



## Selecting the correct Surge Protection Device

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What standard do you use when trying to decide the type, location, and quantity of Surge Protection Device (SPD) units for your facility? This question seldom has an immediate answer when asked to potential SPD customers. When I perform an initial walkthrough in a facility that has potential problems with voltage transients (spikes and surges), I always ask this question. The normal response is "Oh, I don't know I've seen them advertised in magazines...and I have seen them at the office supply or department store..." It is good that many people realize SPD systems exist, but, how does one decide on a system that will give good protection from all normal sources of voltage transients? The answer to this question is to use recognized industry standards to determine the correct number, placement, and size of SPD units to adequately protect your facility, not the advertisement in a magazine or the advertising on a pretty package or (one of my favorite) "This guy I heard told me to do it this way." So...what standard do we use?

The IEEE is the most often quoted source for electrical standards when dealing with power quality. The IEEE stands for "The Institute of Electrical and Electronics Engineers". The IEEE is a society of electrical and electronic engineers from across the country. Members of this society meet on a regular basis to discuss and develop standards that represent a consensus of the broad expertise on the subject of Power Quality along with many other subjects within the Institute. The recommendations of the IEEE come from people in the industry who actually manage and design facilities. Their expertise is widely recognized as "THE INDUSTRY STANDARD".

With that being said...What is the IEEE standard for SPD units? To find the IEEE requirements we must look in a publication from the IEEE called IEEE standard 1100 (also know as the Emerald Book). The IEEE Emerald book states the following:

### **Abstract:**

Recommended design, installation, and maintenance practices for electrical power and grounding (including both power-related and signal-related noise control) of sensitive electronic processing equipment used in commercial and industrial applications are presented. The main objective is to provide a consensus of recommended practices in an area where conflicting information and confusion, stemming primarily from different viewpoints of the same problem, have dominated.... Fundamental concepts are reviewed. Instrumentation and procedures for conducting a survey of



the power distribution system are described. Site surveys and site power analyses are considered. Case histories are given to illustrate typical problems.

The IEEE Emerald book is very specific in its recommendations for SPD Systems. The IEEE 1100 Emerald book is designed just like all other IEEE standards. The book is broken into sections and referred to in the following manner i.e... IEEE 1100 section 3.4.3 deals with the need and types of SPD units available. With the rest of this article I will refer to a few of these standards with respect to helping you make the proper decision on transient voltage protection for your facility.

As mentioned above, Standard 1100 3.4.3 states:

Surges can have many effects on equipment, ranging from no detectable effect to complete destruction. In general, electromechanical devices withstand voltage surges until a dielectric breakdown occurs, while electronic devices can have their operation upset before hard failure occurs. At intermediate levels, progressively more intense upset occurs until breakdown takes place. While electromechanical devices can generally tolerate voltages of several times their rating for short durations, few solid-state devices can tolerate much more than twice their normal rating.

This standard shows that transient surges cause damage by both long term and instantaneous failure. It also states that voltages more than 240 volts on a 120 volt system cause damage to most modern electronic equipment. I mention this because **most** of the cheap SPD units on the market cannot limit a 6000 volt transient surge to 240 volts. This 6000 volt transient surge level is the basic standard from IEEE when speaking about the amount of voltage that can enter in homes or facilities. SPD equipment installed must be able to withstand this 6000 volt transient surge and limit the voltage entering the facility to less than 240 volts on a 120 volt system. (If you currently own a SPD unit check and see what it is rated). The IEEE 1100 standard also tells us where to locate SPD units and how many to use. The standard for this information is:

#### 8.4.2.5 Surge protective device considerations

Recommended practice is that surge protective devices be applied to service entrance electrical switchboards and panelboards, and panelboards located on the secondary of separately derived systems that support information technology equipment, telephone, telecommunications, signaling, television, or other form of electronic load equipment



This tells us to locate SPD units in layers throughout our facility for complete protection. In case we are still confused, IEEE also gives us a diagram for proper location:

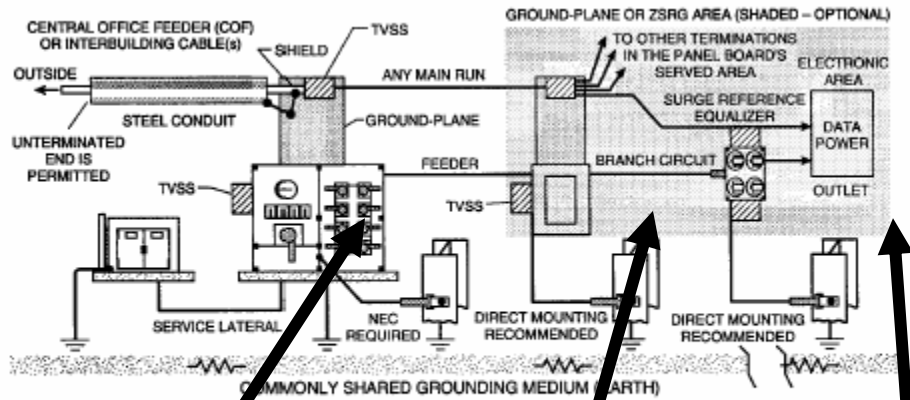


Figure 8-25—Typical locations of power distribution surge protective devices

At the service Entrance

At the sub distribution panels

At individual equipment

These are only a few of the standards in the IEEE 1100 Emerald Book. Standard 8.6 discusses proper coordination of all devices to gain the desired effect of protection of your equipment from transient voltages. Sensitive "sine wave tracking" SPD units are needed for sensitive equipment and robust SPD units are needed for lightning-exposed service entrances and high exposure panels such as parking lot lights, security gates etc.

As we have shown above, there **ARE** specific methods and equipment that can help protect your facility. Proper type, location, and quantity of SPD units using the IEEE standards is the most effective way to protect your equipment. SPD units are not all created for the same purpose, and it will take a specialist to identify and recommend the most cost-effective solution. Please make arrangements to have a Surge Protection Device Site Survey of your facility to bring it up to IEEE standards.