

Classification of electrical and electronic equipment with regard to protection against electric shock

Part 2. Guide to requirements for protection against electric shock

Committees responsible for this Published Document

The preparation of this Published Document was entrusted by the Power Electrical Engineering Standards Policy Committee (PEL/-) to Technical Committee PEL/64, upon which the following bodies were represented:

- Association of Manufacturers of Domestic Electrical Appliances
- British Cable Makers Confederation
- Department of Health
- Department of the Environment (Property Services Agency)
- Department of Trade and Industry (Consumer Safety Unit)
- ERA Technology Ltd.
- Electrical Contractors' Association
- Electrical Contractors' Association of Scotland
- Electrical Installation Equipment Manufacturers' Association
- Electricity Association
- Health and Safety Executive
- Installation of Electrical Engineers
- Lighting Association
- National Inspection Council for Electrical Installation Contracting

This Published Document, having been prepared under the direction of the Power Electrical Engineering Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 January 1993

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The following BSI references relate to the work on this Published Document:
Committee reference PEL/64

Amendments issued since publication

Amd. No.	Date	Text affected

ISBN 0 580 21477 X

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National foreword

This Part of PD 2754 has been prepared under the direction of the Power Electrical Engineering Standards Policy Committee. It is identical with IEC 536-2 : 1992 *Classification of electrical and electronic equipment with regard to protection against electric shock Part 2 : Guidelines to requirements for protection against electric shock*, published by the International Electrotechnical Commission (IEC). The IEC document has been published as a type 2 Technical Report. It is not to be regarded as an International Standard. A review of the Technical Report will be carried out by IEC not later than three years after its publication with the options of extension for a further period of three years, conversion to an International Standard or withdrawal.

Cross-references

International standard	Corresponding British Standard
	PD 6519 <i>Guide to effects of current flowing through the human body</i>
IEC 479-1	Part 1 : 1988 <i>General aspects</i> (Identical)
IEC 479-2	Part 2 : 1988 <i>Special aspects</i> (Identical)
IEC 536	BS 2754 : 1976 <i>Memorandum. Construction of electrical equipment for protection against electric shock</i> (Identical)
IEC 664	PD 6499 : 1981 <i>Guide to insulation co-ordination within low-voltage systems including clearances and creepage distances for equipment</i> (Identical)

A related publication to IEC 417 is BS 5817 : Part 8 : 1988 *Symbols and identification*.

The Technical Committee has reviewed the provisions of IEC 529 and IEC Guide 104, to which reference is made in the text, and has decided that they are acceptable for use in conjunction with this document. There is no equivalent British Standard. The IEC 364 series of documents have been harmonized in CENELEC as the HD 384 series. The British Standard which implements the HD 384 series is BS 7671 *Requirements for electrical installation*.

INTRODUCTION

The concept underlying IEC 536 is based on two principles.

- 1) A distinction between different mechanisms of risk of electric shock:
 - firstly, the risk associated with touching a live-part when the person is at the same time in contact with earth potential or with another live-part of different potential (direct contact),
 - secondly, the risk associated with touching an exposed-conductive-part of electrical equipment which has become live due to an insulation failure, when being at the same time in contact with earth potential or with another conductive part of different potential, e.g. another exposed-conductive-part or an extraneous-conductive-part (indirect contact).

Both risk mechanisms are implicitly addressed by the basic rule that accessible parts shall not be hazardous* under either normal or fault conditions.

- 2) The requirement that every item of electrical equipment shall be provided with some sort of protection against electric shock, which has to be adapted to the installation conditions.

This protection may be provided by the environment, by the equipment itself or by the supply system or by a suitable combination of these, see table 1.

Protection against indirect contact relies on the following complementary measures:

- basic protection which generally provides protection against electric shock but failure of which has to be taken into account, and
- supplementary protection which provides protection against electric shock in case of failure of the basic protection.

This supplementary protection can be achieved either by appropriate construction of the equipment (class II) or by precautions made in the erection of the installation (as for classes 0, I and III) or a special combination of both.

For the four classes of equipment with regard to protection against indirect contact specified in this Technical Report, the most common combinations of protective provisions are collated in table 1.

By definition, an electric shock is liable to produce a pathophysiological effect in the person to whom it occurs.

The means of protection (basic protection + supplementary protection) make it possible either

- to limit the current passing through the human body to a non-hazardous level (as in classes 0, II and III), or

* The borderline for touch voltage, steady-state touch current (and their duration) and stored charge (touch discharge) up to which conductive parts, depending on their shape and on conditions of external influences, can be regarded as non-hazardous, is under consideration.

- to limit the duration of the current passing through the human body so that no hazardous pathophysiological effects result for the person involved (as for class I).

NOTE - Requirements for equipment intended to be fixed, without exposed conductive parts and providing at least basic insulation, are under consideration.

Table 1 – Most common combinations of protective provisions against indirect contact in the equipment and in installations

Classes of equipment	Protective provisions		
	In the equipment (IEC 536 -2)		In the installation (IEC364-4-41)
	Basic protection	Supplementary protection	
0	Basic insulation (5.2.1.1)	—	Non-conducting locations (413.3)
		—	Electrical separation (one equipment only) (413.5)
I	Basic insulation (5.2.2.1)	Protective bonding (5.2.2.2)	Automatic disconnection of supply (Earthed protective conductor plus protective device) (413.1)
II	Basic insulation (5.2.3.1.1)	Supplementary insulation (5.2.3.1.2)	—
	Reinforced insulation or equivalent constructional dispositions (5.2.3.1.1)		
III	Limitation of voltage (5.2.4.1)	—	Protective separation from circuits other than SELV and PELV (411.1)

CLASSIFICATION OF ELECTRICAL AND ELECTRONIC EQUIPMENT WITH REGARD TO PROTECTION AGAINST ELECTRIC SHOCK

Part 2: Guidelines to requirements for protection against electric shock

1 General

1.1 *Scope and object*

This Technical Report contains details of protective provisions against electric shock for both direct and indirect contact. It has been prepared for electrical equipment with rated voltages not exceeding 1 000 V a.c. with a rated frequency not exceeding 1 000 Hz, or 1 500 V d.c. Technical Committees may, however, consider the possibility of using this report for equipment operating at higher voltages and higher frequencies.

NOTES

- 1 The rated voltage is generally recognized as the rated input voltage of the equipment. For particular equipment, e.g. low-voltage generating sets, it is the rated output voltage.
- 2 The scope of IEC 536 is limited to 440 V a.c., but with the possibility of applying it also for higher voltages.
- 3 Attention is drawn to the fact that IEC 536 does not deal with protection against direct contact.

The object of this report is to provide Technical Committees with guidelines for the practical implementation of the principles laid down in IEC 536 for protection against electric shock when specifying requirements for protective provisions applicable to their equipment. Technical Committees may specify more specific or additional requirements, as appropriate to their equipment.

IEC Guide 104 applies in this context.

NOTE - As this report only provides guidelines for the Technical Committees it is not generally sufficient to make reference to or reproduce the text from this report when preparing product safety standards.

1.2 *Reference documents*

IEC Guide 104: 1984, *Guide to the drafting of safety standards, and the role of committees with safety pilot functions and safety group functions.*

IEC 364: *Electrical installations of buildings.*

IEC 364-4-41: 1982, *Electrical installations of buildings. Chapter 41: Protection against electric shock.*
Amendment 2 (1992).