

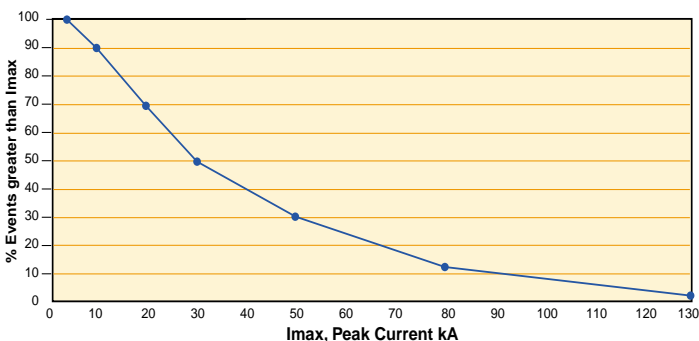
What Surge Rating is Recommended for Service Entrance Locations?

Two issues need to be considered when determining the surge ratings of an SPD for a specific location:

- What is the largest surge impulse the site is likely to require protection against; and
- Will this rating provide sufficient operational life under the more frequent smaller impulses?

Competition between SPD manufacturers has seen ever-increasing surge ratings being offered on the market, to the point where surges of this magnitude are unlikely to ever occur in nature and the life expectancy of the SPD is often in excess of 100 years under statistical conditions. It is not uncommon to find products on the market offering surge ratings up to 600kA 8/20µs per line.

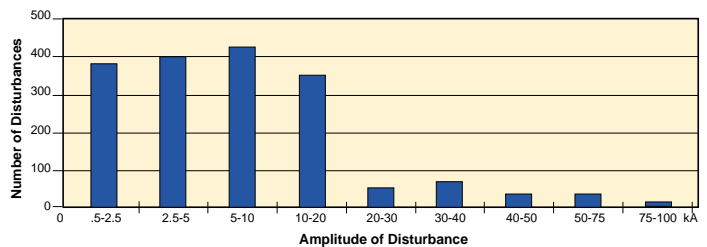
A number of sources provide information on the statistical distribution of the current discharge of the direct lightning strike. The diagram below shows that discharges above 100kA 8/20µs are likely to occur less than 5% of the time. Combined with the fact that most discharges do not strike the power line directly but are magnetically or capacitively coupled to it, and that even under a direct strike to the line the energy will split in either direction and be attenuated by the distribution class arresters, it is not hard to realize that only a small fraction of this initial energy actually enters the facility of concern.



Probability distribution of direct strike current

ANSI/IEEE standard C62.41 has classified the service entrance environment as Cat B/Cat C. Under this classification the highest expected energy level is 10kA 8/20µs. IEEE argues its case by pointing to many years of data collected for observed failure rates of equipment and impulse insulation of the supply system. Put simply, electrical insulation at the service entrance will not allow enough voltage to develop to source currents in the magnitude of hundreds of kAs. Recent work within the IEEE by respected scientists and academics may see the Cat C reclassified to levels nearer a maximum single shot rating of 100kA 8/20µs. It is important to note this 100kA rating includes its own safety overhead, thus higher surge ratings are not required. In addition, the 10/350µs waveshape may be introduced, up to 5kA.

A study that classifies the electrical environment of the primary service entrance to a facility can be found in a 10-year independent study completed during the 1970s. The purpose of this long duration study was to better understand the frequency and magnitude of surges which a typical building might experience in a location of average isokeraunic level, to better protect the computer main frame installations. This again confirms the observation that large surges (>70kA) are rare, but multiple smaller surges are common.



The average number of disturbances per building over a 10 year period

ERICO recommends a single shot rating of 100kA 8/20µs as providing a sufficient, cost effective level of protection for most exposed locations. SPDs rated to this level will provide a typical service life in excess of 15 years. This assertion is supported by the satisfactory field performance of many thousands of SPDs in some of the highest lightning-prone regions of the world.

