited as needed

2.7. COVER PLATES

2.7.1. Except where unique cover plates are required (wall box dimmers, surface raceways, occupancy sensors, etc.), cover plates for switches and receptacles shall be of high-quality Type 302 stainless steel or as dictated by the Architect in the Contract Documents and by Metrolinx or its representatives.

2.7.2. All covers shall be rated for use in the environment in which it is used and for the type of receptacle and box required. All covers shall be labelled with a unique name describing location and source of power.

2.8. WELDING RECEPTACLES

- 2.8.1. The welding switch-rated plugs and receptacles shall be CSA listed to UL 2682 Switch Rated Plugs and Receptacles.
- 2.8.2. Plugs and receptacles shall have constant-pressure butt-contacts with solid silver-nickel tip pin and sleeve contacts are not permitted.
- 2.8.3. Receptacles shall have dead front construction: live parts shall be inaccessible to thin tool or wire.
- 2.8.4. Plugs and receptacles shall be able to close at least once on a conditional short-circuit current of 65 kA.
- 2.8.5. Plugs and receptacles shall incorporate an integral switching mechanism to ensure the load is broken before the plug is removed from the receptacle.
- 2.8.6. Plug and receptacle wire terminals shall be spring-assisted to prevent loosening due to conductor yielding, shocks, vibrations, or thermal cycling.
- 2.8.7. The minimum environmental rating of plugs and receptacles shall be IP66/IP67/IP69k or IP67.
- 2.8.8. Ingress protection shall be done automatically when the plug is inserted into the receptacles, without additional manual operation.
- 2.8.9. Plugs and receptacles shall have a system of different keying positions in order to discriminate between circuits or incompatible operating voltages or frequencies.
- 2.8.10. Ensure Arc Flash Protection by making the plug or receptacle in compliance with NFPA 70E. Integral switching mechanism shall safely make and break inductive loads

2.9. RAIL CONSIST AND UPE SPECIALTY RECEPTACLES, CABLES, AND PLUGS

- 2.9.1. The 600 VAC 3-phase 320 A unit, complete with 120 VDC safety loop controls, receptacles, and plug made by Clement National Company, CAT # CN-GTPC17-Vxxx-V01 with straight or angle adapter, retainer collar, 4-pin accepting 350 MCM and 4 #12 AWG contacts. The contacts shall be copper alloy, silver-plated. The Receptacle shell and putting adapter shall be aluminum alloy with a natural anodic finish. The plug barrel, with a glove cable coupling nut with stranded cable adapter, mechanical clamp nut shall be aluminum alloy with black hard coat anodic finish. These plugs and receptacles shall be used on GO Transit layover wayside plug-ins and cables.

- 2.9.2. The 480 VAC 400 A power and 72 VDC safety loop and controls plug, and receptacle made by Clement National Company shall be used for layover wayside power for Union Pearson Express (UPE) DMU consists. The plug and wayside cabinet receptacle shall match the receptacle on the site. The cable shall be multiple-conductor flexible type, same as 29.1. This consist shall require a ground and receptacle on the cabinet and DMU consist.
- 2.9.3. Check and verify with Metrolinx for latest update prior to design work.

3. EXECUTION

3.1. INSTALLATION

- 3.1.1. Except where necessary to match existing receptacles, install receptacles with their ground slots below, or to the left, of the line and neutral slots.
- 3.1.2. Provide minimum No. 12 AWG wire to receptacles.
- 3.1.3. Provide a separate neutral conductor for each single-phase branch circuit. The neutrals of these single-phase circuits shall not be shared or daisy-chained.
- 3.1.4. Provide GFCI receptacles or GFCI-protected branch circuits for new and existing 125 V duplex receptacles located outdoors, on rooftops, in washroom rooms, in kitchens, and within 1,800 mm of water sources, including but not limited to sinks, cup sinks, fume hood sinks, faucets and hose bibs. Provide GFCI receptacles for water coolers.
- 3.1.5. Provide a nametag on each cover plate of new and existing light switches and receptacles identifying the panel and circuit number feeding the device. Trace the existing circuits using an electronic circuit tracer if necessary. System installation shall be in accordance with all national and local electrical codes.
- 3.1.6. Receptacles shall not be wired in common with lighting circuits, and there shall be no more than six (6) receptacles per circuit in public areas, and no more than four (4) receptacles per circuit in service areas.
- 3.1.7. In general building areas, janitorial outlets are required for cleaning and maintenance. In public open areas, receptacles shall be spaced at maximum 5 m centre to centre, and at ceiling level for Christmas lights as directed by Metrolinx.
- 3.1.8. Tunnel and exterior building receptacles shall be GFCI type with weatherproof cover, 125 V, 20 A, located at spacing to suit 15 m extension cords or as required by Metrolinx.
- 3.1.9. Label all receptacles as per Section 26 05 53 - Electrical Identification and Nomenclature.
- 3.1.10. Mount receptacles at heights specified in Section 26 05 00 - Electrical General Requirement.
- 3.1.11. Test each receptacle for correct polarity and ground continuity. Test the manual trip and reset functions of each GFCI.

END OF SECTION