

# Electrical systems in office furniture and office screens — Specification

ICS 29.020; 97.140

## Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee FW/3, Office furniture, upon which the following bodies were represented:

British Coatings Federation  
 British Contract Furnishings Association  
 British Educational Suppliers Association  
 British Measurement and Testing Association  
 British Office Systems and Stationery Federation  
 Castor Manufacturers (UK) Association  
 Electrical Installation Equipment Manufacturer's Association (BEAMA Ltd)  
 Federation of Electronics Industry  
 Furniture Industry Research Association  
 Interlect  
 SATRA Technology Centre

This British Standard, having been prepared under the direction of the Consumer Products and Services Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 2 September 2002

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First published 1983  
 Second edition April 1990  
 Third edition September 1995  
 Fourth edition September 2002

The following BSI references relate to the work on this British Standard:  
 Committee reference FW/3  
 Draft for Comment 01/711438 DC

### Amendments issued since publication

Amd. No.	Date	Comments

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## Foreword

This British Standard has been prepared by Technical committee FW/3, Office furniture. It supersedes BS 6396:1995, which is withdrawn. This new edition introduces technical changes and is a full revision of the 1995 version of the standard.

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

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### Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 10, an inside back cover and a back cover.

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## 1 Scope

This British Standard specifies requirements for the safe provision and assembly of electrical power, data and telecommunications distribution systems in office furniture and office screens. Requirements are specified for furniture for general use and for furniture for use with specific equipment, parts of which may be built in during manufacture.

Appropriate tests are described for the installed power distribution system in the furniture. The standard applies to single-phase electrical power distribution systems operating at rated voltages up to 250 V a.c. that are connected to the fixed wiring of the permanent installation of the building by a 13 A fused plug and socket outlet arrangement complying with BS 1363. The standard makes provision for the routing of cables through the furniture.

This standard does not apply to electrical appliances used with or within an article of office furniture, for which appropriate standards are available. The standard does not apply to power distribution systems that are permanently connected to the building installation.

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS 1362, *Specification for general purpose fuse links for domestic and similar purposes (primarily for use in plugs).*

BS 1363-1, *Specification for 13 A fused plugs and switched and unswitched socket-outlets — Part 1: Specification for rewirable and non-rewirable 13 A fused plugs.*

BS 1363-2, *Specification for 13 A fused plugs and switched and unswitched socket-outlets — Part 2: Specification for 13 A switched and un-switched socket-outlets.*

BS 3676-1, *Switches for household and similar fixed electrical installations — Part 1: General requirements.*

BS 3955, *Specification for electrical controls for household and similar general purposes.*

BS 4491-1, *Appliance couplers for household and similar general purposes — Part 1: Specification of general requirements.*

BS 4714:1980, *Method for laboratory determination of density or relative density of crude petroleum and liquid petroleum products (hydrometer method).*

BS 4727, *Glossary of electrotechnical, power, telecommunication, electronics, lighting and colour terms.*

BS 5467, *Specification for 600/1000 V and 1900/3300 V armoured electric cables having thermosetting insulation.*

BS 5733, *Specification for general requirements for electrical accessories.*

BS 6004, *Electric cables. PVC insulated, non-armoured cables for voltages up to and including 450/750 V, for electric power, lighting and internal wiring.*

BS 6346, *Specification for 600/1000 V and 1900/3300 V armoured electric cables having PVC insulation.*

BS 6500, *Electric cables — Flexible cords rated up to 300/500 V, for use with appliances and equipment intended for domestic, office and similar environments.*

BS 6724, *Specification for 600/1000 V and 1900/3300 V armoured electric cables having thermosetting insulation and low emission of smoke and corrosive gases when affected by fire.*

BS 7211, *Specification for thermosetting insulated cables (non-armoured) for electric power and lighting with low emission of smoke and corrosive gases when affected by fire.*

BS 7671, *Requirements for electrical installations — IEE Wiring Regulations — Sixteenth edition.*

BS 7919, *Insulated flexible cords and cables for industrial applications.*

BS EN 60127-2, *Miniature fuses — Part 2: Specification for cartridge fuse links.*

BS EN 60598-1, *Luminaires — Part 1: General requirements and tests.*

BS EN 60950, *Specification for safety of information technology equipment including electrical business equipment*.

BS EN 61032, *Protection of persons and equipment by enclosures — Probes for verification*.

### 3 Terms and definitions

For the purposes of this British Standard, the definitions given in BS 4727 apply, together with the following.

#### 3.1

##### **appliance coupler**

means of enabling the connection and disconnection at will of a flexible cable or cord to an appliance or other equipment. It consists of two parts:

- a) a connector, which is the part integral with, or intended to be attached to, the flexible cable or cord connected to the supply; and
- b) an appliance inlet, which is the part integrated in or incorporated in the appliance or equipment, or intended to be fixed to it

#### 3.2

##### **basic insulation**

insulation to provide basic protection against electric shock

#### 3.3

##### **supplementary insulation**

independent insulation applied in addition to basic insulation in order to ensure protection against electric shock in the event of a failure of the basic insulation

#### 3.4

##### **double insulation**

insulation comprising both basic insulation and supplementary insulation

#### 3.5

##### **reinforced insulation**

single insulation system that provides a degree of protection against electric shock equivalent to double insulation under the conditions specified in BS EN 60950

NOTE The term “insulation system” does not imply that the insulation has to be one homogeneous piece. It may comprise several layers that cannot be tested as supplementary or basic insulation.

#### 3.6

##### **building’s electrical installation**

electrical installation of the building comprising the fixed wiring and fixed equipment

#### 3.7

##### **cable management**

system to protect and organize cables, including cables connected to an item of office furniture or to a machine or luminaire used in conjunction with that furniture

#### 3.8

##### **cable management system**

##### **duct**

##### **cableway**

means of enclosing, protecting and separating cables and a means for providing routes for cables to pass through the furniture and thus other elements of the furniture system where appropriate

#### 3.9

##### **circuit protective conductor**

protective conductor connecting exposed conductive parts of equipment to the main earthing terminal

**3.10****cord anchorage**

item that relieves the conductors from strain, including twisting, and in addition protects the conductor insulation from abrasion at that point

**3.11****electrical installation in the furniture**

total mains current-carrying components interconnected within the furniture

**3.12****luminaire**

unit to provide ambient or task lighting attached to the furniture as defined in BS EN 60598-1

**3.13****built-in luminaire**

luminaire forming an integral part of the furniture

**3.14****office furniture**

furniture intended for use in office environments to provide working surfaces, storage and space division or to house or support information technology (IT) equipment, all being independent of the building structure

NOTE Partitions that are permanently attached to the building structure are not considered to be office furniture.

**3.15****permanent installation**

assembly of associated electrical equipment to fulfil a specific purpose, permanently installed in the furniture at the time of manufacture before delivery of the furniture, which is not intended to be moved

**3.16****extra low voltage circuit****ELV**

circuit that is so designed and protected that, under normal and single fault conditions, the voltage between any two accessible parts, one of which may be the body or earth, does not exceed 42.4 V peak or 60 V d.c.

**3.17****hazardous voltage**

voltage exceeding 42.4 V peak or 60 V d.c., existing in a circuit that does not meet the requirements for a limited current circuit

NOTE A limited current circuit is one that is so designed and protected that under both normal conditions and a likely fault condition the current which can be drawn is not hazardous.

**3.18****rated voltage**

primary power voltage as declared by the manufacturer

**3.19****rated current**

maximum input current of the office furniture as declared by the manufacturer

**3.20****socket outlet**

single outlet providing entry for an individual plug

**3.21****skilled person**

person with technical knowledge or sufficient experience to enable him to avoid dangers which electricity can create

**3.22**

**exposed-conductive-part**

conductive part of the equipment which can be touched and which is not a live part but which can become live under fault conditions

**3.23**

**residual current device**

**RCD**

device for making and breaking a circuit and for breaking a circuit automatically when the residual current exceeds a predetermined amount

## **4 General requirements**

**4.1** The office furniture to which a cable management and power distribution system is to be applied shall be fit for that purpose and shall be structurally sound and stable.

**4.2** Furniture shall make provision for:

- a) a suitable cable management system to manage cables; and/or
- b) an electrical power distribution system.

These shall be supplied by either of the following:

- 1) a cable management system and/or a power distribution system built into the furniture during manufacture; or
- 2) a cable management system and/or a power distribution system for later, on-site installation.

The electrical facilities of furniture shall be so designed that under all conditions of normal use, and under a fault condition, protection is provided against personal injury. Also, under all conditions of normal use, the electrical distribution system of the furniture shall be protected against overcurrent.

**4.3** Conformity to the requirements of this standard shall be checked by inspection and, where appropriate, by the specified tests.

**4.4** These requirements are intended for use where no single item of equipment plugged into outlets, where provided, has a rated current exceeding 5 A. Equipment having a higher current shall be independently connected to the building's permanent electrical installation but the cabling may be laid in the cable management system provided in the office furniture.

**4.5** Electrical equipment, components and accessories shall conform to relevant British Standards or European Standards and shall be used within their ratings (see **5.5.2**).

**4.6** The electrical system shall be rated for a total load of 13 A.

**4.7** The construction of the furniture shall be either of the following:

- a) unearthed – where the electrical system installed meets the requirements for reinforced or double insulation; or
- b) earthed – where the furniture has provision for the metal components to be connected to the supply earth (see **5.2**).

## **5 Design requirements**

### **5.1 Protection against electric shock**

**5.1.1** There shall be no user access to parts at hazardous voltage. In particular, covers of ducts and connector boxes that give access to parts at hazardous voltage shall only be accessible by skilled persons. Conformity shall be checked by inspection and by testing using the test probe of BS EN 61032.

**NOTE** Where electrical components are provided or installed meeting relevant electrical standards listed in the normative references, additional inspection and tests might not be necessary.



**5.1.2** Exposed-conductive-parts of office furniture that can acquire a hazardous voltage due to the failure of basic insulation shall be connected to the protective earth terminal of the furniture which will then be conducted to the circuit protective conductor. Alternatively, exposed-conductive-parts of the office furniture shall be separated from parts at hazardous voltage by double or reinforced insulation conforming to the relevant requirements of BS EN 60950.

## **5.2 Earthing**

**5.2.1** Items of office furniture intended to be earthed shall be provided with an earthing terminal that shall be connected to the circuit protective conductor of the supply cable.

**5.2.2** Protective earth conductors shall have a cross-sectional area not less than that of the associated current-carrying conductors. Such conductors may be bare or, if insulated, shall be coloured green/yellow.

**5.2.3** Protective earth terminals shall be resistant to corrosion.

**5.2.4** The resistance of accessible earthed metal parts shall not exceed 0.1  $\Omega$  including resistance of the supply cord when fitted when tested in accordance with 7.4.

## **5.3 Cables and supply cord**

**5.3.1** The supply cord shall be no lighter than ordinary-duty sheathed, 3-core flexible cable consisting of conductors with an appropriate cross-sectional area for the rated load of the system and conforming to BS 6500.

**5.3.2** The internal wiring shall also consist of conductors with an appropriate cross-sectional area for the rated load of the system and conforming to either BS 6004, BS 6346, BS 6724, or BS 7211, or where flexibility is required, BS 6500 or BS 7919.

## **5.4 Supply connection and over current protection**

**5.4.1** For safe and reliable connection to the permanent electrical installation of the building, the supply cord for the item of furniture shall be fitted with a fused plug conforming to BS 1363-1 and having a fuse rating that does not exceed 13 A. Connection to the furniture shall be by either a non-detachable power supply cord or an appliance inlet and connector conforming to a relevant British Standard. Where an appliance inlet and connector are used, their rating shall be not lower than the rated fuse fitted in the plug.

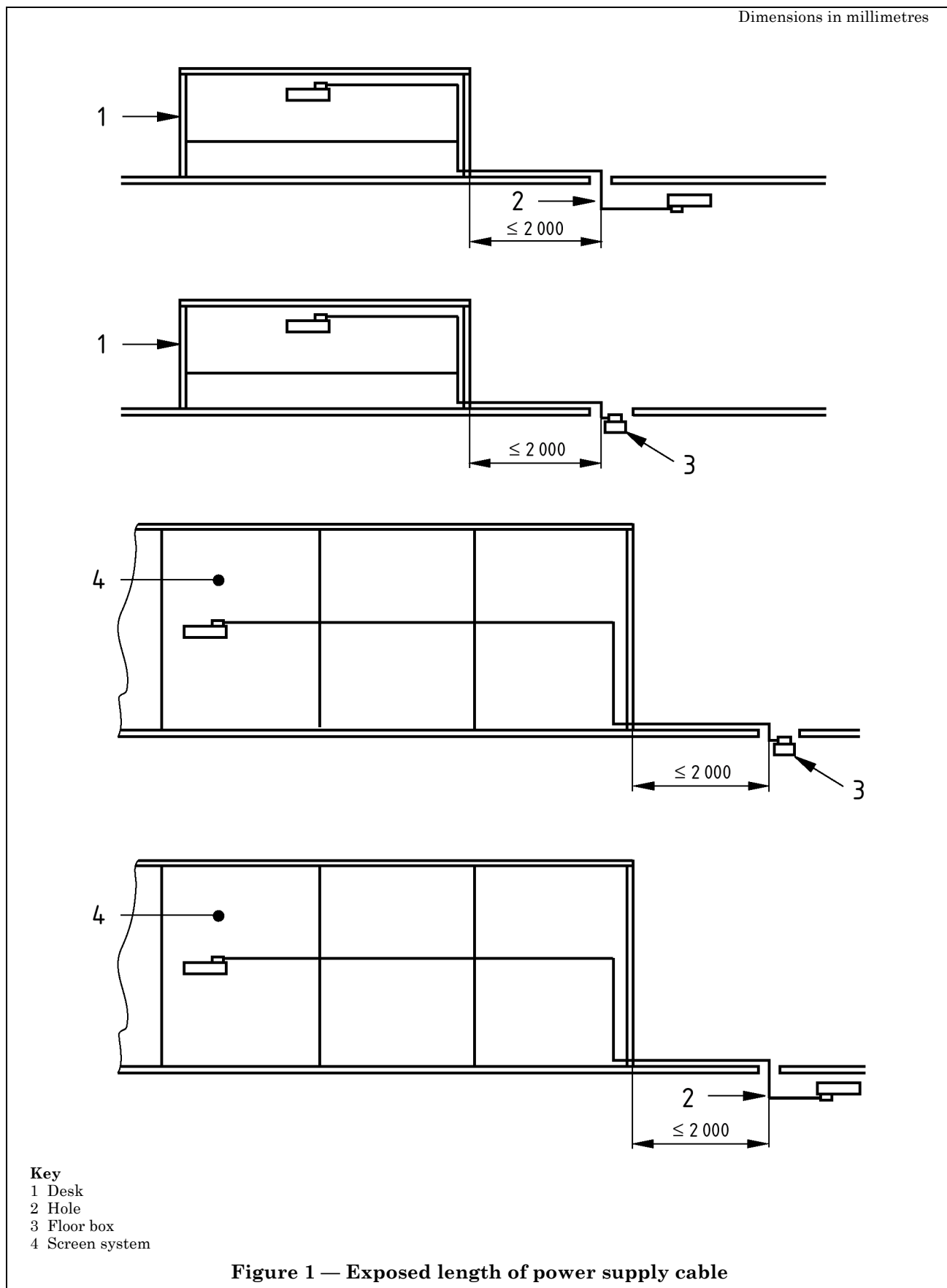
**5.4.2** If one is fitted, the appliance inlet shall be placed so that the appliance connector can be easily inserted and removed.

**5.4.3** The exposed length of a power supply cord shall be not more than 2 m (see Figure 1).

**5.4.4** Provision shall be made to ensure that the supply cord to the furniture is relieved of all undue strain, including twisting, so that the insulation of the conductors is protected.

**5.4.5** Where a supply cord anchorage is used, it shall conform to the relevant requirements of BS 5733, BS 1363, BS 3676-1 or BS EN 60950.

**5.4.6** The outer sheath of a non-detachable power supply cord shall continue into the furniture or socket through any inlet bushing or cord guard and shall extend by at least half the cord diameter beyond the clamp of the cord anchorage. Inlet bushings, where used, shall be fixed and an inlet bushing or cord guard supported by unearthed metal shall be provided with supplementary insulation.



## 5.5 Socket outlets and connectors within items of furniture

**5.5.1** Subject to the limitations specified in 4.4, the configurations of socket outlets connected to a single supply shall be either:

- a) no more than four sockets, where each socket outlet is separately fused or has other overcurrent protection rated at not more than 5 A; or
- b) no more than six sockets, where each socket outlet is separately fused or has other overcurrent protection rated at not more than 3.15 A.

**NOTE** This configuration might not be suitable for equipment which draws more than 3.15 A on start up. The user should carefully consider potential use before specifying this configuration as antisurge fuses might be required.

Fuses shall not be accessible without the use of a tool and shall conform to BS 1362 or to BS EN 60127-2, standard sheets 1 or 5.

**5.5.2** Electrical components and their assemblies used in the electrical power distribution system shall conform to BS 5733 and/or the following standards: BS 1362, BS 1363, BS 3676-1, BS 3955, BS 4491-1, BS 5467, BS 6004, BS 6346, BS 6500, BS 7919 or BS EN 60127-2, where relevant.

**5.5.3** Socket-outlets shall be located so as to:

- be easily accessible; and
- minimize the risk of physical injury.

**5.5.4** Socket-outlets shall be positioned so as to minimize the risk of electrical hazards from liquid spillage.

**5.5.5** On unearthed office furniture for general use, mains socket-outlets within the furniture shall have a protective contact connected to the protective earth conductor of the supply cord.

## 5.6 Construction

### 5.6.1 Cable routing

**5.6.1.1** The designated cableways shall be smooth and free from sharp edges. Fixing screws shall be located or protected so that they cannot damage cables.

**NOTE** In general, a surface is considered well rounded if its curvature has a radius of at least 1.5 mm.

**5.6.1.2** Any holes or apertures through which cables pass shall be shaped and sized so that cables can be fed through without difficulty and shall be fitted with an insulating bush or grommet or suitably rounded as in 5.6.1.1.

**5.6.1.3** All cables shall be placed or protected so that the risk of overheating, chafing or abrasion or other mechanical damage is minimized.

**5.6.1.4** Where cables connect separate moving parts of the furniture, they shall be provided with a cord anchorage at both ends in accordance with BS EN 60950. Where movement is expected as part of normal use, the cables shall be protected from chaffing or damage, and cord guards or inlet bushings conforming to BS EN 60950 shall be provided.

**5.6.1.5** Where cables are likely to be moved during normal use, they shall be flexible cords.

**5.6.1.6** Where work surfaces move to allow access, provision shall be made to retain cables to minimize the risk of damage or suitable covers shall be supplied.

**5.6.1.7** Where cables are not run in a cable management system, cable supports shall be spaced at a maximum distance of 300 mm apart, provided the requirements of 5.6.2 are met.

**NOTE** A combination of cable management systems and cable supports may be used.

### **5.6.2 Segregation of cables**

Where cables run together in parallel, mains electricity supply cables shall be separated from all other cables or be insulated for the highest voltage present. Telecommunication cables, data cables and other cables in ELV circuits may share a common duct (unless suppliers of equipment or telecommunications systems state otherwise).

This shall be achieved by providing:

- a) a 50 mm separation between cables; or
- b) a cable management system (this need not be continuous provided that it conforms to **5.6.1.7**); or
- c) cable screening of individual services; or
- d) b) and c) in combination.

Where a cable management system is provided in the office furniture, it shall be constructed such that any disruption to segregation, such as gaps or junctions between ducts, shall be kept to a minimum and shall not exceed 150 mm.

Where crossover of cables occurs and is unavoidable, e.g. within desk corner links and prior to cables emerging onto the work surfaces, or where excess cables are stored, sheathed cable shall be used and cables shall not be run together in parallel.

### **5.7 Connection between items of furniture**

Where separate items of furniture are electrically interconnected, they shall be fastened together to prevent inadvertent movement of the furniture that could damage the electrical connections.

## **6 Luminaires**

Luminaires shall comply with BS EN 60598-1. Account shall be taken of any heat generated by built-in luminaires. The security of fixings and power cables shall be ensured.

## **7 Electrical tests for electrical installations**

### **7.1 General**

On completion of the installation or subsequent re-installation of the electrical system of the office furniture, the installation shall be inspected and tested in accordance with this clause.

**NOTE** It is recommended that the electrical system installed in the office furniture is periodically maintained, inspected and tested for continued safety.

### **7.2 Continuity and polarity**

A test of all conductors, including the protective earth conductor, shall be made to verify their continuity and correct polarity. This test shall include the supply cord and plug. The electrical system shall be inspected to ensure that any fuses and any single pole switches fitted are connected only in the live conductor.

The values for resistance of earthing conductors shall conform to the requirements specified in **7.4**.

### **7.3 Insulation resistance**

The insulation resistance of completed electrical installations shall be tested using a 500 V d.c test supply. The measured resistance shall not be less than 1 M $\Omega$ . Tests shall be made between conductors and also to earth of the supply cable. The duration of each test shall be not less than 5 s.

Neon indicators shall be removed from the circuit before carrying out this test between conductors by switching off the socket outlet. Where luminaires contain sensitive electronic components, these shall be disconnected prior to the test (see 713-04-04 of BS 7671).

## 7.4 Earth continuity

Earth connections of the installed socket outlets and the accessible metal parts of earthed office furniture shall be tested by passing a current of not less than 1.5 times the rating of the supply plug fuse and no greater than 25 A, derived from an a.c. source with a load voltage not exceeding 12 V.

The tests shall include the supply cord and shall be carried out between the earth pin of the supply plug, the earth connections of the installed socket outlets and where applicable the accessible metal parts of earthed furniture.

The duration of the tests shall be for a period of between 5 s and 20 s. The resistance shall not exceed 0.1  $\Omega$ .

## 8 Marking

### 8.1 Marking requirements

Office furniture and office screens shall be legibly (see 8.2) and durably marked (see 8.3) in a prominent position adjacent to cables or socket outlets with the following information:

- a) the name, trademark or other means of identification of the manufacturer or responsible vendor;
- b) the number and date of this British Standard, i.e. BS 6396:2002;
- c) a statement indicating whether the furniture is of earthed or unearthed construction;
- d) on earthed furniture, the position of any earth terminal, using the earth symbol;
- e) information about where instructions for proper use of the equipment can be obtained;
- f) the rating of any system installed in the furniture, stating 250 V a.c., and that the total current shall not exceed 13 A;
- g) the maximum current rating for each fuse adjacent to its fuseholder;
- h) unless supplied with a pre-fitted plug, the supply cord shall be labelled to show connection requirements and a statement that it is essential that the electrical system be connected to an electrical supply that has a protective (earth) conductor;
- i) a statement that the system should not be reconfigured or altered in any way without reference to the manufacturer's instructions.

### 8.2 Legibility

The height of any graphical symbols shall not be less than 5 mm. The height of letters and numerals either shown separately or with symbols shall be not less than 2 mm.

### 8.3 Durability marking

In normal use, it shall not be possible to remove marking plates and they shall show no curling.

After testing according to Annex A, the marking shall remain legible. Marking produced by an engraving or moulding process shall be deemed to conform without test.

## 9 Instructions

Adequate instructions concerning the safe installation and use of the furniture shall be readily available. These may be supplied by the manufacturer, responsible vendor and/or the supplier/installer of the electrical installation within the furniture. These shall include the following as appropriate:

- a) instructions for connecting and testing continuity, insulation resistance, polarity and socket pins in accordance with clause 7;
- b) the voltage, frequency and current rating for which the system is designed;
- c) the maximum current for each fuse and type;
- d) a statement that no single item of equipment having a rated voltage exceeding 250 V or a rated current exceeding 5 A be connected to the item of furniture;
- e) instructions for connecting earthing conductors for metalwork;
- f) a statement that it is essential that the electrical system be connected to an electrical supply that has a protective (earth) conductor;
- g) a statement that the advice of a person competent in such installation matters shall be sought to ensure that the installation is safe.

## **Annex A (normative)**

### **Marking test method**

#### **A.1 Apparatus**

##### **A.1.1 Cloth.**

**A.1.2 Petroleum spirit**, consisting of a solvent hexane having a maximum aromatics content of 0.1 % by volume, a Kauri-butanol value of 29, an initial boiling point of approximately 65 °C, a dry point of approximately 69 °C and a relative density at 15 °C of approximately 0.68. Relative density can be determined by the method described in BS 4714.

#### **A.2 Procedure**

Rub the marking by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked in petroleum spirit.



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