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PowerHour FAQs

NEC 2017 Requirements for Generator Set Overcurrent Protection

Short circuit performance, selective coordination, and compliance with National Electric Code (NEC) requirements are key elements in the specification and design of reliable backup power systems for life safety applications such as hospitals and other mission critical facilities. This course explores the unique characteristics of generator sets that can impact the design of a truly reliable system.

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Following this PowerHour participants should be able to:

- Identify recent codes changes to NFPA70 NEC 2017 pertaining to engine driven generator set applications
- Explain generator excitation systems and their effect on fault current performance
- Identify basic generator set overcurrent protection requirements in order to specify the correct protection equipment
- Describe the NEC requirements for selective coordination, generator disconnect, arc flash energy reduction and separation of circuits in order to evaluate different means for achieving code compliance

Could the AmpSentry protection curve be affected by future firmware updates?

No, future firmware updates will not impact AmpSentry protection. AmpSentry is integral to the controls and because AmpSentry is UL listed, we have to make sure that it will always function reliably, even after the firmware is updated.

Can the AmpSentry protection curve field be modified by the customer?

The customer can adjust the AmpSentry trip curve to trip earlier, but not to trip later. So, you can increase the level of protection but not reduce it.

And, in addition, the Cummins PCC 3.3 generator set control has a custom programmable overload/overcurrent relay. However, AmpSentry functionality will always supersede the customer relay in order to fully protect the alternator. So, you can be more aggressive and provide more protection, but not less than the minimally-required protection the AmpSentry provides for the alternator.

Does the AmpSentry need to be re-calibrated?

No, re-calibration is not required. Based on how the generator set is configured and built at the factory, the adjusted controls are preloaded with the firmware on the controls and require no further adjustment.

What remedial action is required when there's an overlap between the TCC of two circuit breakers?

The only thing you can do in this situation is adjust the trip curves, if possible. If you're using thermal magnetic breakers, there's no way to adjust the trip curves. However, if you have a fully adjustable solid-state breaker you can adjust the different portions of the trip curves.

Do medium voltage generators come with AmpSentry? Or is it optional?

All Cummins 2.X and 3.X generator set controls include AmpSentry. This is a standard feature for those generators.

How will the E-stop disconnect requirement be affected when the E-stop is located inside the outdoor generator set enclosure, behind a lockable access door?

In this situation a remote E-stop is required. The latest NEC handbook has new requirement that the E-stop be located outside of the enclosure. In the past, local AHJ's have accepted having a remote E-stop function for disconnect.

Are AmpSentry trip curves available with ETAP?

At this time, AmpSentry trip curve are not available with ETAP. We are aware that entering the curve manually while reading data from a PDF is cumbersome. Customers who need assistance with this task should contact their local Cummins service group. A service technician will contact Cummins' application engineering team who can provide an Excel spreadsheet showing the current versus time characteristics. This data can be copied and pasted into the relay settings.

Fire pumps are typically designed to run until they fail, resulting in an oversized OCPD. Is AmpSentry capable of coordinating with fire pump breakers?

Generator sets for a fire pump must be sized for at least 115 percent. AmpSentry sizing is based on the generator set rating. So, the trip characteristic is fitted to the standby rating of the generator set. Assuming the generator is sized correctly, the breaker will not trip.

In addition, the breaker and the cables must be sized to accommodate the locked rotor kVA current of the fire pump. It is unlikely the fire pump requirement would be greater than the generator's requirement. You would have to have a very large fire pump on a fairly small generator for this situation to occur. Because the AmpSentry curve "hugs" the alternator thermal damage curve, assuming the generator has been sized appropriately for the fire pump, the AmpSentry will coordinate with the breaker.

As consulting engineers, we develop the short circuit analysis very early, prior to obtaining the alternator data sheet. How can we account for alternator-based change? Does Cummins have an online library of data sheets containing SKM and ETAP information?

For this kind of information, customers should register to gain access to the Power Suite Library (powersuite.cummins.com). Power Suite includes a wealth of technical information about Cummins products, including all available alternator options. One way to go about it would be to select the largest alternator. But, if you're doing the conversions, you'll need to have the subtransient reactance and other reactance values nailed down before doing the study.

As for the conversions, the SKM software allows the customer to enter the alternator kVA that you've used for your per unit reactances separately from the generator set kW. So, you don't actually have to do the math, you just have to enter the reactances from the alternator data sheet. There's a box to check if you want to use an alternator kVA rating that's different from the generator set kW rating.

We don't have specific alternator models in SKM, so you would have to type in the impedences and time constants from the appropriate alternator data sheet.

After you register for Power Suite, you will have instant access to all the documentation, including the alternator data sheets, which have all the information. So, I suggest that in the initial phases of the program, just take whatever information you have about the loads. Use GenSize, which is our generator sizing software, to come up with an estimate of what the generator set size may be and then GenSize will tell you what alternator is recommended for that application. Then find the alternator data sheet in Power Suite and plug in those values. If the alternator does change later on because load or some other factor has been revised, you would have to re-input those values.

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