

You're Not As Safe As You Think You Are

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With all of the advances in engineering and safety, why is it that every day one maintenance person is either killed or injured in an electrically related incident? One answer is that there is new equipment being delivered to your plant, which is increasing your chances of having one of your people killed or injured. So you're thinking, I strictly follow OSHA guidelines, I constantly train all of my people, I have them in the best protective gear money can buy, so how is this possible?

In my opinion, it is possible because the large majority of effort that has gone into engineering and inspecting for safe electrical systems has ended where the electricity reaches the line side terminals of that new piece of equipment. This oversight has now been corrected in the 2005 National Electric Code. Now labels are required on equipment that clearly state the equipment's Short Circuit Current Rating (SCCR). The NEC specifically addresses this for industrial control panels [Article 409], industrial machinery electrical panels [670], multiple motor HVAC equipment [440], meter disconnect switches [230] and multiple motor controllers [430]. I believe that the standard should also apply to all commercial and industrial equipment.

This is a huge leap forward. Now I believe that the industry needs to be better educated on the SCCR of equipment and the danger associated with not understanding it.

Equipment that you are installing in your plant needs to be either UL Listed to 508A (after April 25, 2006) or have witnessed and documented SCCR testing results. This equipment must also be properly labeled with this SCCR rating. In addition, your facility fault current studies need to be up to date and accurate. If you have met these requirements your only concern is that the labeled SCCR of the equipment is greater than the available fault current at the line terminals of that equipment.

As I have observed, very few electrical equipment manufacturers are producing equipment today that falls under the constraints in the previous paragraph.

The most dangerous and common misconception of SCCR by equipment manufacturers is that the interrupting capacity or rating of a circuit protection device located in or protecting the equipment is also the SCCR of that equipment when it is installed. Meaning, sometimes the manufacturer that labels the equipment with a 22kA SCCR, does so solely because the main circuit breaker or fuse has an interrupting capacity rating of 22kA. This is a mislabeling of the equipment and creates a potentially dangerous and code violating condition in your plant.

In order to build and label a safe piece of equipment, the equipment manufacturer must determine which component in the primary electrical path has the lowest SCCR or withstand rating. An example of one of these components would be a commonly used IEC definite purpose contactor. This component commonly has a withstand rating of 5kA. With only one exception, the panel in which this component is installed must be labeled with a 5kA SCCR, and that equipment then must be installed at a location in your plant with less than 5kA of available fault current. The exception is, if the low withstand rated component, the IEC contactor in our

example, is protected with a current limiting fuse or circuit breaker that is engineered to reduce the available fault current to a level less than 5kA RMS. But be aware, not all breakers and fuses are current limiting. If they are, they will be labeled and UL Listed as such.

Why is this so important? Just as every device within the electrical distribution system of your facility must be rated to handle a worst-case scenario in order to completely protect the people and equipment within your facility, every component within your equipment must be designed to handle a worst-case scenario for exactly the same reason. Seems obvious, doesn't it.

I have a challenge for you. Think of your most recently installed major piece of equipment. Find your most recent fault current study and look up what the available fault current is at that point in your electrical distribution system. If you don't have a recent fault current study, get one done (you'll need it for your arc flash hazard study for OSHA, anyhow), or go to the first transformer on the line side of the equipment. For a rough worst-case estimate divide the kVA by the voltage, divide that by the labeled impedance, and then multiply that by 1000. Now, go to the equipment. Find the label on the equipment with the SCCR, if there is one, and compare it to the available fault current. If the SCCR is greater than the available fault current, good, but you're not done yet. Now either de-energize the panel or put on your protective equipment and open the electrical enclosure door. Find the interrupting capacity of the main fuse or breaker. If the SCCR of the equipment is equal to the interrupting capacity of that device, you need to start getting suspicious of the validity of your equipment's SCCR. Final step, look for the component in the main electrical path that you feel would have the lowest short circuit withstand rating. Now follow the line side back to the main fuse or breaker. If you do not come across a current limiting device in this path, you also need to be suspicious of the validity of the SCCR of that equipment.

A majority of you just realized that you've got a problem. But what exactly is the problem? If you have a short circuit, the breaker or fuse is going to open safely, right? That is right, but the problem isn't with the breaker or fuse operating properly, the problem is if it operates quickly enough. If a component in a piece of equipment has a withstand rating lower than the available short circuit current, it is going to catastrophically fail under a short circuit condition. Nobody wants to put their people in front of a piece of equipment that they know can harm them. And now we're back to the National Electric Code change.

After years of assuming that enough parts of the NEC specifically address over-current protection such that most of the dangerous misapplications of under protected low withstand rating devices shouldn't exist, the NEC finally recognizes and specifically requires equipment to have an accurate SCCR labeled. These labels will now allow you and inspectors to compare fault current studies to the equipment SCCR and ultimately and effectively eliminate the dangerous applications of equipment in your facility. But until equipment manufacturers are educated and proactively change their circuit protection, inspectors are taking this one step further, and not just trusting the label.

I suggest that you do the same.