Technical reference
Overvoltage protection to BS 7671

The latest amendment to the 17th Edition of the Wiring Regulations, BS 7671:2008(+A1:2011), in force from January 2012, establishes a requirement for assessing protection against transient overvoltages (surges) as an integral part of satisfactory electrical system design.

BS 7671 assesses the need to protect AC power circuits, although cross-references transient overvoltage protection on other metallic services including data, signal and telecommunications lines, as defined by IEC/BS EN 62305 Standard for Lightning Protection.

It covers transient overvoltages of atmospheric origin (lightning) or as a result of electrical switching, through two sections:
- **Section 443** which defines the criteria for risk assessment of transient overvoltages, considering factors such as levels of consequential loss and the withstand voltage/impulse immunity of installed electronic systems
- **Section 534** which outlines the parameters for selection and installation of SPDs as appropriate, to ensure satisfactory protection of electronic systems and electrical equipment

Risk assessment

Section 443 establishes that protection against transient overvoltages should be expected where:
- An installation includes bare overhead metallic service lines which are at risk from lightning and
- The level of transient overvoltage anticipated would exceed the withstand voltage of sensitive electrical equipment/ impulse immunity of critical electrical equipment, or
- The risk of potential consequential loss (to life, property or provision of service) would be unacceptable

Whilst direct lightning strokes are not considered, reference is made to BS EN 62305 which would require installation of equipotential bonding SPDs where a structural LPS is installed, or there is a risk of a direct lightning stroke to a service line.

Factors contributing to risk include external influences (thunderstorm days per year) and consequential levels of protection. Irrespective of external influences, where higher reliability or higher risks are anticipated, protection measures should be installed.

Considering the consequential levels of protection defined by BS 7671, protection is required wherever there is a risk of loss of human life (including permanent injury), to public services and to commercial or industrial activity.

Selection & installation of SPDs

Section 534 provides guidance on the selection and installation of SPDs to limit transient overvoltages.

The selection of an SPD is dependent on its location within the installation, the withstand voltage/impulse immunity of equipment at this location, and the expected transient overvoltage energy that the SPD is required to limit. The largest transient overvoltages are expected at the service entrance, i.e. at the origin of the installation.

Additionally transient overvoltages can be anticipated at sensitive and critical equipment as a result of electrical switching within the installation. SPDs should therefore be installed as appropriate at main distribution board level (after the meter), sub-distribution board level to protect sensitive equipment, and locally to protect critical equipment. Where multiple SPDs are installed on the same conductor, these should coordinate with each other to ensure protection levels are not compromised within the system.

The most important characteristic for an SPD is its voltage protection level (*Up*) and not its energy withstand (e.g. I_{imp}). SPDs with lower voltage protection levels (or let-through voltage) offer much better protection to sensitive and critical electronic systems, including:
- Minimal equipment stress (i.e. keeping circuit degradation to a minimum)
- Reduced risk from additive inductive voltages on the SPDs connecting leads
- Reduced risk from downstream voltage oscillations

BS 7671 follows IEC/BS EN 62305 by classifying SPDs by Type. Equipotential bonding SPDs (Type 1) must be installed at the service entrance where a structural LPS is installed or there is an overhead metallic service line at risk from a direct lightning stroke.

Type 1 SPDs however do not provide protection to electronic systems. Transient overvoltage SPDs (Type 2 or Type 3) are required downstream to protect sensitive and critical equipment. These SPDs protect against the transient overvoltages caused by indirect lightning (inductive or resistive coupling) and the electrical switching of large inductive loads.

They should offer Full Mode protection to protect sensitive and critical electronic systems, since transients can occur between all modes. Specific performance parameters for SPDs are defined in BS 7671, which are covered by Furse