

WHEN IS IT NECESSARY TO INSTALL SURGE PROTECTION DEVICES?

The aim of this article is to provide guidance on whether surge protection devices should be installed.

Introduction

The 18th Edition of *BS 7671* saw a number of significant changes to the requirements for provision of surge protection devices (SPDs).

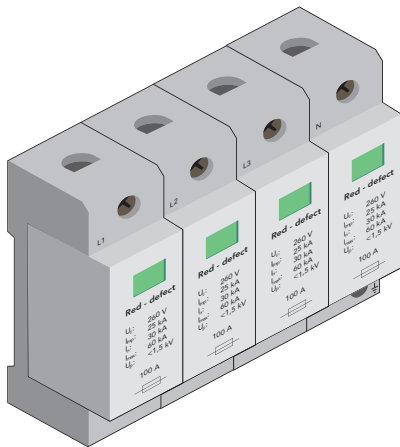


FIG 1 Typical three-phase arrangement

There are undoubtedly many instances where the installation of overvoltage protection for some or all premises is necessary for safety reasons. It should be noted that Section 443 does not specify any requirements for protection against transient overvoltages due to direct or nearby lightning strokes on the structure.

However, as effective overvoltage protection may involve the installation of a number of SPDs of differing types in multiple locations within an installation, the cost of effective provision can be significant.

Moreover, it must be remembered that SPDs deteriorate to some extent whenever they are called to interrupt/divert an overvoltage until they are life expired, at which point their replacement becomes essential in order to continue to provide the level of protection deemed appropriate in the design.

For these reasons, it is important to appropriately assess when – and where within an installation – SPDs should be installed to provide the necessary overvoltage protection cost-effectively.

18th Edition requirements

Regulation 443.4 requires that protection against transient overvoltages is provided

where such overvoltage occurrences could result in:

- serious injury to, or loss of, human life,
- interruption of public services,
- damage to cultural heritage,
- interruption of commercial or industrial activity, or
- where a large number of individuals at the same location could be affected.

This regulation also states that in all other cases a risk assessment according to Regulation 443.5 should be performed in order to determine if protection against transient overvoltage is required. If such a risk assessment is not performed, the electrical installation should be provided with protection against transient overvoltage.

An exception to the requirement to perform a risk assessment is given for single dwelling units where it is considered that the total value of the installation and equipment therein, does not justify such protection. This article does not address what that total value of the installation and equipment is, and such discussions should be had with the client prior to any work being carried out.

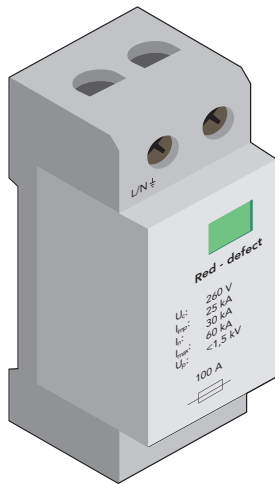


FIG 2 Typical single-phase arrangement

Consideration should also be given to the provision of overvoltage protection where installed equipment is likely to cause:

- switching overvoltages caused by, for example, the switching of a load or interruption of a fault current, or
- disturbances exceeding the overvoltage category of the installation or part thereof, most commonly in the healthy phases of a multi-phase system when phase-earth faults occur.

When is the application of risk assessment required?

The risk assessment methodology is now significantly more in-depth and extensive than the approach used in earlier editions of *BS 7671*, and need only be used when the requirements of Regulation 443.4 do not apply. This regulation requires further clarification and, therefore, the items listed in the indents of Regulation 443.4 will be considered individually.

- i) Where a transient overvoltage could result in serious injury or loss of human life

Protection against transient overvoltages should always be provided in such cases. This would include circuits supplying safety services and facilities providing medical care.

- ii) Where a transient overvoltage may result in interruption of public services

Protection against transient overvoltages should be provided for premises such as those for emergency services such as fire and rescue services, police and ambulance/paramedic services and communication systems. However, the need for overvoltage protection for premises providing public services such as libraries, schools and leisure centres should be determined by risk assessment.

- iii) Where a transient overvoltage may result in damage being caused to items of cultural heritage

Protection against transient overvoltages could be provided for buildings, monuments, artefacts and archaeological sites deemed to be unique or irreplaceable. In some cases this may necessitate the protection of an entire building, particularly where the building itself is the asset.

However in other instances, such as some museums and cultural centres, it can be reasonably argued that only those specific parts of buildings or particular circuits of an installation supplying items of cultural heritage automatically require overvoltage protection. The need to protect other parts of such premises or indeed non-essential circuits therein can be determined via risk assessment.

- iv) Where a transient overvoltage may result in interruption of commercial or industrial activity

Protection against transient overvoltages should be provided for installations such as hotels, banks, industrial plants and the like or parts thereof where a supply interruption is deemed intolerable. Examples might include circuits supplying complex interlinked production processes and storage/processing of valuable, sensitive or otherwise important data. The possible benefits of SPDs should be discussed with the client. However, specific commercial decisions exist outside the safety remit of *BS 7671*.

It must however be recognised that short term interruption of some commercial and industrial activities is insufficient grounds for blanket provision of overvoltage protection.

- v) Where a transient overvoltage may affect a large number of co-located individuals

This indent is effectively addressed where overvoltage protection is provided for instances described in indents (i) to (iii) of Regulation 443.4.

Conclusions

The 18th Edition does not require the provision of SPDs for installations of single dwelling units where the total value of the installation and the equipment therein does not justify the cost of such provision. However this does not mean that the possible benefits of such provision should not be pointed out to a client where the contractor is aware of instances of damage occurring as a result of overvoltage events in a particular area or geographic location.

Protection against overvoltages must always be provided where such voltages could cause serious injury or loss of life. Overvoltage protection should also be provided where an overvoltage could result in:

- interruption to essential public services, or
- damage to cultural heritage, or
- intolerable disruption to industrial or commercial activities.

In the case of non-essential public services, and industrial/commercial activities where some interruption of supply is tolerable, the need for overvoltage protection should be assessed by risk assessment. This should be done with the explicit agreement of the client and may need to be recorded on the Electrical Installation certificate accordingly.

In some cases, such as where overvoltage events are commonplace as a result of industrial activities and exposure to such would cause frequent failure of SPDs, alternative measures such as the use of suitable isolation transformers should be sought to provide more effective and reliable overvoltage protection.

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