

Simplify Downstream Installation with Cascading

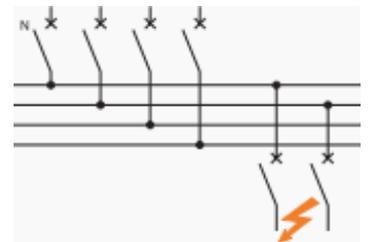
Edvard



Few Words About Cascading

Cascading provides [circuit breakers](#) placed downstream of a limiting circuit breaker with an **enhanced breaking capacity**. The limiting circuit breaker helps the circuit breaker placed downstream by limiting high short-circuit currents.

Cascading makes it possible to use a circuit-breaker with a breaking capacity lower than the short-circuit current calculated at its installation point.



Area of Cascading Application

- Concerns all devices installed downstream of this circuit-breaker,
- Can be extended to several consecutive devices, even if they are used in different [switchboards](#).

The installation standards (**IEC 60364**) stipulate that the upstream device must have an ultimate breaking

capacity I_{cu} greater than or equal to the assumed short-circuit current at the installation point.

For downstream circuit-breakers, the ultimate breaking capacity I_{cu} to be considered is the ultimate breaking capacity enhanced by **coordination**.

Implementation Techniques

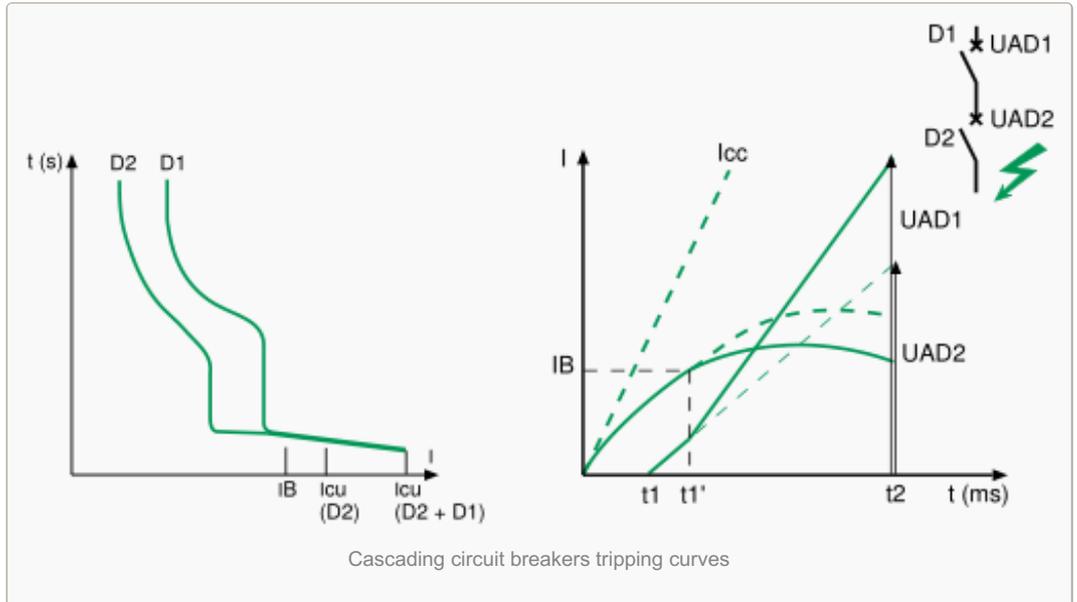
Principles

As soon as the two circuit-breakers trip (as from point **IB**), an arc voltage **UAD1** on separation of the contacts of **D1** is added to voltage **UAD2** and helps, by additional limitation, circuit-breaker **D2** to open.

The association **D1 + D2** allows an increase in performance of **D2** as shown in figure 2 below:

- Limitation curve **D2**,
- Enhanced limitation curve of **D2** by **D1**,
- I_{cu} **D2** enhanced by **D1**.

In actual fact, in compliance with the recommendations of **IEC 60947-2**, manufacturers give directly and guarantee I_{cu} enhanced by the association of **D1 + D2**.



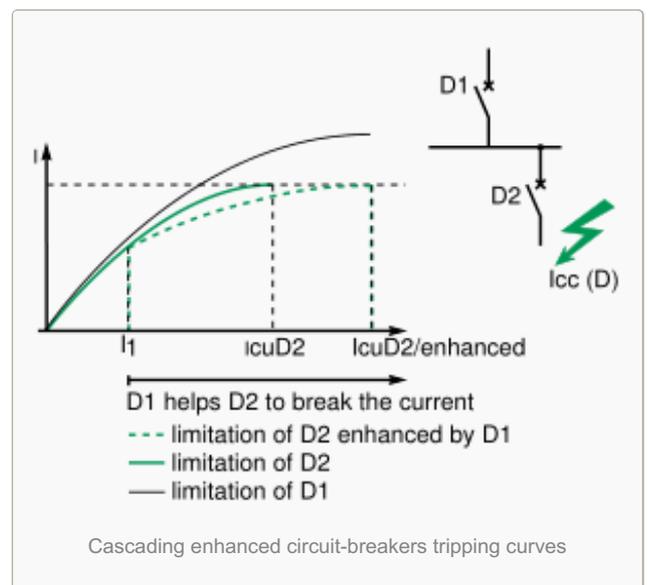
In a cascade system, both the upstream and downstream devices are expected to operate simultaneously so that the **fault energy is shared by the breaking devices**. Unless the combination is tested for the required fault level, the performance of the combination cannot be guaranteed in the field.

After a **major fault** is cleared both the devices of the combination need to be thoroughly examined and replaced if necessary to ensure safe operation during any future fault in the system.

Advantages of Cascading

Cascading allows benefit to be derived from all the advantages of limitation. Thus, the **effects of short-circuit currents are reduced**, i.e.:

- Electromagnetic effects,
- Electrodynamic effects,
- Thermal effects.



Installation of a single limiting circuit-breaker results in considerable **simplifications** and **savings** for the entire downstream installation:

- Simplification of choice of devices by the cascading tables,
- Savings on downstream devices. Limitation enables circuit-breakers with standard performance to be used.

Thanks to cascading, circuit breakers with breaking capacities less than the prospective short-circuit current may be installed downstream from a current limiting circuit breaker. It follows that substantial savings can be made on **downstream switchgear** and **enclosures**.

Resource: *Merlin Gerin/Schneider Electric Circuit breaker application guide*

Source:

<http://electrical-engineering-portal.com/simplify-downstream-installation-with-cascading>