Code changes affecting Short-Circuit Current Ratings based on the 2017 NEC®

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2017 NEC Code Changes - SCCR

- Available at www.bussmann.com
- The NEC
- Short-circuit current ratings (SCCR)
- Code Changes related to SCCR
- Annex 1 Practical approaches to determining available short-circuit current
- Annex 2 Best practices for SCCR requirements during various project stages
- Annex 3 Product solutions to adjustable speed drive short-circuit protection
- Annex 4 Bussmann series resources to help achieve SCCR compliance
- Annex 5 Bussmann series products to help achieve SCCR compliance
What is short-circuit protection?

NEC Article 100 definition

**Short-Circuit Current Rating.** The prospective symmetrical fault current at a nominal voltage to which an apparatus or system is able to be connected without sustaining damage exceeding defined acceptable criteria.

**Hazards of insufficient SCCR**

- **Shock:** Enclosure becomes energized from conductors pulling away from terminations
- **Fire:** Explosive power blows off door exposing flames and molten metal to exterior
- **Projectile (shrapnel):** Enclosure door explosively blows open emitting failing device debris

Available fault current: 20 kA

SCCR: 5 kA

Why is IR/SCCR Important?

- SCCR – mobile carousel: text “SCCR” to 31996
Why is IR/SCCR important??

• SAFETY!
• Cover landed 40 feet away!

110.9 Interrupting Rating. Equipment intended to interrupt current at fault levels shall have an interrupting rating at nominal circuit voltage at least equal to the current at is available at the line terminals of the equipment.

What does this mean?
• “Equipment” is the overcurrent protective device (OCPD)
• A self-protection rating of the fuse or circuit breaker
110.10 key requirement

110.10 Circuit Impedance & Other Characteristics. The overcurrent protective devices, the total impedance, the component short-circuit current ratings, and other characteristics shall be selected and coordinated to permit the circuit-protective devices used to clear a fault to do so without extensive damage to the electrical components of the circuit.

What does this mean?

• OCPDs, total impedance, SCCR and other characteristics “selected and coordinated”
• OCPDs must clear fault without extensive damage
• SCCR applies to the device or equipment

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Service entrance equipment

110.24(A)
- Available fault-current field marked on equipment
- Documented and made available to those authorized to design, install, inspect, maintain and operate the system. **New in 2017**

110.24(B)
- Verify or recalculate with changes in electrical system

Exceptions for industrial installations where only qualified persons service equipment

Industrial control panels

409.110(4)
- SCCR marked on nameplate “plainly visible”

409.22(B) **New in 2017**
- Determine available short-circuit current
- Date and documentation to AHJ

409.22(A)
- Do not install when SCCR less than available short-circuit current
Motor control centers

**Code requirements**

430.98(A)
- Motor control center marked with SCCR

430.99 **New in 2017**
- Available short-circuit current at motor control center
- Date and documentation to AHJ

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HVAC/R equipment

**Code requirements**

440.4(B)
- SCCR marked on nameplate
  - With few exceptions

440.10(B) **New in 2017**
- Determine available short-circuit current
- Date and documentation to AHJ

440.10(A) **New in 2017**
- Do not install when SCCR is less than available short-circuit current
Elevator control panels

**Code requirements**

620.16(A) **New in 2017**
- SCCR marked on control panel

620.51(D) **New in 2017**
- Field marked with maximum available short-circuit current

620.16(B) **New in 2017**
- Do not install when SCCR is less than available short-circuit current

Industrial machinery

**Code requirements**

670.3(A)(4)
- SCCR marked on nameplate and “plainly visible”

670.5(2) **New in 2017**
- Field marked with maximum available short-circuit current

670.5(1)
- Do not install when SCCR is less than available short-circuit current
Emergency systems: Transfer equipment

Code requirements

700.5(E) New in 2017
Transfer equipment SCCR must be field marked on exterior

- ATS listed to UL 1008 have multiple options for SCCR dependent on which OCPD utilized and voltage
- Whatever OCPD designer chooses and is installed, the corresponding SCCR must be marked on outside.

- Similar requirements for ALL transfer switches — New in 2017
- See 701.5(D), 702.5, 708.24(E)

Understand two other SCCR options for an ATS

1. Specific manufacturer’s circuit breaker and type (with instantaneous trip):
   The CB manufacturer and type permitted has to be explicitly stated on the SCCR marking.

   Example: if an Eaton CHLD 600 A CB is used on a 480 V system, field mark the exterior with “Short-Circuit Current Rating 65 kA rms symmetrical at 480V.”

2. Short-circuit current withstand and closing with a circuit breaker:
   Requires a CB with an instantaneous trip having a maximum interrupting time (verified by the manufacturer’s time-current curve) that’s equal to or less than the value in the Time Duration column.

   Example: a 480 V system, if the selected CB has an instantaneous trip which interrupts the short-circuit current in 0.05 or less seconds, then field mark the exterior with “Short-Circuit Current Rating 50 kA rms symmetrical at 480 V”
Emergency systems:
Transfer equipment

Understand the most common SCCR options for an ATS

3. Short-time current ratings with a circuit breaker:
   Any CB with a short-time delay can be used if the circuit breaker's short-time delay setting is equal to or less time than the marked Time Duration.

   Example: If using a 600 A trip/800 A frame power CB with a short-time delay set at 0.5 second then field mark the exterior with "Short-Circuit Current Rating 20 kA rms symmetrical at 480 V."

4. Short-circuit current withstand and closing with fuses:
   Fuses of a specific class and not exceeding the maximum ampere rating shown can be used.

   Example: If Bussmann series Class J LPJ-600SP fuses (600 A /600 V) are selected, the equipment exterior could be field marked with "Short-Circuit Current Rating 200 kA rms symmetrical at 480 V."

Compliance is simple

1. Determine available short-circuit current
   - FC² - Fault Current Calculator

2. When specifying and ordering electrical equipment, communicate the required SCCR levels

3. Do not install equipment if SCCR is not equal to or greater than the available short-circuit current

4. Before energizing, AHJ to verify SCCR is equal to or greater than available short-circuit current
Short Circuit Current Calculations

• To determine the short-circuit (fault) current:
  • Draw the one-line diagram
  • Identify sources of short-circuit current (utility, generation, motors)
  • Include system component information (transformers, conductors, busway, overcurrent devices are not considered)
  • Use calculation method (ohmic, per unit, point-to-point, software) to find the “bolted fault current”.
    • Zero impedance connection – worst case
  • Use “typical” fault current values as a reference only.

Short-Circuit Current Factors

• Typically highest at service point

• Decreases in downstream equipment (due to impedance of transformers and conductors)
Bussmann Short-Circuit Calculator

- NEW version
  - Apple or Android Apps
  - Web (run from homepage after entering contact info)

Create a System

1. Choose three phase or single phase system
2. Click on Add to my System
3. Select a component you want to add

Calculating available fault current and creating 110.24 labels has never been easier!
Add a Transformer

1. Select Add Transformer
2. If you have a known primary fault current you can add it here. If not, select assume infinite
3. Enter values into the appropriate fields

Calculating available fault current and creating 110.24 labels has never been easier!

Add Motor Contribution

1. After adding a Transformer, you will be asked if you want to add motor contribution
2. You can complete a quick calculation by selecting a % of your transformer’s FLA or add it manually
3. Add these calculations to your system

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Add to system (Conductors)

1. Select Add To My System
2. Add Conductor Run or Buss Run
3. Add the correct values and Add To System

Calculating available fault current and creating 110.24 labels has never been easier!

System Summary

1. View system one-line diagram
2. Email one-line diagram
3. Select a specific fault to create a label

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Create a label

1. Select a fault and click on Create Label

2. Enter the email address, project name, fault name, and label size, then Send Label

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Selecting Protective Devices Handbook (SPD)

- This comprehensive guide to electrical overcurrent protection and electrical design considerations is based on the 2014 NEC®.
- With over 250 pages, this industry-leading handbook has new or expanded information on the following:
  - OCPD servicing and maintenance
  - Industrial control panels
  - Electrical safety
  - Fuses for hazardous locations
  - Photovoltaic systems and fuses
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