



BSI Standards Publication

Information technology — Cabling installation —

Part 2: Installation planning and practices inside
buildings

National foreword

This British Standard is the UK implementation of EN 50174-2:2009+A2:2014, incorporating corrigendum April 2011. It supersedes BS EN 50174-2:2009+A1:2011 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CENELEC text carry the number of the CENELEC amendment. For example, text altered by CENELEC amendment A1 is indicated by A1 A1.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by CEN corrigendum April 2011 is indicated in the text by AC1 AC1 tags.

The UK participation in its preparation was entrusted to Technical Committee TCT/7, Telecommunications - Installation requirements.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Date	Text affected
31 July 2015	Implementation of CENELEC amendment A1:2011 and corrigendum April 2011
30 April 2015	Implementation of CENELEC amendment A2:2014

English version

**Information technology -
Cabling installation -
Part 2: Installation planning and practices inside buildings**

Technologies de l'information -
Installation de câblages -
Partie 2: Planification et pratiques
d'installation à l'intérieur des bâtiments

Informationstechnik -
Installation
von Kommunikationsverkabelung -
Teil 2: Installationsplanung
und Installationspraktiken in Gebäuden

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: Avenue Marnix 17, B - 1000 Brussels

Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 215, Electrotechnical aspects of telecommunication equipment.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50174-2 on 2009-05-01.

This European Standard supersedes EN 50174-2:2000.

The following dates were fixed:

- | | | |
|--|-------|------------|
| – latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2010-05-01 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | 2012-05-01 |

EN 50174 comprises three parts. All three parts support the specification, implementation and operation of information technology cabling. There are specific requirements for cabling systems that are in accordance with the design requirements of the EN 50173 series. However, the three parts also apply to cabling systems of any design including those in accordance with standards such as EN 50098-1 or EN 50098-2.

This part, EN 50174-2, is concerned with the planning and installation of information technology cabling using metallic cabling and optical fibre cabling inside buildings. It provides guidance as to the responsibilities of those involved and is intended to be referenced in relevant contracts.

Additional clauses containing normative requirements for specific types of premises will be added as amendments, or as revisions, to this standard. At the time of publication of this European Standard, the following clauses are planned:

- homes;
- data centres;
- operator buildings.

It does not cover those aspects of installation associated with the transmission of signals in free space between transmitters, receivers or their associated antenna systems (e.g. wireless, radio, microwave or satellite).

This document contains two informative annexes:

- Annex A, providing information on EMC and protection;
- Annex B, containing a minimum set of responsibilities applicable to installers and enabling national-specific amendment to define other responsibilities.

Foreword to amendment A1

This amendment to the European Standard EN 50174-2:2009 was prepared by the Technical Committee CENELEC TC 215, Electrotechnical aspects of telecommunication equipment.

The text of the draft was submitted to the formal vote and was approved by CENELEC as amendment A1 to EN 50174-2:2009 on 2011-01-03.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2012-01-03
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2014-01-03

This amendment introduces:

- a new Clause 10 with specific requirements for installation of cabling in homes;
- a new Clause 11 with specific requirements for installation of cabling in data centres;
- detailed requirements and recommendations for installation of cabling in office (including commercial) (see Clause 8) premises and in industrial premises (see Clause 9);
- some technical and editorial modifications to the other clauses.

Foreword to amendment A2

This document (EN 50174-2:2009/A2:2014) has been prepared by CLC/TC 215 "Electrotechnical aspects of telecommunication equipment".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2015-08-26
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2017-08-26

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This amendment covers:

- a new Clause 12 on common pathways and spaces within multi-tenant buildings;
- a modified treatment of A.3 to ensure to that it addresses the planning and installation of electrical isolation components internal to buildings (EN 50174-3 will include an Annex with the same topic for external to buildings);
- some technical and editorial changes to Clauses 3, 4, 5, 8 and 11.

Contents

Introduction.....	8
1 Scope and conformance.....	11
1.1 Scope	11
1.2 Conformance.....	11
2 Normative references.....	12
3 Terms, definitions and abbreviations	14
3.1 Terms and definitions	14
3.2 Abbreviations	17
4 Requirements for planning installations of information technology cabling	18
4.1 Safety	18
4.2 Documentation	20
4.3 Pathways.....	20
4.4 Pathway systems	21
4.5 Cable management systems	22
4.6 Closures	24
4.7 Cabling	25
A2 4.8 Filtering and electrical isolation components and surge protective devices	25 A2
4.9 Spaces	25
A2 4.10 Planning for repair	26 A2
5 Requirements for the installation of information technology cabling.....	26
5.1 Safety	26
5.2 Documentation	28
5.3 Installation practice	28
5.4 Surge protective devices.....	34
5.5 Labelling.....	34
5.6 Testing.....	34
5.7 Contractual acceptance	35
5.8 Operation.....	35
6 Segregation of metallic information technology cabling and power supply cabling.....	35
6.1 General.....	35
6.2 Requirements.....	36
6.3 Recommendations	43
7 Electricity distribution systems and lightning protection	44
7.1 Electricity distribution systems	44
7.2 Protection against lightning and induced overvoltages.....	46
8 Office (commercial) premises	46
8.1 General.....	46
8.2 Office (commercial) premises cabling design overview	47

8.3	Requirements for planning installations of information technology cabling	47
8.4	Requirements for installers of information technology cabling	56
8.5	Segregation of metallic information technology cabling and power supply cabling	56
9	Industrial premises	57
9.1	General.....	57
9.2	Industrial premises cabling design overview	57
9.3	Requirements for planning installations of information technology cabling	58
9.4	Requirements for installers of information technology cabling	61
9.5	Segregation of metallic information technology cabling and power supply cabling	61
10	Homes	62
10.1	General.....	62
10.2	Home cabling design overview.....	62
10.3	Requirements for planning installations of information technology cabling	65
10.4	Requirements for installers of information technology cabling.....	72
10.5	Segregation of metallic information technology cabling and power supply cabling.....	72
11	Data centres.....	72
11.1	General	72
11.2	Data centre cabling design and planning overview	73
11.3	Requirements for planning installations of information technology cabling.....	79
11.4	Requirements for installers of information technology cabling	90
11.5	Segregation of metallic information technology cabling and power supply cabling	90
A2 12	Common infrastructures within multi-tenant buildings	90
12.1	General.....	90
12.2	Spaces in common areas	91
12.3	Pathways in common areas	91
12.4	Requirements for planning installations of information technology cabling	92
12.5	Requirements for the installers of information technology cabling	103
12.6	Segregation of metallic information technology cabling and power supply cabling.....	103 A2
Annex A	(informative) EMC and protection.....	104
A.1	Coupling mechanisms and countermeasures.....	104
A.2	The EMC concept	107
A.3	Filtering and electrical isolation components and surge protective devices	111
Annex B	(informative) Application of responsibilities	117
Bibliography		120
Figures		
A2	Figure 1 – Schematic relationship between the EN 50173 series and other relevant standards A2	9
	Figure 2 – Cable arrangement in a metallic section.....	24
	Figure 3 – Continuity of metallic cable management systems	30
	Figure 4 – Interruption of metallic cable management systems at fire barriers	30

Figure 5 – Flowchart for cable separation calculation	39
Figure 6 – Separation of power supply and information technology cables without dividers	40
Figure 7 – Separation of power supply and information technology cables with dividers	41
Figure 8 – Separation of cables in pathway systems	42
Figure 9 – Example of layered cable trays with smaller width upper trays	51
Figure 10 – Example of accessible row of floor tiles to provide access to lower tray	52
Figure 11 – Minimum dimensions for rooms housing cabling components only	55
Figure 12 – Minimum dimensions for rooms housing active equipment in addition to cabling components	56
Figure 13 – Structure of generic cabling in industrial premises	58
Figure 14 – Configuration of apparatus-based functional elements within industrial premises	58
Figure 15 – Pathways within homes	63
Figure 16 – Example of infrastructure supporting star cabling topology	63
Figure 17 – Example of infrastructure supporting various cabling topologies	64
Figure 18 – Example of primary distribution space	68
Figure 19 – Example of local distribution spaces and junction boxes	70
Figure 20 – Growing complexity of point-to-point connections	74
Figure 21 – Impact of fibre optic jumper cabling changes with direct point-to-point connections	75
Figure 22 – Example of direct point-to-point cabling	75
Figure 23 – Structured fibre optic cabling	76
Figure 24 – Managing changes with a structured fibre optic cabling system	77
Figure 25 – Generic data centre cabling in accordance with EN 50173-5	78
Figure 26 – Generic office cabling in accordance with EN 50173-2	78
Figure 27 – Functional elements and connections providing redundancy within generic cabling in accordance with EN 50173-5	81
 Figure 28 – Example of common pathways and spaces in a multi-tenant building	91
Figure 29 – Example of layered cable trays with smaller width upper trays	97
Figure 30 – Example of accessible row of floor tiles to provide access to lower tray	98 
Figure A.1 – Screened cables reduce capacitive coupling	104
Figure A.2 – Electrical field to cable, capacitive coupling example	106
Figure A.3 – Magnetic field to loop, inductive coupling example	106
Figure A.4 – Magnetic field	107
Figure A.5 – Earthing arrangement	107
Figure A.6 – Earthing and bonding of filters	112
Figure A.7 – Mounting of filters	113
Figure A.8 – Installation of power filter	113
Figure A.9 – Installation guidelines for transformers	115
Figure A.10 – Installation guidelines for optocouplers	115
Figure A.11 – Short connections of surge protective devices	116

Tables

Table 1 – Contextual relationship between EN 50174 series and other standards relevant for information technology cabling systems	10
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Table 2 – Stacking height for typical distances L	21
Table 3 – Classification of information technology cables	37
Table 4 – Minimum separation S	38
Table 5 – Power cabling factor	38
Table 6 – Separation requirements between metallic cabling and specific EMI sources	43
Table 7 – Environmental requirements for office premises	53
Table 8 – Environmental requirements for industrial premises	60
Table 9 – Minimum requirements for dimensions of primary distribution spaces	69
Table 10 – Requirements for dimensions of secondary distribution spaces	70
Table 11 – Minimum dimensions of spaces allocated to junction boxes	71
Table 12 – Environmental requirements for data centres	87
Table 13 – Environmental requirements for multi-tenant buildings	100
Table A.1 – EMC checklist	108
Table A.2 – Actions resulting from the answers of Table A.1	109
Table B.1 – Responsibilities template	118
Table B.2 – Example of completed responsibilities	119

Introduction

The importance of services delivered by information technology cabling infrastructure is similar to that of utilities such as heating, lighting and electricity supplies. As with those utilities, interruptions to service can have a serious impact. Poor quality of service due to lack of planning, use of inappropriate components, incorrect installation, poor administration or inadequate support can threaten an organisation's effectiveness.

There are four phases in the successful implementation of information technology cabling. These are:

- a) design;
- b) specification – the detailed requirement for the cabling, including the planning of its accommodation and associated building services addressing specific environments (e.g. electromagnetic) together with the quality assurance requirements to be applied;
- c) installation – in accordance with the requirements of the specification;
- d) operation – the management of connectivity and the maintenance of transmission performance during the life of the cabling.

This European Standard is in three parts and addresses the specification, installation and operational aspects. The EN 50173 series and other application standards cover design issues.

EN 50174-1 is used during the specification phase. It addresses the:

- installation specification, quality assurance documentation and procedures;
- documentation and administration;
- operation and maintenance.

This part, EN 50174-2, and EN 50174-3 are intended to be used by the personnel directly involved in the planning aspects (of the specification phase) and installation phase. EN 50174-2 is applicable inside buildings and EN 50174-3 is applicable outside buildings.

This European Standard is also relevant to:

- architects, building designers and builders;
- main contractors;
- designers, suppliers, installers, inspectors (auditors), maintainers and owners of information technology cabling;
- public network providers and local service providers;
- end users.

This part, EN 50174-2, contains requirements and recommendations relating to the installation planning and practices by defining:

- i) planning strategy (road map) and guidance depending on the application, electromagnetic environment, building infrastructure and facilities, etc.;
- ii) planning and installation requirements for metallic and optical fibre information technology cabling depending on the application, electromagnetic environment, building infrastructure and facilities, etc.;
- iii) the practices and procedures to be adopted to ensure that the cabling is installed in accordance with the specification.

Figure 1 and Table 1 show the schematic and contextual relationships between the standards produced by CLC/TC 215 for information technology cabling, namely:

- 1) this and other parts of the EN 50174 series;
- 2) generic cabling design (EN 50173 series);
- 3) application dependent cabling design (e.g. EN 50098 series);
- 4) testing of installed cabling (EN 50346);
- 5) equipotential bonding requirements (EN 50310).

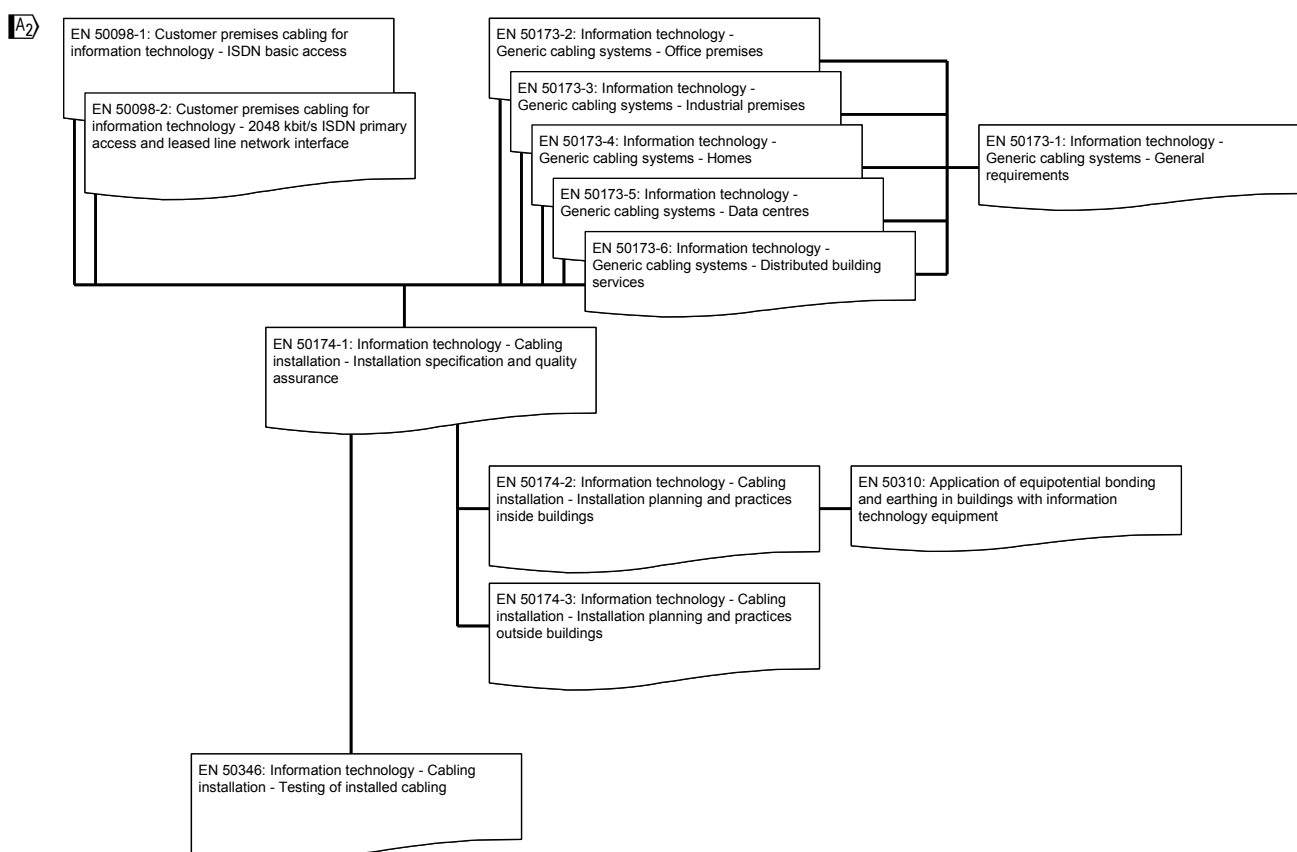


Figure 1 - Schematic relationship between the EN 50173 series and other relevant standards 

A₂ Table 1 — Contextual relationship between EN 50174 series and other standards relevant for information technology cabling systems

Building design phase	Generic cabling design phase	Specification phase	Installation phase	Operation phase
EN 50310 6. Earthing networks	EN 50173 series except EN 50173-4 4: Structure 5: Channel performance 7: Cable requirements 8: Connecting hardware requirements 9: Requirements for cords and jumpers A: Link performance limits	EN 50174-1 4: Requirements for specifying installations of information technology cabling 5: Requirements for installers of information technology cabling		EN 50174-1 4: Requirements for specifying installations of information technology cabling
		Planning phase		
	and EN 50173-4 4 and 5: Structure 6: Channel performance 8: Cable requirements 9: Connecting hardware requirements 10: Requirements for cords and jumpers A: Link performance limits	EN 50174-2 4: Requirements for planning installations of information technology cabling 6: Segregation of metallic information technology cabling and power supply cabling 7: Electricity distribution systems and lightning protection	EN 50174-2 5: Requirements for the installation of information technology cabling 6: Segregation of metallic information technology cabling and power supply cabling 8: Office (commercial) premises 9: Industrial premises 10: Homes 11: Data centres 12: Common infra-structures within multi-tenant premises	
		and EN 50174-3 and (for equipotential bonding) EN 50310	and EN 50174-3 and (for equipotential bonding) EN 50310 and EN 50346 4: General requirements 5: Test parameters for balanced cabling 6: Test parameters for optical fibre cabling	

1 Scope and conformance

1.1 Scope

This European Standard specifies requirements for the following aspects of information technology cabling:

- a) planning;
- b) installation practice.

This European Standard is applicable to all types of information technology cabling inside buildings (and may be applied to cabling that is defined as part of the building) including generic cabling systems designed in accordance with the EN 50173 series. The requirements of Clauses 4, 5 and 6 of this standard are premises-independent unless amended by the requirements of premises-specific clauses.

This European Standard:

- 1) details the considerations for satisfactory installation and operation of information technology cabling;
- A1 2) excludes specific requirements applicable to other cabling systems (e.g. power supply cabling); however, it takes account of the effects other cabling systems may have on the installation of information technology cabling (and vice versa) and gives general advice; A1
- 3) excludes those aspects of installation associated with the transmission of signals in free space between transmitters, receivers or their associated antenna systems (e.g. wireless, radio, microwave or satellite).

This European Standard is intended for application within commercial and residential premises.

- A1 This standard is applicable to certain hazardous environments. It does not exclude additional requirements which are applicable in particular circumstances, defined by e.g. electricity supply and electrified railways. A1

1.2 Conformance

For a cabling installation to conform to this European Standard:

- a) the planning of the installation shall meet the requirements of Clause 4;
- b) the installation practices shall meet the requirements of Clause 5;
- c) the additional requirements of the applicable premises-specific clause shall be met;
- d) the equipotential bonding system within the premises shall be in accordance with EN 50310;
- e) where a lightning protection system is required, it shall conform to the "integrated lightning protection system" according to EN 62305-4;
- f) other lightning protection systems, including the "isolated lightning protection system" according to EN 62305-3 are allowed provided that specific restrictions are applied both to the implementation of the information technology cabling and the requirements of EN 50310 as agreed between the planners of the lightning protection system and the information technology cabling;
- A1 g) local regulations, including safety, that are more stringent than the requirements listed in a) to f) shall be met. A1

The responsibilities for specific elements of conformance may be made by national-specific amendment of Annex B.

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.

CLC/TR 50450:2006, *Resistibility requirements for equipment having (a) telecommunication port(s)*

EN 50085-1, *Cable trunking systems and cable ducting systems for electrical installations – Part 1: General requirements*

EN 50085-2 (series), *Cable trunking systems and cable ducting systems for electrical installations*

^[A1] EN 50090-9-1:2004, *Home and Building Electronic Systems (HBES) – Part 9-1: Installation requirements – Generic cabling for HBES Class 1 Twisted Pair* ^[A1]

EN 50173-1: ^[A2] 2011 ^[A2], *Information technology – Generic cabling systems – Part 1: General requirements*

EN 50173-2, *Information technology – Generic cabling systems – Part 2: Office premises*

EN 50173-3:2007, *Information technology – Generic cabling systems – Part 3: Industrial premises*

EN 50173-4, *Information technology – Generic cabling systems – Part 4: Homes*

EN 50173-5, *Information technology – Generic cabling systems – Part 5: Data centres*

EN 50174-1:2009, *Information technology – Cabling installation – Part 1: Installation specification and quality assurance*

EN 50174-3, *Information technology – Cabling installation – Part 3: Installation planning and practices outside buildings*

EN 50288 series, *Multi-element metallic cables used in analogue and digital communication and control*

EN 50310, *Application of equipotential bonding and earthing in buildings with information technology equipment*

EN 50346, *Information technology – Cabling installation – Testing of installed cabling*

^[A1] EN 50491 series, *General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS)*

^[A2] EN 50491-6-1, *General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) - Part 6-1: HBES installations - Installation and planning* ^[A2]

EN 60079-0, *Electrical apparatus for explosive gas atmospheres – Part 0: General requirements* (IEC 60079-0:2004, mod.)

EN 60079-14, *Explosive atmospheres – Part 14: Electrical installations design, selection and erection* (IEC 60079-14)

EN 60079-17, *Explosive atmospheres -- Part 17: Electrical installations inspection and maintenance* (IEC 60079-17)

EN 60332-1-2, *Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-mixed flame* (IEC 60332-1-2)

EN 60529, *Degrees of protection provided by enclosures (IP code)* (IEC 60529)

^[A1] EN 60670 series, *Boxes and enclosures for electrical accessories for household and similar fixed electrical installations* ^[A1]

EN 60825 (series), *Safety of laser products* (IEC 60825 series)

1) In preparation.

- EN 60950 (series), *Information technology equipment – Safety* (IEC 60950 series, mod.)
- EN 61000-6-1, *Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity for residential, commercial and light-industrial environments* (IEC 61000-6-1)
- EN 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments* (IEC 61000-6-2)
- EN 61000-6-3, *Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments* (IEC 61000-6-3)
- EN 61000-6-4, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments* (IEC 61000-6-4)
- EN 61241-14, *Electrical apparatus for use in the presence of combustible dust – Part 14: Selection and installation* (IEC 61241-14)
- EN 61386-1, *Conduit systems for cable management – Part 1: General requirements* (IEC 61386-1)
- EN 61386-2X (series), *Conduit systems for cable management – Part 2X: Particular requirements* (IEC 61386-2X series)
- EN 61534 (series), *Powertrack systems* (IEC 61534 series)
- EN 61537, *Cable management – Cable tray systems and cable ladder systems* (IEC 61537)
- EN 61558-1, *Safety of power transformers, power supplies, reactors and similar products – Part 1: General requirements and tests* (IEC 61558-1)
- EN 61643 (series), *Low voltage surge protective devices* (IEC 61643 series, mod.)
- EN 61784-1, *Industrial communication networks – Profiles – Part 1: Fieldbus profiles* (IEC 61784-1)
- EN 61784-2, *Industrial communication networks – Profiles – Part 2: Additional fieldbus profiles for realtime networks based on ISO/IEC 8802-3* (IEC 61784-2)
- EN 61784-3, *Industrial communication networks – Profiles – Part 3: Functional safety fieldbuses – General rules and profile definitions* (IEC 61784-3)
- EN 61784-3-1, *Industrial communication networks – Profiles – Part 3-1: Functional safety fieldbuses – Additional specifications for CPF 1* (IEC 61784-3-1)
- EN 61784-5-2, *Industrial communication networks – Profiles – Part 5-2: Installation of fieldbuses – Installation profiles for CPF 2* (IEC 61784-5-2)
- EN 61784-5-3, *Industrial communication networks – Profiles – Part 5-3: Installation of fieldbuses – Installation profiles for CPF 3* (IEC 61784-5-3)
- EN 61918, *Industrial communication networks – Installation of communication networks in industrial premises* (IEC 61918:2007, mod.)
- EN 62305-2, *Protection against lightning – Part 2: Risk management* (IEC 62305-2)
- EN 62305-4, *Protection against lightning – Part 4: Electrical and electronic systems within structures* (IEC 62305-4)
- HD 384/HD 60364 (series), *Low-voltage electrical installations* (IEC 60364 series, mod.)
- HD 60364-1:2008, *Low-voltage electrical installations – Part 1: Fundamental principles, assessment of general characteristics, definitions* (IEC 60364-1:2005, mod.)
- HD 60364-4-41:2007, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock* (IEC 60364-4-41:2005, mod.)
- HD 384.4.442 S1:1997, *Electrical installations of buildings – Part 4: Protection for safety – Chapter 44: Protection against overvoltages – Section 442: Protection of low-voltage installations against faults between high-voltage systems and earth*
- HD 60364-4-443, *Electrical installations of buildings – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances – Clause 443: Protection against overvoltages of atmospheric origin or due to switching* (IEC 60364-4-44:2001/A1:2003, mod.)

HD 384.5/HD 60364-5 (series), *Electrical installation of buildings – Part 5: Selection and erection of electrical equipment* (IEC 60364-5 series, mod.)

HD 384.5.52 S1:1995, *Electrical installations of buildings – Part 5: Selection and erection of electrical equipment – Chapter 52: Wiring systems* (IEC 60364-5-52:1993, mod.)

HD 60364-5-534, *Low-voltage electrical installations – Part 5-53: Selection and erection of electrical equipment – Isolation, switching and control – Clause 534: Devices for protection against overvoltages* (IEC 60364-5-53:2001/A1:2002 (Clause 534), mod.)

HD 60364-5-54, *Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements, protective conductors and protective bonding conductors* (IEC 60364-5-54:2002, mod.)

EN 300 253:2002, *Equipment Engineering (EE) – Earthing and bonding of telecommunication equipment in telecommunication centres*

IEC 60050-195:1998, *International Electrotechnical Vocabulary (IEV) – Part 195: Earthing and protection against electric shock*

IEC 60050-826:2004, *International Electrotechnical Vocabulary (IEV) – Part 826: Electrical installations*

IEC/TR 61000-5 (series), *Electromagnetic compatibility (EMC) – Part 5: Installation and mitigation guidelines*

IEC/TR 61000-5-2, *Electromagnetic compatibility (EMC) – Part 5: Installation and mitigation guidelines – Section 2: Earthing and cabling*

IEC/TR 61000-5-3, *Electromagnetic compatibility (EMC) – Part 5-3: Installation and mitigation guidelines – HEMP protection concepts*

A1 Text deleted **A1**

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 50174-1 **A2**, EN 50310 **A2** and the following apply.

Where the cabling is designed in accordance with standards in the EN 50173 series, the additional definitions of those standards are applicable.

A2 Note 1 to entry: **A2** The definitions with respect to earthing and bonding are taken from series IEC 60050 and EN 300 253:2002; reference to these standards is indicated in square brackets.

A2 3.1.1

access provider

operator or another entity providing the means to enable external telecommunications service provision to a subscriber

[SOURCE: EN 50700:2014, 3.1.1; EN 50174-3:2014, 3.1.2]

3.1.2

access provider space

location of access provider transmission and support equipment **A2**

A1 3.1.3

co-hosting data centre

data centre in which multiple customers are provided with access to network(s), servers and storage equipment on which they operate their own services/applications

A2 Note 1 to entry: **A2** Both the information technology equipment and the support infrastructure of the building are provided as a service by the data centre operator. **A1**

A1 3.1.4

co-location data centre

data centre in which multiple customers locate their own network(s), servers and storage equipment

A2 Note 1 to entry: **A2** The support infrastructure of the building (such as power distribution and environmental control) is provided as a service by the data centre operator.

A2 3.1.5

data centre

structure, or group of structures, dedicated to the centralized accommodation, interconnection and operation of information technology and network telecommunications equipment providing data storage, processing and transport services together with all the facilities and infrastructures for power distribution and environmental control together with the necessary levels of resilience and security required to provide the desired service availability

[SOURCE: EN 50600-1:2012, 3.1.9]

3.1.6

distribution space

space within a home that corresponds to the installation space IS4 or IS5 of EN 50491-6-1 and that may house the home distributor (secondary home distributor) of EN 50173-4 and associated equipment **A2**

3.1.7

earth electrode

conductive part, which may be embedded in the soil or in a specific conductive medium, e.g. concrete or coke, in electric contact with earth

[IEC 60050-826:2004, 826-13-05; IEC 60050-195:1998, 195-02-01, modified]

3.1.8

earthing conductor

conductor which provides a conductive path, or part of the conductive path, between a given point in a system or in an installation or in equipment and an earth electrode or an earth-electrode network

[IEC 60050-826:2004, 826-13-12; IEC 60050-195:1998, 195-02-03, modified]

3.1.9

enterprise data centre

data centre that is operated by an enterprise which has the sole purpose of the delivery and management of services to its employees and customers

A2 3.1.10

entrance room

space within, or at the boundary of, a building housing the demarcation point where facilities owned by access and/or service providers interface with the premises cabling

Note 1 to entry: For generic cabling in accordance with EN 50173-5, the demarcation point is the external network interface (ENI) and the data centre cabling at that point is the network access cabling. **A2**

3.1.11

equipment connection space

space within a home that corresponds to the installation space IS6 of EN 50491-6-1 and that may house the outlets (TO, BO, MATO, CO) of EN 50173-4 together with attached equipment

3.1.12

equipotential bonding

provisions of electric connections between conductive parts, intended to achieve equipotentiality

[IEC 60050-826:2004, 826-13-19; IEC 60050-195:1998, 195-01-10]

3.1.13

functional earthing conductor

conductors that are only used for functional earthing (not protection) **A1**

A2 3.1.14

hand hole

point of access to a pathway that is too small for a person to enter to perform work but that allows the routing of cables during the cable installation process such that bending and pulling requirements are met **A2**

A1 3.1.15

high-voltage

voltage over AC 1 000 V r.m.s. or DC 1 500 V

3.1.16

home entrance

space at the boundary of a home that may house the interface(s) between the home networks and external networks provided to the home and that demarcate the administration and maintenance of the two networks

A2 *Text deleted* **A2**

3.1.17

junction box

space within a home that corresponds to the installation space IS5 of EN 50491-6-1 and housing a closure, typically in accordance with the EN 60670 series, designed to allow cables to be routed between pathway systems

3.1.18

local distribution space

space within a home that corresponds to the installation space IS5 of EN 50491-6-1 and that may house the area connection point (ACP) of EN 50173-4

A2 3.1.19

maintenance hole (telecommunications)

vault/chamber located in the ground earth as part of an underground conduit system and used to facilitate placing, connectorization, and maintenance of cables as well as the placing of associated equipment, in which it is expected that a person will enter to perform work **A2**

3.1.20

metallic information technology cable/cabling

cables (cabling) utilising metallic conductors for signal transmission

A2 3.1.21

multi-tenant building

building which is designed to accommodate more than one tenant each of which has their own tenant entrance facility but share building entrance facilities (BEF) and associated distribution spaces **A2**

3.1.22

network operator data centre

data centre that has the primary purpose of the delivery and management of broadband services to the operators' customers

3.1.23

parallel earthing conductor

earthing conductor that is parallel to the power supply cable or information technology cable

3.1.24

PEN conductor

conductor combining the functions of both a protective earthing conductor and a neutral conductor

[IEC 60050-826:2004, 826-13-25; IEC 60050-195:1998, 195-02-12] **A1**

A2 3.1.25

primary building distribution space

space accommodating the main point of distribution of any common cabling infrastructure within multi-tenant buildings **A2**

A1 3.1.26

protective (earth) conductor

conductor provided for purposes of safety, for example protection against electric shock

[IEC 60050-826:2004, 826-13-22; IEC 60050-195:1998, 195-02-09]

A2 3.1.27

secondary building distribution space

space accommodating optional points of distribution, additional to the main point of distribution, of any common cabling infrastructure within multi-tenant buildings **A2**

3.1.28

segregation

the use of earthed electrically conductive barriers or physical separation to prevent electromagnetic interference between external noise sources, including power supply cabling, and information technology cabling

3.1.29

semi-detached house

residence of a single family within a building containing two single-family houses where access to external service provision is shared

A2 3.1.30

service provider

the operator of any service that furnishes telecommunications content (transmissions) delivered over access provider facilities

Note 1 to entry: The access provider and the service provider can be a single entity

[SOURCE: EN 50700:2014, 3.1.20; EN 50174-3:2014, 3.1.15]

3.1.31

service provider space

location of service provider transmission and support equipment **A2**

3.1.32

single-family house

residence of a single family within which access to the home entrance space is limited to dweller of the house **A1**

A2 3.1.33

subscriber

identifiable entity, and the space allocated to that entity, within the premises that may require a future direct connection to the access network

[SOURCE: EN 50700:2014, 3.1.21] **A2**

3.1.34

surge protective device

a device intended to protect the electrical apparatus from high transient over-voltages and to limit the duration and frequently the amplitude of the follow-on current

A2 Note 1 to entry: **A2** The device contains at least one non-linear component.

A2 3.1.35

tenant entrance facility

facility that provides all necessary mechanical and electrical services for the entry of telecommunications cables into a tenants space and which may allow for transition from external to internal cable **A2**

3.2 Abbreviations

For the purposes of this document, the abbreviations given in EN 50174-1 and the following apply.

Where the cabling is designed in accordance with standards in the EN 50173 series, the additional abbreviations of those standards are applicable.

AC	alternating current
BN	bonding network
CATV	cabled distribution television
CBN	common bonding network
CSA	cross-sectional area
 CPL	Central Patching Location 
DC	direct current
EMC	electromagnetic compatibility
EMI	electromagnetic interference
ffs	for further study
HVAC	heating, ventilation and air conditioning
 HBES	Home and Building Electronic System
HE	Home Entrance 
IBN	isolated bonding network
N	neutral conductor
PE	protective (earth) conductor
PEC	parallel earthing conductor
PEN	conductor combining the functions of both a protective conductor and a neutral conductor
SELV	safety extra-low voltage
 SHD	Secondary Home Distributor 
SPD	surge protective device
TCL	transverse conversion loss
TNV	telecommunication network voltage
 UPS	Uninterruptible Power Supply
ZPL	Zone Patching Location 

4 Requirements for planning installations of information technology cabling

4.1 Safety

4.1.1 Personnel

Internal procedures, in accordance with local regulations, shall be in place to ensure that all persons visiting the premises are aware of:

- a) the locations and boundaries of hazardous areas;
- b) the procedures to be adopted when working in or in proximity to these hazardous areas;
- c) fire precautions;
- d) escape routes.

A1 4.1.2 Power supply cabling A1

The proper implementation of the requirements of this standard require that electrical installations are undertaken in accordance with the HD 384/HD 60364 series and/or local regulations as appropriate.

4.1.3 Optical fibre cabling

The hazard classification of areas containing optical fibre information technology equipment and optical fibre information technology cabling shall be undertaken in accordance with EN 60825-2 in order to define appropriate installation and labelling practices.

4.1.4 Transmission and terminal equipment

Information technology cabling shall be connected to equipment that incorporates safe signal circuitry complying with the SELV circuit and the TNV requirements as defined in the EN 60950 series.

Equipment connected shall comply with the protection requirements against electric shock of the relevant product safety standards.

The connection of active equipment to information technology cabling shall not introduce hazards for other users of the system.

4.1.5 Cells and batteries

A2 If cells and batteries that produce gases and fumes (e.g. lead-acid batteries that produce hydrogen and oxygen) are to be installed, provision shall be made for the necessary ventilation (see EN 60079-10-1:2009, Clause 6) and recommended environmental conditions. Local regulations shall be complied with.

NOTE EN 60079-10-1 is being revised (currently circulated for CENELEC enquiry) and will contain more detailed requirements regarding ventilation, once finalized. **A2**

A2 4.1.6 Pathways and pathway systems

The selection of pathways and pathway systems shall enable the installation of fire barriers, where required. **A2**

4.1.7 Closures

NOTE The following requirements apply unless specifically allowed otherwise by local regulations.

A1 Closures and combined terminal and distribution devices (fittings) providing facilities for the termination or (and) distribution of both information technology cables and power supply cables shall be designed to provide separate covers for the two cabling types.

A2 Alternatively, a single overall cover is allowed provided that the power supply cabling remains protected to prevent electric shock after removal of the cover. **A2**

Where both information technology cabling and power supply cabling are contained within a closure then:

- a) if the closure is metallic, it shall be provided with a protective earth in accordance with 4.1.2;
- b) the compartment in the closure shall have a barrier (either conducting or non-conducting) between the two cable types. If compartment barriers are conductive, they shall be earthed in accordance with the relevant local regulations for protective earth;
- c) the front plates on the closure shall allow separate access to the information technology cabling and the power supply cabling and shall be retained such that the use of a tool is necessary to gain access thereby preventing inadvertent misconnection between the power supply and the information technology cabling;
- d) the entry plates for the information technology cables and the power supply cables shall be separately removable. **A1**

4.1.8 Cables

4.1.8.1 Chemical hazard

The selection of cables shall be based upon the relevant product standards or manufacturers recommendations for appropriate use in chemical hazard areas.

4.1.8.2 External cables containing flammable materials

A2 Information technology cables that do not comply with the minimum recommended performance requirements of EN 60332-1-2 shall be either:

- a) terminated in an entrance facility which is outside the external fire barrier of the building;
or
- b) terminated inside the building, within 2 m (unless an alternative distance is specified by local regulations) of the point of internal penetration of the external fire barrier or any length exceeding 2 m is installed within trunking or conduit that is considered as a fire barrier in accordance with local fire regulations.”

NOTE This also applies where the cable has to pass through a space between two external fire barriers within a building. **A2**

4.1.9 Termination points

A1 Termination points for both information technology cables and power supply cables shall be located and oriented in such a way as to prevent ingress of moisture or other contaminants and to reduce the risk of damage to the cables connected to them. Connecting hardware selected for information technology cabling shall not be interchangeable with the sockets or plugs used for power supply distribution. **A1**

4.2 Documentation

In addition to the documentation required by EN 50174-1, the additional information produced by observing the requirements and recommendations of Clause 4 shall be provided to those installing the information technology cabling.

4.3 Pathways

4.3.1 Cable segregation

Where separation between different cabling systems is required this shall be maintained by physical separation to prevent unintended change during installation or extensions to the installation.

A1 Metallic information technology cabling and power supply cabling shall be segregated in accordance with the requirements of Clause 6. **A1**

4.3.2 Protection of installed cabling

Cable pathways shall provide protection to the installed cabling except in zones where the cabling can neither be damaged nor have its transmission properties adversely affected (e.g. rising zones, connecting ducts, equipment rooms, etc.).

Appropriate space shall allocated to the storage of cable loops (service loops).

4.4 Pathway systems

4.4.1 Requirements

Pathways, entry points to the pathways and the pathway systems selected shall ensure cables are able to be installed and, where appropriate, fixed in accordance with the applicable minimum bend radius (during installation, during operation – static and during operation – dynamic). This may be achieved by the use of pre-fabricated curved corners, drop-outs, radius limiters or other means. Where multiple cable types (and bundled or dual/shot-gun types) are involved, the largest minimum bend radius shall apply.

Minimum bend radius is specified by manufacturers' instructions. If instructions do not exist the following shall apply:

- the minimum bend radius for 4-pair balanced cables shall be 8 times the cable diameter;
- the minimum bend radius for optical fibre cables and coaxial cables shall be 10 times the cable diameter;
- the minimum bend radius for other metallic information technology cables shall be 8 times the cable diameter.

NOTE 1 For cables with additional protection, minimum bend radius may be greater than specified above.

Appropriate space shall be allocated to drawboxes and the storage of cable loops (service loops).

The maximum stacking height in pathway systems is specified by manufacturers' instructions. If instructions do not exist the following shall apply:

- for pathway systems that provide continuous support (e.g. trays), the stacking height shall not exceed 150 mm;
- for pathway systems that provide non-continuous support (e.g. basket, ladder or hooks):
 - the maximum distance allowed between supporting elements of the pathway system is 1 500 mm;
 - the maximum stacking height shall be calculated according to the following formula (the integer values shown in Table 2 are calculated using the formula and are for information only).

$$h = 150 / (1 + L \times 0,000\ 7) \quad (1)$$

where

h maximum stacking height (mm);

L distance between points of support (mm).

Table 2 – Stacking height for typical distances L

L mm	h mm
0	150
100	140
150	136
250	128
500	111
750	98
1 000	88
1 500	73

Pathway systems protruding through a floor shall not be terminated less than 50 mm above the finished floor surface.

A2 NOTE 2 This protrusion aids in preventing poured concrete and other constructions debris from entering the pathway during construction, protects cabling from mechanical damage and protects cabling and fire-stop materials from water and other liquid spills. **A2**

A1 4.4.2 Recommendations

During initial planning, the initial quantity of cables should not use more than 40 % of the usable cross-sectional area within the chosen pathway system subject to the following definition for useable cross-sectional area:

- a) for uncovered pathway systems and cable management systems (e.g. tray or basket), cables are not installed above the sidewalls (note electromagnetic screening performance of the selected cable management system may require modified criteria - see Clause 6);
- b) bends in the pathway systems may restrict the useable cross-sectional area dependent upon the specified bend radii of the cable to be installed;
- c) for non-enclosed pathway systems to which cables are to be attached or supported by (e.g. messenger/ catenary wires or designated routes) the cross-sectional area shall be considered to be the minimum available area surrounding the pathway system. **A1**

4.5 Cable management systems

4.5.1 Requirements

The selection of cable management systems shall take into account the requirements and recommendations of 4.4 and Annex A.

The selection of cable management systems shall consider:

- a) the strength of the electromagnetic fields along the pathway (proximity of electromagnetic conducted and radiated disturbing sources);
- b) the authorized level of conducted and radiated emissions;
- c) the type of cabling, e.g. coaxial, category of balanced cable (if a cable management system is selected to support a specific cable technology, it may not be suitable for installations of other cabling technologies in the future);
- d) the quality of equipotential bonding in the building;
- e) the type of closures to be housed, if appropriate;
- f) the immunity of the equipment connected to the information technology cabling system (if a cable management system is selected to support the interconnection of equipment having a specific level of electromagnetic immunity, it may not be suitable for other equipment);
- g) other environment constraints (chemical, mechanical, climatic, fire, etc.);
- h) the MICE environmental classification of EN 50173-1;
- i) any future information technology cabling system extension.

The selection of cable management systems shall allow installation and removal of the cable without risk of damage.

Cable management systems of the types listed below shall comply with the relevant European Standards:

- 1) conduit systems: EN 61386-1 and the relevant Part 2;
- 2) cable trunking systems and cable ducting systems: EN 50085-1 and the relevant Part 2;
- 3) power track systems: series EN 61534;
- 4) cable tray systems and cable ladder systems: EN 61537.

The selection of cable management system shall be made by considering in combination:

- the cabling products to be contained;
- the electromagnetic performance of the cable management system;
- the segregation requirements of Clause 6.

Where metallic or composite cable management systems are planned to be used specifically to provide electromagnetic screening for the information technology cables to be contained within them the requirements and recommendations of 5.3.3.3 shall be included in the planning of the installation. Any covers used shall provide the required electromagnetic screening performance.

A1 Text deleted **A1**

Where non-metallic cable management systems are planned to be used and if the equipment to be connected to the cabling (by unscreened cables) is not affected by low frequency disturbances then a metallic conductor (cable or barrier) may be installed within the cable management system to improve the electromagnetic protection provided to the cabling by reducing the common mode loop area. Where used, the metallic conductor shall be:

- i) designed to withstand large common mode and power fault currents;
- ii) connected to the local protective earthing system at both ends using a low impedance conducting element (e.g. a large metal wall of the apparatus cabinet).

A1 Text deleted **A1**

Conduits shall not:

- I) contain more than two bends of up to 90° max between pulling points (e.g., outlets, telecommunications rooms, or pull boxes);
- II) be subject to cumulative changes in direction of more than 180° between pulling points.

Bends within conduit shall be accessible and able to act as pulling points unless:

- III) no additional cables are to be installed within the conduit, following the initial installation of cable;
- IV) cables are to be removed before any additional installation takes place.

The inside radius of a bend in conduit shall be at least 6 times the internal conduit diameter.

Bends in the conduit shall not contain any kinks or other discontinuities that may have a detrimental effect on the cable sheath during cable pulling operations.

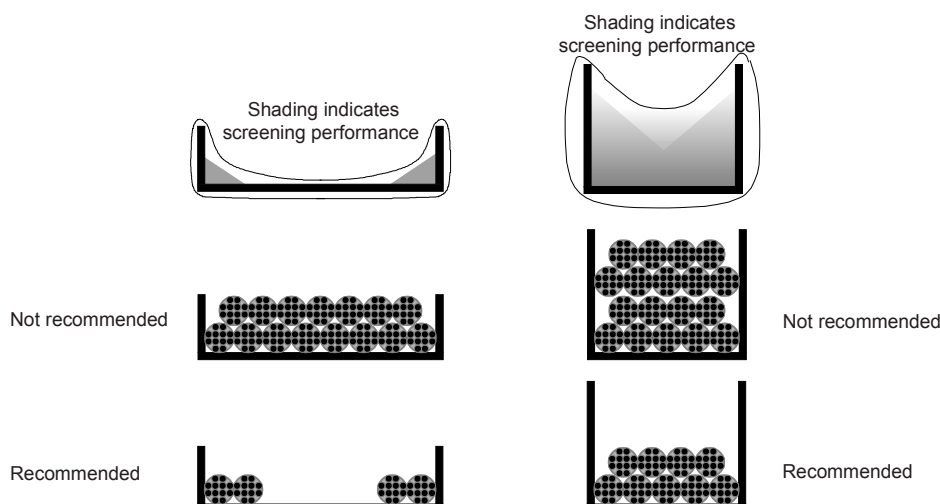


Figure 2 – Cable arrangement in a metallic section

4.5.2 Recommendations

Provided that the cabling is installed in accordance with the EN 50174 series, the cable management system can contribute to reduce electromagnetic interference:

- through a screening effect on the circuits within the cable management system;
- by improving the cohabitation between circuits contained in the cable management system;
- by reducing perturbations transferred from current flowing through the cable management system onto circuits contained in the cable management system.

For the purposes of electromagnetic screening within trays as shown in Figure 2:

- the inner corners provide the greatest effect;
- for a given internal cross-sectional area, high sidewalls provide greater useable capacity.

For the purposes of electromagnetic screening, where cables are to be installed on metallic building structural members (e.g. beams), inner corners provide the greatest effect.

A1 Non-metallic cable management systems are neutral products from the electromagnetic point of view. They do not provide electromagnetic screening to the contained cabling, but they do not perturb the cabling by transferring induced currents or leakage currents. Non-metallic cable management systems should be used where electromagnetic screening is not required by the cables to be installed within them. **A1**

4.6 Closures

A2 The closures shall be large enough to allow management of the cable and cable elements to be accommodated, taking into account the bend radius requirements defined in the instructions provided by the telecommunications cable manufacturer and/or supplier. Where instructions are not available, the radius applied to cable elements shall be the minimum of 30 mm or that of the cable, whichever is the greater. **A2**

AC1 The closures shall be located such that it is possible to undertake subsequent measurements, repair, expansion or extension of the installed cabling with minimal disruption and in safety (see EN 50174-1:2009, 4.2.6). **AC1**

The cable entrance to closures shall

- a) maintain the environmental performance of the closure;
- b) provide the necessary cable support and prevent kinking at the point of entry into the closure;
- c) provide strain relief for the cable if not already done by separate fixtures within the closure;
- d) be capable of accepting suitable glands.

4.7 Cabling

4.7.1 Requirements

4.7.1.1 General

The installation of the cabling shall be in accordance with Clause 5.

Mixing of unscreened and screened components within a channel may cause transmission performance to be adversely affected and shall only be implemented in accordance with manufacturers or suppliers instructions.

4.7.1.2 Screened cabling

The installation of the cabling shall be in accordance with 5.3.6.3.

The screen shall be continuous from the transmitter to the receiver.

The planning of the installation shall consider the effect that the earthing of the cabling screen has on the electromagnetic performance of the screened cabling. Independent of earthing for the purposes of safety:

- a) where the screen is earthed at one end only the screening effectiveness for low frequency electrical fields depends upon the performance of the cable screen;
- b) additional screening effectiveness is provided against high frequency electromagnetic fields if the screen is earthed at both ends.

NOTE 1 The connection of equipment to installed screened cabling which has been earthed at one end only may result in the system becoming earthed at both ends.

Special materials (e.g. μ -metal, Permalloy etc.) are typically required to improve screening performance at very low frequencies magnetic fields (e.g. 50 Hz).

NOTE 2 Further information is provided in Annex A.

A2 4.8 Filtering and electrical isolation components and surge protective devices

See A.3. A2

A1 4.9 Spaces

A2 Requirements and recommendations for the spaces in different types of premises are found in Clauses 8, 9, 10, 11 and 12. A2

4.10 Planning for repair

The planning of the installation should take into account the procedures to be applied following damage to the installed cabling - which is assumed to occur during the lifetime of an installation.

Planning options which address the practicality of repairs include:

- a) the provision of resilience by means of cabling redundancy which affects the timescale within which a repair may need to be effected;
- b) the selection of pathway and pathway systems and/or the installation of service loops to simplify the repair process;
- c) the sub-division of the fixed cabling to introduce cable sections to simplify replacement of such sections taking account of predicted operational access restrictions;
- d) the allocation of performance margin to allow for the chosen repair procedures;
- e) the maintenance of service provision by means of temporary repairs which precede the final corrective action.

Where damage occurs, corrective actions include one or more of the following procedures:

- repair of damaged components;
- replacement of damaged components;
- installation of additional components to provide the required function.

The selection of the appropriate procedure shall take into account:

- 1) the available margin between the initial (i.e. pre-damaged) performance of the cabling and the requirements of the service provided over the cabling;
- 2) the objectives of the user for the transmission performance of the cabling i.e. to maintain of the initial performance (perhaps to support network evolution) or to allow for gradual degradation during repair(s) subject to the available margin;
- 3) financial constraints taking into account the available margin and the objectives of the user;
- 4) the media and type of cables to be repaired;
- 5) practicality constraints;
- 6) time constraints which may be affected by a range of factors including the practicality constraints;

The user should ensure that documentation exists which defines contingency planning, procedures for fault analysis and for initiating, monitoring and recording all repairs undertaken. 

5 Requirements for the installation of information technology cabling

5.1 Safety

5.1.1 General

5.1.1.1 Power supply cabling

Electrical installations shall be undertaken in accordance with the HD 384/HD 60364 series and/or local regulations as appropriate.

5.1.1.2 Explosive or flammable environments

The installation of information technology equipment and information technology cabling in situations where explosive or flammable materials are generated, prepared, processed, handled, stored or otherwise encountered shall be carried out in accordance with EN 61241-14, EN 60079-0, EN 60079-14 and EN 60079-17 as appropriate.

5.1.1.3 Optical fibre cabling

The following practices shall be adopted:

- a) exposed optical fibre ends shall be kept away from the skin and eyes;
- b) the quantity of optical fibre waste shall be minimised;
- c) waste fragments shall be treated with care and collected (not by hand) and disposed of in suitable containers via an approved agency or according to local regulations;
- d) connector end faces, prepared optical fibres or fractured optical fibres shall not be viewed directly unless the power emitted from the optical fibre is known to be safe (as defined within series EN 60825) and under local control.

Installation practice shall be in accordance with the requirements and recommendations of EN 60825-2 for the relevant hazard classification (see 4.1.3).

5.1.1.4 Guards and signs

All necessary guards, protective structures and warning signs shall be used to protect both personnel and cabling components.

Relevant local regulations for safe working practices shall be complied with.

5.1.2 Pathways

It is possible for explosive, asphyxiating or toxic gases to build up in ducts, draw pits, maintenance holes or other closed chambers. Before entering any such areas, they shall be well ventilated and the atmosphere shall be tested to detect any potentially hazardous gases. Where a gas hazard is detected the installer shall inform the nominated site contact and appropriate action shall be agreed and undertaken.

5.1.3 Closures

[A1] Before installing information technology cabling within closures containing power supply cabling the following shall be ensured:

- a) the compartment shall prevent inadvertent contact with the power supply cabling;
- b) where a barrier is used between the power supply cabling and the information technology cabling (either conducting or non-conducting) it shall meet a minimum of IP20 as specified in EN 60529;
- c) metallic closures and conductive compartment barriers shall be earthed in accordance with 5.1.1.1. **[A1]**

5.1.4 Cables

Measures shall be taken to prevent any liquids and/or gels present within the information technology cable from leaking in pathways, closures or at any point of termination.

[A1] Information technology cables that do not comply with the minimum recommended performance requirements of EN 60332-1-2 shall be installed according to the instructions of the planner (see 4.1.8.2). **[A1]**

5.2 Documentation

In addition to the documentation required by EN 50174-1, the additional information resulting from the planning process (see Clause 4) shall be obtained.

5.3 Installation practice

5.3.1 Storage of cabling components and equipment

5.3.1.1 Requirements

The environmental conditions under which cabling components, inspection and test equipment are stored shall be compatible with the manufacturers'/suppliers' specifications.

Cabling components shall be inspected for damage following delivery. Documentation supplied with the components shall be checked for compliance with the procurement specification and shall be retained.

If required by the quality plan, detailed component inspection and acceptance testing shall be undertaken as soon as practicable. Any packaging removed to allow inspection and/or testing shall be replaced in order to provide the required environmental and physical protection to the components.

Where protective caps, or equivalent, have been used to protect components, they shall not be removed until necessary and shall be replaced or renewed as necessary until the installation is completed.

5.3.1.2 Recommendations

The ends of stored cable should be sealed to prevent ingress of contaminants.

5.3.2 Pathways

The accessibility and availability of pathways in accordance with the installation specification and the installation schedule shall be confirmed. The client shall be advised of all necessary deviations or actions required.

The accessibility and availability of proposed locations of cable drums (or reels) and associated installation equipment in accordance with the installation schedule shall be confirmed. The client shall be advised of all necessary deviations or actions required.

The accessibility and availability of proposed locations of cable service loops shall be confirmed. The client shall be advised of all necessary deviations or actions required.

The installer shall ensure that all necessary installation accessories are available.

A2 Where it is necessary, and relevant permission has been obtained, to open:

- a) ceiling tiles, floor covers or trunking covers, only the minimum number shall be removed and these shall be replaced on completion of works;
- b) fire barriers and gas seals, they shall be opened only when necessary and resealed on completion of works. **A2**

5.3.3 Pathway systems

5.3.3.1 General

5.3.3.1.1 Requirements

- ▣ Any structures, fixtures and fittings used to support the telecommunications cabling within the pathways shall be installed in accordance with instructions provided by the manufacturer(s) and/or supplier(s) of the fixtures and fittings. ^{A1}

Existing catenary wires shall be checked for satisfactory function and, where necessary, catenary wires shall be replaced.

Pathway systems shall be left clean and free from obstruction with all separators and bridging pieces in place before the cabling installation commences.

Cleats or temporary structures (to assist cabling installation) shall be fitted where necessary. Abrasive supports (e.g. threaded rod) installed within the cable fill area shall have that portion within the pathway system protected with a smooth, non-scratching covering so that cable can be pulled without physical damage.

^{A1} *Text deleted* ^{A1}

Cable management systems shall be installed:

- a) in accordance with the requirements of Clause 4;
- b) to allow installation and removal of the cable without risk of damage to the cable;
- c) without sharp edges or corners that could damage the cabling installed within or upon them;
- d) to enable the creation of fire barriers in accordance with local regulations;
- e) taking into account relevant external/environmental influences – in particular:
 - cable management systems shall be installed to ensure that water or other contaminant liquids cannot collect;
 - where required, sections of cable management systems shall be jointed to prevent ingress of gases, liquids, etc.

5.3.3.1.2 Recommendations

Cable management systems should be installed in such a way that the transmission of acoustic noise is minimized.

5.3.3.2 Electrically conductive cable management systems

- ▣ Where an electrically conductive cable management system is installed, sections shall be bonded to earth in accordance with 5.1.1.1 in order that the cable management system acts as a PEC described in 7.1.3.4. ^{A1}

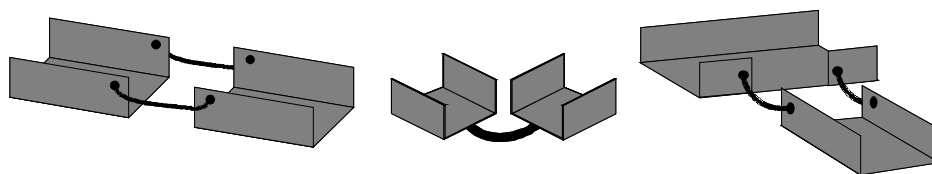
5.3.3.3 Electromagnetic screening

5.3.3.3.1 Requirements

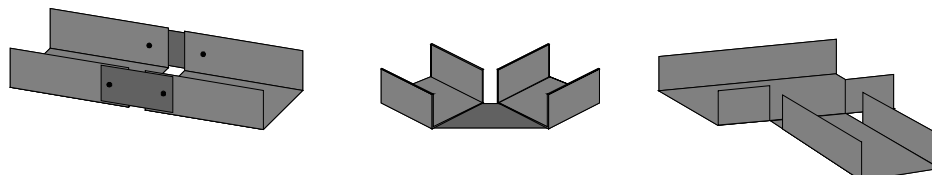
The following requirements apply to metallic or composite cable management systems that are required specifically to provide electromagnetic screening for the information technology cables to be contained within them (see 4.4.1):

- a) if the cable management system is constructed from multiple sections:
 - the sections shall be interconnected to ensure continuity;
 - bonds shall have performance in accordance with EN 50310 (illustrated in Figures 3 b) and 3 c));
- b) cable management systems shall be functionally bonded in accordance with EN 50310;
- c) **A2** Figure 4 shows cable management systems crossing a wall at which a fire barrier is to be installed following cable installation. Unless specifically allowed by local regulations, the fire-stop materials or firestopping techniques, the cable management system shall be interrupted (with the smallest gap consistent with the construction of the fire barrier and allowing for the thermal expansion of the cable management system) and the two metallic sections shall be bonded. The bonds shall have performance in accordance with EN 50310; **A2**
- d) if adjustments or extensions to the pathways system are carried out, the component used shall maintain the intended electromagnetic performance (e.g. a metallic sections shall not be replaced by plastic sections).

a) non-conformant



b) conformant



c) recommended

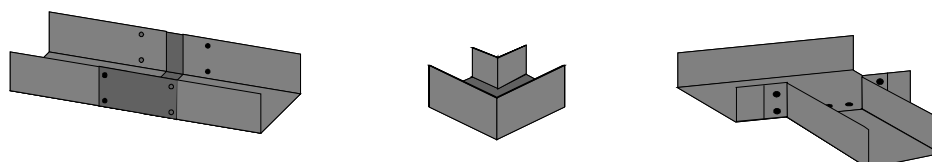


Figure 3 – Continuity of metallic cable management systems

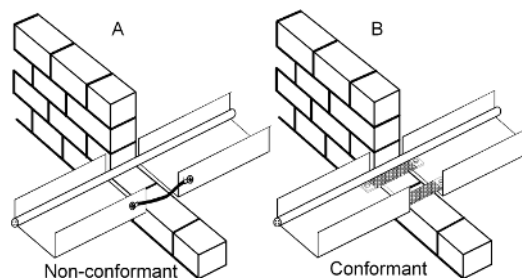


Figure 4 – Interruption of metallic cable management systems at fire barriers

5.3.3.3.2 Recommendations

A1 The following recommendations apply to metallic or composite cable management systems that are required specifically to provide electromagnetic screening for the information technology cables to be contained within them (see 4.5.2): **A1**

- a) the shape of the metallic section should be maintained over its full length;
- b) if the cable management system is constructed from multiple sections, continuity between these sections should be provided – examples of solutions are (in order of preference):
 - a full perimeter weld or solder to ensure a very low impedance connection;
 - spot welded, riveted, bolted or screwed joints provided that the surfaces in contact are good conductors (no paint or insulating coat), safeguarded against corrosion and a good electrical contact between the all parts is ensured (periodic maintenance may be required in harsh environments);
 - braided, stranded or mesh straps of less than 10 cm in length where the cross-sectional area (CSA) of each strap is a minimum of $2,5 \text{ mm}^2$ (ffs).

NOTE 1 It is possible that local regulations and series EN 60950 require a greater CSA for electrical safety.

- c) when trunking or cable trays with covers are used, the continuity between the base and the cover should be provided – examples of solutions are (in order of preference):
 - many contacts over the full length;
 - as a minimum, connections at both ends using braided, stranded or mesh straps of less than 10 cm in length where the CSA of each strap is a minimum of $2,5 \text{ mm}^2$ (ffs).

NOTE 2 It is possible that local regulations and series EN 60950 require a greater CSA for electrical safety.

- d) all bonds should be as short as possible.

NOTE 3 The long term stability of earth connections and connections between sections or parts of cable management systems depends on the galvanic coupling of the materials used.

NOTE 4 A short single lead connection between two parts of the cable management system will result in high local impedance and, therefore, degrades its electromagnetic performance (see Figure 3a)). From frequencies of a few MHz upwards, a 10 cm mesh strap between the two parts of the cable management system will improve the impedance by more than a factor of 10.

5.3.4 Closures

The accessibility and availability of proposed locations of closures in accordance with the installation schedule shall be confirmed. The client shall be advised of all necessary deviations or actions required.

Closures shall be:

- a) fixed or mounted in position using the recommended fittings;
- b) labelled and identified according to the installation specification.

Optical fibre adaptors within closures shall be fixed or fitted with suitable protective caps to prevent the ingress of foreign material.

Documentation shall be provided to enable subsequent installation of the cabling into the closures.

5.3.5 Cable installation

5.3.5.1 General

Installation of cables shall be in accordance with the instructions supplied by their manufacturers/suppliers.

Installation of cable shall be undertaken according to the installation schedule.

A1 Metallic information technology cabling and power supply cabling shall be segregated in accordance with the requirements of Clause 6. **A1**

NOTE Testing of secure/safe/sufficient separation is described in EN 61140 (for mains power AC frequencies of 50 Hz to 60 Hz).

When installing cables, cords or jumpers appropriate techniques shall be applied to:

- a) eliminate cable stress caused by:
 - tension in suspended cable runs;
 - tightly cinched cable bundles;
- b) ensure that minimum bend radii are as specified by the cable manufacturer, supplier or in accordance with the relevant product standard (rollers or other devices shall be used to avoid damage);
- c) ensure that the tensile load applied to the cables and cable bundles as specified by the cable manufacturer, supplier or in accordance with the relevant product standard.

Unless otherwise stated in the suppliers/manufacturers specification, the maximum tensile load applied to a bundle shall be that specified for a single cable.
- d) prevent pressure marks (e.g. through improper fastening or crossovers) on the cable sheath or the cable elements;
- e) prevent optical fibre within cables experiencing direct stress following installation (where long vertical runs are proposed optical fibre cables may need to deviate from the vertical by the inclusion of short horizontal runs or loops at intervals as recommended by the manufacturer);
- f) avoid joints other than those in accordance with the installation specification.

5.3.5.2 Environments and contaminants

Cabling components shall be acclimatised at the recommended environmental condition before installation.

Cables shall not be exposed to humidity levels or temperatures outside their specified limits; this includes localised effects such as those from hot air blowers or gas burners.

The installation process shall not degrade the intended environmental performance of the pathway/cable management system e.g. water seals and fire barriers shall be re-fitted upon completion of the installation.

Where there is an identified risk of ingress to a cable of water or contaminants during installation, the cable ends shall be sealed.

5.3.5.3 Installation into pathways

5.3.5.3.1 Requirements

Precautions shall be taken during the installation of draw ropes, where used, to prevent the draw ropes becoming entangled with cables.

Where cable is to be installed in shared pathways precautions shall be taken to avoid damage to existing cables or structures within those routes.

When simultaneously pulling multiple cables within a pathway the loose ends of each cable shall be labelled with a unique identifier. Where cable elements cannot be otherwise identified, labels shall be applied.

The position of information technology cables and the location of closures in cable management systems shall be in accordance with the instructions provided by the manufacturers/suppliers of the cable management systems (subject to meeting the segregation requirements of Clause 6). When installing cables into cable management systems they shall be secured as specified in the installation specification.

The final placement of cables and cable bundles shall take into account the risk of damage due to external influences.

[A1] The re-instatement of the fire rating of fire barriers in accordance with local regulations shall be implemented using the specified fire-stop materials and/or fire-stopping techniques. **[A1]**

5.3.5.3.2 Recommendations

When installing in vertical pathways (e.g. risers), cables should be lowered rather than pulled upwards.

Cables should be installed in the inner corners of metallic building structural members (e.g. beams), where used, in order to provide the most effective electromagnetic screening.

5.3.5.4 Requirements for closures

Cables entering closures shall use appropriate glands and fittings or similar to:

- a) maintain the environmental performance of the closure;
- b) provide the necessary cable support and prevent cable kinking;
- c) provide strain relief for the cable if not already provided by separate fixtures within the closure.

An excess length of cable shall be provided at each closure to enable subsequent access to the closure for termination, jointing and repair of the cable. Where the quality plan requires installed cable tests to be undertaken, prior to the termination or jointing of the cable, the excess length shall take this into account.

A1 The bend radii of telecommunications cables and telecommunications cable elements within closures shall be in accordance with the instructions provided by the telecommunications cable manufacturer and/or supplier. **A1** **A2** Where instructions are not available, the radius applied to cable elements shall be the minimum of 30 mm or that of the cable, whichever is the greater. **A2**

Any cabling not contained within a cable management system shall be protected from physical damage by use of appropriate measures.

Within closures, each cable element shall be uniquely identifiable using one or more of the following methods:

- 1) colour coding;
- 2) labelling;
- 3) physical position routing.

Closures containing optical fibre terminations or joints shall be labelled in accordance with EN 60825-2 for the relevant hazard classification (see 4.1.3).

If required by the quality plan, installed cable tests shall be undertaken as soon as practicable following cable installation.

5.3.6 Jointing and termination of cables

5.3.6.1 General

Cables shall be jointed or terminated in accordance with the instructions provided by the manufacturer/supplier of the connecting hardware. If special tools are required for jointing or termination, then only those recommended by the manufacturer shall be used.

Cable elements not terminated within connecting hardware shall be treated as detailed in the installation specification.

Sharp bending that would compromise transmission performance of cables shall be avoided.

Following jointing or termination, the cable elements shall be arranged within the closure in a manner that allows access to individual connectors, joints and cable elements with minimal disruption to neighbouring components during subsequent repair, expansion or extension of the installed cabling.

The presentation of cable elements within joints, terminating and connecting hardware and closures shall be in accordance with the installation specification.

5.3.6.2 Balanced cabling

The connecting hardware used for balanced cabling shall be installed to provide minimal signal impairment by preserving wire pair twists and conductor separation as closely as possible to the point of mechanical termination (by not changing the original twist). In addition only a minimum of the cable sheath shall be removed in accordance with the manufacturer's instructions.

5.3.6.3 Screened cabling

A1 The cable screen shall totally surround the cable along its entire length (a screening contact applied only through the drain wire has little effect at high frequencies).

Cable screens shall be terminated at each termination point to maintain the intended performance of the cable screen termination of connecting hardware. Where instructions for termination of a specific cable are not available from the manufacturer/supplier of the connecting hardware: **A1**

- a) special attention shall be paid to the assembly of connection elements. The screen contact shall be applied over 360 degrees according to the Faraday cage principle. The screening connection shall be of a low impedance design;
- b) the screening shall continue through an appropriate screen connection; normal pin contacts alone shall not be used;
- c) discontinuities in the screening shall be avoided: e.g. even small holes in the screen, pigtails or loops;
NOTE Discontinuity dimensions of the order of 1 % to 5 % of the wavelength can reduce the overall screening effectiveness.
- d) screen connections shall be firmly fixed, for instance by strapping or clamping;
- e) screens shall not be used as a strain relief;
- f) screens shall be bonded in accordance with the installation specification and additional planning information (see 4.7);
- g) screen connections shall be safeguarded against corrosion and a good electrical contact between all parts is ensured (maintenance periods may be dependent upon the environment, see EN 50174-1).

5.3.6.4 Optical fibre cabling

Joints (fusion or mechanical splices) and their strain relief mechanisms shall be fixed and supported within the optical fibre management system of the closure.

Within joints the protection and retention of the optical fibres shall be in accordance with manufacturers' instructions.

Labelling of installations shall be such that the polarisation of optical fibre connections of more than one optical fibre is known and consistent throughout the installation.

The end-faces of terminated optical fibres shall be subjected to visual inspection as defined in EN 50346.

5.3.7 Cords and jumpers

Cords and jumpers shall be secured in such a way that mechanical damage is avoided during subsequent access.

See 5.3.5.1 for additional requirements that apply to cords and jumpers.

5.4 Surge protective devices

When surge protective devices are installed, special care shall be taken to ensure equipotential bonding of the surge protective devices earth together with the main earth and the equipment's earth in accordance to installation requirements of HD 60364-5-534 and the EN 61643 series. **A2** See A.3.3 for additional information. **A2**

5.5 Labelling

See EN 50174-1 in addition to the requirements of this standard.

5.6 Testing

A1 If required by the quality plan, final cabling inspection and tests shall be undertaken as soon as practicable following marking, labelling and fitting of all components associated with the telecommunications cabling into their final locations. **A1**

5.7 Contractual acceptance

- A1** If required within the installation specification, acceptance procedures shall be undertaken as soon as practicable following marking, labelling and fitting of all components associated with the telecommunications cabling into their final locations.

5.8 Operation

5.8.1 Requirements

Provided that there is no risk of damage to cables or the pathway system additional cables may be installed within pathway systems according to the following rules:

- a) using all the useable cross-sectional area (see 4.4.2) within:
 - 1) uncovered pathway systems and cable management systems;
 - 2) pathway systems and cable management systems from which covers are removed before installation of cables;
 - 3) non-enclosed pathway systems and cable management systems;
- b) using up to 40 % of the useable cross-sectional area (see 4.4.2) within conduit (unless the conduit contains empty sub-conduits).

5.8.2 Recommendations

No additional recommendations.

6 Segregation of metallic information technology cabling and power supply cabling **A1**

6.1 General

This clause specifies requirements and recommendations for unscreened and screened cables in accordance with EN 50288 series together with other balanced and unbalanced (including coaxial) cables. Where appropriate the requirements and recommendations are specific to particular cable specifications.

The segregation requirements of 6.2 assume that:

- A1** a) the electromagnetic environment complies with the levels defined in the EN 61000-6 series for conducted and radiated disturbances (e.g. power cabling);
- b) the power supply is non-deformed but has high frequency content consistent with the switching and operation of connected equipment in accordance with the EN 61000-6 series;

NOTE 1 "Deformed" power supplies and the use of other equipment lie outside the scope of this standard and may require additional engineering practices.

- c) the information technology cabling supports one or more applications listed in EN50173-1 or defined in the premises-specific clauses of this standard. **A1**

The segregation requirements of 6.2 are those required with regard to electromagnetic interference (EMI). Local regulations for safety may contain different segregation requirements. In these circumstances safety has highest priority but the more stringent requirement shall take precedence.

The premises-specific clauses of this standard may contain modified segregation requirements. Where manufacturers' instructions require more stringent installation practices, these shall be followed.

When cabling is installed in an electromagnetic environment exceeding the levels of EN 61000-6 series the separations may need to be increased.

6.2 Requirements

6.2.1 General segregation requirements

A1 The requirements for separation between information technology cables and power supply cables depend upon:

- a) the electromagnetic immunity of the information technology cable measured as
 - coupling attenuation for screened balanced cables;
 - transverse conversion loss (TCL) for unscreened balanced cables;
 - screening attenuation for unbalanced (coaxial) and twin axial cables;
- b) the construction of the power supply cable;
- c) the quantity of, and type of electrical circuit provided by, the power supply cables;
- d) the presence of dividers between the information technology cables and power supply cables. **A1**

The minimum separation requirement “*A*” is calculated by multiplying the minimum separation “*S*” obtained from Table 4 by the power cabling factor “*P*” from Table 5. The value of “*S*” obtained from Table 4 depends upon the Segregation Classification of the information technology cable of Table 3. A flow-chart approach to this calculation is shown in Figure 5.

The separation requirements for Segregation Classification “a” in Table 4 shall be applied if:

- 1) the mix of applications is unrestricted;
- 2) the type of cabling to be installed is unrestricted;
- 3) the relevant cable performance is unknown.

A1 Where the cabling to be installed is in accordance with, and is intended to support the applications of Class D or above listed in the EN 50173 series the separation requirements for classification “b” in Table 4 represent the minimum requirements of this standard. Reduced separations based upon the other classifications of Table 4 may restrict the type and use of cables installed in the pathways and cable management systems selected. **A1**

Segregation of cabling to support CATV systems is addressed in EN 60728 series (EN 50083 series).