

ELECTRICAL BULLETIN

2012-01

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Pg 1 of 8

Date : March 1, 2012

Subject: **Adoption of the new C22.1-12 - Canadian Electrical Code, Part 1 (2012)**

Effective May 1, 2012, the 2012 edition of the Canadian Electrical Code (CEC), Part 1 will be adopted and required to be adhered to for all of Nova Scotia as authorized by the Electrical Installation and Inspection Act and the associated Electrical Code Regulations.

To ensure uniformity in electrical inspections the code is adopted with no amendments.

Future bulletins may be issued from this office and the electrical inspection authorities to provide clarity and direction on how various rules are interpreted and should be reviewed by all users of the code.

Electrical installations which have been issued a permit and have started electrical work prior to May 1, 2012 and where the plans, where applicable, were accepted prior to May 1, 2012 may be inspected to the 2009 CEC.

Where electrical work starts or plans are submitted on or after May 1, 2012 design, review and inspections shall be per the 2012 CEC regardless of when the permit was issued.

The electrical inspection department reserves the right to determine whether electrical work was started on any installation prior to May 1, 2012.

As in previous editions where a change to a section or rule has been made from the previous code the change is identified. In the 2012 CEC changes are identified by a small triangle located in the left- hand margin.

The following are **brief summaries** of the more significant changes to the 2012 CEC.

Code users should review all code changes identified in the code and incorporate them into their design and installations where appropriate.

Tables 1-4 -Allowable ampacities of conductors

Tables 1-4 have been significantly changed to harmonize with the US National Electrical Code (NEC).

The new ampacities will be limited or affected by at least two new rules 4-006 and 14-104 (2) which will be explained in more detail in the upcoming summaries.

In many situations the cable size required will remain the same.

The increased ampacities may assist when derating factors are applied.

Note: Tables D8A to D15B for underground ampacities are based on 90 C rated cables, to obtain the ampacities for 75 C derate by a factor of 0.886 and for 60 C a factor of 0.756. See Appendix B rule 4-004 for further information.

Section 4 -Conductors

Rule 4-006 Temperature limitations

This new rule has significant impact on the manner in which cable sizes are chosen where the ampacities of Tables 1-4 are used.

This new rule requires that the maximum conductor termination temperature rating of the electrical equipment must be considered when determining the maximum allowable ampacity of the conductor that can be connected to it.

The temperature rating of the conductor is required to match or exceed the lowest temperature rating of the electrical equipment or any wire connector (ie lug or terminal connector).

The temperature rating of wire connectors is typically 90 C and is higher than the electrical equipment conductor temperature termination rating of a typical breaker which is 75 C , therefore it would be the breaker rating that is used not the wire connector rating. The ampacity rating of the conductor would be based on using the 75 C temperature column of the ampacity Tables.

Wire that is rated for 90 C can still be used but the maximum conductor termination temperature rating of the electrical equipment dictates which temperature column in the appropriate Table to use in determining the maximum allowable ampacity of the conductor.

Where the equipment is not marked , a 90 C maximum conductor termination rating shall be used by default.

Remember that a conductor terminates at both ends, the termination on each end must be considered , and the lowest conductor termination temperature rating of the electrical equipment at one end dictates which temperature column in the appropriate Table to use in determining the maximum allowable ampacity of the conductor.

Example1: Based on 2012 CEC -Table 2 ampacities

Scenario 1- 150 A calculated non continuous load - 150 A breaker with 75 C maximum conductor termination temperature rating -RW90 wire being used to terminate at other end to 90 C rated electrical device

Step 1-determine minimum conductor insulation rating which is 75 C - RW 90 is permitted

Step 2- go to Table 2

Step 3- use 75 C temperature column

Step 4 - find conductor size with ampacity of at least 150 A

Step 5- conductor size to use - 1/0 - RW 90

Scenario 2- same as above but all termination ratings are 60 C

Step 1- minimum conductor insulation 60 C -RW90 can be used

Step 2- go to Table 2

Step 3- use 60 C temperature column

Step 4- find conductor size with ampacity of at least 150 A

Step 5- conductor size to use - 3/0 -RW90 - Rule 8-104 (2) -the calculated load in a circuit can not exceed the ampere rating of the circuit which is 150 A so a 2/0 conductor is not permitted

Section 14-Protection and control

Rule 14-104 (2)-Rating of over current devices

This new rule provides limitations for the maximum over current device that can be used on small conductors ,No. 14, 12 & 10 AWG, and overrides rule 14-104 (1) (a) and Table 13.

To correlate with the actual test conditions of the over current device the wire sizes indicated above are limited to being protected by a maximum over current device even though the ampacities shown in the Tables may exceed the rating of the over current device.

Section 6 -Control and protective equipment

Rule 6-206- Consumer's service equipment location

This rule has been revised, eliminating the requirement for a deviation to place consumer equipment outside of the building it is serving.

However, the rule as written only allows the service disconnect means (breaker or fuse over current device) to be placed outside , not the service distribution part of the service entrance.

The service disconnect means becomes the service box and may only contain the main over current device and not the feeder or branch over current devices. (see Bulletin Note 1)

Therefore, the distribution or panel board with the feeder or branch over current devices must be located inside the building.

The service disconnecting means shall be service entrance rated.

Where the main over current device is placed outside, the 3 m distance with regard to termination into the consumer service equipment beyond where the conductors enter the building is no longer applicable and the incoming conductors may extend beyond the 3 m maximum.

Section 10 -Grounding and bonding

Rule 10-812 and Table 17 -Grounding conductor size fo alternating-current systems for service equipment

Table 17 has been eliminated and rule 10-812 revised to indicate that a grounding conductor connected to a grounding system meeting the grounding electrode requirements of rule 10-700 can be a No. 6 AWG copper conductor in most circumstances.

The rationale for this change is that the majority of the fault current will be taken by the service grounded conductor (neutral) back to the source and that a No. 6 AWG conductor is sufficient to carry any portion of the fault current that does not flow back on the neutral.

It should be noted that the utility always requires a service grounded conductor (neutral) for metering purposes sized in accordance with rule 4-024 of the CEC.

There are exceptions in other sections of the CEC that may require larger ground conductors such as in section 36 of the CEC or where the ground fault current has been determined to exceed the with stand capability of a No. 6 AWG conductor, a larger ground conductor to accommodate that fault current is required.

Section 12 -Wiring methods

Rules 12-602(6) and 12-902(2)-Armoured cable and Raceways

These rules have been revised to allow armoured cable to be pulled in a conduit where the conditions as stipulated in 12-902(2)(b) have been complied with.

The conditions require calculations be provided to indicate that the maximum pulling tension of the cable has not been exceeded . Such calculations must be acceptable to the Provincial Chief Electrical Inspector or the inspection department and provided upon request.

Where such calculations are not performed, the installation is permitted where the number of bends and length of the cable complies with the conditions specified in the rule.

Rule 12-2250 -Cablebus

This is an entire new set of rules to cover cablebus installations which may appear similar to cable tray installations but they are not .

A new definition has been added in section 0 and Appendix B notes added for clarity and direction.

At present no certification exists for the complete assembly of a cablebus installation and only the cablebus enclosure can be certified.

The installation of a cablebus system is the assembly of components onsite per the manufacturers instructions and the installation of the overall assembly is in accordance with the CEC.

The following steps are required for the use of cablebus:

1. the assembly of the cablebus components on site per the manufacturers direction
2. a special inspection of the assembly is performed; and
3. the overall installation is inspected per the new rules 12-2250 to 12-2260 in the CEC

Drawings or calculations from the manufacturer may be requested by the inspection department or the special inspection inspector to clarify or confirm any aspect of the cablebus assembly.

Step 2 ,as indicated above, is required until such time a standard and acceptable procedure has been developed to accommodate the field assembly of cablebus that is acceptable to the Provincial Chief Electrical Inspector .

Section 2 -Maintenance and operation

Rule 2-314 and Rule 26-704-Receptacles required for maintenance of equipment on rooftops

The previous CEC did not provide any requirement for receptacles to be located on roof tops to provide service workers the power they require to perform maintenance work for rooftop mounted electrical equipment.

Rule 2-314 now requires a receptacle be installed on the roof top where any HVAC or similar equipment is installed ,except for a dwelling unit , and that the receptacle be installed in accordance with rule 26-704.

Rule 26-704 dictates the requirements for GFCI protection, a separate branch circuit and the configuration, location and mechanical protection of the rooftop receptacle .

Section 18- Hazardous locations

A new equipment protection level (EPL) marking has been introduced for Class 1 locations (Explosive Gas Atmospheres) and are identified as Ga,Gb or Gc.

New equipment for Class 1 locations will start to have the above markings as indicated above on the equipment and older equipment in stock or in the field may continue to use the methods of protection, as identified in rules 18-100 (c) or 18-150(1) (d) of the CEC , to determine suitability for the intended zone.

An Appendix B table has been provided to correlate the acceptable EPL marking required for each Zone.

Section 50 -Solar photovoltaic systems

There have been several changes made to this section.

Rules pertaining to voltage drop and the requirement for dc arc-fault protection have been added.

Grounding requirements are now referred to the new section 64 of the CEC.

Section 64-Renewable energy systems

This is an entirely new section to deal with renewable energy systems such as :

- stationary fuel cell systems
- small wind systems
- large wind systems
- micro-hydro power systems ; and
- hydrokinetic power systems

Extensive notes and diagrams have been added to Appendix B to assist in understanding this new section.

Bulletin Note:

1. Low ambient temperatures may affect the proper operation of the main over current device located outside and therefore the outside enclosure may be required to be temperature controlled.

Documentation may be requested to indicate that the main over current device is suitable for outdoors without temperature control where no temperature control has been provided.

Such documentation must be acceptable to the Provincial Chief Electrical Inspector or the electrical inspection department .

General Notes: For information only

It should be noted that the following are requirements per the National Building Code (NBC) 2010 and are not part of the CEC.

The enforcement and interpretation of any of the following requirements is determined by the local building inspector.

The NBC has been adopted by the Province and has been in force since June 1,2011.

The following are a few of the changes in the 2010 NBC that affect the electrical industry with regard to design or installation.

1. The requirement for smoke alarms in dwelling units- the 2010 NBC -rule 9.10.19.3 now mandates the installation of a smoke alarm not only on each floor level of a dwelling **but also in each bedroom.**

2. There is a new requirement in the 2010 NBC -rule 3.2.4.6 -the commissioning of life safety and fire protection systems.

This new requirement requires that where life safety and fire protection systems are installed to comply with the NBC or the National Fire Code ,they must be commissioned as a whole to ensure the proper operation and inter-relationship between the systems.

3. Rule 3.1.5.18 of the 2010 NBC requires cables, used for the transmission of voice, sound or data with combustible insulation and run in free air in a plenum of a building required to be of noncombustible construction,to be **FT-6 rated**.

4. Also, rule 3.1.5.20 of the 2010 NBC requires totally enclosed non-metallic raceways used in a plenum in a building required to be of noncombustible construction to be **FT-6 rated**.

5. Any issues with regard to the FT rating of cables or raceways within a building should be addressed by the local building inspector.

The above general notes are limited excerpts from the NBC and there may be additional information, situations or conditions associated with any of the NBC rules indicated above and the entire rule should be read or the local building inspector consulted prior to any design or installation if there is any question as to what is required.

Any questions regarding the CEC portion of this bulletin may be forwarded to the Provincial Chief Electrical Inspector, David MacLeod,C.E.I.,P.Eng. at 902-424-8018. Email: macleodd@gov.ns.ca

Website: <http://www.gov.ns.ca/lae/electricalsafety/electricalbulletins.asp>