

Tables 11 and 19 in the CE Code - are they necessary guides to the Code users or obstacles to use of approved equipment?

by Ark Tsisserev P.Eng.

Let's acknowledge a few undisputed facts:

1. All electrical equipment used in installations under provisions of the CE Code, Part I must be approved, and it also must be of a kind or type and rating approved for specific purpose for which it is intended to be utilized (Re: Rule 2-024).

2. Word "approved" (in respect to electrical equipment) is defined in the CE Code, and it means by this definition that approved equipment is:

"(a) equipment that has been certified by a certification organization accredited by the Standards Council of Canada in accordance with the requirements of

(i) CSA standards; or

(ii) other recognized documents, where such CSA standards do not exist or are not applicable;
or

(b) equipment that conforms to the requirements of the regulatory authority".

It should be noted that the vast majority of electrical equipment is made "approved" by it's certification to an applicable CSA safety standard for electrical equipment. All such current product standards (known by the industry experts as "Part II" standards) are referenced in Appendix A to the CE Code, Part I. In fact, the installation Code is called the "CEC, Part I", and the CSA safety standards for electrical products represent the "CE Code, Part II".

It should be also noted that the for the purpose of item (a)(ii) of definition "approved", certain equipment (i.e. the equipment comprising a fire alarm system, electromagnetic locks, etc.) certified to the ULC standards is deemed to be "approved", as there are no

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CSA standards for such electrically connected fire safety equipment.

3. All "approved" electrical equipment must be marked to ensure that it is suitable for the particular installation. Such markings must consist of a certification monogram and other relevant means of equipment identification as described in Rule 2-100 of the CE Code, Part I.

Now, after we have recognized these three undisputed facts, we can state with a full certainty that if a piece of electrical equipment is "approved" for the specific purpose of its use in accordance with the applicable product standard, such piece of electrical equipment should be installed under rules of the CE Code, Part I without any additional conditions.

This statement is accurate for majority of electrical products.

However, in case of electrical conductors (in addition to this generic requirement) another criteria must be met. This criteria is - compliance with condition of use of the conductors as per Table 11 (when such conductors are represented by flexible cords, heating cords, equipment wires, festoon and elevator cables or portable power cables), and compliance with condition of use listed in Table 19 (when such insulated conductors are intended for a permanent installation in accordance with Section 12 of the CE Code, Part I) .

How does a Code user know about a need to comply with such additional criteria? The answer could be found in two Sections of the Code: Section 4 and Section 12. Rule 4-010 (which governs installation of flexible cords), mandates compliance of already "approved" flexible cords with Table 11. Rule 4-038 covers use of portable power

cables. This rule requires that "approved" portable power cables be used in accordance with conditions listed in Table 11.

Rule 4-006 covers selection criteria for all insulated conductors, and it mandates use of these conductors in accordance with conditions described in Table 19.

It is interesting to note that although Rule 12-100 re-enforces the requirement already existing in Rule 4-006 - by mandating use of Table 19 for installation of conductors in suitable locations, this Rule also outlines the generic objective criteria for use of these conductors under provisions of the Code.

This criteria is listed in respect to:

- "(a) moisture, if any;
- (b) corrosive action, if any;
- (c) temperature;
- (d) degree of enclosure; and
- (e) Exposure to mechanical injury."

There are some Code users that consider this objective criteria of Rule 12-100 as the main condition for selection of "approved" wiring products for installation under provisions of the Code.

These code users are in the opinion that such criteria should be expanded into Rules of Section 4 that cover installation of flexible cords and portable power cables. They are adamant that Tables 11 and 19 become an obstacle to trade, particularly in those cases when the Code has not "caught up" with a new approved wiring product. These electrical practitioners feel that Tables 11 and 19 should be moved from the mandatory body of the Code to the informative appendix. They argue that Tables 11 and 19 may be unnecessarily restrictive and

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may not accurately and efficiently reflect new technologies in wiring products and certification of new wiring products to the applicable Part II standards.

However, there are numerous Code users who rely on guidance provided by these Tables in respect of condition of use for specific wiring, and these electrical safety stakeholders have no doubts about advantages of retaining these Tables as a mandatory part of the Code.

This issue has been brought up to the CSA as a proposal to relocate these table into an informative Appendix.

Of course, technical experts who participate in the development of the code are dealing with this issue at their respective S/C's (Section 4 and Section 12) via a consensus process. But a public input is always welcome, and the CSA has established a mechanism for a comprehensive public review of every technical subject.

I'm not going to express my view point on the subject in this article (I expressed it in the consensus process at the technical S/C's level), but in light of this discussion I'd like to pose to the readers just an example of two questions - to illustrate the fact that Table 19 is certainly not perfect and should be improved, if it is to stay in the body of the Code.

So, my first example relates to installation of armoured cables in raceways. Everyone is aware that power utilities request that their supply service cables be installed in the customer owned raceways, and that such requests are routinely satisfied by the designers and installers, and such installations are accepted by the regulators. But what does the CE Code tell us on this subject? Rule 12-902 states that the conductors for use in raceways must be of types specified in Table 19. Table 19 does not appear to allow use of armoured cables in race-

ways. Does this mean that the designers, installers and regulators routinely violate the Code? Does it mean that Rules of the Code need improvement?

I'll answer to the latter question with a confident "Yes". And such improvement is taking place.

My second example relates to use of a fire alarm and signal cable (FAS 90) in Class 2 circuits intended for security systems installations. Table 19 appears to permit only extra-low-voltage ELC Type cable for such installation. Does it mean that the superior FAS cable is not allowed for this purpose under Table 19?

My answer is: "It is allowed. However, to recognize this fact – Table 19 should be improved accordingly"

Although I have many more examples on this subject (and I also have an answer to the last question), I will advise the readers to communicate these issues with the electrical inspection authorities responsible for the enforcement of the adopted CE Code in their respective jurisdictions.



Ark Tsisserev, FEC, M.Sc., P. Eng

Rule 10-812 – Grounding Conductor Size

by Leslie Stoch

Rule 10-812 specifies minimum grounding conductor sizes for low-voltage electrical systems up to 750 volts. This article discusses the complexities of this rule, which as you know, was revised in the 2009 Canadian Electrical Code.

Sub-rule 1 tells us that, when the electrical system grounding electrode is a continuous metallic public water system or other interconnected electrode systems that may provide multiple ground-fault current paths back to the source, the minimum grounding conductor size must be selected from Table 17. Sub-rule 2 continues on to say that the minimum grounding conductor size for other types of grounding electrodes must not be smaller than 6 AWG.

Appendix B explains that the minimum grounding conductor size for a solidly grounded electrical system need not be larger than 6 AWG, since most of the ground-fault current will be carried back to the source by the grounded circuit conductor (service neutral).

Appendix B further makes clear that when a continuous underground public metallic water system or other low impedance system is used as the grounding electrode, or that the source and electrical service grounding electrodes are interconnected, the minimum grounding conductor size must be selected from Table 17, since a sizable portion of the ground-fault current will be carried by the grounding conductor.

How to interpret Rule 10-812?

If your electrical system grounding electrode is a metallic water system, use Table 17.

If the electrical utility's transformer and your electrical service are grounded to the same grounding electrode or separate interconnected grounding electrodes, use Table 17.

If the electrical utility's transformer and your electrical service are grounded to separate grounding electrodes (other than a metallic water system), the system grounding conductor need not be larger than 6 AWG.

But a note of caution — if the building is supplied by a metallic water system and it's not being used as the electrical system grounding electrode, the water system will need to be bonded to your electrical system grounding electrode (ground rods, ground plate, and so forth). Therefore a low impedance return path is established and you will still need to use Table 17.

All well and good, but this rule is also a bit of a head scratcher. What if your building



has 5000-ampere electrical service equipment? Will the minimum 6 AWG grounding conductor size be heavy enough to safely carry the available ground-fault current? For an electrical service of this size, even though most

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ground-fault current is expected to return along the system neutral, the portion flowing back along other paths may be sufficient to burn off the system grounding conductor.

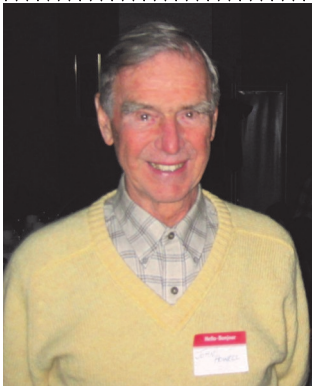
And I'm also struggling with the technical justification for the revised rule. We know that the impedance of the ground fault path consists of resistance and inductive reactance. Previously, testing has provided conclusive proof that the lowest impedance fault paths are always closest to the current-carrying conductors. Magnetic fields produced by the circuit conductors will force fault current along the path closest to the circuit conductors (the system neutral). Other paths further from the circuit conductors (such as a metallic water system or interconnected grounding electrodes), even though they may have low resistances, will usually have higher total impedances and therefore will only be expected to carry a much smaller portion of the fault current.

Play it safe. Always use Table 17. As with previous articles, you should always consult with

the electrical inspection authority in each province or territory for a more accurate interpretation of any of the above.

Courtesy, IAEI News

About Leslie Stoch: Leslie Stoch, P.E. is principal of L. Stoch & Associates, providing electrical engineering and ISO 9000 quality systems consulting. Prior to that, he spent over 20 years with Ontario Hydro as an electrical inspection manager and engineer. Les holds a B.S. in electrical engineering from Concordia University in Montreal. .



Sadly, I received a note regarding "**John Howell**" a long time **Life Member** of the Electrical Inspectors Association " John passed away on February 9, 2010. Our deepest sympathy go out to his Family & Friends.

What's New
Do you have any
technical information or
letters to the editor,
please mail or email :
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Review of the Change to the 2009 Canadian Electrical Code

by Ted Simmons

This is the sixth article in a series reviewing the changes to the 2009 Canadian Electrical Code. This article will focus on the changes pertaining to Sections 18 to 24 inclusive.

Section 18 - Hazardous locations

Rule 18-002 - Special terminology

In order to clarify the intent of several of the requirements in Section 18, the term “fluid” has been added and is defined as a substance in the form of a gas, vapour, or liquid.

For example, the previous wording flammable gas or liquid seals used in Rule 18-072 has been replaced with the term “flammable fluid seals”.

The term “hazardous location” has also been added with a note to remind Code users that this term is defined in Section 0.

Rule 18-012 - Maintenance

This rule was previously located in Section 2, however, since requirements outlined in this rule pertain specifically to hazardous locations, the rule has been relocated to Section 18. In addition, due to the critical nature of maintaining the integrity and consequent safety of electrical installations in hazardous locations, a list of standards and guides has been included in Appendix “B” to assist owners and operators of hazardous locations in developing appropriate maintenance procedures.

Rule 18-052 - Marking

In order to ensure that electrical equipment installed in Class I locations is approved for that

specific use, the word “permitted” has been replaced with “approved” in subrule 4.

Rule 18-068 - Cable trays

The previous rule stated cable trays shall not be used to support cables in hazardous locations and then provided exceptions or installation methods by which cable trays could be used. The new rule is less prescriptive and indicates that cable trays can be used in Class I and Class II locations provided they are installed to minimize the build up of dust or fibre on the cables.

Rule 18-072 - Flammable fluid seals

The previous rule required that electrical equipment containing a seal intended to prevent flammable fluids from reaching the electrical housing or conduit was not to be used at pressures in excess of the marked working pressure (MWP). The revised rule still requires electrical equipment with a primary seal be used at pressures lower than the MWP, however, the rule now permits electrical equipment with a primary seal in contact with flammable fluid to be constructed or installed so as to prevent the migration of flammable fluid through the wiring system.

A new note has been added to Appendix “B” to provide further information on this subject. The note indicates that equipment containing a primary seal that complies with Standard ANSI/ISA 12.27.01 has been designed to prevent the migration of flammable fluid through the equipment into the wiring system provided

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it is operated at or lower than the equipment rated pressure. In situations where devices containing primary seals are not marked to indicate conformance with ANSI/ISA 12.27.01, other means may be used to prevent fluid migration through the wiring system. Typically, this could involve the use of suitable barriers between the primary seal and the wiring system such as secondary seals or short lengths of mineral insulated or (MI) cable.

Rule 18-072 also includes a new Subrule (2) which indicates where secondary seals are used in conjunction with a primary seal to prevent the migration of flammable fluids through the wiring system, the possibility of primary seal failure shall be indicated by design features (examples of which are listed in Appendix "B"). These features will make the occurrence of a primary seal obvious or be provided with acceptable marking to advise personnel that the enclosure may contain flammable fluid under pressure.

It should be noted that the revisions to Rule 18-072 and the accompanying information contained in Appendix B have resulted in the requirements for the provision of secondary seals to be removed from rules 18-092, 18-108 & 18-154.

Rule 18-114 - Motors and generators, Class I, Zone 1

A new Subrule (2) has been added to indicate that when installed in Class I, Zone 1 locations, increased safety "e" motor installations shall meet the thermal protection requirements of Section 11.3 of IEC 60079-14 (edition 4.0, 2007-12). Extracts from this standard that outline additional requirements for the application of method of protection "e" (increased safety) motors in Class I, Zone 1 hazardous locations has been added to Appendix "B".

Rule 18-150 - Equipment in Class I, Zone 2 locations

In order to condense and simplify the Code, this rule has been re-written to incorporate the requirements previously located in rules 18-152, 18-154 and rules 18-160 to 18-168 inclusive.

Rule 18-152 - Wiring methods, Class I, Zone 2

Subrule (1)(d) has been revised to permit the use of armoured cables with overall non-metallic jackets, such as Teck 90, ACWU 90, or aluminum sheath RA 90 in Class I, Zone 2 locations.

Section 20 - Flammable liquid and gas dispensing and service stations, garages, bulk storage plants, finishing processes and aircraft hangers.

Rule 20-000 - Scope

In order to eliminate errors and assist users in the proper selection of equipment, the previous Subrule (4) which stated equipment permitted for installation in Class I, Zone 2 locations shall also be permitted for installations in Class I, Division 2 locations has been deleted. **It is essential to note the requirements for Equipment used in Class I, Division 2 locations are now located in Rule J18-150 in Appendix J.**

Rule 20-108 - Sealing

In order to provide uniform application and eliminate questions pertaining to the type of floor material, the word masonry has been deleted from Subrule (2).

Section 22 - Locations in which corrosive liquids, vapours, or excessive moisture are likely to be present.

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Rule 22-204 - Wiring methods in buildings housing livestock or poultry

In order to protect non-metallic sheathed cables from damage due to rodents, Subrule (5) has been expanded to include several additional areas where protection is required for the cable. Protection is now required where cables are installed:

a) in exposed locations, less than 300mm above any horizontal surface.

b) in exposed locations on the side of floor joists or other structural members less than

100mm below the upper surface of the floor joists or other structural members.

c) run in attics; or

d) run in concealed spaces.

As noted in Subrule (5) the protection can be provided by rigid steel or rigid non-metallic conduit or other suitable material. A new note has been added to Appendix “B” to remind electrical personnel that non-metallic sheathed cable is not approved for installation in a continuous raceway system. In other words, the raceway is to be used as protective sleeving only.

Section 24 - Patient care areas

Rule 24-104 - Bonding to ground in basic care areas

In the previous Code, Rule 24-104(2) required that bonding conductors be sized not smaller than the minimum size required for the circuit conductors.

For example, if No.10 TW75 copper conductors were used for the branch circuit wiring, the minimum size of bonding conductor would be

No.10 AWG copper. Rule 24-102(2) has been revised and now permits the bonding conductor to be sized in accordance with

Table 16 provided it is not smaller than No.12 AWG copper.

Using our previous example and the new requirement permitting the use of Table 16, the first step involves referring to Table 2 and determining the ampacity of the No.10 TW75

copper branch circuit conductors which as indicated in the table is 30A. The next step involves taking this value to Table 16 which indicates that for a conductor ampacity of 30A, a No.12 bonding conductor is required.

More on the 2009 CEC changes in future articles.



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GENERAL MEETING

Monday, September 20, 2010

Firefighters Hall

6515 Bonsor Ave., Burnaby, B.C.
(next to Metro Town Centre)

SOCIAL HOUR: 5:15 — 6:00 p.m.
DINNER: 6:00 — 7:00 p.m.
MEETING: 7:00 — 9:00 p.m.

Dinner: \$30

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