

# BS 8436 cables: a non RCD-protected circuit option

*Bill Allan examines one way to avoid nuisance tripping by looking at a cable that doesn't require RCD protection*

The requirements in Regulation Grouping 522.6 of BS 7671:2008 regarding impact protection of cables mean effectively that in typical domestic premises, PVC flat twin and earth cables must be provided with additional protection by means of a 30 mA RCD.

Some householders may not be pleased about this, perhaps because of the possibility of nuisance tripping, and may inquire whether it is possible under the new regulations to install circuits which don't require RCD protection. One option which could be offered in such circumstances is to install BS 8436 cables.

Regulation 522.6.6(i) of BS 7671:2008, when read in conjunction with Regulation 522.6.7, mentions cables complying with BS 8436 as not requiring additional protection by a 30 mA RCD when concealed within a wall or partition at a depth of less than 50 mm from the surface of the wall or partition.

Cables to BS 8436 are also referred to in Regulations 522.6.5(ii), 522.6.8(i) and Table 4A3 in Appendix 4. The prospect of being able to offer customers the option of non RCD-protected circuits will be of interest to many contractors. Therefore, this article will provide some general information about BS 8436 cables.

## BS 8436 cables

BS 8436 cables, which are sometimes referred to by trade names such as Earthshield or Shieldguard, are suitable for use in thin walls and partitions (Fig 1). They are rated at 300V/500V and include two core, three core and four core cables. Their internal construction includes a laminated aluminium tape screen which is bonded to the outer sheath and is in contact with a copper circuit protective conductor (cpc).

The cpc has the same cross-sectional area as the core conductors. BS 8436 cable has a conductor operating temperature of 70°C to enable it to be used with standard accessories and also with Type B circuit-breakers, both of which are rated at 70°C. They have XLPE insulation, which is tougher than PVC, and the cable is tested with a 1.6 mm diameter nail – the same diameter as the standard picture hook nail – to create a line-to-earth fault. They have solid, circular copper conductors and a low emission of smoke and corrosive gases when affected by fire. The applicable

current rating Table is 4D2A and the voltage drop table is Table 4D2B.

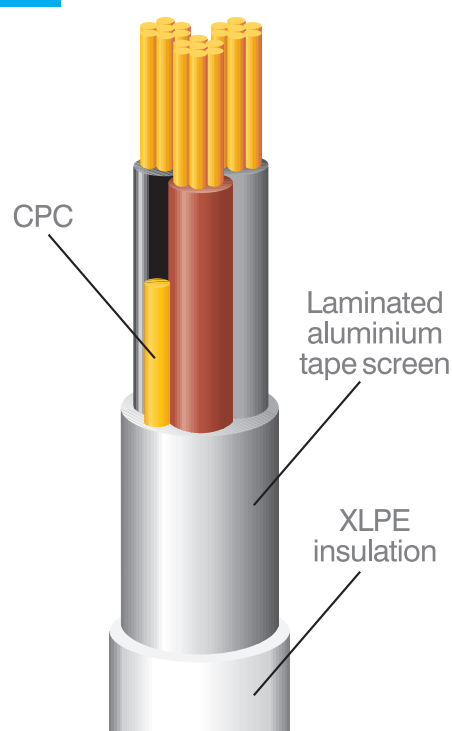
## Using BS 8436 cables

No special tools are necessary when using BS 8436 cables and they can be fixed with standard round PVC clips and terminated using standard back boxes, using a rubber grommet in the normal way to protect the cable against sharp edges. As the cpc is bonded to the aluminium screen, by terminating the bare cpc, you are earthing the screen.

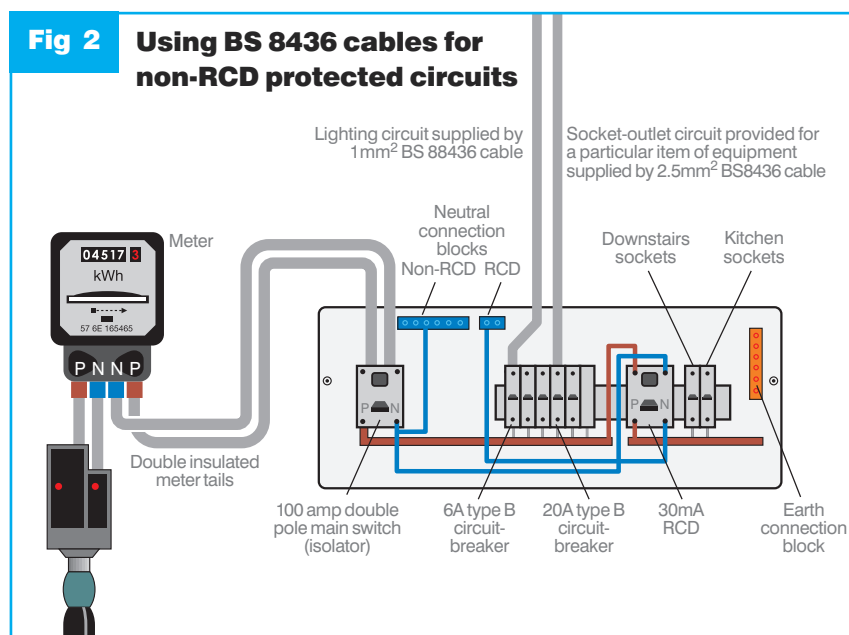
## Restrictions

BS 8436 cables have certain restrictions on their use. They must only be used on circuits which are protected by Type B circuit-breakers to BS EN 60898 or Type B RCBOs to BS EN 61009, with a current

**Fig 1** BS 8436 cable



**Fig 2 Using BS 8436 cables for non-RCD protected circuits**



rating not exceeding 16A for 1.0 mm<sup>2</sup> cables, 20 A for 1.5 mm<sup>2</sup> cables and 32A for 2.5 mm<sup>2</sup> cables, but only where they are used in ring final circuits.

Protection devices with lower current ratings could be used. For example, 6A cbs could be used with 1 mm<sup>2</sup> cable to supply lighting circuits and a socket-outlet provided for a particular item of equipment – such as a freezer or a computer – could be wired in 2.5 mm<sup>2</sup> and protected against overcurrent by a 20A cb (Fig 2).

Circuit-breakers are categorised according to their instantaneous tripping characteristic. Type B, for example, trip instantaneously at five times the current rating of the device, effectively, 0.1 seconds (see Fig.3.4 in Appendix 3 of BS 7671:2008). Therefore, the maximum current required to cause these protective devices to operate in a time of 0.1 seconds will not exceed 80 A (5x16) for 1.0 mm<sup>2</sup> cables, 100A (5X20) for 1.5 mm<sup>2</sup> cables and 160A (5X32) for 2.5 mm<sup>2</sup> cables. The cables have been tested to safely carry safely such current levels for one second (10 times 0.1 seconds) to ensure a safety margin in the test.

There are different classes of circuit-breaker, according to the amount of let-through energy permitted by the device (Fig 3). From the adiabatic equation (see Regulation 543.1.3 of BS 7671:2008)

$$I^2 t \leq k^2 S^2$$

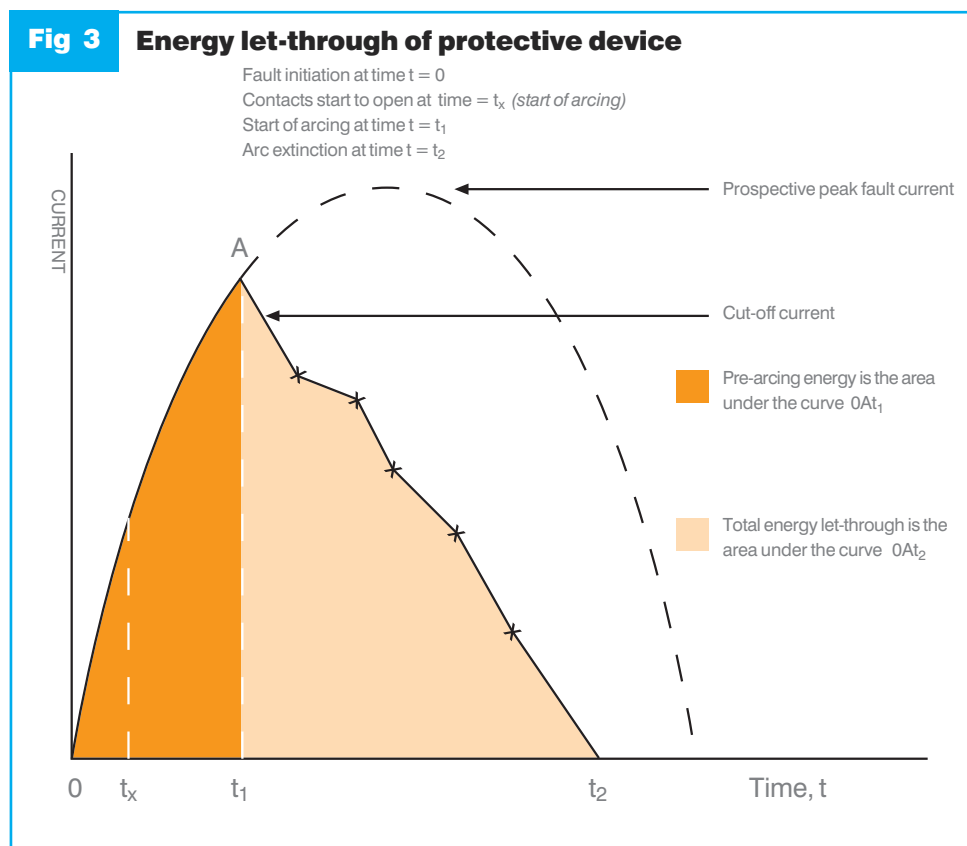
where,

$I^2 t$  = the energy let-through,

$k^2 S^2$  = the energy withstand of the cable.

The energy level of the Type B circuit-breaker used for BS 8436 cables needs to be Class 3, which lets through less energy than Class 1 or Class 2. The energy class is indicated on the circuit-breaker. When purchasing Type B circuit-breakers, you will find that they probably comply with this requirement. However, it's up to the purchaser to find out if this is the case.

**Fig 3 Energy let-through of protective device**



## Cost

BS 8436 cables are relatively expensive at present. We were quoted £90 for 100 metres of 1.5 mm<sup>2</sup> cable and this includes a reasonable discount. However, to put it in some sort of perspective, it is possible, under the 17th Edition, to install a new lighting circuit which is unprotected by a 30 mA RCD by using standard flat twin and cpc cable but with BS 8436 cables for the switch drops. If we use three metres for one switch drop, this works out at £3 per switch drop, which doesn't seem too bad.

## Conclusion

The use of BS 8436 cables gives contractors an option to offer domestic customers who are concerned about nuisance tripping of RCDs on particular circuits. Further information can be obtained from the BS 8436 standard. It must be borne in mind however that a socket-outlet is provided for connection of a certain item of equipment, it must be specifically labelled or otherwise identified, in accordance with Regulation 411.3.3.