

# Clearing up Confusion over 80% vs. 100%-rated Circuit Breakers

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 2 min read | Paul Desmond



When building or upgrading a data center, at some point you need to make a decision about which [circuit breakers](#) to use. While on the face of it that may seem to be a simple decision – use the one that’s the best fit for your load – in fact it can become significantly more complicated if you don’t have a thorough understanding of breaker ratings and what they mean.

Understanding the difference between the two begins with a reading of the 2011 National Electric Code. Section 210.20(A) of the code basically says that a circuit breaker for a branch circuit must be rated such that it can handle the noncontinuous load plus 125% of the continuous load. (A continuous load is one where the maximum current is expected to continue for 3 hours or more.) In other words, the breaker needs an extra 25% capacity of the continuous load for headroom. That, of course, means you need a larger, more expensive breaker.

There is, however, an exception. When the circuit breaker is listed for operation at 100% of its rating, the additional 25% requirement goes away. Instead, the device simply has to be able to handle the sum of the continuous load and the noncontinuous load.

Now, in practice, you may think it will nearly always make sense to buy 100%-rated breakers and call it a day. But as the [podcast](#) points out, it’s not quite that simple.

You need to do some load calculations to determine if your loads are primarily continuous or noncontinuous. If all your loads are non-continuous, you don’t have to worry about the 125% requirement so you can just size your breakers for 100% of your load. In that case, standard, 80%-rated breakers will be more economical.

If you do have some continuous loads, Shishani says it’s best to segment your circuits so they’re all the same flavor, either continuous or noncontinuous. Then the choice of breaker will become clear.

Where you can’t do that, you need to determine the load on each branch circuit, then calculate the required ampere rating you need for each circuit breaker. The rating will be higher for the standard, 80%-rated breakers because you need to allow for an extra 25% capacity on the continuous loads. That may make the 100% breakers the more economical choice. On the other hand, if you need room for growth, that may also play into the equation.

The podcast goes through a few sample calculations to help you understand all the tradeoffs. [Check it out](#) to see if you can save some money the next time you need to buy circuit breakers.

**Tags:** [Capacity Management](#), [Circuit Breakers](#), [Data Center Optimization](#), [Data Center Planning](#), [Podcast](#), [Power Management](#)



## Conversation

**Mike Ahern** 9 years ago

How are the 100% breakers identified in the latest catalog?

**Mohamed Shishani** 9 years ago

@Mike Ahern, 100% breakers are identified with a "C" suffix in the part numbers in the online digest. For 100% rated circuit breakers add a "C" in the 9th character place (for example, HDL26015C or JDL26150C)

**Lu** 9 years ago

What are the design difference between 1000A 80% rated circuit breaker and 800A 100% rated circuit breaker? in terms of frame size and contact size? They can both be used for 800A continuously, but the cable size for 1000A 80% rated breaker is bigger than 800A 100% rated breaker, right?

**DM.** 8 years ago

Am I correct in assuming that the 80% vs. 100% only applies above a certain voltage and/or amperage level? I have to install some "smaller" breakers and want to know if I need the extra 125% head room.

**Ahmed Musa** 8 years ago

Sir,  
 I wondering if we have an equivalent background for the 80% CBs in IEC or BS standards.

**Mohamed Shishani** 8 years ago

Hello Ahmed, this is a National Electrical Code compliance. I am not sure that this requirement is valid in IEC

**Mohamed Shishani** 8 years ago

Hello Ahmed, This is a requirement to meet the National Electrical Code (NEC) I am not sure this is valid in IEC

**Ernest Kithsiri** 7 years ago

80% rated breakers are available only up to 600A or so? Am I correct?

**Jared1089** 7 years ago

I believe that overload devices rated to U.S. (North American ?) standards are rated for continuous load of no more than 80% of rating and that such devices rated to IEC standards are rated for use on loads to 100% of rating. Schneider sells both products as a global company, and a "hot-shot" engineer may find he can shave some cost by designing with one or the other, but I think the customer is best served by using what is common to the area of the application. It will typically not be maintained by hot-shot engineers. The IEC standards will likely take-over one day, but for now people (customers) need to work with what's at hand.

**Daniel Manosalva** 7 years ago

What is the main difference between a standard and a 100% rated circuit breaker? I have read only about when to use either of them but not about their physical difference. Is it only the enclosure? What would happen if I use a standard CB in a 100% rated enclosure and make a 100% current flow through it?

**Kurt** 6 years ago

Great question of which the manufactures will not answer. I heard that the lugs are the only difference. Seems strange Daniel, but not really. Anyone willing to reply must include references (i.e. prove it!) Kurt

**bob** 6 years ago

where can i download the podcast

**Jae Wiss** 6 years ago

Hi Bob – apologies for the delay We are looking into this issue. Thank you for your patience.

**Kristen Larsen** 6 years ago

The podcast issue has been resolved and it is available online here: <https://static.schneider-electric.us/assets/products/circuit-breakers/podcasts/player.html>

Thank you!

**Steven Miller** 6 years ago

The link to the podcast does not work. (<https://sedatacenters.com/resources/videos/podcasts/100-percent-vs-80-percent-powerpact-circuit-breakers/>) What is the correct link?

**Jae Wiss** 6 years ago

Hi Steven – thank you for pointing out this error. I will look into it and get back to you as soon as possible.

**Kristen Larsen** 6 years ago

The podcast issue has been resolved and it is available online here: <https://static.schneider-electric.us/assets/products/circuit-breakers/podcasts/player.html>

Thank you!

**ronald hansen** 6 years ago

The 100% verses 80% rated devices is a topic that comes up from time to time especially in how some AHJ's are enforcing the rule. The City of Orlando Florida for example mandates that all main circuit breakers be rated at 100% regardless. In most applications the load at the service entrance is mostly noncontinuous with continuous lighting loads at 125%. The way I apply the code is this. If I have a 1500 amp calculated load the circuit breaker will be 1600Amp. There is no need to use a 2000amp circuit breaker for your service unless the load is mostly continuous. Service demands on commercial buildings in many cases are less than 50% of connected with power factors ranging anywhere from 50 to 70% sometimes more. The code typically forces the design professional to size his power distribution system based on connected load rather than demand load [ with some exceptions ] and the electrical system in reality is oversized by a factor of three or more.

**Tim** 5 years ago

OK. I'm helping a friend remodel her kitchen. I worked as an electrician in my twenties. Not at 60, a lot of that info has long left my cranium. My question is about proper breaker amp rating. She is adding a cook top that is rated at, believe it or not- 35.2 amps at 240 VAC. I purchased some 6 ga. 3 conductor, the run is about 30 feet. Do I use a 30 amp breaker, which would possibly trip when using all burners. Or do I go up to a 40 amp?

**Ted** 5 years ago

It depends on the type of wire (AL or CU) the type of insulation (I assume your using THHN or THWN?) the amount of conductors in the raceway and the temp rating of your breaker (I assume 75C?). Making certain assumptions of copper wire, THHN insulation and that your not running any other current-carrying conductors in the raceway, you could go up to 50amp.

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