KEY 2018 CE CODE CHANGES IMPACTING WIRE & CABLE: A SUMMARY WITH Q&A OPPORTUNITY

By: Isaac Müller, Applications Engineer

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AUDIENCE PARTICIPATION

- **Questions can be asked at any time using the chat function on the webinar screen**
- **Any unanswered questions will be followed up through email**
- **This presentation will be emailed to all registrants**

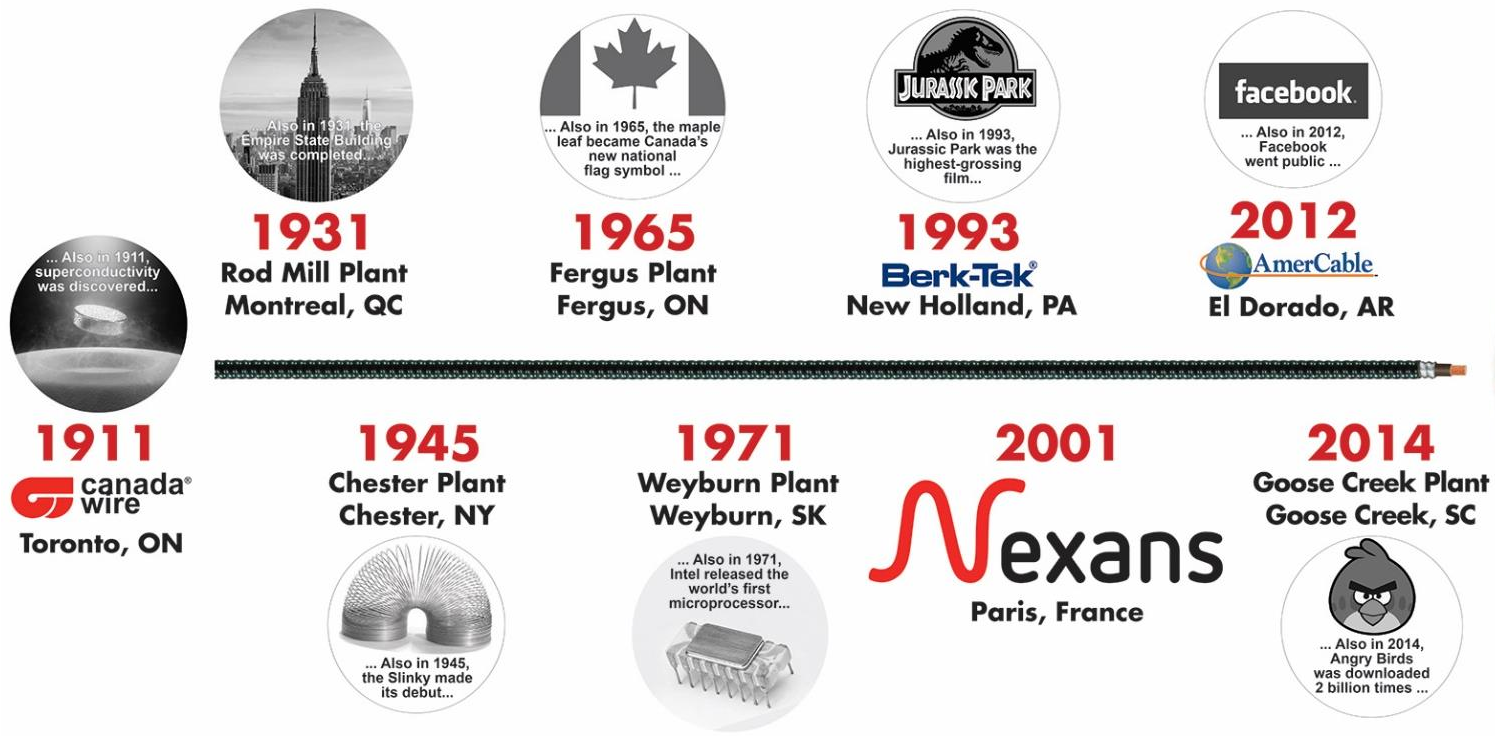
INTRODUCTION

Isaac Müller, P.Eng.
Applications Engineer
Nexans Canada Inc.

Active CE Code Member:

- Chair of Section 4 (conductors);
- Vice-Chair of Section 12 (wiring methods); and
- Voting member of the Committee on Canadian Electrical Code, Part I, representing wire and cable manufacturing.

Nexans is a global leader with a long legacy in North America



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INDUSTRY EDUCATION

- Nexans' leadership - educating the industry on wire and cable
- Canadian Electrical code changes
- Prior VFD webinar that was well attended – click here to watch it
- Contact me at Isaac.muller@nexans.com with other topics of interest for future webinars

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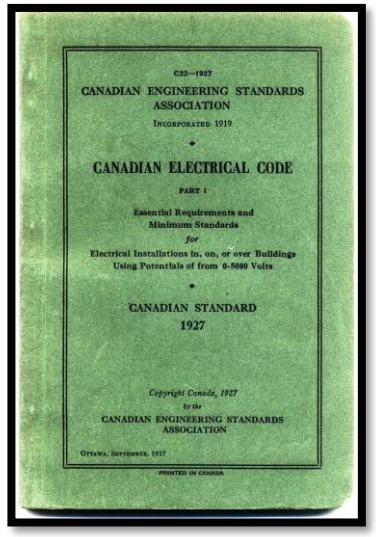
SUPPORT WE OFFER

- Full technical support for products manufactured
- Electrical and physical cable properties calculations (i.e. impedances, dimensions)
- Conductor ampacity and temperature calculations
- Post installation product support, including detailed cable failure analysis
- Overhead line calculations, including conductor ampacity, temperature, impedance, as well as sag and tension

FUN FACTS


C22—1927

CANADIAN ENGINEERING STANDARDS ASSOCIATION

INCORPORATED 1919

CANADIAN ELECTRICAL CODE

PART I

Essential Requirements and Minimum Standards for Electrical Installations in, on, or over Buildings Using Potentials of from 0-5000 Volts

CANADIAN STANDARD 1927

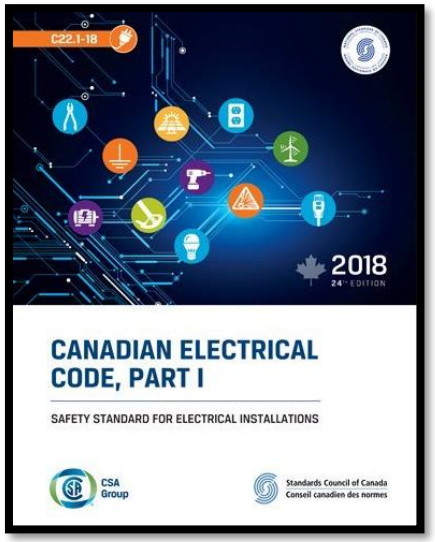
Copyright Canada, 1927 by the CANADIAN ENGINEERING STANDARDS ASSOCIATION

OTTAWA, SEPTEMBER, 1927

PRINTED IN CANADA

1927 Code, 1st Edition

Total number of pages = 139
Number of Sections = 24
Number of Tables = 13



2018 Code, 24th Edition

Total number of pages = 943
Number of Sections = 41
Number of Tables = 98

There is **ONE** rule in the code that hasn't changed! Rule 7001, Subrule (a) in the 1927 Code is now Rule 2-300, Subrules 1) and 4) in the 2018 Code

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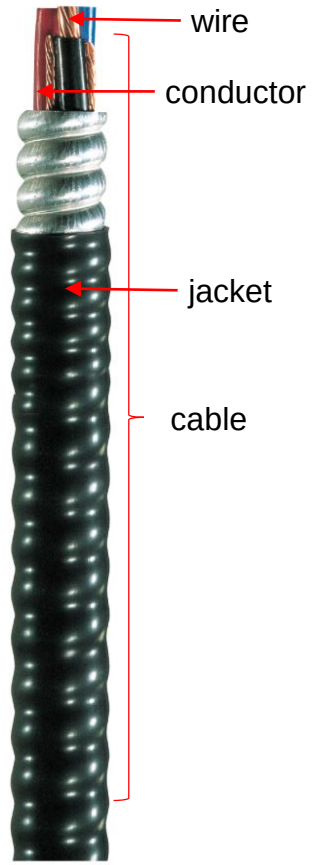
AGENDA

- Definition Changes
- Rules Moved
- The 5% rule
- Continuous loads
- Installation requirement changes
- Specific cables changes impacting tray cables, grounding & bonding changes and Power over Ethernet (PoE)
- Summary
- Q&A

DEFINITIONS ADDED

“wire”, “cable”, “jacket” & “conductor”



- In Section 0, Definitions have been added for **“wire”, “cable”,** and **“jacket”**
- The definition for **“conductor”** has been modified to be more precise, and include sub-definitions for “bare conductor”, “covered conductor”, and “insulated conductor” since all have a distinct purpose or application – bare and covered conductors are not voltage rated, whereas insulated conductors are voltage rated
- Most Sections of the CE Code have been updated to reflect these definitions

What does this mean?

“wire”, “cable”, and **“conductors”** are all different in their construction and application. When in doubt, check the definitions

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DEFINITIONS ADDED

“Hazardous location cables”

- In Section 18 (Hazardous locations), a definition for **“Hazardous location cables”** has been added
- These are cables that are marked “HL”

What does this mean?

When selecting and installing cables in HL locations, look for the **HL marking**

RULES MOVED FROM SECTION 4 TO SECTION 12

- Scope for Section 4 has been clarified, several rules within Section 4 were identified as being **“wiring method” rules that should be moved to Section 12**
- The following rules in Section 4 have moved to Section 12:

	From	To
Insulated conductors	4-008	12-102
	4-008(1)	12-102(3)
Uses of flexible cord	4-012	12-402
	4-012(1)	12-402(1)
Equipment wire	4-020(1)	12-122(1)
Uses of portable power cable	4-040(1)	12-406(1)

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RULES MOVED FROM SECTION 12 TO SECTION 4

- Scope for Section 4 has been clarified, one rule within Section 12 was identified as being a **conductor sizing or ampacity rule** that should be moved to Section 4
- The following rule in Section 12 has moved to Section 4:

	From	To
Ampacities of conductors in cable trays	12-2210(1) to (5)	4-004(23) to (25)

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5% RULE DELETED

- Subrule 8-106(1) has been deleted
- The Subrule has been inconsistently applied
- Existed in the Code for some time however, Rule 8-104 and 8-106(1) in conflict
- Scope for Section 8 has been clarified, confirming that **conductor ampacities are determined by Section 4, not Section 8**

What does this mean?

Maximum allowable conductor ampacities are as listed in the appropriate ampacity table, with correction factors applied

CONTINUOUS LOAD RULE REVISED

- Rule 8-104 has been one of the most misunderstood Rules in the CE Code
- As a result, **continuous load requirements have been simplified**
- Subrules 8-104(5) and (6) have been reworded to require two things:
    1. Continuous load not exceed the continuous operation marking on the fused switch or circuit breaker; and
    2. Continuous load not exceed a specified percentage (unchanged) of the allowable ampacity for the conductors as selected in accordance with Section 4

What does this mean?

- Determine the maximum allowable conductor ampacity based on Section 4
- Determine the maximum allowable load based on Rule 8-104

NEW SUBRULE FOR IDENTIFIED CONDUCTORS

- New Subrule 4-028(2) now **requires an identified conductor (neutral) be installed** at each manual or automatic control location
- It was recognized that modern control devices require power to operate
- Traditionally, the bond connection was used as the return path for the current to operate the control device
- More control devices result in high bond currents which are unacceptable

What does this mean?

Where a 3 conductor cable has worked for 3-way switch applications in the past, a 4 conductor cable may be required – you may need 4c NMD90 or AC90!!!

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NEW SUBRULE TO RECOGNIZE TC-ER CABLES

- Subrule added to Rule 12-2202 (insulated conductors and cables in cable trays) to recognize TC-ER cables – **unarmoured tray cables that have passed the tests for mechanical crush and mechanical impact for armoured cables**
- These cables are used within cable tray, and may transition from cable tray to equipment or other cable tray, but must be supported every 1.5 m, and may not exceed 7.5 m in length unless continuously supported

What does this mean?

Unarmoured tray cables, if marked TC-ER, may be installed in a similar manner to armoured cables

GROUNDING & BONDING

- Section 10 has been reorganized into a more logical flow of requirements and reduced in size
- Objectives for solidly grounded, impedance grounded, and ungrounded systems are clearly specified at the beginning of the Section
- Tables 16A and 16B have been combined into a single table **where the minimum bonding conductor size is now determined based on the ampere rating or setting of overcurrent device protecting conductors, equipment, etc, or the allowable ampacity of the largest ungrounded conductor or group of conductors**
- **Rule 10-210 now dictates that the grounded conductor of a solidly grounded ac system supplied by the supply authority be connected to a grounding conductor (and bond jumper installed) at one point only at the consumer's service**

What does this mean?

- Double check that you're meeting the new grounding and bonding requirements
- A USEI90 cable to an outbuilding will need a bonding conductor

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NEW RULES FOR POWER OVER ETHERNET (POE)

- New Rules 16-300 to 16-350 and Table 60
- PoE has been in use for many years
- Recent revisions to IEEE standards for communications cables **have recognized higher power applications for PoE, such as lighting**
- **Power levels approaching 100 W per cable while using the cable for communication applications is now possible**
- PoE is typically implemented as a "structured" cable system
  - Cables are bundled together for extended lengths
  - Cable heating is a function of the power it carries
  - Installation and layout become critical factors in ensuring safe operation

What does this mean?

Data cables can now carry power to devices other than typical data devices

SO THIS IS IT, RIGHT?

- The CE Code is not a static document – it's constantly evolving
  - Make electrical installations safer
  - Recognize changes in the industry and products
  - Harmonize with other Codes and standards
- Rule 4-006 (Temperature Limitations) Task Group activities
  - Active since Rule first written into the CE Code (2012)
  - Reviewing application and industry understanding of Rule
  - Will likely propose Appendix B notes for consistent application of Rule
  - Reviewing device manufacturer temperature testing and marking
- Table 19 (Conditions of Use for Wire and Cable) Task Group activities
  - Key goals are to make a smaller table, with more information, and eliminate the notes
  - Every cable will be represented in the table, along with an appropriate Rule

SUMMARY

- Definition Changes
- Rules Moved
- The 5% rule
- Continuous loads
- Installation requirement changes
- Specific cables changes impacting tray cables, grounding & bonding changes and Power over Ethernet (PoE)
- The CE Code is constantly evolving – it is not a static document

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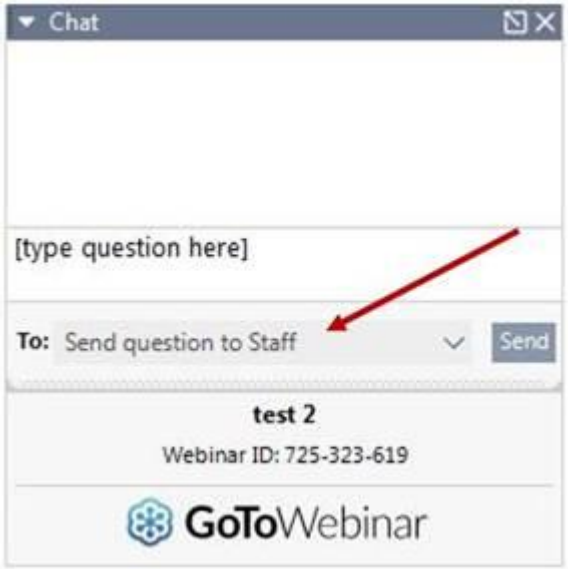
QUESTIONS



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