

INTRODUCTION TO BRITISH STANDARDS FOR FIRE CABLES



A review and introduction into the British Standards involved in the design, manufacture and testing of fire resistant cables for emergency building services.

1.0 Introduction

The British Standard Institution (BSI) is a private company incorporated by Royal Charter and publishes British Standards for a wide range of uses underlined by their principle to 'make excellence a habit'. New and existing British Standards that involve fire resistant cables continue to be major discussion points with clients, consultants and installers so this review is Draka's introduction to some of the common British Standards that relate to fire resistant cables.

2.0 Risk Assessment and the Law

UK building regulations are law and they make it clear that buildings need a risk assessment conducted early in the design stage to assess the fire risk. For public buildings this commonly results in the need for fire detection, fire alarm and emergency escape lighting systems. It may also result in the need for life safety and fire fighting systems to be included.

3.0 British Standards for emergency building services

Whether a building requires these systems is for others and not the responsibility of a cable manufacturer, an electrical designer or installation teams. As a manufacturer however, Draka has developed, manufactured and tested cables for many years and can provide information to building owners, design and installation teams on the performance of cables for the systems. It is for these emergency building service applications that BSI has researched, developed and published British Standards as codes of practice and are the most common applications for fire resistant cables.

3.1 "BS 5839-1: Fire detection and fire alarm systems for buildings. Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises."

This British Standard was first published in 1980 and has been reviewed and revised with the current edition published in 2013. It is a 'code of practice' which provides considerations and some specific criteria for the design, installation and maintenance of fire detection and fire alarm systems required as a result of the fire risk assessment. In terms of cable it describes the requirements for circuit integrity during fire and advises upon the use of 'standard' or 'enhanced' fire resistant cable for different parts of the building. It refers to a number of details, for example the preferred sheath colour of the cable, to the metallic fixing methods and lists other British Standards to meet the requirements for critical circuits in fire detection and fire alarm systems. This British Standard is the starting point for designers and installers of fire alarm systems and forms part of the maintenance programme for the life of the building.

3.2 "BS 5266-1: Emergency lighting. Code of practice for the emergency escape lighting of premises."

First published in 1975 the latest and current revision is 2011 which is the first edition to include reference to cables with 'standard' and 'enhanced' fire resistance. It details and categorises which applications require the use of which of the cable types. Emergency escape lighting systems are employed to ensure that in the event of power failure to lighting circuits that sufficient illumination is provided to guide occupants along predetermined escape routes and through appropriate exits to safety. This is especially needed for those unfamiliar with the building layout; Transport hubs for example such as underground metro systems or airports. As we saw for fire detection and fire alarms this British Standard also does not decide if an escape lighting system is needed, that is for others. It provides design considerations and advice on how to support the fire risk assessment should an emergency escape lighting system be required and which cables are needed.

3.3 "BS 8519: Selection and installation of fire-resistant power and control cable systems for life safety and fire-fighting applications. Code of practice."

Originally published in 2005 as BS 7346-6 and replaced by BS 8519 in 2010 this new British Standard is also a code of practice. The standard lists a broad range of Life Safety and Fire Fighting systems and it details the fire resistance required of cable for the power and control of each one. The code defines the actual requirements for fire resistance and a new set of parameters for cables: Category 1, 2 and 3 for power or control cables. Life safety and fire fighting systems are different from the two British Standards described above, BS 8519 does not address evacuation systems. Life safety systems include smoke and heat exhaust ventilation systems designed to manage deadly quantities of smoke and very high temperature toxic gases to protect people still in the building. Life safety systems include communication links to occupied, non-evacuated areas as part of the fire strategy, for example intensive care wards in a hospital. BS 8519 addresses fire fighting systems of the type for fire fighters to take control of the fire. For example, sprinkler pump power & control circuits and also power and control of fire fighting lifts used by the fire fighters move around large and complex buildings. BS 8519 helps designers select the appropriate cable for systems that prolong life and fight fire.

4.0 British Standards for cable construction

British Standards for cable construction tell manufacturers what materials to use for conductors, for insulation, for wire armour or metallic protection and for the final sheath. It specifies exactly what conductor resistance is required, the low smoke and zero halogen performance required. Specific to each cable type they are the recipe or construction manual for cable makers.

4.1 “BS 7629-1 Electric cables. Specification for 300/500 V fire resistant screened cables having low emission of smoke and corrosive gases when affected by fire. Multicore and multipair cables.”

Draka’s FT30 Saffire and FT120 cables have been designed and tested to meet the requirements of BS 7629-1 and they are certified by BASEC and by LPCB. The British Approvals service for Cables (BASEC) also conducts random sample collection and testing and it audits a manufacturer’s procedures and test results to make sure the cable is as it should be. This is third party certification and provides confidence to engineers, building owners and insurers that the cable component of emergency systems meets all the necessary requirements. This British Standard is the construction manual for the manufacturers of small cables that need low fire hazard performance and fire resistance.

4.2 “BS 7846: Electric cables. Thermosetting insulated, armoured, fire-resistant cables of rated voltage 600/1000 V, having low emission of smoke and corrosive gases when affected by fire. Specification”

Draka’s FTP and FTP120 fire resistant armoured power cables meet the requirements of this standard and also feature BASEC and LPCB third party certification. These cables are designed to handle, install and perform as a normal armoured power cable and can be used in calculation and design programs in the same way. This standard, like BS 7629-1 above, details all material types, the physical dimensions such as conductor material and sizes, minimum insulation and sheath thickness. BS 7846 is the design, manufacture and test manual for cable makers to provide fire resistant power cables for use in emergency building services.

4.3 “BS 60702-1: Mineral insulated cables and their terminations with a rated voltage not exceeding 750 V. Cables”

This standard last reviewed and published in 2002 details materials and dimensions of the original cable design to achieve fire resistance. This cable has a copper sheath which contains copper conductors and a powdered, hygroscopic magnesium oxide insulation. These mineral insulated copper clad cables (MICC) require special terminations and glands and although certainly achieve very high levels of fire integrity, their use in building services has been replaced over the last twenty years by the modern design of extruded composite cables such as Draka’s FT range.

5.0 British Standard tests for fire resistance

British Standards for fire resistance set out to test the integrity provided by a cable during fire in particular, circuit continuity at rated voltage. Each of these British Standards is a specification for the actual fire test. They detail the design and dimensions of test rigs and how many cable samples are used, how they are prepared and how the burners are calibrated. They list the methods of cable attachment, how circuit continuity is measured, the test voltages and the burner gas and air mixture. These standards are the fire test instruction manuals for the test engineers and ensure consistent methods are used by all.

5.1 “BS EN 50200: Method of test for resistance to fire of unprotected small cables for use in emergency circuits.”

Originally written as the ‘EN’ or European Norm standard it was adopted by BSI and published as a ‘BS EN’ in 2000. The 2006 revision replaced its predecessor and also BS 8434-1:2003 which has since been withdrawn. As the title describes this is a test for small cables (it defines up to and including 20mm diameter) with a flame temperature of 850 °C and a physical impact. This impact is a steel bar striking the predefined backboard the cable is mounted on at intervals for the duration of the test. The test durations are 15, 30, 60, 90 & 120 minutes with cable integrity given as PH15, PH30, PH60, PH90 or PH120 should they pass. When the 2006 BS EN was reviewed it was revised to include BS 8434-1 test which was significant. The 2000 version had testing elements of flame and indirect shock only and this was **insufficient** to meet the requirements of BS 5839-1: 2002 ‘standard’ fire resisting cables because there was no water test. This meant that the most commonly needed fire resistant cable had to meet the requirements of two tests in two British Standards. The 2006 review was revised to incorporate the water spray element of BS 8434-1 into its Annex ‘E’. This has meant that ‘standard’ fire resisting cables required by BS 5839-1 must achieve PH30 AND Annex ‘E’ of BS EN 50200:2006. So, two tests now within the same standard. For emergency escape lighting systems described by BS 5266-1 ‘standard’ fire resisting cables are required to achieve PH60 classification and Annex E. This is still a regular discussion point: ‘standard’ fire resisting cables must pass two fire tests ‘Annex E’ and PH30/PH60.

5.2 “BS 8434-2:2003+A2:2009: Methods of test for assessment of the fire integrity of electric cables. Test for unprotected small cables for use in emergency circuits. BS EN 50200 with a 930°C flame and with water spray”

This test method is used to assess a cable for ‘enhanced’ fire resistance required for applications in fire detection, fire alarm, emergency escape lighting and some life safety and fire fighting control circuits. As the title says, it is for small cables but at a higher nominal flame temperature, 950 °C as opposed to 850 °C.

BS 8434-2 is a two hour test which includes direct flame, indirect impact and a water spray test. Cables that are required for 'enhanced' fire resisting circuits must meet BS EN 50200 PH120 classification and they must also meet BS 8434-2. This fire test is for the additional performance required by 'enhanced' fire resisting cables and is the procedure used by the fire test engineer.

5.3 "BS 8491 Method: for assessment of fire integrity of large diameter power cables for use as components for smoke and heat control systems and certain other active fire safety systems"

This fire test procedure is also part of the fire test engineer 's tools to calibrate the rig, prepare the cable samples, conduct the test and record the result correctly. It is still in the first edition, published in 2008, and supports in particular, the use of fire resistant power cables for life safety and fire fighting systems of the type typically required by large and complex buildings.

5.4 "BS 6387: Test method for resistance to fire of cables required to maintain circuit integrity under fire conditions."

This British Standard is a fire test procedure only. The first edition was 1983, the second, 1994 and third and current edition is 2013 and over those editions it had included a very wide variety of tests and classifications.

Common emergency building services described above, no longer call for cable to meet the requirements of this test. It has now become a performance requirement called for in construction projects typically in overseas territories where UK building regulations are not in effect but fire resisting cables are still required. The test is included in this review because between 1983 and 2000 it was the only UK fire resistance test for circuit integrity with water and it had become synonymous with the requirements for emergency systems. The current standard still retains the method of testing flame only, flame with impact and flame with water spray as separate tests on fresh samples. It retains only the C, W and Z tests and although classification allows single or combinations of them, the most common is still CWZ. BS 6387 although current is no longer required in UK emergency building services.

6.0 Summary

British Standards that involve fire resistant cables fall into three types.

- i. Applications Standards** – Systems that use fire resistant cables.
- ii. Construction Standards** – Specifications to manufacture fire resistant cables.
- iii. Test Standards** – Procedures for testing fire resistant cables.

Protection of lives and property are prerequisites during fire and electrical emergency building services are tools to help achieve that. British Standards constitute the best practice for systems, procedures and products; be sure your cables meet them.



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