SURGE PROTECTION 103 : APPLICATIONS DISCUSSIONS

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1. Review from *Surge Protection 101* & *Surge Protection 102*.

1.1 Why install SPDs?

SPDs are identified by Codes & Standards as a required component of a Lightning Protection System (LPS). Within the LPS, SPDs are the only defense against threats to safeguard electrical and electronic power continuity. Threats are: Lightning (20%); transients from utility company switching activities (40%); internally-generate transients from generator, motor and pump startups (40%).

1.2 Where to Install SPDs?

Power continuity protection begins at incoming power panels (Type I/Cat. C), at system distribution panels (Type II/Cat B), individual equipment and wall outlet points of use (Type III/Cat A). *IEEE STD 1100 Powering & Grounding Electronic Equipment* recommends that "additional SPDs be applied to downstream electrical switchboards and panel boards..." This is termed a **Layered Approach**.

2. System Wide Protection Overview.

Figure 1 – Protection Categories per ANSI/IEEE C62.41

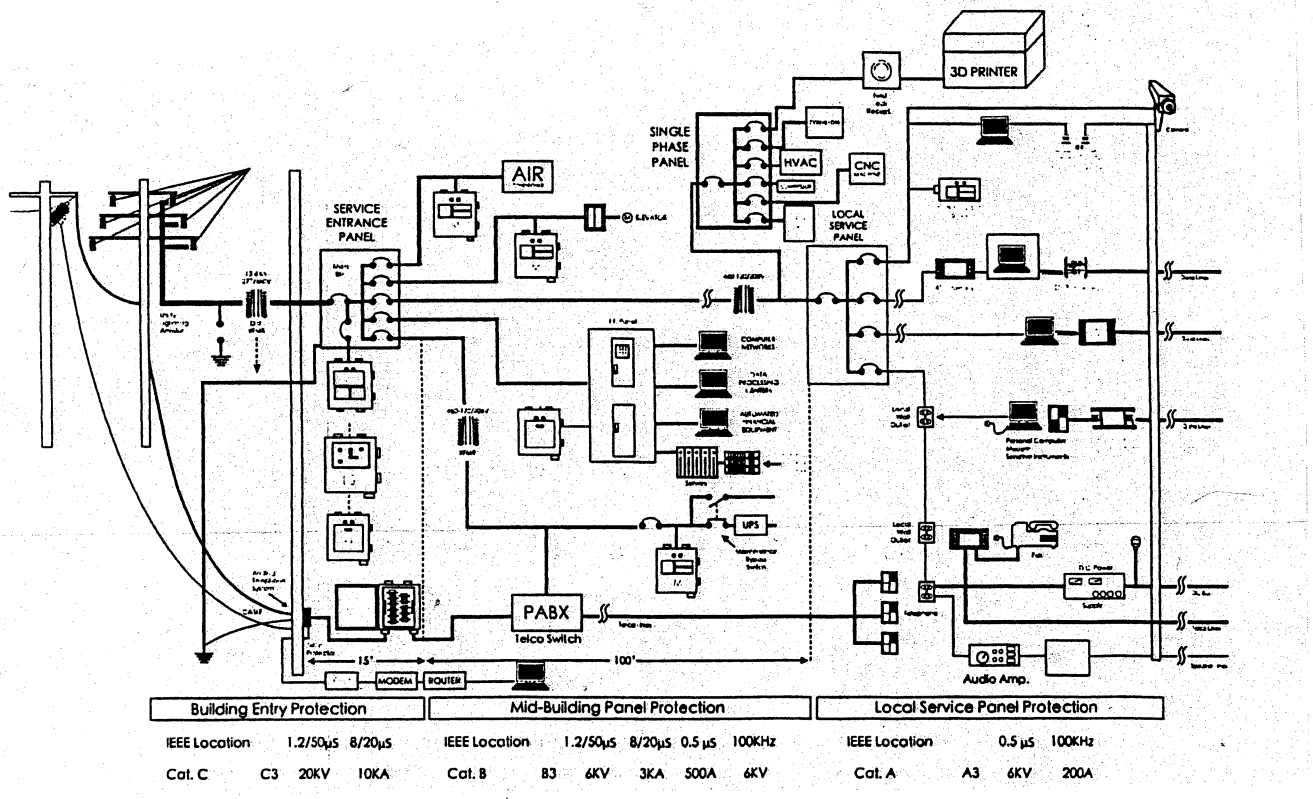
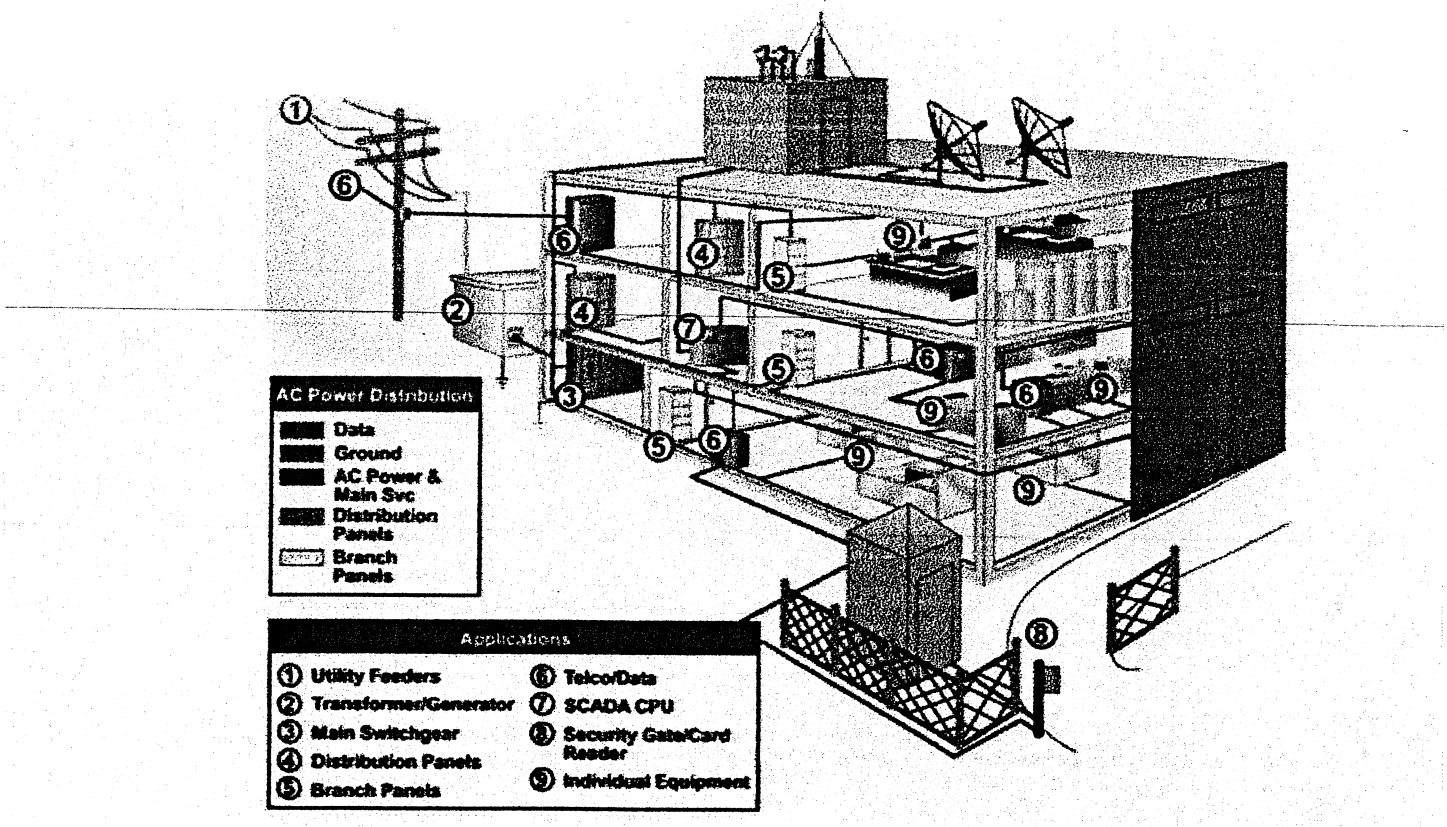


Figure 2 – Manufacturing Facility with Generalized SPD Applications



A **Layered Approach** for a complex process control operation will have many SPD candidates. Consider such activities as: Outdoor Lighting & Controller; Gate Controllers; HVAC; Conveyors; Lab Equipment; Utility/Telco Closet; Mainframes & Servers; Welding Station; Electric Hoists & Crane Systems; Wave Solder Machines; Computer Stations; Air Compressor; Water Pumps; CNC Controllers; Motor Control Centers; Intercom Systems; Security Systems (CCTV); Radio Net; Forklift Charging Stations; UPS; Standby Power Generators; other sensing and control functions.

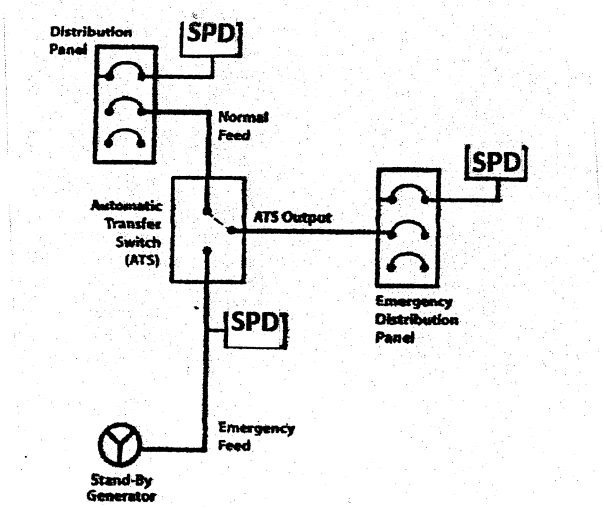
3.0 Three Overlooked SPD Candidates Common to Many Facilities.

3.1. UPS. A UPS provides backup power in the event of loss of utility power. Many UPSs contain single stage low energy and low pulse life Cat. A or Cat. B SPDs. This may protect the UPS and connected loads from a limited number of transient events, but it is not a transient solution. Static Type UPSs and Rotary Type UPSs require different SPD treatments. In either case, ANSI/IEEE Std. C62.41 recommends SPD protection for UPS rectifier-charger input circuits and the associated UPS bypass circuits. A SPD unit placed on line in front of the UPS will protect the investment in the UPS and the connected equipment. It follows that if the connected load is of sufficient value to be UPS-protected against power outages, so also should the UPS and the downstream operation be protected against transient insults. During UPS maintenance downtime, the SPD will filter out transients and surges during the static bypass mode of operation. The UPS itself will benefit with fewer maintenance problems and and extended lifetime.

3.2 Communications, Data and Security Circuits such as Radio Antennas, Closed Circuit TV Cameras, Motion Sensors, Gate Controllers and like equipment. Where exterior equipment sends low voltage signals over copper wire to interior monitoring devices, SPDs are required. Protect the signal side with properly bonded and grounded SPDs immediately as they enter the structure. Also, the interior monitoring equipment requires an SPD plugged into the AC outlet. Example: Motorola 800 MHZ radio network: SPD at the coaxial feed line; SPD at the base station.

3.3 Automatic Transfer Switches (ATS). ATSs are installed at the threshold of power to the facility. All power to all critical loads flows through them. The ATS routes both normal utility power and generator emergency power. If the ATS is transient-insulted the facility power feed will be compromised. Components within an ATS such as dense micro-circuitry on input control boards can be surge victims. SPDs serve these components to remain within their safe operating range. If the ATS suffers transient damage, the user may have neither generator nor utility power.

Figure 3 – Locations of SPDs for a Standard Automatic Transfer Switch, 2 Inputs, 1 Output



4.0 Conclusion. SPD applications are integral to transient protection regardless of upset sources. Layered surge-deflecting SPDs are the major contributor to operational continuity for most facilities. Each structure or facility is unique. Each will require studies to determine selection of mission-sensitive electrical services for operational continuity.

5.0 References.

5.1 IEEE 1100 Powering & Grounding Electronic Equipment, IEEE NY NY 2005

5.1.1 Annex 9H, Factors in Selecting Large-Scale AC and DC Power

5.1.2 Annex 9K, Fundamental Concepts of Surge Protection

5.1.3 Annex 9L, Additional Information on Surge Protection

5.2 Standler, R.B., Protection of Electronic Circuits from Overvoltages, John Wiley NY 1989

5.3 ANSI/IEEE STD C62.41 Recommended Practice for Surge Voltages in Low-Voltage AC Circuits, ANSI, NY NY

5.4 Sources include MCGSurge, Alltec Global, EMC Solutions, Schneider, Polyphaser, and others.