



## Developing an effective SCCR plan for facilities and purchasers of industrial equipment

### Contents

Description .....	Page
Background .....	2
Challenges associated with equipment SCCR code compliance .....	3
Misconceptions regarding equipment SCCR .....	4
Concepts for developing an equipment SCCR protection plan. ....	5
Conclusion .....	6
Appendix A: "Worst case" fault current calculation and example .....	7
Appendix B: Evaluating and implementing an SCCR plan for existing and new equipment .....	8
Appendix C: Fault current warning label .....	9
Appendix D: Writing an SCCR requirement into a machinery/equipment specification for suppliers. ....	10



*Equipment SCCR that is lower than the available fault current can pose a serious danger.*

## Background

Short-Circuit Current Rating (SCCR) is the amount of current an electrical component or assembly is able to safely withstand in the event of a fault (also commonly referred to as a short-circuit current event) when properly applied. SCCRs apply to almost all industrial control panels used for operating machinery and equipment.

The Occupational Safety and Health Administration (OSHA) and the National Electrical Code® (NEC®) require sufficient short-circuit current protection of industrial control panels to protect equipment and personnel from certain risks in the event of a short-circuit (fault) event. Protection from fault current events is often properly specified and applied in electrical switchgear and distribution equipment (such as panel boards and switchboards), but it is often misunderstood or misapplied when it comes to industrial control panels.

This application note is written to raise the level of awareness regarding the need for equipment SCCR, as well as describe concepts for creating an equipment SCCR plan. It's important to note that each facility should consider its unique needs and circumstances when developing an SCCR plan for their equipment. SCCR plans may consist of some or all of the solutions presented in this application note, or may require other solutions to achieve compliance with prevailing agency, code and regulatory requirements. Always consult qualified resources when developing and evaluating an SCCR plan.

The NEC® requires industrial control panels be marked with the assembly SCCR as well (409.110, 670.3(A), 440.4(B)). The NEC® and OSHA require that electrical equipment provide sufficient protection against short-circuit current events. 1910.303(b)(5) of the OSHA regulation requires all electrical equipment, including equipment that is already installed or new equipment being installed, meet this requirement and does not provide for any exemptions. Section 409.22 of the NEC® prohibits the installation of industrial control panels in locations where available fault currents exceed the equipment's assembly SCCR. The available fault current is the amount of current that would be available in the event of a short-circuit event, and can vary depending on the location in the electrical distribution system, among other factors.

In the event of a short-circuit (fault current) event, overcurrent protective devices, such as circuit breakers and fuses, will open the circuit. It is not enough that the overcurrent protective devices have a sufficient interrupting rating for the fault current levels. The other devices in the circuit, such as contactors, disconnects, power distribution blocks and others, will also see a portion of the available fault current. The fault current these devices experience is the amount of current the overcurrent protective device "lets through" before completely opening the circuit, (commonly referred to as the "let-through current"). The amount of let-through current will vary depending on the magnitude of the fault current, type of overcurrent protective device and its amp rating, and other factors. It is important that the components not intended to interrupt fault-level currents be properly paired with overcurrent protective devices. These non-overcurrent protective devices must be properly rated with sufficient "withstand" ratings in conjunction with overcurrent protective devices so that they do not sustain extensive damage. This rating, called the Short-Circuit Current Rating (SCCR) of the device, is typically applied to components that do not provide overcurrent protection and are used in power circuits of control panels. These component SCCR are established and certified through actual short-circuit testing that validates the SCCR and the conditions by which the rating is achieved.

The ability of these devices to withstand short-circuit events depends greatly on the circuit's overcurrent protective device attributes and sometimes external factors (such as wire size and length, enclosure volume and type, etc.). The requirements are specified as a part of device component SCCR and must be properly applied in order to achieve the specified level of protection against a short-circuit.

In addition to component SCCR for non-overcurrent protective devices in the panel's circuit, the overall control panel must have an assembly short circuit current rating (assembly SCCR). This is most commonly determined using the UL 508A procedure that uses the component SCCR to determine the panel's or assembly's SCCR.

### What is the risk?

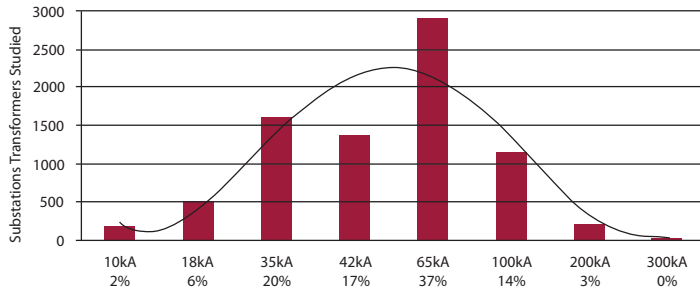
Panels with insufficient assembly SCCR that are subjected to a short-circuit event can expose personnel and equipment to serious danger. Without sufficient assembly SCCR, it is likely that the devices inside the panel will sustain and cause damage within the panel, and it's also possible that damage may extend outside the panel.

Insufficient assembly SCCR poses the following hazards:

- Electric shock and burns
- Burns associated with arc flash and contact with heated surfaces
- Injury associate with flying debris
- Damage to equipment or the facility
- Arc blast (shock waves, shrapnel, etc.)
- Vaporized metal

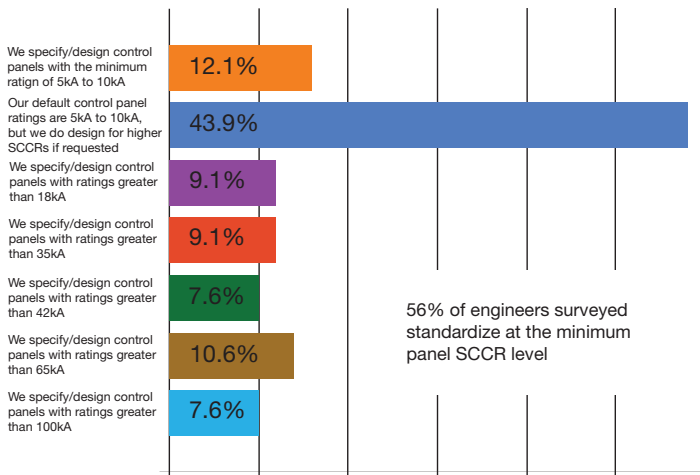
Insufficient equipment SCCR can pose significant risk to personnel, and can also result in fines and negative publicity.

Data indicates that regulation and code requirements for adequate protection against short-circuit events may not be applied properly for new equipment installations.



A 2014 distribution analysis of substation quotations shows the majority of the estimated short-circuit currents (available fault currents) at the substation transformer secondaries are between 35kA and 100kA. However, surveys show a significant majority of OEMs standardize on a bare minimum equipment SCCR of between 5kA to 10kA. One would expect that the distribution analysis of industrial control panel SCCRs have a similar curve shape, but shifted to the left due to impedance that reduces the fault current level at the location in the circuit where the equipment is installed.

**Customer survey responses regarding the SCCR level applied to industrial control panels**



The data indicate there may be a significant difference between actual available fault current and the assembly SCCR protection level that’s applied to equipment’s control panel, potentially placing personnel and equipment at risk. Further examination is needed to understand why this may be occurring and the challenges that may make equipment SCCR compliance more difficult to achieve.

If sufficient equipment SCCR is required by code, how can equipment be installed without a sufficient SCCR for the available fault current? In cases of new construction or facility expansion, it is common for an electrical inspector to provide oversight of the equipment’s installation. In these cases, a permit is pulled for the project and an electrical inspector verifies that the code has been followed.

However, many equipment installations do not require a permit and thus it is common for an electrical inspector to not be present during the installation. Under these situations, the responsibility for code compliance falls on the Authority Having Jurisdiction (AHJ), which in many cases may be the property owner or their agent. They may not be aware of the equipment SCCR code requirement, nor understand the available fault current level that’s present at the location in the electrical distribution system where the equipment is installed. As a result, equipment is often installed without verifying there is proper equipment SCCR protection against a short-circuit event.

**Challenges associated with equipment SCCR code compliance**

The NEC® and OSHA regulations require that electrical equipment has sufficient protection against short-circuit events. However, there are several challenges to these requirements for equipment SCCR compliance:

- Lack of awareness of code requirement
- Unknown available fault current levels at each circuit location where equipment is located
- Uncertainty of how to address existing equipment with an inadequate assembly SCCR
- Lack of assembly SCCR requirements on new equipment specifications
- Difficulty locating component SCCRs for the devices used in industrial control panels
- Misinterpretation/misapplication of the UL 508A standard for control panels
- Changes in the electric distribution system that can raise available fault current levels, thus potentially affecting the adequacy of the existing equipment’s assembly SCCR

**Lack of awareness of code requirement**

The requirements that industrial control panels be rated with an assembly SCCR were established in the 2005 cycle of the NEC®. But what about the existing equipment installed before then? According to the OSHA regulations (1910.303(b)(5)), there is no exemption for pre-existing equipment. However, many may not be aware nor fully understand this requirement, the terminology, assessment methods or implications.

**Unknown available fault current**

Fault current studies are sometimes performed during installations of electrical distribution gear (such as switchboards and panelboards), but often ignored at downstream equipment. Available fault current calculation can range from simple to complex, which may require the support of calculating tools and/or a qualified third party to perform this task.

### Existing equipment with inadequate SCCR

Another challenge that many face is the uncertainty of how to resolve insufficient assembly SCCR in existing equipment. A qualified third party can perform an analysis on equipment with an unknown assembly SCCR and re-label it with the determined equipment SCCR. However, this may only confirm that the equipment SCCR was inadequate to begin with. It is often difficult to raise the industrial control panel's SCCR after it's been installed. In some cases, select panel devices can be replaced with others having higher component SCCRs, but this poses the risk that such substitutions may result in another changes like altered equipment performance or voiding of warranties. It is possible to lower the available fault current to acceptable levels for the installed equipment by installing forms of impedance upstream. One such example is an isolation transformer. These, too, can be challenging to execute. There is not a single solution to resolve all issues with insufficient equipment SCCR. Cost, available space, and other factors may influence the approach for resolving insufficient equipment SCCR for each situation.

### Lack of SCCR requirements on new equipment specifications

For the reasons mentioned above, most specifications provided to equipment manufacturers lack a minimum acceptable equipment SCCR requirement. Thus, manufacturers often provide a standard design that provides the minimum default equipment SCCR of just 5kA. Many manufacturers are uncertain on what level of equipment SCCR they should standardize upon, as available fault current varies from installation site to installation site. Without clear insistence or guidance on equipment SCCR, this important requirement is often ignored up front during equipment design and installation. Once installed, it is often very difficult and expensive to raise the equipment's SCCR.

### Difficulty locating component SCCR

Surveys show that seven out of ten equipment designers have some degree of difficulty locating component SCCR for the devices they use in their industrial control panels. Looking for this information can result in extended design costs and project delays. Engineers without access to comprehensive component SCCR information often make design decisions that result in specifying devices that are larger than needed for the application and result in higher material costs and possibly a larger enclosure. Component SCCR are found on the device's label, or instruction sheet. Certain component SCCR are permitted to be posted on UL's SCCR web page by manufacturer, but not all available component SCCR types are posted. This often creates confusion and frustration for the design engineer. These difficulties can negatively impact panel component purchases for the manufacturer and the purchaser. It is important that the right component solutions be applied to achieve equipment SCCR objectives in an efficient manner.

### Misinterpretation/misapplication of industrial control panel SCCR standards

Surveys show that four out of ten equipment designers claim to have some degree of difficulty understanding or applying the UL 508A standard regarding SCCR for their industrial control panels. This could result in insufficient protection against short-circuit events, or it could result in an inefficient/deficient design. It is important that manufacturers provide proper documentation that verifies their equipment's SCCR was properly determined in accordance with UL 508A, or that the design was tested and certified by a qualified third party. Errors could have a significant impact should a short-circuit event occur.

### Electrical system changes that result in higher available fault current

Fault current level is influenced by a myriad of factors. Changes within the electrical distribution system and leading up to the utility source could raise or lower available fault current levels downstream. Available fault current is subject to the source supply and the amount of impedance in the circuit. Some changes that yield positive benefits for electrical distribution efficiency or electrical supply capacity may inadvertently increase available fault current levels. For example, replacing an upstream transformer with a larger or higher efficiency one that will have a lower impedance. Another example could be replacing electrical conductors with larger conductors or a more efficient busway (with lower impedance). A more common example of changing available fault current levels is relocating existing equipment within the facility to a location with less total circuit impedance. Any of the above may result in higher available fault current, which may in turn be larger than the SCCR of the equipment located downstream. Industrial facilities should consider an equipment SCCR plan that provides a protection level that takes into account future changes that can increase fault current levels.

### Misconceptions regarding equipment SCCR

In addition to the aforementioned difficulties, misconceptions have developed regarding the application of equipment SCCR.

Below are some of the major misconceptions and considerations regarding their validity:

- Standardizing on a high assembly SCCR will result in significantly higher equipment costs or a compromise in functionality.
- This statement is not necessarily true considering the total cost of the equipment. In most cases, the cost of the electrical components is a small percentage of the overall equipment cost. While it may be true that the component material costs may slightly increase, these incremental costs may be avoided or mitigated with the right information and resources, such as a searchable component SCCR tool. Eaton provides the SCCR Protection Suite tool, which enables equipment manufacturers to quickly and easily find component SCCR solutions. With the right information, a high equipment SCCR can be achieved with limited to no increase in material costs.

- Responsibility of assembly SCCR requirements belongs solely with the equipment manufacturer or installer.
  - While the NEC® requires that assembly SCCR for the location be verified at installation, the ultimate responsibility for approving the installation falls on the Authority Having Jurisdiction (AHJ). In cases where there aren't any federal, state, regional or local authorities governing an installation (such as is the case in most equipment installations), the property owner or their designated agent is considered the AHJ. OSHA regulations stipulate that employers must provide a safe working environment as defined in their regulations, of which protection against short-circuit events is a requirement. Should a short-circuit event occur that results in injury to personnel, the employer or the property owner (or their agent) may be held responsible.
- Current-limiting fuses or circuit breakers resolve all insufficient equipment SCCRs.
  - This may be true in some cases, but not all. Context of current-limiting overcurrent protective device application must be considered before declaring the panel's assembly SCCR. UL 508A Supplement SB permits using current-limiting devices to raise the SCCR of downstream devices, but only for branch circuit components. They do not apply to any of the devices in the feeder circuit, nor can they be used to raise the interrupting rating of a downstream overcurrent protective device.
- The interrupting rating of the circuit breaker or fuse upstream of the equipment control panel can be used to determine the required SCCR of the downstream equipment.
  - This, too, is incorrect, as series ratings are often applied in electrical distribution equipment. Series ratings raise the interrupting capacity of a downstream device when tested in combination with an upstream device. Series rating permits more cost-effective panelboard solutions to be used in a distribution system. For this reason the circuit breaker or fuse upstream of the equipment should not be used to determine the required assembly SCCR for the equipment control panel.

These regulations, standards and code requirements for equipment SCCR exist to improve the safety of the electrical systems for the worker and the workplace, but an effective equipment SCCR protection plan is necessary not only to ensure proper protection during installation, but also sustained protection following the installation.

### Concepts for developing an effective equipment SCCR plan

There are two primary areas that must be addressed in order to achieve proper equipment SCCR levels, and regulatory and code compliance:

- Existing installed equipment
- New equipment

Addressing and resolving these areas can vary in approach and implementation costs. All aspects influencing available fault current levels and equipment SCCR should be carefully considered for each site and situation. One should not think one particular method will work equally well in all situations.

However, certain concepts can be applied that result in developing an equipment SCCR plan that will provide protection for employees and equipment while taking into account immediate and future needs.

- Determine the present available fault current levels. This includes the available fault current at each location where equipment is installed and at distribution points, such as panelboards and switchboards.
- Consider factors that may affect future fault current levels. These include changes to the electrical distribution system which may increase the available fault current. These include, but are not limited to:
  - Future power needs that result in an increase in size of the upstream transformer or power source
  - Improved efficiency of the upstream transformer or power source
  - An improvement in the efficiency of the conductors or equipment in the electrical distribution system
  - A decrease in a conductor length
- Consider factors that may require a higher equipment SCCR in the future. One such factor could be relocating equipment to a location in the circuit where the fault current is higher.
- Consider methods to resolve insufficient existing equipment SCCR and their implementation. Such methods may include introducing a small transformer ahead of the location of equipment with inadequate SCCR. Other forms of impedance may be used, or it may be possible that a qualified resource can alter existing equipment to improve its SCCR.

- Define a minimum acceptable equipment SCCR specification for new equipment that takes into account present and future available fault current levels as described above.
  - Where appropriate and beneficial, consider grouping equipment types by their power demand or by their location. For example, some equipment types may have high power demands with higher available fault current levels and higher equipment SCCR needs. These equipment types are likely to have higher SCCR protection needs than other types of equipment. Other equipment types, such as HVAC equipment, may be consistently located far enough from the nearest power source such that the available fault current is lower. These equipment types may also be grouped together when developing an equipment SCCR plan.
- Require that equipment suppliers provide documentation detailing the individual component SCCRs and method by which the equipment SCCR was determined. This not only supports the accuracy of the determined equipment SCCR, but also identifies the required replacements parts so maintenance personnel can retain the equipment's SCCR during regular maintenance activities.
- Document requirements. Documentation is a critical step in communicating equipment SCCR requirements to both suppliers and personnel and is a key part in sustaining an SCCR plan. Documentation should be considered in the following forms:
  - Supplier specifications/requirements regarding equipment SCCR
  - Procedural documentation related to maintenance or change management that could affect equipment SCCR level.
  - Labels indicating available fault current (and date calculated) and minimum equipment SCCR requirements including downstream equipment. Consider placing these labels at each electrical distribution system point where equipment may be installed, such as a panelboard or a transformer.
  - Equipment operation and maintenance manuals including specific text that precludes component substitution that may invalidate the equipment SCCR and possibly void the warranty
  - Training documentation for maintenance and other personnel
  - Other relevant documentation
- Train appropriate personnel on code and regulatory requirements, and company standards regarding equipment SCCR.

Appendix A, B, C and D provide examples for some of these concepts.

## Conclusion

The NEC®, OSHA and UL® recognize the need to provide adequate protection against short-circuit events. This can only be achieved by understanding available fault current, communicating protection requirements to personnel and equipment suppliers, and proper application of components in the industrial control panel. Execution of a proper equipment SCCR plan will provide adequate protection for employees and equipment.

## Appendix A

### “Worst case” fault current calculation and example

“Worst case” available fault current calculation is based on the worst case fault condition at the transformer’s secondary. It considers the fault contribution from the transformer, motor loads, and other sources. Any other aspects that could potentially increase fault current levels, including planned changes, should be considered when determining a “worst case” available fault current level.

$$I_{FC} = I_{sc\ trans} + I_{sc\ motors}$$

Where:

$I_{FC}$  = “Worst case” fault current

$I_{sc\ trans}$  = Fault current contribution from transformer

$I_{sc\ motors}$  = Fault current contribution from motors

UL 1561 Listed transformers 25kVA and larger have a  $\pm 10\%$  impedance tolerance, which can affect short-circuit current levels. Thus a 0.9 factor is applied to the transformer’s impedance percentage (%). The fault current contribution of a 3 PH transformer ( $I_{sc\ trans}$ ) is calculated using the following equation:

$$I_{sc\ trans} = \frac{kVA \times 1000}{V \times 1.732 \times Z \times 0.9}$$

Where:

kVA = Transformer size

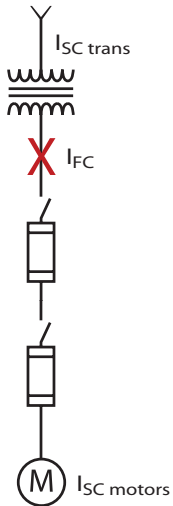
V = Secondary voltage

Z = Transformer percent impedance

This equation assumes unlimited current from the utility. Often it is unknown how much current is available from the utility, and the above formula is commonly used to define a “worst case” condition from the utility. Generally this assumption will not vary significantly from the actual value.

A commonly accepted practice to estimate motor generated short circuit current ( $I_{sc\ motors}$ ) is to multiply the total motor FLA by 4.

Fault current from other sources are less common and in most cases have limited fault current but should be considered in the worst case scenario if the source is supplying power the same time as the transformer source.

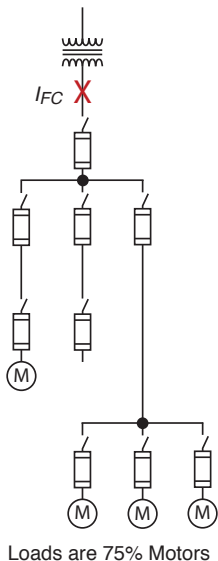


### “Worst case” available fault current calculation example:

In this example, the circuit is fed by a 2000kVA substation transformer with 5.75% rated impedance and a 480V secondary.

Currently 50% of the loads are motors, but the facility management anticipates that may increase to 75%.

Thus 75% will be used when determining the impact of motor loads on the available fault current.



2000kVA Substation transformer

5.75% Impedance

480V Transformer secondary

$$I_{sc\ trans} = \frac{kVA \times 1000}{V \times 1.732 \times Z} = \frac{2000 \times 1000}{480 \times 1.732 \times 0.0575 \times 0.9} = 46,487A$$

$$I_{sc\ motors} = \text{Total motor FLA} \times 4 = \frac{2000 \times 1000}{480 \times 1.732} \times 75\% \times 4 = 7217A$$

$$I_{fc} = I_{sc\ trans} + I_{sc\ motors}$$

$$I_{fc} = 46,478 + 7217 = 53,704A$$

**Fault Capacity = 54kA**

**Minimum Acceptable SCCR = 55kA**

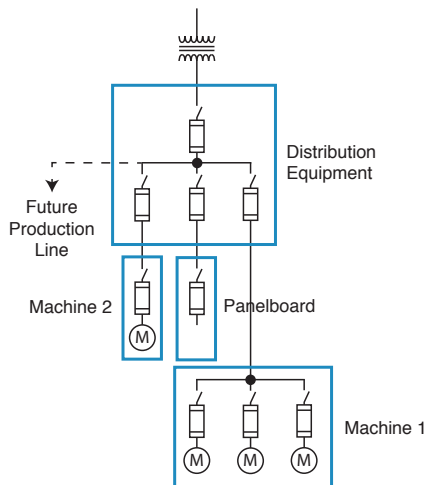
A minimum acceptable SCCR for new equipment is established at 55kA.

This ensures all properly rated equipment located at any point downstream of the transformer will have sufficient SCCR, regardless any equipment relocations or upgrades to the electrical distribution system.

## Appendix B

### Evaluating and implementing an SCCR plan for existing and new equipment

In this example, a facility needs to evaluate their electrical distribution system for compliance, and resolve any issues. They also need to establish an assembly SCCR plan for new equipment so that future additions will maintain compliant with OSHA and NEC® requirements regarding protection against short-circuit events. In this case, the substation transformer is 2000kVA, with 5.75% rated impedance and a 480V secondary. Currently 50% of the loads are motors, but expected to climb to 75% with future additions. The facility plans to install a new production line later this year. The existing equipment must also have their assembly SCCRs determined.



2000kVA Substation transformer  
5.75% Impedance  
480V Transformer secondary

First, let's determine the worst case available fault current level at the transformer's secondary:

$$I_{sc \text{ trans}} = \frac{kVA \times 1000}{V \times 1.732 \times Z} = \frac{2000 \times 1000}{480 \times 1.732 \times 0.0575 \times 0.9} = 46,487A$$

$$I_{sc \text{ motors}} = \text{Total motor FLA} \times 4 = \frac{2000 \times 1000}{480 \times 1.732} \times 75\% \times 4 = 7217A$$

$$I_{fc} = I_{sc \text{ trans}} + I_{sc \text{ motors}}$$

$$I_{fc} = 46,478 + 7217 = 53,704A$$

In this case, the worst case available fault current level at the transformer's secondary is 53,704 amps.

Upon inspecting Machine 1, it is determined by the equipment label that Machine 1's control panel is rated for 42kA. However, Machine 2 is older equipment and its equipment label does not list an assembly SCCR for the control panel.

Using the worst case available fault current level, Machine 1 is not compliant (42kA < 54kA). The facility decides to pursue a more precise available fault current calculation at Machine 1. There are three 500MCM cables per phase running approximately 500 feet between the substation transformer and Machine 1. Using Eaton's FC<sup>2</sup> fault current calculator, they determine the calculated available fault current to be 27,782 amps. Based on this calculation, the equipment SCCR of Machine 1 is adequate for the available fault current at its location in the electrical distribution system (42kA > 27.782kA).

There are several options to resolve Machine 2's unknown equipment SCCR issue. One is to assume the minimum 5kA equipment SCCR on the control panel and determine a more precise fault current level calculation for the point in the electrical distribution system where Machine 2 is located. In this case, a copper bus runs approximately 100 feet to Machine 2. Using Eaton's FC<sup>2</sup> calculator, the available fault current is 48,817 amps. This does not resolve the issue as the assumed 5kA default equipment SCCR is less than the available fault current (5kA < 48.817kA). Machine 2 is older and will be replaced in a few years. Management considers a reworking and recertification of its control panel to be a significant investment for a piece of equipment that will soon be replaced. Machine 2 has a relatively small load, so a decision is made to investigate lowering the available fault current level below 5kA by installing an isolation transformer ahead of Machine 2. It is determined that a 15kVA transformer is properly sized to support the Machine 2's load, and a calculation of the worst case available

fault current on the isolation transformer's secondary resulted in an available fault current level of 1023 amps, which is below the panel's minimum assembly SCCR (1.023kA < 5kA). To remedy the 5kA default equipment SCCR assumed for Machine 2, the facility hired an electrical contractor to install a 15kVA transformer and associated circuit protection, and the issue of the unmarked equipment SCCR on Machine 2's control panel was resolved.

Now that the existing equipment SCCR has been resolved, the facility determines its equipment SCCR specifications for any new equipment. The substation transformer is fairly new and expected to be in service for some time. However, some portions of the electrical distribution system have aged, and it is expected some portions may be replaced with busway to lower energy losses and system impedance. Thus the facility management determines to standardize on a minimum 55kA equipment SCCR for any new equipment purchases. This standardized 55kA equipment SCCR will provide flexibility and accommodate any utility changes or electrical distribution system upgrades while ensuring the required short-circuit event protection for personnel.

Facility management wants to sustain their equipment SCCR plan it has established for the existing and new equipment. They elect to post available fault current labels at key points in the electrical distribution system along with the minimum acceptable equipment SCCR for new or relocated equipment. These labels also include warnings to maintenance personnel and contractors that they are not to make any changes or additions to the electrical system without prior approval from facility management. They follow up these events with annual training for all personnel to advise them of these changes, associated risks, and their respective responsibilities.




## Appendix C

### Fault current warning label

Available fault level labels are designed to enable awareness of and to maintain equipment SCCR compliance. In order to increase effectiveness, consider placing labels at points where electrical systems are accessed by qualified maintenance personnel or contractors. Examples are at main transformers, main switchboards, distribution panelboards, or on the equipment control panels.

Eaton's Bussmann business offers an online and mobile application specifically for calculating available fault current levels called FC<sup>2</sup>. This application allows users to calculate fault current levels at a location in an electrical distribution system and provides the ability to print labels for that location. Visit [www.cooperbussmann.com/FC2](http://www.cooperbussmann.com/FC2) for more information and access this no-cost application.

 <small>Powering Business Worldwide</small>	<b>FC<sup>2</sup></b>   available fault current calculator
Project Name:	<b>Brazing Line</b>
Fault Name:	<b>X2</b>
System:	<b>Three-Phase</b>
Avail. Fault Current L-L-L (Amps):	<b>36,080</b>
Voltage L-L (Volts):	<b>240</b>
Calculation Performed On:	<b>Jul 24, 2014 @ 9:58am</b>
Calculation performed via the Eaton Available Fault Current Calculator v1.3	

## Appendix D

### Writing an SCCR requirement into a machinery/equipment specification for suppliers

#### PART 1 PRODUCTS

##### 1.01 MANUFACTURERS

- A. Eaton
- B. Bussmann
- C. Moeller

The above listing of specific manufacturers does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

##### 1.02 ELECTRICAL POWER AND CONTROL COMPONENTS

###### A. SCCR Protection

1. Electrical components used in power circuits, including circuit protection devices such as circuit breakers, motor circuit protectors, miniature circuit breakers and fuses, as well as switching devices such as NEMA contactors and overload relays, IEC contactors and overload relays, manual motor protectors, Type E combination motor controllers, Type F combination motor controllers, soft starters, disconnects (fused and non-fused), as well as termination/distribution devices such as busbar distribution systems, power distribution blocks and terminal blocks, as well as power transformation/conversion devices such as variable frequency drives, transformers and power supplies shall be selected from the following approved SCCR protection suite [Select one]:

- a. Eaton Ultimate Protection Suite – 200kA+ SCCR
- b. Eaton Premium Protection Suite – 100kA+ SCCR
- c. Eaton High Level Protection Suite – 65kA+ SCCR
- d. Eaton Mid-Level Protection Suite – 35kA+ SCCR
- e. Eaton Basic Protection Suite – 18kA+ SCCR

2. Other types of devices not included in 1.02 A. 1, such as solid state relays, servo drives and other special application controllers, must meet minimum SCCR requirements of \_\_\_\_ kA at \_\_\_\_ volts [Enter Requirements].

##### 1.03 INDUSTRIAL CONTROL PANEL ASSEMBLY

A. The short circuit current rating of the panel shall be no less than \_\_\_\_ kA at \_\_\_\_ volts as determined using procedures prescribed in UL 508A [Enter Requirements].

#### PART 2 EXECUTION

##### 2.01 PROTECTION

A. The short-circuit current rating of the industrial control panel(s) associated with the machinery or equipment shall be determined and verified using the online OSCAR SCCR Compliance application by Eaton.

B. The manufacturer shall provide documentation that states and verifies short-circuit current rating, including approval references for each component and explanation of how the panel SCCR was determined.

**Eaton**  
Electrical Sector  
1000 Cherrington Pkwy  
Moon Township, PA 15108  
United States  
www.eaton.com

**Eaton's Bussmann Business**  
114 Old State Road  
Ellisville, MO 63021  
United States  
www.bussmann.com

© 2015 Eaton  
All Rights Reserved  
Printed in USA  
Publication No. 10367  
February 2015

Eaton is a registered trademark.

All other trademarks are property  
of their respective owners.