

### CANADIAN ELECTRICAL CODE

**SUBJECT:** Section 12 – Wiring Methods

#### Conductors General

##### Insulation Thickness on Conductors Used in Ungrounded or Impedance Grounded Systems

With the change in the conductor standards, RW90 conductor is now available with a voltage rating of 600V. The suitability of this conductor on 600V ungrounded and impedance grounded systems, where past practice has been to use 1000 V conductors, has been questioned.

Electro-Federation C A N A D A has issued a paper explaining that the insulation thickness on low voltage conductors is intended for mechanical strength as well as insulation value. Therefore, it is thicker than would be required for insulation value alone. Based on this, the wire and cable manufacturers have agreed that 600V RW90 rated cable is suitable for use on 600V ungrounded or impedance grounded systems.

##### **Rule 12-012 Underground Installations**

###### Mechanical Protection for Direct Buried Conductors

The Appendix B Note on Rule 12-012 indicates that polyethylene water pipe in conformance with CSA Standard B137.1, Polyethylene Pipe for Cold Water Services is considered acceptable for mechanical protection of conductors or cables used for direct earth burial.

Although acceptable for mechanical protection of conductors or cables installed underground, this material is not approved as a wiring material and should not be installed as a raceway inside buildings.

###### Protection of Conductors and Cables

A review of Rule 12-012(5) indicates that it is intended to apply to cables other than armoured cable, mineral-insulated cable and aluminum-sheathed cable. Requirements for mechanical protection of these cables are stipulated in Rules 12-604 and 12-710 (see comments on Rule 12-604 below).

##### **Rule 12-120 Supporting of Conductors**

###### Use of Cable Ties

The Provincial Code Advisory Committee has questioned the use of cable ties (TY-RAPS). The code mandates the use of approved (see Rule 2-024) straps and other devices to support cables and conduit or EMT. However, cable ties used for *securing* need not be approved.

Issue of this STANDATA is authorized by  
the Chief Electrical Administrator



[Original Signed]

Clarence C. Cormier, P.Eng.



SAFETY CODES COUNCIL

“Securing” should not be confused with “support” (i.e., TECK cable in a horizontal run of cable tray is supported by the tray and may be secured to the tray with cable ties). Another application where cable ties need not be approved is when conductors or cables are permitted to be bundled.

The need to exercise good judgement is necessary in certain situations. A cable in a vertical run of cable tray may be interpreted as requiring support in long runs but only need to be secured where the length of run is relatively short.

### **Rule 12-306 Conductor Supports**

When using wood poles to support overhead conductors, the following guidelines are recommended:

The poles should be treated with an acceptable preservative to prevent premature rotting and:

- (a) Be of sufficient length to provide the conductor clearances specified in Rule 6-112
- (b) Be guyed where necessary to maintain the specified clearances
- (c) Have a minimum circumference at the top of 430 mm
- (d) Have a minimum circumference measured at a point 1.8 m from the butt of:
  - (i) 700 mm - for poles not exceeding 7.7 m in length; or
  - (ii) 760 mm - for poles exceeding 7.7 m but not exceeding 9.2 m; or
  - (iii) 810 mm - for poles exceeding 9.2 m but not exceeding 11.0 m; or
  - (iv) 860 mm - for poles exceeding 11.0 m but not exceeding 12.2 m; and
- (e) Be set in the ground a minimum depth of:
  - (i) 1.5 m - for poles not exceeding 7.7 m in length; or
  - (ii) 1.6 m - for poles exceeding 7.7 m but not exceeding 9.2 m; or
  - (iii) 1.8 m - for poles exceeding 9.2 m but not exceeding 12.2 m;

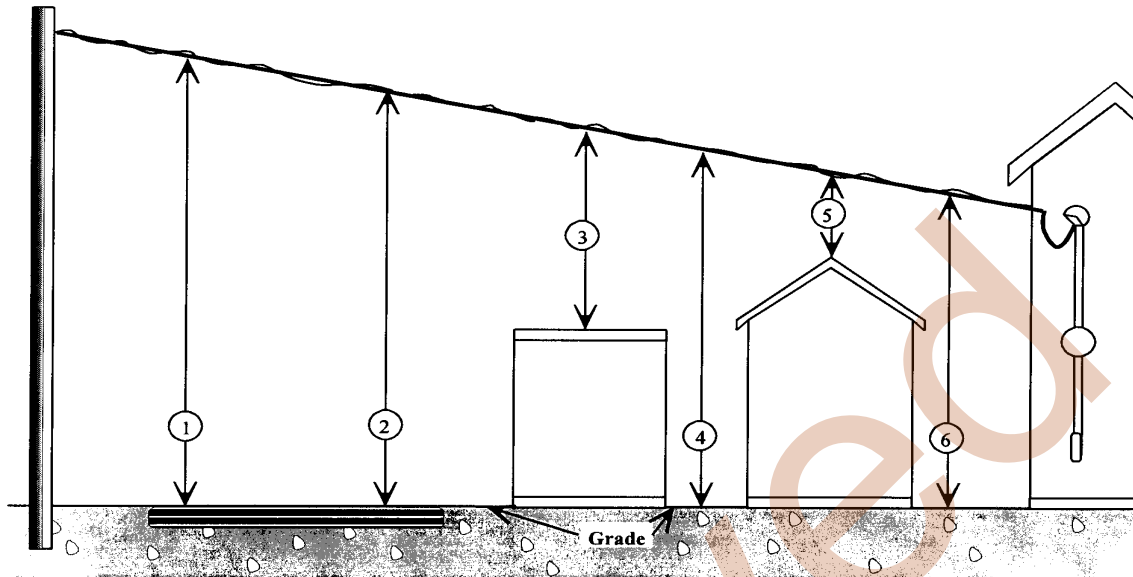
except that for poles set in rock, concrete, or fabricated bases, this depth may be reduced.

### **Rule 12-310 Clearance of Conductors**

Although the Canadian Electrical Code does not specifically prescribe conductor clearances for overhead conductors that are not service conductors, the clearance requirements of Rule 6-112 for service conductors are used. Farms are interpreted as commercial /industrial premises and the 5m clearance in 6-112 is recommended.

Clearances for conductors over buildings are required to be 2.5m over flat roofs and at least 1m over peaked roofs. Where metal roofing is involved, a 3m clearance is recommended. Buildings of this type may require a supporting mast so that at least a 3m clearance over the roof can be maintained.





- Legend:
- 1) Across highways, streets, lanes, and alleys: 5.5m
  - 2) Across driveways to commercial and industrial premises: 5m
  - 3) Over flat roofs: 2.5m (3m if of metal)
  - 4) Across driveways to residential garages: 4m
  - 5) Over peaked roofs: 1m (3m if of metal)
  - 6) Across ground normally accessible to pedestrians: 3.5m

Conductor clearances for electrical utility installations are prescribed in the Alberta Electrical Utility Code.

**Rule 12-516 Protection for Cable in Concealed Installations**

Non-metallic sheathed cable should not be run horizontally through sections of a building where it is known that cupboards or other fixtures will be installed that may require the use of long mounting nails or screws that could pierce the cable. Unless the wall construction is such that horizontally run cables are at least 50 mm from the outer edges of the wooden members, cables should be protected by protection plates or sleeves of 16 MSG steel or the equivalent.

**Rule 12-604 Protection for Armoured Cables in Lanes**

Rule 12-604 indicates that unless otherwise protected, armoured cable must be protected with steel guards where located less than 2 m above grade in lanes and driveways. However, the cable may be subject to similar damage in other locations. To meet the intent of Rule 12-604, armoured cable located in areas where the cable may be subject to mechanical damage from vehicles or equipment must have mechanical protection for 2 m above grade.

Where underground cables extending to an overhead supply system are intended to be installed on a supply authority's pole, mechanical protection should be provided by non-metallic conduit or similar non-metallic material. Please contact the local supply authority before placing cables on their pole.



**Rule 12-606 Use of Thermoplastic Covered Armoured Cable**

Armoured cables having an overall outer covering, such as Type ACWU and Type TECK, must be provided with mechanical protection where necessary to ensure the outer covering is not subject to mechanical damage as stated in Rule 12-606. Cables having an overall outer covering that are used in hazardous areas must be installed in a manner that will not subject the covering to mechanical damage either during or after installation.

**Rule 12-904 Conductors in Raceways**Separation of Conductors in Cable Trays

For Cable Tray installations involving Type TC Tray Cable, the outer coverings on adjacent cables are interpreted as providing the required separation between the conductors in accordance with Rule 12-904(2)(b), provided the combined thickness of the outer jackets is at least equal to 1.5 mm.

**Rules 12-1104, 12-1154, 12-1508 Temperature limitations**

The Appendix B note to Rules 12-1104, 12-1154, and 12-1508 reads; *“Tests show that 90 °C conductors, continuously loaded, under conditions of 50% fill and 30 °C ambient, do not result in a temperature exceeding 75 °C. Conductors having insulation ratings in excess of 90 °C may be used in PVC conduit, provided that the ampacity is derated to 90 °C.”*

The 90°C ampacity in the 2012 code is intended to maintain conductor temperatures below 90°C, with a safety margin. The calculations of temperature achieved under various conditions have not been done, but the safety margin would almost certainly not keep the temperature below 75°C. The Appendix B note no longer applies.

**Rule 12-1114 Maximum Spacing of Conduit Supports**Use of Stand-offs To Support Conduit Risers on Supply Authority Poles

The Alberta Electrical Utility Code (EUC) has requirements for mounting equipment on poles to discourage unauthorized climbing. Where the supply authority requires stand-offs and the required distance between supports exceeds that required in the Canadian Electrical Code, Part I, for the raceway, the following is recommended:

Rigid PVC or HFT conduit with a trade size of 63 or larger will be acceptable with spacing between supports of 2.5 m, at one point only, to comply with the EUC requirement. Spacing between supports for the balance of the riser is to comply with Rule 12-1114. This raceway may be installed as a continuous run, or as a sleeve to support a raceway with a smaller trade size. Please contact the local supply authority before placing any equipment on their pole.

**Rule 12-1402 Use (of Electrical Metallic Tubing)**

Installations where Electrical Metallic Tubing (EMT) is subject to excessive vibration are considered “subject to mechanical injury” as referenced in paragraph (a) of this rule. You are cautioned to avoid using EMT in these situations. Some examples of where vibration may be “excessive” are gravel crushers, saw mills, planer mills, etc.



## Rule 12-2202 Conductors in Cable Trays

### Installation of Bonding Conductors in Cable Tray

Although a green insulated single conductor is permitted as the bonding conductor in cable trays, it must be flame tested in compliance with Rule 2-126. Wire and cable certified to CSA Standard C22.2 No. 75 Thermoplastic Insulated Wires and Cables (ie: Type TW, TWU, etc.) has been flame tested to the Vertical Flame Test, equivalent of that recognized by the FT1 mark.

Wire and cable certified to CSA Standard C22.2 No. 38, Thermoset Wire and Cable, (ie: RW, RWU XLPE) however, has no mandatory flame test requirement. Such wires or cable would not be acceptable for installation in a cable tray unless specifically tested and marked accordingly.

The Alberta Building Code contains flame spread requirements for wire and cables as indicated in Rule 2-126 of the Canadian Electrical Code. In order to meet the requirements for wire and cable in non-combustible buildings, it will be necessary to use materials or installation methods specifically approved for those applications.

## Rule 12-3000 Outlet Boxes & 12-3004 Terminal Fittings

The Code does not permit “conduit fittings” to be used as a junction box. However, in Alberta we have interpreted the term “equivalent device” in 12-3000(1) to include “conduit fittings” in special applications (i.e., connection to solenoids, photocells, etc.). Wire leads from these devices must be integral to the device. Where the device has a bonding conductor and the conduit fitting has no provisions for attaching a bonding conductor, a separate bonding conductor must be provided in the conduit system to the fitting. The fitting must also comply with the requirements of Rule 12-3034 and Table 22.

### **Support - General**

#### Rules 12-1010, 12-1404, 12-3010, 12-3012

Rules 12-1010 and 12-1404 indicate that conduit and EMT is to be securely fastened. Rules 12-3010 and 12-3012 stipulate the conditions under which boxes, cabinets and fittings are to be supported on supports rigidly secured to the structural unit. To comply with the above rules, conduit, EMT, outlet boxes and similar enclosures are to be securely fastened to rigidly secured supports or structural members of the building. The use of suspended ceiling support wires for this purpose is not considered as meeting the intent of these rules.

## 12-3022 Entrance of conductors into boxes, cabinets, and fittings

### Tray Cable

Installations have been encountered where a tray cables enter a box, cabinet or fitting without box connectors to secure the cables or provide strain relief. In addition, the space between the cables is filled with various products, such as dux seal, in an attempt to stop the infiltration of dust and moisture into the enclosure, as well as prevent flame spread. In some instances, tray will extend down to the top of an enclosure and the tray cable or a number of





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tray cables will enter the enclosure directly through a knockout c/w grommet or short conduit sleeve without a box connector to secure the cable in place.

Good industry practice suggests that each cable be secured to prevent strain or stress on the cable or termination in the cabinet. In addition, openings through which the conductors pass must not have remaining openings large enough to permit entrance of a test rod 6.75 mm in diameter.

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