

BRITISH STANDARD

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

ICS 13.220.40; 29.060.20



NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

Publishing and copyright information

The BSI copyright notice displayed in this document indicates when the document was last issued.

© BSI 2008

ISBN 978 0 580 57269 2

The following BSI references relate to the work on this standard:

Committee reference GEL/20/18

Draft for comment 06/30152609 DC

Publication history

First published January 2008

Amendments issued since publication

Amd. no.	Date	Text affected
-----------------	-------------	----------------------

Contents

Foreword *iii*

1	Scope	<i>1</i>
2	Normative references	<i>1</i>
3	Terms and definitions	<i>1</i>
4	Test chamber	<i>1</i>
5	Apparatus	<i>2</i>
6	Verification procedure for the source of heat	<i>11</i>
7	Test specimens	<i>12</i>
8	Test procedure	<i>15</i>
9	Test report	<i>18</i>

Annexes

Annex A (informative) Guidance on the provision of a suitable test chamber *19*

Bibliography *20*

List of figures

Figure 1	– Schematic of the test configuration	<i>5</i>
Figure 2	– Plan view of apparatus	<i>6</i>
Figure 3	– End elevation view of apparatus	<i>7</i>
Figure 4	– Rubber bush	<i>8</i>
Figure 5	– Arrangement of holes on burner face	<i>8</i>
Figure 6	– Position of water jet device	<i>9</i>
Figure 7	– Temperature measuring arrangement	<i>10</i>
Figure 8	– Example of mounting of a larger diameter test specimen	<i>13</i>
Figure 9	– Example of mounting of a smaller diameter test specimen	<i>14</i>
Figure 10	– Basic circuit diagram	<i>16</i>

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 20, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard is published by BSI and came into effect on 31 January 2008. It was prepared by Subcommittee GEL/20/18, *Fire testing*, under the authority of Technical Committee GEL/20, *Electric cables*. A list of organizations represented on this committee can be obtained on request to its secretary.

Relationship with other publications

The test method given in this British Standard is technically identical with the test method given in BS 7346-6:2005, Annex B. It is intended that when BS 7346-6:2005 is amended Annex B will be taken out.

Information about this document

The test method given in this British Standard includes subjecting the cable under test to radiation via direct impingement corresponding to a constant temperature attack of 842 °C, to direct mechanical impacts corresponding to a force of approximately 10 N, and to direct application of a water jet simulating a water fire fighting jet.

NOTE Although this test method has changes to accommodate the application of impacts and the water jet, it is based on the test method given in BS EN 50362, which has the constant temperature attack of 842 °C. This is the same constant temperature attack as used in the test method given in BS EN 50200.

BS 7346-6 specifies three fire survival times depending upon the application of the cables: either 30 min or 60 min for life safety systems (LS), and 120 min for fire fighting systems (FF). The test method given in this British Standard includes three different test durations to allow testing of cables intended for these different applications.

It is emphasized that fire tests do not assess a fire hazard, nor can the results of fire tests alone guarantee safety. They only provide information to assist in the assessment of the suitability of a cable for a given application.

Hazard warnings

WARNING. This British Standard calls for the use of substances and/or procedures that can be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

The test given in this British Standard may involve the use of dangerous voltages and temperatures. Suitable precautions should be taken against the risk of shock, burning, fire and explosion that may be involved and against any noxious fumes that may be produced.

Use of this document

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its methods are expressed as a set of instructions, a description, or in sentences in which the principal auxiliary verb is “shall”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

1 Scope

This British Standard describes a method for assessment of the fire integrity of large diameter power cables for use as components for smoke and heat control systems as given in BS 7346-6, and certain other active fire safety systems. It is applicable to cables of rated voltage not exceeding 600/1 000 V and of overall diameter greater than 20 mm.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS EN 60529:1992, *Specification for degrees of protection provided by enclosures (IP code)*

BS EN 60584-1, *Thermocouples – Part 1: Reference tables*

BS EN 60695-4, *Fire hazard testing – Part 4: Terminology concerning fire tests for electrotechnical products*

BS EN ISO 13943, *Fire safety – Vocabulary*

IEC 60269-3, *Low-voltage fuses – Part 3: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household and similar applications) – Examples of standardized systems of fuses A to F*

3 Terms and definitions

For the purposes of this British Standard the terms and definitions given in BS EN ISO 13943 and BS EN 60695-4 apply.

4 Test chamber

WARNING. The test method given in this British Standard may involve the use of dangerous voltages and temperatures. Suitable precautions should be taken against the risks of shock, burning, fire and explosion that may be involved and against any noxious fumes that may be produced.

The test shall be carried out in a suitable chamber of minimum volume 10 m³, with facilities for disposing of any noxious gases resulting from burning. Sufficient ventilation shall be available to sustain the burner flame (see 5.3) for the duration of the test.

The locations of any air inlets and exhaust chimney shall be such that the burner flame remains stable during the verification procedure and during the tests.

NOTE 1 It might be necessary to have suitable shielding of the burner flame to ensure its stability.

The same ventilation and shielding conditions shall be used in the chamber during both the verification and the test procedures.

NOTE 2 Guidance on the choice of suitable chambers and on ventilation and shielding conditions is given in Annex A.

The atmosphere in the chamber shall be between 10 °C and 40 °C at the start of each test.

5 Apparatus

NOTE The arrangement of the apparatus is shown in Figure 1, Figure 2 and Figure 3.

5.1 Test ladder, for mounting the test specimen, comprising a steel framework as shown in Figure 1. The two central vertical elements of the ladder shall be adjustable in order to accommodate test specimens of different sizes of cable. The test ladder shall be $(1\,200 \pm 100)$ mm long and (600 ± 50) mm high, and the total mass of the test ladder shall be (18 ± 1) kg. Ballast, if required, shall be placed on the test ladder.

NOTE 1 Angle iron, (45 ± 5) mm wide and (6 ± 1) mm thick with slots cut to allow for movement of the vertical elements and the fixing of the bolts and clips (see 7.2), has been found to be a suitable material for construction of the test ladder.

The test ladder shall be fastened to a rigid support framework by four bonded rubber bushes of hardness 50 to 60 Shore A. To enable this to be done, each horizontal element of the test ladder shall be extended beyond the end vertical elements and shall have a mounting hole not more than 200 mm from each end vertical element, the exact position and diameter being determined by the particular bushes and supporting framework used. The bushes shall be fitted between the horizontal elements of the ladder and the support framework, as illustrated in Figure 1 and Figure 2, so as to allow movement of the test ladder under impact.

NOTE 2 A typical rubber bush is illustrated in Figure 4.

5.2 Circuit continuity checking and voltage withstand arrangement, comprising a three-phase star-connected transformer, or one or more single-phase transformers, of sufficient capacity to maintain the test voltage, up to the maximum leakage current allowable, together with a suitable load and an indicating device (e.g. a lamp).

NOTE 1 Consideration should be given to the characteristics of the fuse or circuit breaker (see 5.9) when selecting the power rating of the transformer.

NOTE 2 A lamp would constitute both a load and an indicating device. If a load other than a lamp is used a separate indicating device would be needed, such as a bell or a buzzer.

5.3 Source of heat, comprising a horizontally mounted ribbon type propane gas burner with a venturi mixer. The burner face length shall be (500 ± 25) mm and the burner face width shall be nominally 10 mm. The face of the burner shall have three staggered rows of round holes centred on the face of the burner, 1.32 mm in diameter and drilled at 3.2 mm centres, as shown in Figure 5.

NOTE 1 A centre feed burner is recommended.

NOTE 2 In addition to the three rows of holes specified, a row of small holes milled on each side of the burner face is permitted, to serve as pilot holes for keeping the flame burning.

The flow rates of propane gas and of air to the burner shall be monitored by flow meters. Mass flow meters should be used as a means of controlling accurately the input flow rates. Rotameter type flow meters may be used as an alternative but are not recommended.

If rotameter type flow meters are used, correction factors shall be applied to the readings to take account of the temperature and pressure of the propane gas and the air supply.

NOTE 3 Guidance on the use of rotameter type flow meters, and the application of appropriate correction factors, is given in BS EN 50200:2006, Annex B.

The volume flow rate of propane gas to the burner shall be (10 ± 0.4) l/min, which is equivalent to a mass flow rate of (319 ± 13) mg/s. The volume flow rate of air to the burner shall be (160 ± 8) l/min, which is equivalent to a mass flow of $(3\,267 \pm 163)$ mg/s.

NOTE 4 The mass flow rates given above have been calculated from the specified volume flow rates at reference conditions of 100 kPa (= 1 bar) and 20 °C.

NOTE 5 The purity of the propane gas is not specified. Use of an industrial grade of propane gas that contains impurities is permitted provided that the burner meets the performance requirements specified in 6.4.

The performance of the burner and associated controls shall be verified using the procedure given in Clause 6. The exact burner position to be used during testing shall be determined during the verification procedure, when the values of V and H to be used shall be determined. The burner shall be rigidly fixed during the test so as to prevent movement relative to the test specimen.

For the purposes of this test, the air supplied to the burner shall have a dew point not higher than 0 °C.

NOTE 6 If the air is supplied from a compressor, an in-line drying facility needs to be used to achieve this.

NOTE 7 The source of heat and associated controls are the same as those specified in BS EN 50362:2003, 6.4.