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**Board Staff Documents
Cross-examination Questions**

Oral Hearing

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Ontario Electrical Safety Code

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**Electrical
Safety
Authority**



**CANADIAN STANDARDS
ASSOCIATION**

This publication contains the complete text of CSA C22.1-09,
Canadian Electrical Code, Part I (21st edition), and Ontario
Amendments to that Code.

Ontario Electrical Safety Code

(Twenty-fourth edition)

consisting of

CSA C22.1-09
Canadian Electrical Code, Part I
Safety Standard for Electrical Installations
(Twenty-first edition)

AND

Ontario Amendments to CSA C22.1-09,
Canadian Electrical Code, Part I



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- *The Canadian Electrical Code, Part I, is a voluntary code for adoption and enforcement by regulatory authorities.*
- *The Canadian Electrical Code, Part I, meets the fundamental safety principles of International Standard IEC 60364, Electrical Installations of Buildings.*
- *Consult with local authorities regarding regulations that adopt and/or amend this Code.*

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Ⓐ Add Section 75 as follows:

Section 75 — Installation of lines and wiring of buildings

Ⓐ 75-000 Scope

- (1) This Section applies to
 - (a) installations of primary and secondary lines except for lines owned by a supply authority;
 - △ (b) poles and pole-mounted electrical equipment; and
 - (c) installation of electrical equipment in farm buildings and similar structures.
- (2) This Section supplements or amends the general requirements of this Code.

Ⓐ 75-002 Special terminology

In this Section, the following definitions apply:

ACSR — aluminum conductor, steel reinforced.

Classified — poles graded according to strength whereby the minimum circumferential dimensions are determined so that all poles of the same class, regardless of length, will withstand the same horizontal force applied 0.6 m from the top of the pole when supported 1.8 m from the butt end in accordance with CSA O15 series.

CMS — Central Metering System.

Distribution system — the system by which electrical power or energy is distributed to the receiving equipment and includes components such as primary line, secondary line, services, distribution transformers, distribution equipment, and other equipment of a similar nature.

Free-standing pole — a pole structure and base assembly that is installed with engineering direction without the use of guys.

Lines —

Primary line — a distribution system operating at more than 750 V but not more than 50 000 V phase-to-phase.

Secondary line — a distribution system operating at 750 V or less.

Neutral-supported cable — two or three insulated conductors and a bare neutral.

Open wire bus — a secondary line conductor with a weatherproof covering on the phase conductors and includes a bare neutral.

Penta — wood poles treated with pentachlorophenol.

- △ **Pole-mounted lighting systems** — a system of luminaires, poles, sign luminaires, underpass illumination, cables, power supply equipment, control system, and associated materials required to provide illumination on a roadway or associated appurtenances on private premises.

Power conductor — a conductor that conveys electrical power or energy and is not part of a communication circuit.

- △ **Roadway lighting systems** — a system of luminaires, poles, sign luminaires, underpass illumination, cables, power supply equipment, control system, and associated materials required to provide illumination on a roadway or associated appurtenances on a Municipal or a Provincial right of way.

Ⓐ △ 75-004 General requirements

- (1) Every installation under this Section shall be inspected in accordance with Section 2 of this Code.
- (2) Where the work consists of the installation of a service, the contractor shall consult the supply authority as to the layout of the service and the location of the transformer and meter, regarding compliance with applicable codes or standards under a rule or by-law of the supply authority.
- (3) Where the work consists of the installation of conductors over or under a railway, the contractor shall submit to the inspection department a plan of the crossing endorsed by the railway company with an approval of the work.
- (4) Where approval is required from the supply authority by this Rule, such approval shall be obtained prior to commencement of any work with respect to the installation.
- (5) Where a consumer desires to install the conductors of a primary or secondary line across a public road, the crossing shall not be made without written permission from both the supply authority and the authority having jurisdiction over the road and shall have the minimum clearance as specified in Rule 75-310(1).

A) Poles, guys, and framing equipment

75-200 Poles

All secondary line, primary line, and transformer poles shall be new, classified, and made of

- (a) wood;
- (b) steel;
- (c) concrete;
- Δ (d) fibre-reinforced polymer; or
- (e) other acceptable material.

75-202 Equipment attached to poles

- (1) No electrical equipment shall be attached to the poles of a supply authority without permission of the supply authority.
- (2) Equipment mounted on a pole shall be mounted on the same 1/3 continuous pole circumference leaving the remaining 2/3 of the continuous pole circumferences clear for climbing purposes.
- Δ (3) Stainless steel bands shall not be used as the sole support for electrical equipment installed on wooden poles.
- Δ (4) Electrical equipment installed on metal or concrete poles shall be permitted to be supported by stainless steel strapping and buckles that shall have a minimum support strength of 4.5 kN.

75-204 Joint use of poles for communications circuits and power conductors

Power conductors and communication circuits shall not be carried on common poles unless written consent for the joint use of the poles is obtained from the supply authority and the operators of the communication circuits.

Δ **75-206 Wood poles**

- (1) The pole "Species — Treatment" combinations listed in Table 102 are acceptable for new installations.
- (2) Notwithstanding Rule 75-200, pressure-treated pine and butt-treated western cedar poles for new lines can be re-used provided that the poles are classified, are not more than 10 years old, have no visible signs of damage, and their re-use is lawful under Rule 2-030.
- (3) Wood poles shall adhere to the following requirements:
 - (a) a transformer pole shall be a minimum of class 5 and in accordance with the requirements of Table 103;
 - (b) a single-phase primary line pole or a secondary line pole shall be a minimum of class 7; or
 - (c) a three-phase primary line pole shall be a minimum of class 5.
- (4) Notwithstanding Rule 75-200, a used wood pole may be used on secondary lines only after its condition has been checked by the inspection department and before the pole is set in the ground.

75-208 Marking of wood poles

All wood poles shall have the following marking:

- (a) butt marking showing
 - (i) type of wood;
 - (ii) supplier's code or trademark; and
 - (iii) class and length;
- (b) side markings located above the groundline in accordance with Table 104; and
- (c) side marking that shall include
 - (i) treatment plant;
 - (ii) class and length;
 - (iii) type of wood;
 - (iv) last 2 numerals of year of treatment; and
 - (v) preservation code letter.

75-210 Steel poles set directly in soil

Steel poles set directly in soil are acceptable subject to compliance with Rules 75-212 through 75-224.

75-212 Grounding of steel poles

- (1) The steel pole shall be permitted to be used as the grounding electrode for equipment mounted on the pole where the steel pole is directly embedded in soil and the portion of the pole in contact with the soil is not coated with any non-metallic coating or covering and such an installation is in accordance with the manufacturer's recommendations.
- (2) Where a pole is used as the ground electrode for the transformer, the transformer shall be bonded to the pole and the neutral in accordance with Specifications 44 and 45.

75-214 Guying of steel poles

- Δ (1) Notwithstanding Rule 75-250, guys directly attached to steel poles need not have a guy insulator, and the attachment hardware shall be suitable for the poles.
- (2) The number and placing of guys, in addition to meeting the requirements of this Code shall be in accordance with the manufacturer's recommendations.
- (3) The baseplate and top cap recommended by the manufacturer for the poles shall be installed.
- (4) Clamps for the neutral conductor shall be a type designed for the poles.
- (5) Spool-type insulating supports shall not be permitted.
- (6) A bolt to guard against pole splitting at the top shall not be required.
- (7) The distance from top of the pole down to the top bolt for pole line hardware shall be permitted to be 10 cm rather than the 15 or 20 cm used for wood poles.
- (8) Pole mounts for rock shall not be permitted.
- (9) Swamp cribbing shall be permitted to be used only where permitted by and in accordance with the manufacturers' instructions.

75-216 Steel pole installations in known corrosive soils (see Appendix B)

Additional below-grade corrosion protection shall be required for steel poles set directly in soil where there is knowledge or a history of aggressive corrosion of steel or iron in the soil.

75-218 Steel pole requirements

- (1) The poles shall be manufactured in compliance with the designs used to assign classes and other applicable requirements in CSA C22.3 No. 1.
- (2) The poles shall be galvanized.
- (3) Evidence of compliance with Subrules (1) and (2) shall be included in a report from a certification organization or from a professional engineer.
- Δ (4) Notwithstanding Rule 75-200, a used steel pole can be used on secondary lines only after it is authorized by the inspection department prior to being set in the ground.

75-220 Marking of steel poles

- (1) The poles shall be side marked above the ground line in accordance with Table 104, with manufacturer's code or trademark and with the last two digits of the year of manufacture, pole class, and length.
- (2) The pole class marking used for pole design loads shall have equivalency with the wood pole classes 1, 2, 3, 4, 5, and 6 as set out in CAN/CSA-O15, where the equivalency is based on the requirements for Grade 2 construction as defined in CSA C22.3 No. 1.

75-222 Insulators on steel poles

Insulators that may be mounted directly on grounded steel structures are specified in Table 100.

75-224 Depth of setting of steel poles

Depth of setting for steel poles shall be as shown in Table 104.

75-228 Concrete poles

Installations of concrete poles shall be in accordance with Rules 75-232 through 75-238.

75-230 Insulators on concrete poles

Insulators that may be mounted directly on grounded concrete poles are specified in Table 100.

75-232 Grounding of concrete poles

- (1) Each pole shall be installed with a grounding stud and shall be connected to the system neutral or ground rod to provide grounding for the reinforcing bars.
- (2) The reinforcing bars shall not be considered as a ground electrode.

75-234 Concrete pole selection

- (1) Accepted pole classes shall be in accordance with the equivalencies in Table 101.
- Δ (2) Notwithstanding Rule 75-200, a used concrete pole may be used on secondary lines only after its condition has been checked by the inspection department and before the pole is set in the ground.

75-236 Marking of concrete poles

The poles shall be side marked above the ground line in accordance with Table 104, with manufacturer's code or trademark, and with the last two digits of the year of manufacture, pole class, and length.

75-238 Depth of setting of concrete poles

Depth of setting for concrete poles shall be as shown in Table 104.

 75-239 Fibre-reinforced polymer poles (see Appendix B)

- (1) Fibre-reinforced polymer poles shall be manufactured in accordance with ASCE Manual 104, Recommended Practice for Fibre-Reinforced Polymer Products for Overhead Utility Line Structures.
- (2) Fibre-reinforced polymer pole shall be side marked above the ground line in accordance with Table 104, with manufacturer's code or trademark, and with the last two digits of the year of manufacture, pole class, and length.

B) General

 75-240 Length of poles

Subject to Rule 75-310,

- (a) every pole in a primary line shall be at least 12.2 m (40 ft) in length;
- (b) every pole in a secondary line shall be at least 9.2 m (30 ft) in length;
- (c) notwithstanding Items (a) and (b), in case of rock pole mounts approved in accordance with Rule 75-242(6)(b), the above pole lengths shall be permitted to be reduced by 1.5 m; and
- (d) notwithstanding Item (a), lesser pole lengths shall be acceptable for stand alone transformer pole installations, provided that the vertical height of any live part is at least 7 m (23 ft) above grade level.

 75-242 Setting of poles

- (1) Where a pole having a length shown in column 1 of Table 104 is set in earth, the butt end of the pole shall be buried to a depth at least that prescribed in column 2 of Table 104.
- (2) Where a pole having a length shown in column 1 of Table 104 is set in solid rock using a rock auger, the butt end of the pole shall be buried to a depth at least that shown in column 2 of Table 104, less
 - (a) 30 cm for fair rock and limestone; or
 - (b) 60 cm for solid rock, granite or massive limestone.
- (3) Where poles are installed on slopes or hillsides, the depth of the hole shall be measured from the lower side of the opening.
- (4) Corner and dead-end poles shall be offset away from anchor, or raked towards the anchor in accordance with Specifications 3 and 4.
- (5) Pole mounts are acceptable on rock, in accordance with Specification 5, when in accordance with a code or standard under a rule or by-law of the supply authority.
- (6) Where it is impossible to employ the above methods,
 - (a) poles shall be cribbed in accordance with
 - (i) Specification 6 — Swamp cribbing with steel culvert section for wood poles; or
 - (ii) Specification 7 — Swamp cribbing with steel culvert section for wood poles with butt of pole not reaching solid earth at normal setting depth.
 - (b) when bedrock is encountered, pole setting reduction using filled steel culverts as a partial substitute shall be permitted for normal soil setting depth, provided that
 - (i) the use of steel culverts is limited to situations where the lack of readily available equipment for rock removal (by blasting or drilling);
 - (ii) the number of steel culverts, when used, is limited to two adjacent pole locations; and
 - (iii) the installation is conducted in accordance with Specification 8.

 75-244 Pole spans and framing

- (1) Poles used in secondary lines shall be placed not more than 40 m apart.
- (2) Subject to Subrule (3), poles used in primary lines shall be placed not more than 90 m apart.
- (3) Poles used in primary lines shall be framed according to the following Specifications:
Specification 9 — Primary, 1-phase, 2.4 to 8 kV, maximum span 90 m.
Specification 10 — Primary, 1-phase, 2.4 to 16 kV, maximum span 90 m.
Specification 11 — Primary, 3-phase, 2.4/4.16 to 8.0/13.8 kV.
Specification 12 — Primary, 3-phase, 2.4/4.16 to 16/27.6 kV.
Specification 13 — Primary, 3-phase, line angles 4°–90°, 2.4/4.16 to 16/27.6 kV.
Specification 14 — Primary, 3-phase, crossarm, 2.4/4.16 to 16/27.6 kV.
Specification 15 — Primary, 3-phase, underbuilt, 2.4/4.16 to 16/27.6 kV.
Specification 16 — Primary, 3-phase, 44 kV.
Specification 17 — Primary, 3-phase, line angles 4°–90°, 44 kV.
Specification 18 — Primary, 3-phase, crossarm, 44 kV.

**75-246 Anchors**

- (1) Poles at dead ends or angles shall be anchored as follows:
 - (a) where a steel plate anchor is used, it shall be installed in the manner prescribed by Specification 19;
 - (b) where a log anchor is used, it shall be installed in the manner prescribed by Specification 20;
 - (c) where an expansion anchor is used, it shall be installed in the manner prescribed by Specification 21; or
 - (d) where a screw anchor is used, it shall be installed in the manner prescribed by Specification 22.
- (2) Where anchors are installed in
 - (a) solid rock, the anchors shall be installed in accordance with either Figure 1 or 2 of Specification 23; or
 - (b) shale or limestone, the anchors shall be installed in accordance with Figure 1 or 2 of Specification 24.
- (3) Power driven screw anchors shall be installed in accordance with the manufacturer's specifications.
- (4) All backfill associated with the installation of anchors shall be well tamped.

**75-248 Guy wires and guards**

- (1) Guy wires shall
 - (a) be of 7-strand steel;
 - (b) have a diameter of at least 9 mm; and
 - (c) be galvanized.
- (2) Arrangement of guys shall be in accordance with Specifications 25, 26, and 39.
- (3) Suitable guys shall be required for dead-ended temporary service that is mounted on a treated post and for spans greater than 10 m.
- (4) Notwithstanding Subrules (2) and (3), a guy is not required for dead-ended temporary service that is mounted on a pole and where the span does not exceed 10 m.
- (5) Guy guards shall be installed at all locations.
- (6) The guy guard shall be made of plastic and shall provide good visual identification for public safety.
- (7) Where two or more guys are attached to one anchor, a guy guard shall be installed on the upper guy only.
- (8) Guys shall not be required for support of a free-standing terminal pole where the specific pole installation includes a design drawing for the pole and supporting base, and the design drawing shall be from the pole manufacturer or shall be signed by a professional engineer.

**75-250 Strain insulator on pole guys**

- (1) Every guy shall have a strain insulator installed in the manner prescribed in Specification 25, and pre-formed guy grips suitable for the purpose may be used instead of 3-bolt clamps.
- (2) A second strain insulator at a point below the point of possible contact of the conductor and guy wire shall be installed in accordance with Specification 25 where
 - (a) the guyed pole carries a transformer or a fused switch; and
 - (b) the breaking of a guy wire could cause a part of the guy wire below the strain insulator to fall against a conductor carried by the pole.

**75-252 Anchoring for change of line direction**

- (1) Arrangement of guys and anchoring for change of line direction shall be in accordance with Specification 26.
- Δ (2) Arrangement of guys and anchoring for dead-end construction shall be in accordance with Specification 26.
- Δ (3) Transformer poles fed from underground circuits with no overhead distribution shall have three down guys placed approximately 120° apart and attached below the transformer.
- Δ (4) Subrule 3 does not apply to free-standing terminal poles.

**75-254 Span guy construction**

- (1) Where a span guy shall be installed, it shall be constructed in the manner prescribed in Specification 4.
- (2) Where the span between the guyed pole and stub pole crosses over or under conductors operating at a potential of more than 150 V to ground, a second strain insulator shall be installed in the span at a point between the power conductors and the guyed pole and not less than 2.5 m from the stub pole, in accordance with Specification 25.

**75-256 Guys on poles**

- (1) A guy wire shall be attached to the pole with an approved fitting shown in Item 1 of Specification 27 in the manner prescribed in Specification 3 and in such a way that there is no contact between the guy wire fitting or its mounting bolt and any ground wire on the pole.
- (2) Acceptable pre-formed guy grips may be used in place of the approved fitting mentioned in Subrule (1).
- (3) The back of an insulator through bolt shall not be used as an attachment point for guys.

 75-258 Anchor distance from pole

The distance of an anchor from its pole shall be at least one-third the height of the pole above ground.

 75-260 Hardware

All hardware shall be galvanized or corrosion resistant.

 75-262 Crossarms

- (1) Crossarms, if made of wood shall
 - (a) be Douglas Fir, Western Larch, Western Hemlock, Yellow Cypress, Jack Pine, or Lodgepole Pine; and
 - (b) have dimensions in accordance with Specification 29 and be at least 120 mm wide and 95 mm thick.
- (2) Steel crossarms shall have dimensions in accordance with Specification 30.

 75-264 Braces for crossarms on primary lines

-  (1) All crossarms shall have two braces, each 864 mm in length.
- (2) One piece, "V"-shaped crossarm braces shall be permitted.
-  (3) Notwithstanding Subrule (1), braces shall not be required if the crossarm is equipped with a mounting bracket designed to provide the equivalent support of braces.

 75-266 Insulators

Insulators shall be selected in accordance with Specifications 31, 32, 33, or Table 100.

 75-268 Warning signs

All poles carrying primary or secondary lines shall have the following warning sign: "Danger — Keep Off. If work on this pole or near wires is necessary, call a qualified person."

C) Primary and secondary line clearances and installations

 75-302 Clearances between power conductors and communication circuits

- (1) Electrical equipment, power conductors, communication circuits, and equipment shall be constructed and maintained so as to create no undue hazard to previously installed facilities.
- (2) Where power conductors and communication circuits are carried on separate parallel pole lines, such lines shall be spaced apart sufficient distance such that one line cannot fall upon the other line in the event of a pole breaking.
- (3) Where lines cross such that the conductors of one circuit may fall upon the conductors of another circuit, the power conductors shall be installed such that the clearance between the upper conductors at maximum sag and the lower conductors assumed to form a straight line between its points of support is at least in accordance with Specification 1, Item 4.
- (4) Where power conductors and communications circuits are carried on the same pole, the power conductors shall be installed such that the clearance between the upper conductors at maximum sag and the lower conductor complies with Specification 2.
- (5) Subrules (3) and (4) shall not apply to a service span from a pole to a building.

 75-304 Location of conductors on primary lines

- (1) Where primary line conductors cross other conductors of lower voltage, the conductors of the circuit having the highest voltage shall be installed above such other conductors of lower voltage and shall have minimum clearances in accordance with Specification 1, Items 1 and 2.
- (2) The neutral conductor associated with primary line shall be located below the phase conductors and shall have minimum clearances in accordance with Specification 1, Item 2 and shall be a minimum of 200 mm below the transformer.

 75-306 Clearances in service span

Where the voltage of power conductors is not more than 750 V, the distance between the power conductors and a communication drop-wire in the service span from a pole to a building shall be not less than 300 mm.

 75-308 Span with secondary service line attached to buildings or mobile homes

- (1) The span of neutral-supported cables, types NS75 and NS90, shall be not more than 38 m from the point where the secondary service line is attached to a building to the nearest pole.
- (2) Notwithstanding Subrule (1), the span shall be not more than 10 m from the point where the secondary overhead service line is attached to a mobile home or similar structure to the nearest pole or other point of attachment.

75-310 Primary and secondary lines clearances

- (1) The poles that support the phase conductor of a primary line shall be so located and of such height as to afford a clearance of 7 m measured vertically between the conductors under maximum sag conditions and the ground.
- (2) Notwithstanding Subrule (1) for high voltage line installations where plans are submitted for examination to the inspection department, the clearances listed in Table 34 are acceptable.
- (3) The primary line neutral shall be considered a secondary conductor and shall have the same minimum vertical clearance as specified in Subrule (4).
- Δ (4) Conductors of a secondary line shall have a minimum 6 m measured vertically between the conductors under maximum sag conditions and the ground.

75-312 Clearances of conductors from buildings

- (1) An overhead primary line conductor shall be kept at least 3 m at maximum conductor swing measured horizontally from a building.
- (2) Primary line conductors shall not be installed over buildings unless the installation is lawful under Rule 2-030, and work shall not begin until the plans and specifications for the work are approved in accordance with Rule 2-010.
- (3) No building, mobile home or structure shall be placed or constructed within at least 3 m at maximum conductor swing measured horizontally from the nearest conductor of an overhead primary line.
- Δ (4) Where the conductor swing is not known, a distance of 1.8 m shall be used.
- Δ (5) An overhead secondary line conductor shall be kept at least 1 m measured horizontally from any building except where necessary to connect to the electrical wiring of a building.

75-314 Clearances for other structures

- (1) Notwithstanding Rule 36-110, conductors of a primary line shall
 - (a) not be located closer than 12 m measured horizontally from silos to the closest conductors, with the conductor at rest;
 - (b) not be located over wells from which pump rods may be lifted and come in contact with the conductors;
 - Δ (c) have sufficient clearance from free-standing poles that support flood or area lighting, flagpoles, antennae, or other similar structures so as to permit the structure to fall in an arc, without touching the conductors at rest;
 - (d) not be located within 6 m, measured horizontally from wind-mills or similar structures to the closest conductor, with the conductor at rest; and
 - (e) have a minimum vertical clearance of 3.1 m above fencing at maximum sag.
- (2) Conductors of a secondary line shall not be installed closer than 1 m measured horizontally from structures.
- (3) The poles and equipment associated with a primary or secondary line shall be located and suitably protected so as to avoid the possibility of damage from contact with vehicles.

75-316 Overhead conductors

Primary line conductors shall be bare and not less than No. 2 AWG ACSR.

75-318 Sag between poles

Open wire bus, neutral-supported cable, and ACSR shall be installed so that the sag of the conductors between poles is determined by using Tables 105 or 107 to 112 whichever is applicable to the size and type of conductor being installed and with respect to applicable span and temperature.

75-320 Sag between pole and building

Open wire bus, neutral-supported cable, and ACSR shall be installed so that the sag of the conductors between a pole and a building is determined by using Tables 105 or 107 to 112, whichever is applicable to the size and type of conductor being installed and with respect to applicable span and temperature.

75-322 Compression connections

Compression connectors are required for all overhead current carrying connections.

75-324 Attachment of secondary service conductors

- (1) Secondary service conductors shall
 - (a) terminate on a dead-end rack of a type shown in Specification 35;
 - (b) be attached to a pole in accordance with either Specification 36, 37, 38 or 39; or
 - (c) be attached to the timber framing of a building by a one-wire rack such as shown in Figure 1 of Specification 35.

- △ (2) Where it is necessary to install an approved service mast to meet the requirements of Rule 6-112, the mast shall be attached to the building as shown in Specification 28 and guyed, if necessary, in accordance with the Note to Specification 28.

 75-326 Tree trimming

- (1) The owner of a private line shall provide clearance to the line from trees and other forms of woody growth in compliance with a code or standard under a rule or by-law of the supply authority concerning tree trimming.
- (2) Where there is no applicable code or standard under a rule or by-law of the supply authority concerning tree trimming, all trees and woody growth adjacent to a line shall be trimmed so that minimum clearance to the nearest conductor horizontally at maximum conductor swing and vertically at a maximum sag shall be
- (a) 1 m for secondary lines; and
 - (b) 4 m for primary lines.

 △ **75-328 Submarine power cable**

Submarine power cables shall be manufactured to one of the following Standards:

- (a) ICEA S-95-658/NEMA WC70;
- (b) ICEA S-96-659/NEMA WC71;
- (c) ICEA S-93-639/NEMA WC74; or
- (d) CSA C68.10.

D) Grounding and bonding

 75-402 Crossarms

Where porcelain dead-end insulators are used, steel crossarms shall be connected to a ground electrode with a conductor of not less than

- (a) No. 4 AWG stranded bare copper conductor for 27.6 kV and below; and
- (b) No. 1/0 AWG stranded bare copper conductor for voltages greater than 27.6 kV.

 △ **75-404 Grounding overhead installations**

Grounding for pole-mounted equipment, hardware, crossarms, and/or a system neutral shall be installed in accordance with Specification 34.

 75-406 Grounding conductors

- (1) Metal guards or metal conduit shall not be used as protection for a grounding conductor in locations accessible to livestock.
- (2) A grounding conductor run underground to a ground electrode shall
- (a) be buried in the earth to a depth not less than 250 mm below the ground level;
 - (b) not be located within 3 m of a doorway; and
 - (c) not be located in an area normally frequented by livestock.

 △ **75-408 Grounding the service box on a transformer pole**

- (1) Where a service box is installed on a transformer pole and the supply authority owns the transformation,
- (a) the pole-top equipment/system ground conductor and ground electrode shall be installed at the pole by the supply authority;
 - (b) the contractor shall install a grounding conductor, connect one end to the identified neutral conductor in the service box, bond it to the non-current carrying metal parts of the electrical equipment, and extend at least 500 mm of the ground conductor outside of the service equipment for connection to the supply authority ground conductor; and
 - (c) the supply authority shall connect the service ground conductor to the supply authority ground wire.
- (2) The neutral conductor shall be installed and connected in the service box.
- (3) The neutral conductor shall be installed with both the line and the load conductors on the service pole.
- (4) Where the transformation is privately owned, the owner shall supply and install all grounding and bonding.

 △ **75-410 Neutral voltage mitigation devices installed on transformer poles**

- (1) The device shall be approved.
- (2) All grounding conductors shall be insulated (minimum 600 V) and shall be not less than No. 4 AWG copper.
- (3) Each grounding conductor shall have mechanical protection up to the neutral voltage mitigation device in accordance with Specification 34.
- (4) Primary and secondary ground electrodes shall be spaced not less than 5 m apart.

- (5) A permanent warning sign shall be installed directly below the device and shall read: "WARNING — Primary and secondary grounding conductors shall be interconnected prior to disconnecting this device for service or removal" or the equivalent.



75-412 Multiple grounding on primary lines system neutral

- (1) The system neutral on primary distribution lines shall be multi-grounded.
- (2) The standard number of grounds per km of circuit shall be 4.
- (3) The neutral potential shall not exceed 10 V rms to a remote ground at any point under steady-state conditions.

E) Services



75-502 Guys on service masts

- (1) Where the distance from the upper support clamp on the service mast to the point of attachment exceeds 1.5 m, or where the span exceeds 30 m, or the weather loaded tension is known to exceed 270 kg (600 lbs), the mast shall be guyed in accordance with Specification 28.
- (2) Guy wires shall
 - (a) be of stranded steel;
 - (b) have a diameter of at least 6 mm (1/4 in); and
 - (c) be galvanized or corrosion resistant.



75-504 Service box installation

- (1) When metering equipment is installed outdoors, the midpoint of the meter shall be located 1750 ± 100 mm, from finished grade, in accordance with Specifications 28 and 40.
- (2) Where a service box is installed on a transformer pole, no equipment other than that shown in Specification 40 shall be placed on the pole, except that one temporary service may be attached in addition to the permanent service.
- (3) Service boxes shall not be installed on poles located on a public road.
- (4) The following requirements shall apply to the Central Metering System (CMS):
 - (a) a standard pole-mounted distribution transformer without a secondary breaker or pole-mounted switch shall be used to supply multi-building installations;
 - (b) the method of entry of conductors into a building shall be in accordance with Rules 6-206 and 6-302;
 - (c) each building shall have a main service box at point of entry;
 - (d) the service equipment shall be bonded to the neutral;
 - (e) a ground electrode shall be installed at each service box in accordance with Rule 10-700;
 - (f) new overhead yard wiring shall be
 - (i) neutral-supported cable with a minimum of No. 2 AWG aluminum, and when in parallel, shall comply with Rule 12-108; and
 - (ii) notwithstanding Item (i), open wire bus shall be permitted where circuit ampacity exceeds 200 A;
 - (g) the minimum ampacity of overhead or underground conductors feeding more than one service or building shall be based on 80% of the sum of the ratings of all service boxes supplied;
 - (h) transformer pole hardware and metering equipment shall be in accordance with Specifications 41, 42, and 43;
 - (i) if metering is located on other than a transformer pole, the meter socket shall be connected to the ground electrode and the system neutral in accordance with Specification 34;
 - (j) pole-top switches shall be installed to the following requirements:
 - (i) the switch shall be approved for the purpose;
 - (ii) the minimum rating of a transfer switch shall be equal to or greater than 80% of the sum of all service boxes supplied;
 - (iii) the minimum clearances on the pole shall be those shown on Specification 41;
 - (iv) underground services shall be in accordance with the requirements of Rule 6-300; and
 - (v) pole-top transfer switches used in conjunction with Central Metering Systems shall be installed in accordance with Specification 41;
 - (k) all equipment mounted on a pole shall be mounted on the same 1/3 continuous pole circumference leaving the remaining 2/3 of the continuous pole circumference clear for climbing purposes; or
 - (l) CMS-type service shall not have more than four subdivisions of the service extending from one pole.

F) Installations of electrical equipment

Δ 75-602 Pole-mounted luminaires

- (1) Where pole-mounted luminaires are installed on poles carrying the conductors of a primary line, the luminaire shall be at least 3 m below the primary conductors.
- (2) Where luminaires are installed on a pole, there shall be signs cautioning that high voltage is present and advising that lamp changing shall be done only by qualified persons.
- (3) Notwithstanding Subrule (1) where the supply authority owns the pole-mounted luminaires, the clearance requirement does not apply.
- (4) Where pole-mounted luminaires are controlled from more than one point by switches, each switch shall be wired and connected so that the identified (neutral) conductor runs directly to the luminaire(s) controlled by it.
- (5) The identified conductor of the circuit supplying the pole-mounted luminaire shall be permitted to be connected to the neutral conductor of a feeder or subfeeder.
- (6) Each lighting circuit shall have adequate overcurrent protection, for example, a weatherproof in-line fuseholder assembly is acceptable for this purpose.
- (7) All non-current-carrying metal parts of a luminaire shall be bonded to ground in accordance with Section 10.

Δ 75-604 Roadway lighting systems

- (1) Roadway lighting systems shall be installed in accordance with Rule 2-024(3) and Rules 30-100 to 30-1036, except that Rule 30-1006(1) need not apply.
- (2) In-line fuseholders shall be acceptable to satisfy the requirements of Rules 30-1002 and 30-1008, for single luminaires fed from overhead distribution systems where a dedicated roadway lighting bus is not available.

Δ 75-606 Aerially supported cables

- (1) Overhead cables shall be neutral-supported cables of Type NS75 or Type NS90.
- (2) Individual conductors of the moisture-resistant, rubber-insulated type suitable for exposed wiring where exposed to the weather as specified in Table 10 and cabled together with a messenger cable, shall be
 - (a) stranded; and
 - (b) not less than No. 12 AWG copper or No. 10 AWG aluminum.

G) Farm buildings

Δ 75-702 Grounding/bonding in milking areas

- (1) Livestock waterers, wire mesh, grates, metallic water pipes, stanchions, water bowls, vacuum lines, grain feeders, gates, support posts, and other metals shall be bonded together by a separate stranded copper conductor not smaller than No. 6 AWG.
- (2) The metallic equipment bonded in Subrule (1) shall be grounded and connected to the system neutral ground at the distribution panel by a separate single-stranded copper conductor not smaller than No. 6 AWG.
- (3) In milking parlours, concrete floors shall have a No. 9 gauge wire mesh, dimensions 15 × 15 cm (6 × 6 in), and bonding and grounding shall comply with Subrules (1) and (2).

Roadway Lighting Systems

**Rules 2-024(5) (page 15),
30-1000 (page 164) to 30-1036 (page 166)
and Section 75 (page 241)**

Scope

This bulletin covers all Roadway Lighting Systems and similar installations on a Municipal or a Provincial right of way and all electrical work and electrical equipment associated with, or connected to these systems.

Effective Date

This bulletin shall become effective on January 1, 2003. Projects designed or tendered prior to the implementation date will be exempt from this process.

Direction

Systems and similar installations that shall meet the requirements of the Ontario Electrical Safety Code include but are not limited to the following: Tunnel Lighting, Pedestrian Lighting, Spot Lighting, Illuminated Street Signs, and Decorative Lighting Circuits.

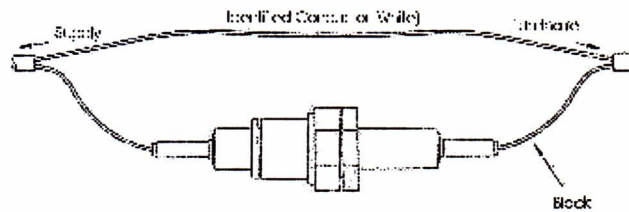
Definitions (for the purposes of this document)

Roadway Lighting Systems: a system of luminaires, poles, sign luminaires, underpass illumination, cables, power supply equipment, control system and all associated materials required to provide illumination on a roadway or associated appurtenances.

Service Equipment Requirements

Roadway Lighting Systems shall meet the service entrance requirements of Rule 30-1002

Exception: A single street light fixture shall be permitted to be connected within an existing overhead street lighting circuit by an inline fuse enclosed in a weatherproof fuse holder. The fixture bonding requirements shall be in accordance with Rule 30-1030.



Ontario Electrical Safety Code Exceptions

Rule 30-1006(1) warning sign requirements need not apply to Roadway Lighting Systems

Rules 30-1100 to 30-1122 do not apply to Roadway Lighting Systems

The requirements of Section 75 do not apply to Roadway Lighting Systems.

Receptacles fed from Local Distribution Companies (LDC) or Street Lighting Circuits (See Diagrams)

Where receptacles are installed for decorative lighting and are fed from a LDC or street lighting circuits, the code shall apply to the receptacle circuit.

Exceptions

Where an existing circuit is to supply new receptacles, intended for decorative lighting, inline fuse holders shall be permitted in lieu of service entrance equipment where:

- Ground Fault Circuit Interrupter (GFCI) of the Class A Type protection is provided and;
- Any circuit less than 1.5m above grade is
 - Mechanically protected or
 - Installed in Rigid Metallic Conduit complete with metallic weatherproof boxes, intended to reduce the likelihood of damage, and;
- Where there is no equipment bonding conductor present at the existing installation, a new bonding conductor shall be established by connecting a bond wire, on the supply side of any GFCI protection, to the system neutral.

Note 1: This shall only be allowed where the system neutral is multi-grounded and is connected to a grounding electrode within 5 pole spans, in either direction, of this connection. The neutral potential must not exceed 10 volts under steady state conditions.

Note 2: Refer to Rule 2-132. "Ground fault circuit interrupters shall be permitted as supplementary protection from shock hazard but shall not be used as a substitute for insulation or grounding..."

Diagram #1

Decorative Tree Lighting Receptacles

Where a Complete and Confirmed Road Patch IS Available at the Site

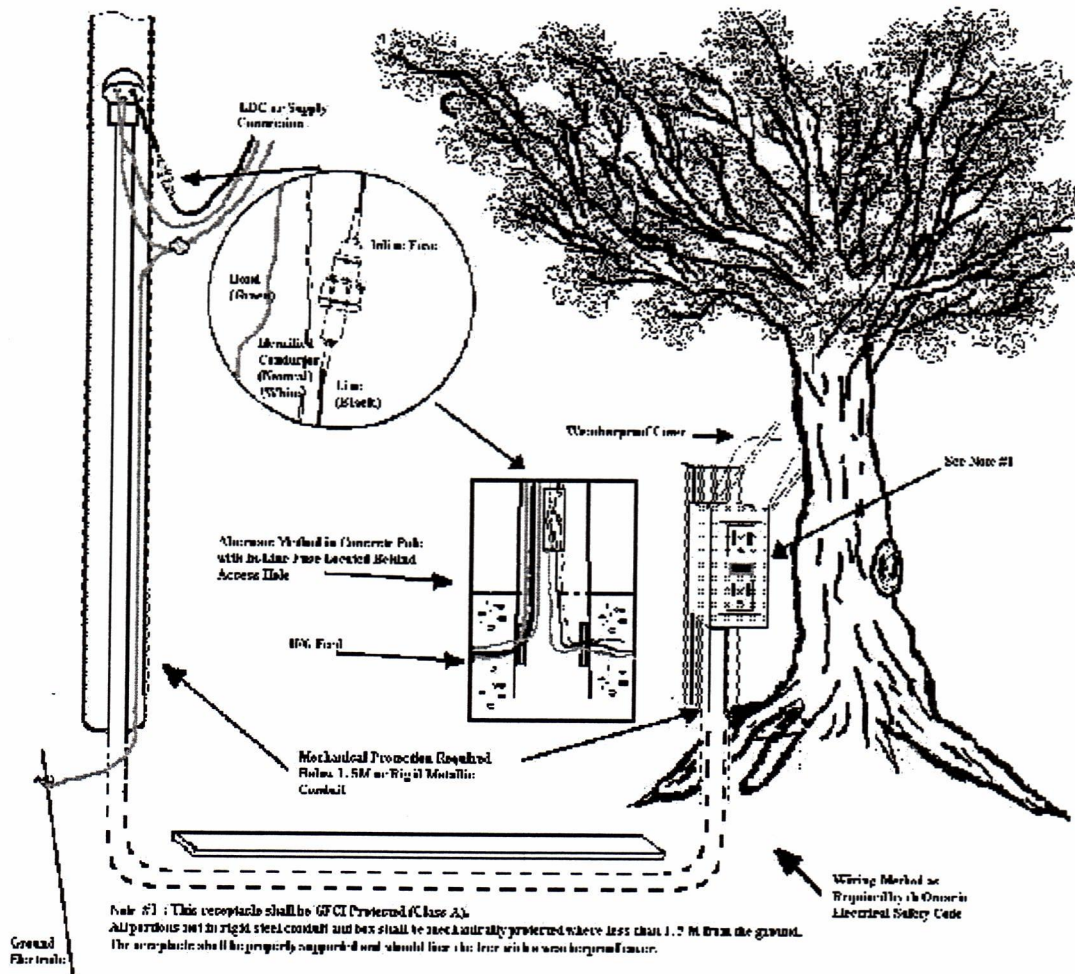


Diagram # 3

Decorative Lighting Requirements

Where a Complete and Confirmed Bond Path IS NOT Available at the Same

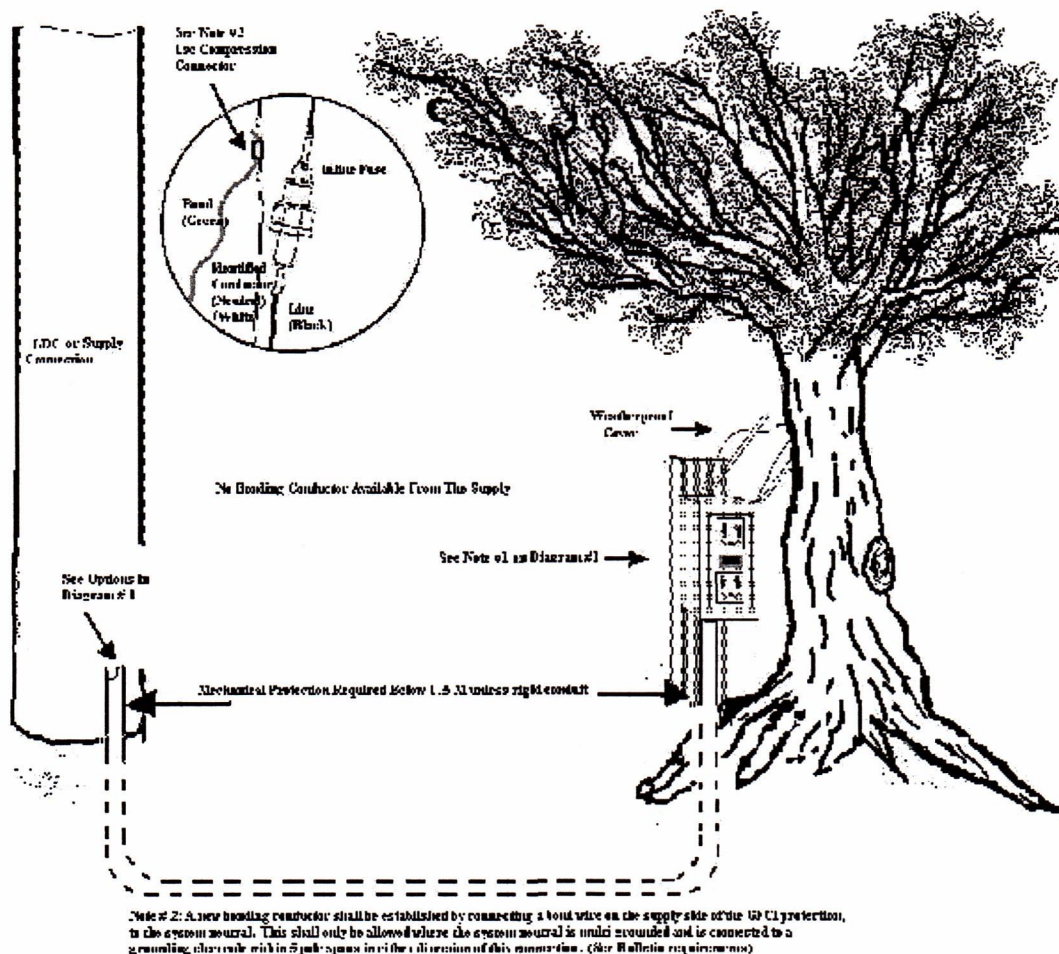
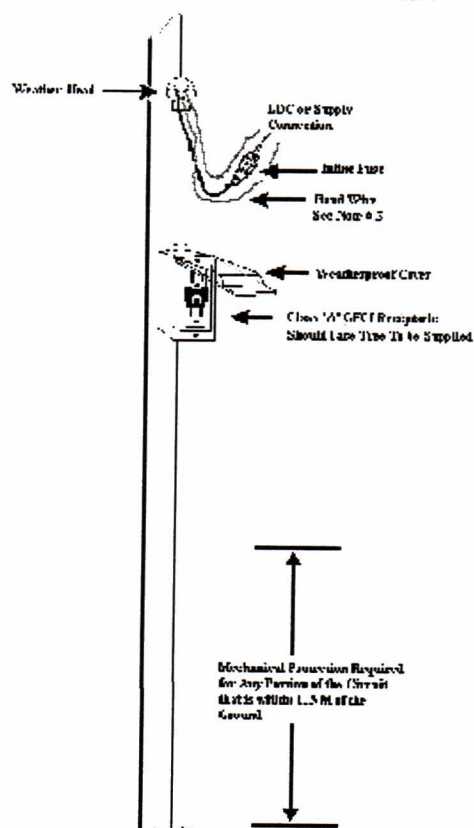


Diagram 6.3

Decorative Tree Lighting Receptacle

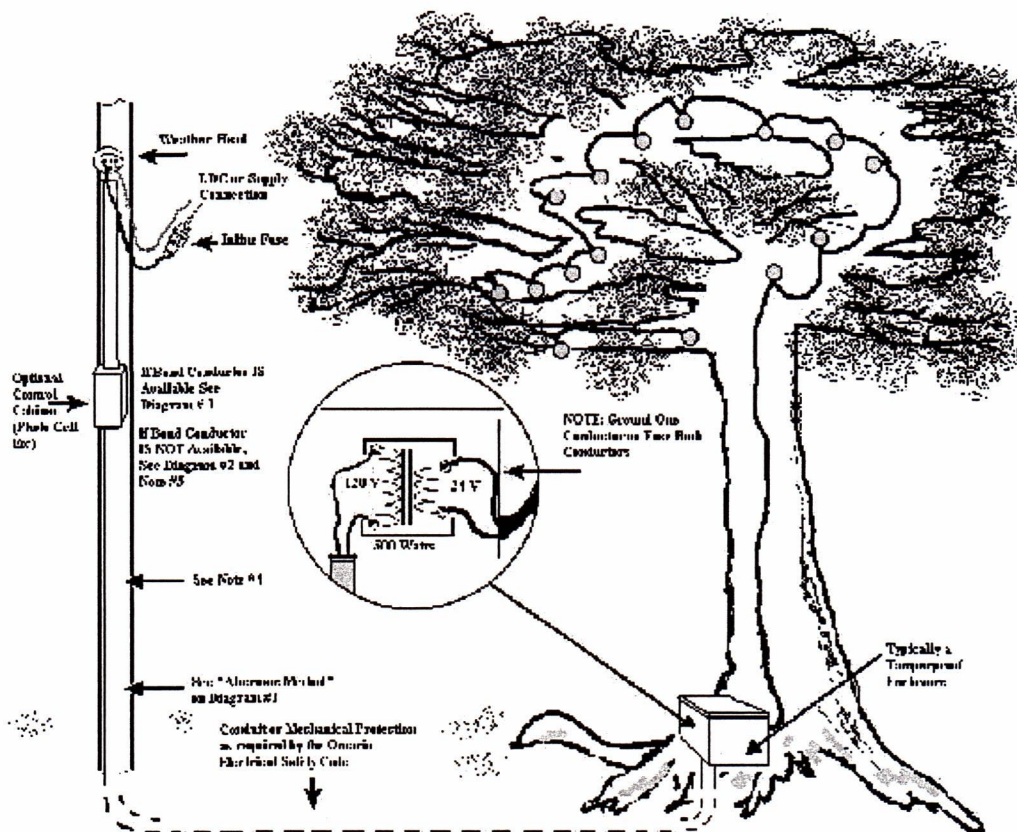
Minimum Allowance 2.5M



Note 4.3: A new bonding conductor shall be established by connecting a bond wire on the supply side of the GFCI protection, in the system neutral. This shall only be allowed when the system neutral is earth grounded and is connected to a grounding electrode within 5 pole spans in either direction of this connection. (See Bulletin requirements)

Diagram #4

Ultra Low Voltage Tree Lighting System



Note #4: All portions of the rigid metal conduit and box shall be mechanically protected where less than 1.5M from the ground.

Note #5: A new bonding conductor shall be established by connection a bondwire, at the point of attachment, to the system neutral. This shall only be utilized where the system neutral is metal grounded and is connected to a grounded electrode within 5 pole spans in either direction of cable connection. (See Bulletin synchronous)

Approval of Equipment

Service entrance switches, inline fuse holders, fuses and GFCI's shall be approved for their intended use. Roadway lighting system equipment need not be approved, but shall be manufactured to the **Canadian Highway Bridge Design Code (CHBDC)**, **Municipal Standards (MS)** or the **Ontario Provincial Standard (OPS)**. The Electrical Safety Authority may permit other standards, subject to review.

Rationale

Equipment manufactured to the **CHBDC**, **MS** or **OPS** standards have become an acceptable Ontario industry practice.

Roadway lighting systems by their nature must be able to withstand the elements. They are part of a life safety system that requires them to be robust.

These items pose no fire or shock hazard when installed and maintained properly and can be accepted as part of the wiring installation as per Rule 2-024(5)



Update: Ownership Demarcation Point

PURPOSE: The purpose of this document is to clarify the concept of ownership demarcation point. Since the introduction of Regulation 22/04 ownership demarcation has been an ongoing issue. Electrical Inspectors must know the demarcation point location in order to correctly apply the requirements of the Ontario Electrical Safety Code.

DEFINITION: The ownership demarcation point is defined as:

- (a) The point at which the distributor's ownership of a distribution system, including connection assets, ends at the customer, and
- (b) Is not located beyond,
 - (i) The first set of terminals located on or in any building, or
 - (ii) An electrical room or vault in a building where the electrical room is of tamperproof construction, bears a sign to indicate that it is an electrical room or vault and is accessible to authorized persons.

CONTACTS: The distributor has historical site-specific customer information and will know the ownership demarcation point location.

SCENARIOS: The location of the ownership demarcation point can be unique for each customer, however the following scenarios are typical.

Residential - Secondary Supply Services owned and maintained by the distributor

The ownership and demarcation point is typically located at:

- (i) The top of the customer's service entrance stack for overhead services
- (ii) The line side of the customer's meter base for underground services

Commercial and Industrial - Secondary Supply Services owned and maintained by the distributor

The ownership and demarcation point is located at:

- (iii) The top of the customer's service entrance stack for overhead services
- (iv) The line side of the customer's meter base for underground services or
- (v) The line side of the customer's junction box or vertical raceway

Customer Owned - Secondary Supply Services

The ownership demarcation point is located at:

- (vi) The secondary connection at the transformer or the service bus or at the property line.

Primary Supply Service Residential and Commercial Customers

The ownership demarcation point is located at:

- (vii) At the secondary terminals of the transformer, when the transformer is owned by the distributor
- (viii) At the supply terminals of the customer's primary disconnecting device when the transformer is owned by the customer



Electrical Distribution Safety

After May 11, 2004, Ontario Regulation 22/04 requires that if a distributor intends to change the demarcation point or transfer the ownership of a distribution system to a person who is not a distributor then on completion of the transfer the system is subject to the Ontario Electrical Safety Code requirements. The distributor must inform the customer and ESA in writing of these changes. In addition, a report identifying any modifications that are required to meet the Ontario Electrical Safety Code must be provided to the customer and ESA.

If in the course of an inspector's duties, there is a requirement to identify the ownership demarcation point, the inspector should contact the distributor and ask that they provide a written confirmation of the ownership demarcation point. If a dispute arises between a customer and a utility in regards to the demarcation point, it is not the responsibility of the inspector to solve or mediate the dispute. The inspector will allow the customer and the distributor to reach a satisfactory resolution, and once informed of their decision, can then apply the applicable Ontario Electrical Safety Code rules.