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**Standard Ampacity Settings With
Electronic Trip Circuit Breakers****Applications Notes & Data**

The available trip settings of various "Sensitrip" trip units sometimes do not exactly match the ampacity ratings of standard thermal magnetic circuit breakers. For example the 250A rating cannot be set on any of our Sensitrip electronic trip circuit breakers, the closest setting is either 240A or 260A. Questions have been raised regarding the acceptability of these settings.

The only potential reason to question breaker ratings is the requirement in the NEC that electrical circuits be protected by overcurrent protective devices, either fuses or circuit breakers, that are sized appropriately. Article 210-20 requires overcurrent protection for branch circuit conductors and 230-90 requires overcurrent protection for service conductors, both refer to 240-3 and 240-6 for the ratings of the required protective devices.

Article 240-3 addresses general protection of conductors, specifying that conductors be "... protected against overcurrent in accordance with their ampacities as specified in section 310-15, unless otherwise permitted ..." and goes on to list several exceptions. One of these exceptions (240-3(b)) allows for selecting the "next higher standard overcurrent device rating" if the ampacity is below 800A. Above 800A the ampacity of the conductors must be "equal to or greater than the rating of the overcurrent device as defined in Section 240-6." Both of these statements allow some flexibility in sizing the overcurrent protective device to the ampere rating of the conductors.

There are two main application issues here.

First, in looking at the tables in section 310 the given cable ampacities do not exactly match the standard thermal magnetic breaker ratings given in 240-6(a), such as 250A. In fact I could not find 250A in any table as a given ampacity for any cable size. Further, even if there were an exact 250A ampacity shown for a specific cable size, the various de-rating factor for temperature, conduit fill, etc., can significantly reduce the ampacity. The result is that the matching of the overcurrent device to the cable ampacity will not usually mean that an exact ampacity such as "250" would be required in an overcurrent protective device to meet the code.

Secondly, section 240-6 lists "Standard Ampere Ratings" for overcurrent protective devices. 240-6(a), "Fuses and Fixed-Trip Circuit Breakers", shows various ratings from 15 to 6000A, including our example 250A. This is the list that is generally referred to as the "standard" ratings. However, the Sensitrip circuit breakers are not "fixed" they are adjustable trip circuit breakers. Further, right after the listings of the "standard" fixed breaker ratings is a statement that "The use of fuses and inverse time circuit breakers with nonstandard ampere ratings shall be permitted."

The next two paragraphs 240-6(b) and (c) specifically address "Adjustable-Trip Circuit Breakers", which would include the Sensitrip breakers. In these paragraphs there are no specific ampacities shown.

Paragraph (c) specifically says that the rating is permitted to be "...equal to the adjusted current setting (long-time pickup setting)." Subject to the conditions in 240-6(c) for restricted access. This means that it would be allowable to adjust the trip unit long-time pickup setting to the next rating above the de-rated cable ampacity, if below 800A, or, to choose a setting less than or equal to the cable ampacity if above 800A, in accordance with 240-3(b). The exact setting, or "rating", value on the adjustable trip unit is not dictated by the code. Further, the term "standard" in the phrase "next higher standard overcurrent device rating" can be interpreted to mean the next available setting on that particular circuit breaker.

Due to the typical interval between long-time pickup settings on an electronic trip breaker, in many cases, the next higher setting on an 800A or smaller breaker will be lower than the next higher rating of the standard fixed-trip breaker. For example, if the cable ampacity were to be 258A, the code allowed next higher fixed-trip breaker rating would be 300A, in the case of the Sensitrip the next setting would be 260A. The 260A setting would obviously provide better protection. Although this is one of the "best case" examples, the typical amp difference between trip settings on an electronic trip breaker is less than the typical difference between fixed-trip ratings of thermal magnetic breakers resulting in equal or better protection.