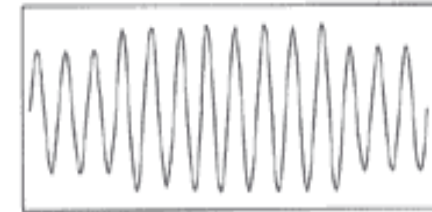
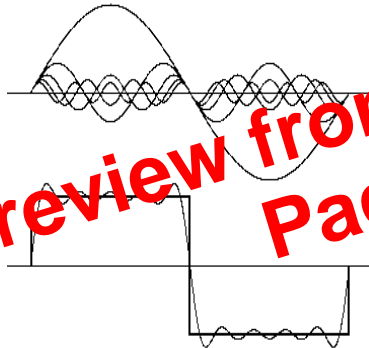


What is NOT a Transient Surge?

Harmonics



Sustained Overvoltage

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Page 6 of 30



Powerfactor Imbalance

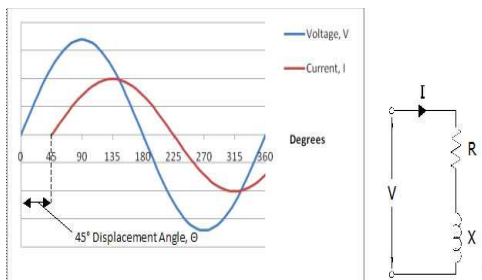
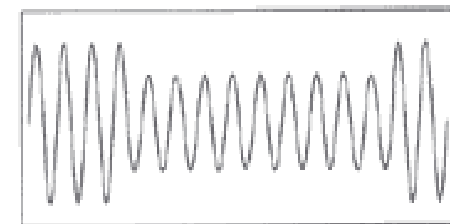


Figure1 Displacement Angle



Undervoltage

Surge Protective Devices are designed to protect against

one thing **Transient Surge**



The Effects of Transients on Business

\$80B

“Power related problems cost companies over \$80 billion a year”

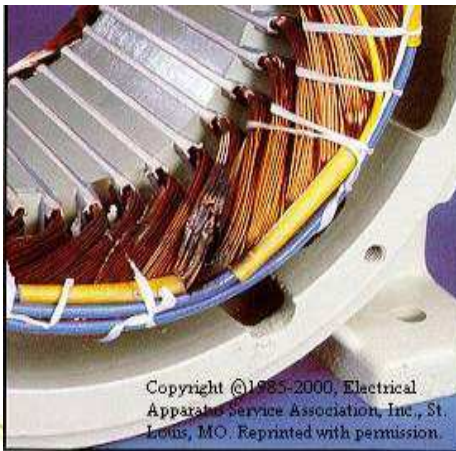
(Source: Lawrence Berkeley National Laboratory)



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Page 8 of 30

“Industry experts estimate that power surges cost businesses \$26 billion annually in lost time and equipment repairs and replacements”

(Source: Insurance Institute for Business & Home Safety)



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- High Facility Maintenance Costs
- Equipment Failure
- Long-term System Degradation
- Process disruptions
- Data Loss or Corruption
- Costly Downtime
- Safety to drinking water

Where to install Surge Protection

At the service entrance – to protect from externally generated surges

- Externally generated surges can be the highest energy surges

At any panels that have conductors that exit the building – to protect from alternate paths for lightning induced surges to enter

- Outdoor lighting
- Rooftop HVAC
- Outdoor equipment (Points often identified as 'back door')

Panels feeding critical loads – IEEE Emerald Book

- *“For large surge currents, this diversion is best accomplished in several stages. The first diversion should be performed at the entrance to the building, then, any residual voltage resulting from the action of the first protective device can be dealt with by a second protective device at the power panel of the computer room, or at the terminals of a connected load, or both.”*

Critical loads

- Point of Use

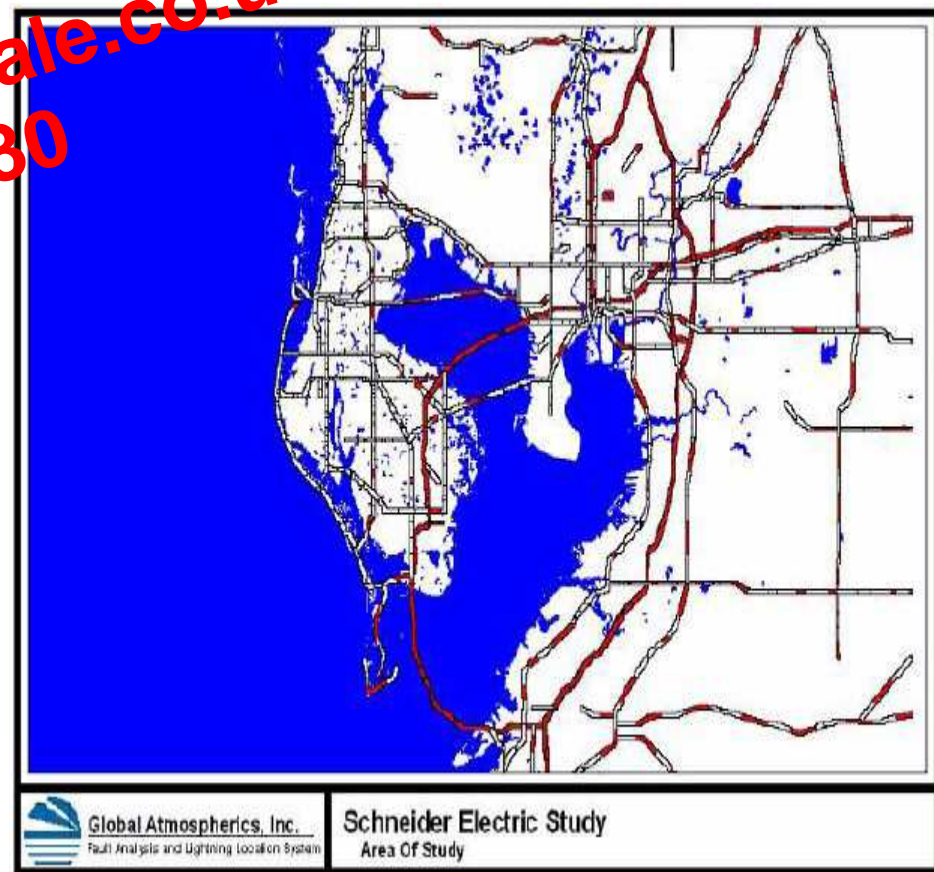
How Big of SPD is Needed?

SE Lightning Study

> July 15, 2000 Tampa Bay Area

> National Lightning Detection Network

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Page 19 of 30



Underwriters Laboratories

Industry Standard



ANSI/UL 1449

Surge Protective Devices

- Third Edition effective September 2009
 - TVSS to SPD
 - Introduction to Types of SPDs (Type 1,2,3,4)
 - Voltage Protection Rating
 - Nominal Discharge Current Rating
- Fourth Edition effective September 2014
 - Clarification
 - Additional testing not in effect till 2016 (PV)

ANSI/UL 96A

Lightning Protection Systems

ANSI/UL 1283

Electromagnetic Interference filters