METROLINX

Electrical Receptacles and Plugs Specification

Specification 26 27 26

Revision 01
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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, 1.2.6, 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

LIST OF CONTENT

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 (layouts, riser diagrams, schematics, 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 be 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 are unacceptable.

1.2.6. Receptacles and Plugs identification shall be in accordance with Section 26 05 23 – Electrical Identification and Nomenclature

1.2.7.

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 23 – 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.

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. The contractor shall provide a manufacturer 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. Contractor to 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 it's representative(s) for acceptance. Interim and final inspections shall be performed with Metrolinx or it's representative(s) present.

1.10.4. Regulatory Requirements: Furnish products listed and classified by CSA and ULC, as suitable for application, and shall be stamped accordingly

2. PRODUCTS

2.1. GENERAL

2.1.1. All receptacles and plugs shall comply with CSA, NEMA, 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 must 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 wash rooms.

2.1.8. Receptacles can meet the following requirement:

a) Corrosion resistant - 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 designed so that dust will 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., IP 20);

c) Power light- Electrical receptacles include a power light to indicate if they are live. The receptacle shall be illuminated to make connection easier in dim or dark work spaces;

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., IP-55, IP-44). Some devices shall be approved for moisture resistant, and under water applications.

2.1.9. Switched duplex receptacles shall be wired so that only the top receptacle is switched. The lower receptacle shall be un-switched.

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 receptacle with suitable cover shall be used in outdoor or we/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) are to be provided only with Metrolinx special permission.

2.2.3. Receptacles in communications rooms, electrical rooms, service rooms shall be 20 A 120 V duplex non-locking grounding type (5-20R).

2.2.4. Receptacle shall be suitable for minimum No. 10 AWG for back and side wiring.

2.2.5. Duplex Receptacles on Emergency Circuit: In rooms without emergency powered general lighting, the emergency receptacles shall be self-illuminated type and red colour.

2.2.6. Isolated ground receptacles shall only be used for outlets connected to the UPS power supply as indicated on the Contract Drawings.

2.2.7. GFCI receptacles indoors and outdoors. Ground Fault Circuit Interrupter (GFCI) Class A Duplex Receptacles

a) Shall be an integral unit, hospital-grade, suitable for 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 amperes, 125 V, 2-pole, 3-wire. Where a specialty control or communication box is installed requiring a duplex GFCI or regular receptacle with equipment, components transformers and the like it must be CSA or ESA approved with stickers.

b) Ground fault interrupter shall be consisting of a differential current transformer, solid state sensing circuitry and a circuit interrupter switch. Device shall have nominal sensitivity to ground leakage current of 4-6 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 second.

c) Shall have an uto-monitoring (self-test) manual test feature and reset switch.

2.2.8. Receptacles with integrated USB sockets

a) Extra Heavy duty industrial, single phase, 20 amperes, 120 V, 2-pole, 3-wire, non-locking grounding type NEMA/CSA 5-20R, with break-off feature for two-circuit operation and integrated USB sockets. This type of duplex receptacle shall be used in specific locations such aswork station areas in communication,electrical rooms, and waiting areas.

2.2.9. Colour coded in service rooms 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, 30A, 120V grounding type NEMA/CSA 5-30R are to be provided in Electrical and Communication rooms for emergency cooling.

2.3.2. Suitable 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 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. Consist of a duplex receptacle, mounted in box with a gasketed, weatherproof, cast metal cover plate and cap over each receptacle opening where acceptable code use. Rated single phase, 20 A, 120 V, 2-pole, 3-wire

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

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 it's representative(s)

2.7.2. All covers must be rated for use in the environment it is used and for the type of receptacle and box it is to cover. All covers are to 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 must have constant pressure butt-contacts with solid silver-nickel tips, 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 fully 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 compliance to NFPA 70E. Integral switching mechanism shall safe make and break of inductive loads

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

2.9.1. The 600V ac 3 phase 320 A unit complete with 120V dc safety loop controls receptacles and plus 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 are to be copper alloy silver plated. The Receptacle shell and putting adapter is to be aluminum alloy with a natural anodic finish. The plug barrel with a glove cable coupling nut with stranded cable adapter, mechanical clamp nut to be aluminum alloy with black hard coat anodic finish. These plug and receptacles are 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 Station Pearson Express (UPE) DMU consists. The plug and wayside cabinet receptacle must match the receptacle on the site. The cable must be multiple conductor flexible type as per the ones used for GO Transit. This consist will also 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 washrooms 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 5 m centers maximum, and at ceiling level for Christmas lights as directed by GO transit.

3.1.8. Tunnel and exterior building receptacles shall be GFCI type with weather proof cover, 125V, 20A, located at spacing to suit 15 m extension cords or as required by Metrolinx.

3.1.9. Other receptacle requirements (Refer to the DRM for further details)

a) Electrical/Mechanical Rooms - minimum 2 receptacles per room;

b) Station attendant room - electrical and communications outlets for computers and fare equipment, voice-links and alarms, etc., in millwork and walls and partitions.

c) Elevator and escalator machine room - as required by Code.

d) Maintenance facility, shop and garage receptacles shall suit equipment requirements.

e) Receptacles shall be provided for tenants and vending machines as required.

f) Communications room - minimum of 4 receptacles with 2 on emergency power, provide receptacles for racks.

3.1.10. Label all receptacles as per Section 26 05 23 – Electrical Identification and Nomenclature.

3.1.11. Mount receptacles at heights specified in Section 26 05 00 – Electrical General Requirement.

3.1.12. Test each receptacle for correct polarity and ground continuity. Test the manual trip and reset functions of each GFCI.

END OF SECTION