BS EN 50173-6:2013

BSI Standards Publication

Information technology — Generic cabling systems

Part 6: Distributed building services

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National foreword

This British Standard is the UK implementation of EN 50173-6:2013.

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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CENELEC

European Committee for Electrotechnical Standardization
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Foreword

This document (EN 50173-6:2013) 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) 2014-07-22
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2016-07-22

The European Standards EN 50173:1995 and EN 50173-1:2002 have been developed to enable the application-independent cabling to support ICT applications in office premises. Their basic principles, however, are applicable to other types of applications and in other types of premises.

Therefore, CLC/TC 215 has established relevant European Standards which address the specific requirements of these premises. In order to point out the commonalities of these cabling design standards, these European Standards are published as individual parts of the EN 50173 series, thus also acknowledging that standards users recognise the designation “EN 50173” as a synonym for generic cabling design.

At the time of publication of this European Standard, EN 50173 series comprises the following standards:

— EN 50173-1 *Information technology – Generic cabling systems – Part 1: General requirements*
— EN 50173-2 *Information technology – Generic cabling systems – Part 2: Office premises*
— EN 50173-3 *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 50173-6 *Information technology – Generic cabling systems – Part 6: Distributed building services*

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

Introduction

The importance of the information technology cabling infrastructure is similar to that of other utilities such as heating, lighting and electricity supplies. As with other utilities, interruptions to service can have 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.

Historically, the cabling within premises comprised both application-specific and multipurpose networks. Standards within the EN 50173 series have enabled a controlled migration to generic cabling (with an associated reduction in the use of application-specific cabling) and supported the development of high data rate applications based upon defined cabling models.

This European Standard, EN 50173-6, specifies generic cabling that supports a wide range of communication services within premises that comprise single or multiple buildings on a campus. It has been prepared to reflect the increasing use of generic cabling in support of non-user specific services, many of which require the use of remote powered devices including:

I) telecommunications, e.g. wireless access points;

II) energy management, e.g. lighting, power distribution, incoming utility metering;

III) environmental control, e.g. temperature, humidity;

IV) personnel management, e.g. access control, cameras, passive infra-red (PIR) detectors, time and attendance monitoring, electronic signage, audio-visual (AV) projectors;

V) personal information and alarms, e.g. paging, patient monitoring, nurse call, infant security.

The distribution of these services is provided:

i) using the balanced cabling channel Classes of EN 50173-2 and the all-silica optical fibre cabling channel Classes of EN 50173-1;

ii) to locations other than those specified by premises-specific standards in the EN 50173 series either as a stand-alone structure and configuration or as an overlay to an EN 50173 structure and configuration.

This European Standard is not intended to replace the application of other premises-specific standards in EN 50173 series but has been prepared in recognition of the fact that, although certain functional elements of service distribution cabling may be co-located with those of other generic cabling infrastructures, service distribution cabling may be:

- specified, installed and operated by different entities than those responsible for other generic cabling infrastructures that may be installed within the premises;
- specified and installed at a different time than other generic cabling infrastructures that may be installed within the premises.

This European Standard provides:

a) users with an application independent generic cabling system and an open market for cabling components;

b) users with a flexible cabling scheme such that modifications are both easy and economical;

c) building professionals (for example, architects) with guidance allowing the accommodation of cabling before specific requirements are known; i.e. in the initial planning either for construction or refurbishment;

d) industry and standardization bodies with a cabling system which supports current products and provides a basis for future product development and applications standardization.

This European Standard specifies multi-vendor cabling, and is related to:

- standards for cabling components developed by Technical Committees of CENELEC and/or IEC;

- standards for the quality assurance and installation of information technology cabling (EN 50174 series) and testing of installed cabling (EN 50346);

- applications developed by the Technical Committees of IEC (including the subcommittees of ISO/IEC JTC 1) and study groups of ITU-T.

The applications listed in EN 50173-1:2011, Annex F, have been analysed to determine the requirements for a generic cabling system. These requirements, together with statistics concerning premises geography from different countries and the models described in Clause 6, have been used to develop the requirements for cabling components and to stipulate their arrangement into cabling systems.

As a result, generic cabling defined within this European Standard is targeted at, but not limited to, office premises. It is anticipated that the generic cabling system meeting the minimum requirements of this European Standard will have a life expectancy in excess of ten years.

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 part and other parts of EN 50173 series;

2) application dependent cabling design (e.g. EN 50098 series);

3) installation (EN 50174 series);

4) testing of installed cabling (EN 50346);

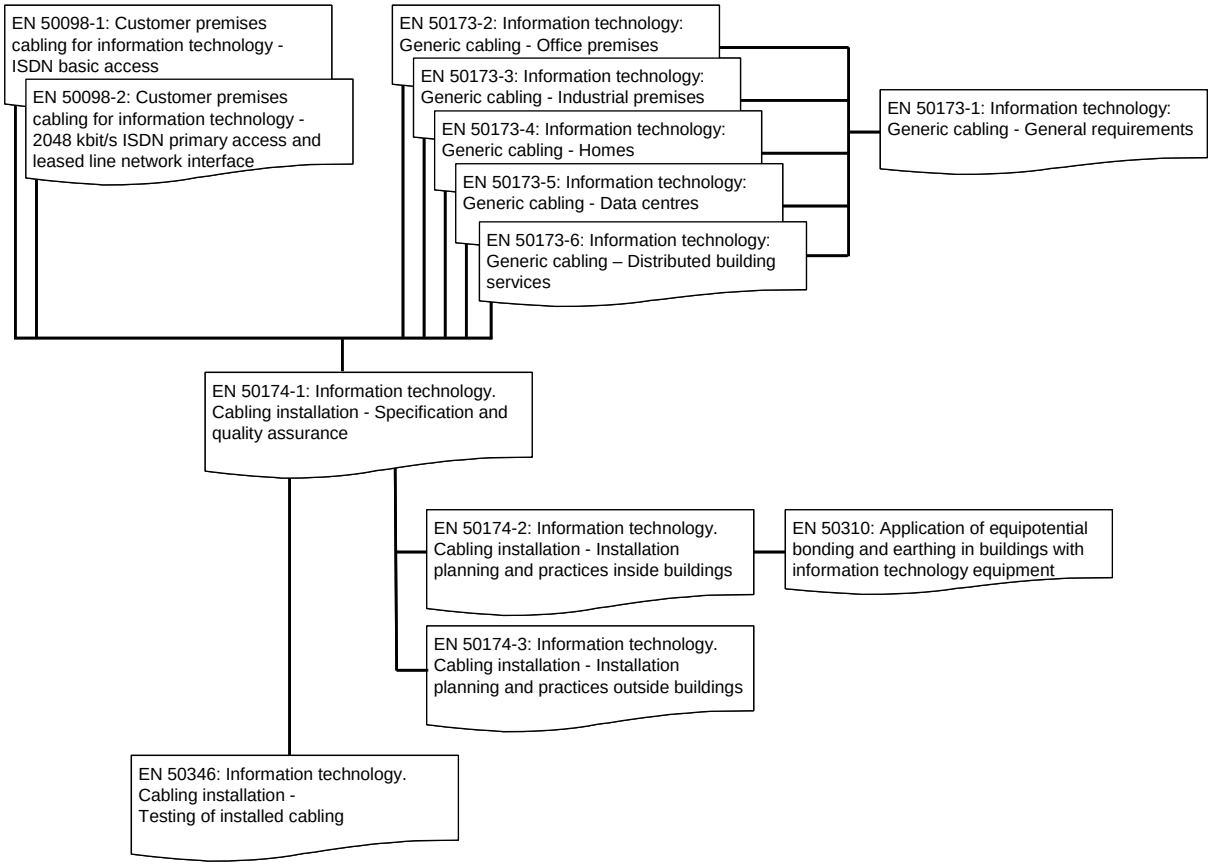
5) equipotential bonding requirements (EN 50310).

In addition, a number of Technical Reports have been developed to support or extend the application of these standards, including:

– CLC/TR 50173-99-1, *Cabling guidelines in support of 10 GBASE-T*;

– CLC/TR 50173-99-2, *Information technology – Implementation of BCT applications using cabling in accordance with EN 50173-4*;

– CLC/TR 50173-99-3, *Information technology – Generic cabling systems – Part 99-3: Home cabling infrastructures up to 50 m in length to support simultaneous and non simultaneous provision of applications*.



NOTE For the purposes of the standards in EN 50173 and EN 50174 series, the term “information technology” includes ICT, BCT and CCCB applications.

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

Table 1 — Contextual relationship between EN 50173 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. Bonding 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 mains power cabling 7: Electricity distribution systems and lightning protection **and EN 50174-3** and (for equipotential bonding) **EN 50310**	**EN 50174-2** 5: Requirements for the installation of information technology cabling 6: Segregation of metallic information technology cabling and mains power cabling 8: Office (commercial) premises 9: Industrial premises 10: Homes 11: Data centres **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 generic cabling that supports a wide range of communication services within premises that comprise single or multiple buildings on a campus. It addresses the increasing use of generic cabling in support of non-user specific services, many of which require the use of remote powered devices including telecommunications, energy management, environmental control, personnel management, personal information and alarms.

The distribution of these services is provided to locations (e.g. for wireless access points, remote powered devices and building management systems) other than those specified in premises-specific standards in EN 50173 series by means of either:

a) an overlay structure and configuration to that specified within EN 50173 series, or

b) a stand-alone structure and configuration.

It covers balanced cabling and optical fibre cabling.

This European Standard is based upon and references the requirements of EN 50173-1, and in addition specifies implementation options.

Safety (electrical safety and protection, optical power, fire, etc.) and electromagnetic compatibility (EMC) requirements are outside the scope of this European Standard and are covered by other standards and regulations. However, information given in this European Standard may be of assistance in meeting these standards and regulations.

1.2 Conformance

For a cabling system to conform to this European Standard:

a) the structure and configuration shall conform to the requirements of Clause 4;

b) the interfaces to the cabling at the service outlets (SO) and service concentration points (SCP) shall conform to the requirements of Clause 8 with respect to mating interfaces;

c) connecting hardware at other places in the cabling structure shall meet the requirements specified in Clause 8;

d) the performance of channels shall conform to the requirements of Clause 5. This shall be achieved by one of the following:

   1) a channel design and implementation ensuring that the prescribed channel performance Class of Clause 5 is met;

   2) attachment of appropriate components to a link design meeting the prescribed performance Class of Annex A. Channel performance shall be ensured where a channel is created by adding more than one cord to either end of a link meeting the requirements of Annex A;

   3) using the reference implementations of Clause 6 and compatible cabling components conforming to the requirements of Clauses 7, 8 and 9, based upon a statistical approach of performance modelling.

e) local regulations concerning safety shall be met.

In addition, the requirements of EN 50174 series shall be met.

The test parameters to be measured and the sampling levels to be applied for a particular installation shall be defined in the installation specification and quality plans for that installation prepared in accordance with EN 50174-1.

The treatment of measured results that fail to meet the requirements of this subclause, or lie within the relevant measurement accuracy, shall be clearly documented within a quality plan as described in EN 50174-1.

Test methods to verify conformance with the channel and link requirements of Clause 5 and Annex A respectively are specified in EN 50346.

2 Normative references

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

EN 50173-1:2011, *Information technology — Generic cabling systems — Part 1: General requirements*

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

EN 50174-2, *Information technology – Cabling installation – Part 2: Installation planning and practices inside buildings*

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

EN 61076-3-106:2006, *Connectors for electronic equipment — Product requirements — Part 3-106: Rectangular connectors — Detail specification for protective housings for use with 8-way shielded and unshielded connectors for industrial environments incorporating the IEC 60603-7 series interface (IEC 61076-3-106:2006)*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 50173-1 and the following apply.

NOTE EN 50173-1:2011, 3.1.5, defines “application” as “system, with its associated transmission method that is supported by telecommunications cabling”.

3.1.1
area feeder cable
cable connecting the service distributor to the service concentration point(s) of Type B generic cabling

3.1.2
building service
non-user specific service within premises including, but not restricted to, building automation, security, access control, building management, wireless access points, information displays and alarm systems

3.1.3
distributed building service
building service provided to locations additional to those specified in premises-specific standards in EN 50173 series

3.1.4
network conversion interface
passive or active device allowing the attachment of cabling of different network topologies to a service concentration point

3.1.5
service area cord
cord connecting the service outlet to the terminal equipment

3.1.6
service concentration point
connection point in the Type A generic cabling between a service distributor and a service outlet or a connection point offering connections to terminal equipment at the end of Type B generic cabling

3.1.7
service concentration point cable
cable between a service concentration point and a service outlet

3.1.8
service distribution cable
cable connecting the service distributor to the service outlet(s) or service concentration point(s) of Type A cabling

3.1.9
service outlet
fixed connecting device where the service distribution cabling terminates

3.2 Abbreviations

For the purposes of this document, the abbreviations given in EN 50173-1 and the following apply.

AV	Audio-visual
OE EQP	Opto-electronic equipment
PIR	Passive Infrared
SCP	Service Concentration Point
SD	Service Distributor
SO	Service Outlet
TE	Terminal Equipment
WAP	Wireless Access Point

4 Structure of the generic cabling for distributed building services

4.1 General

Clause 4 identifies the functional elements of generic cabling, describes how they are connected together to form subsystems and identifies the interfaces at which application-specific components are connected. Channels, created by connecting application-specific cabling components to the generic cabling, are used to support applications (see EN 50173-1:2011, Annex F).

In general, all functional elements, subsystems and interfaces from the campus distributor to the floor distributor as described in EN 50173-1 are applicable.

4.2 Functional elements

4.2.1 Stand-alone structure

In addition to the distributors specified in EN 50173-1, this European Standard specifies two implementations of generic cabling for distributed building services. This European Standard enables:

a) Type A generic cabling to the SO;

b) Type B generic cabling to the SCP, thereby providing the opportunity for:

— application-specific cabling to be installed between the SCP and terminal equipment;

— application-specific equipment to be connected at the SCP.

The specification of application-specific cabling and equipment that may be connected to the SCP is outside the scope of the European Standard.

Type A generic cabling uses the following functional elements and interfaces:

1) service distributor (SD);

2) service distribution cable;

3) service concentration point (SCP);

4) service concentration point cable (SCP cable);

5) service outlet (SO).

For Type B generic cabling uses the following functional elements and interfaces:

i) service distributor (SD);

ii) area feeder cable;

iii) service concentration point (SCP).

Groups of these functional elements are connected together to form cabling subsystems (see 4.3).

4.2.2 Overlay structure

The structure of Type A and Type B generic cabling in association with generic cabling of other standards in EN 50173 series is described in Annex C.

4.3 General structure and hierarchy

4.3.1 Type A generic cabling

4.3.1.1 Stand-alone structure

Type A generic cabling systems contain up to three cabling subsystems: campus backbone, building backbone and service distribution cabling. The cabling subsystems are connected together to create a generic cabling system with a structure as shown in Figure 2. The composition of the cabling subsystems is described in 4.4.1, 4.4.2 and 4.4.3. The functional elements of the cabling subsystems are interconnected to form a basic hierarchical topology as shown in Figure 3.

Where the functions of distributors are combined (see 4.7.2.1), the intermediate cabling subsystem(s) are not required.

Connections between cabling subsystems are either active, requiring application-specific equipment, or passive. Connection to application-specific equipment adopts either an interconnect or a cross-connect approach (see EN 50173-1). Passive connections between cabling subsystems adopt either a cross-connect approach, by way of either patch cords or jumpers, or an interconnect approach.

The SO shall be connecting hardware in accordance with Clause 8.

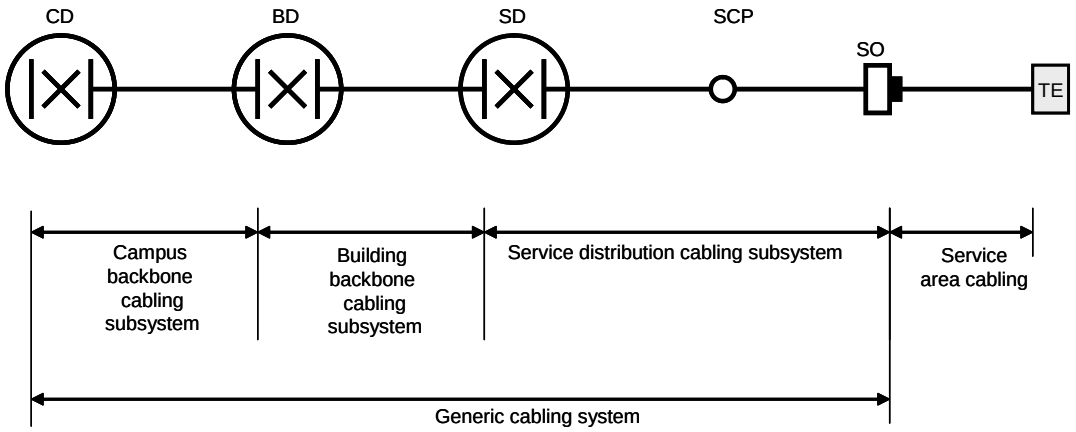


Figure 2 — Structure of Type A generic cabling

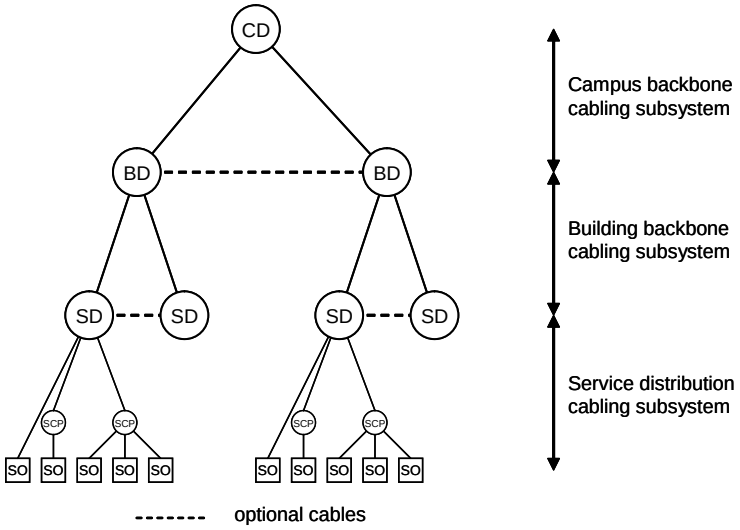


Figure 3 — Hierarchical structure of Type A generic cabling

4.3.1.2 Overlay structure

The structure of Type A generic cabling in association with generic cabling of other standards in EN 50173 series is described in Annex C.

4.3.2 Type B generic cabling

4.3.2.1 Stand-alone structure

Type B generic cabling systems contain up to three cabling subsystems: campus backbone, building backbone and area feeder cabling. The cabling subsystems are connected together to create a generic cabling system with a structure as shown in Figure 4. The composition of the cabling subsystems is described in 4.4.1, 4.4.2 and 4.4.4. The functional elements of the cabling subsystems are interconnected to form a basic hierarchical topology as shown in Figure 5.

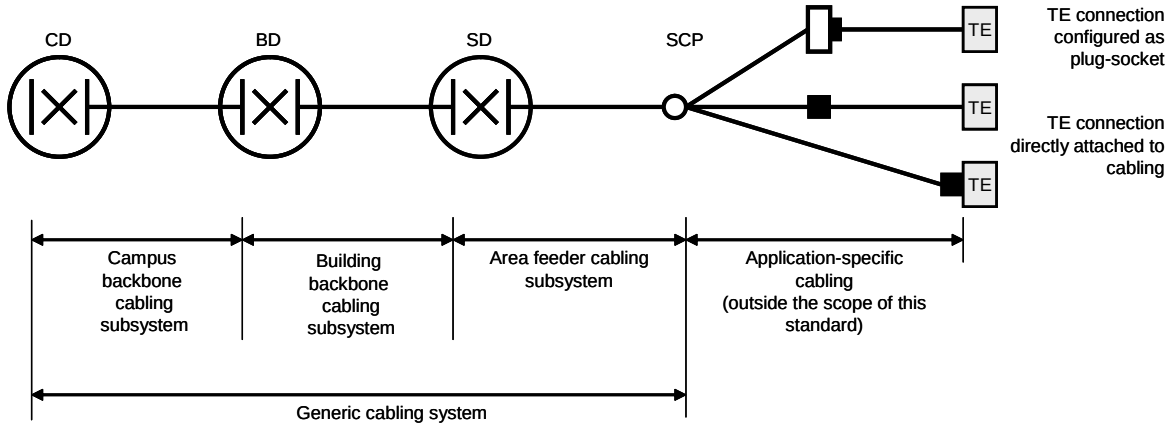


Figure 4 — Structure of Type B generic cabling

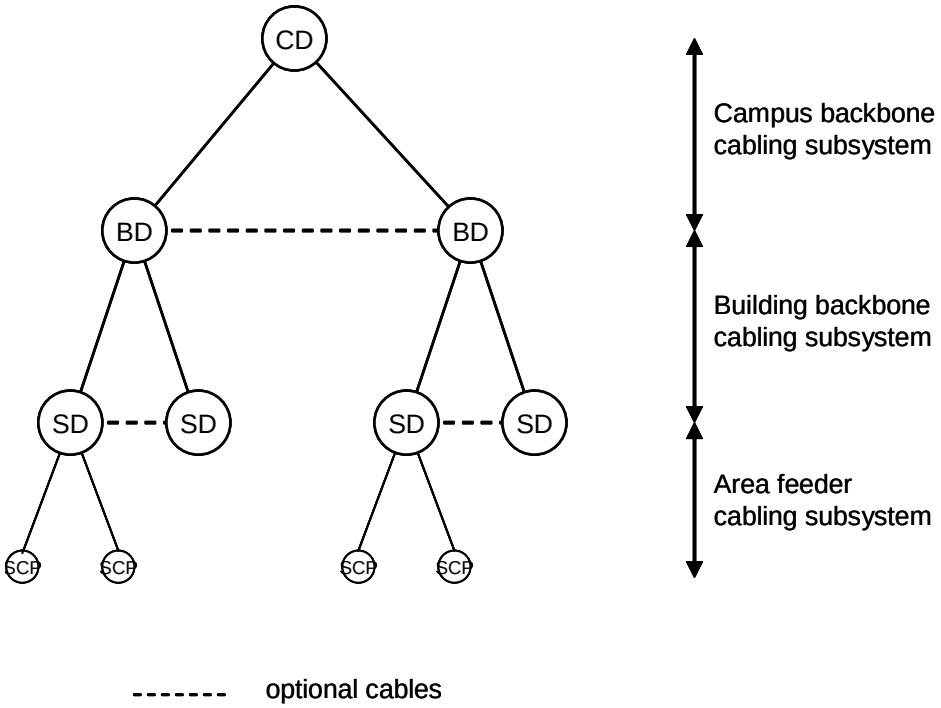


Figure 5 — Hierarchical structure of Type B generic cabling

Where the functions of distributors are combined (see 4.7.2.1), the intermediate cabling subsystem(s) are not required.

Connections between cabling subsystems are either active, requiring application-specific equipment, or passive. Connection to application-specific equipment adopts either an interconnect or a cross-connect approach (see EN 50173-1). Passive connections between cabling subsystems adopt either a cross-connect approach, by way of either patch cords or jumpers, or an interconnect approach.

4.3.2.2 Overlay structure

The structure of Type B generic cabling in association with generic cabling of other standards in EN 50173 series is described in Annex C.

4.4 Cabling subsystems

4.4.1 Campus backbone cabling subsystem

See EN 50173-1.

4.4.2 Building backbone cabling subsystem

See EN 50173-1.

4.4.3 Service distribution cabling subsystem (Type A generic cabling)

The service distribution cabling subsystem extends from an SD to the SO(s) connected to it. The subsystem includes:

a) the service distribution cables;

b) the mechanical termination of the service distribution cables at the SO and the SD together with associated patch cords and/or jumpers at the SD;

c) (an) SCP(s) (optional);

d) the SCP cable(s).

Although service area and equipment cords are used to connect terminal and transmission equipment, respectively, to the cabling subsystem, they are not considered part of the cabling subsystem because they are application-specific. Service distribution cables shall be continuous from the SD to the SO(s) unless an SCP is installed (see 4.7.6).

4.4.4 Area feeder cabling subsystem (Type B generic cabling)

The area feeder cabling subsystem extends from an SD to the SCP(s) connected to it. The subsystem includes:

a) the area feeder cables;

b) the mechanical termination of the service distribution cables at the SCP and the SD together with associated patch cords and/or jumpers at the SD;

c) SCP(s).

Although equipment cords are used to connect transmission equipment to the cabling subsystem, they are not considered part of the cabling subsystem because they are application-specific. Area feeder cables shall be continuous from the service distributor to the SCP(s).

4.4.5 Design objectives

4.4.5.1 Service distribution cabling (Type A generic cabling)

Service distribution cabling should be designed to support the broadest set of existing and emerging applications within the environmental conditions defined in Clause 5 and therefore provide the longest operational life. This will minimise disruption and the high cost of re-cabling.

Pathways shall be selected and pathway systems shall be installed in accordance with EN 50174 series to support the predicted quantity of SCPs and SOs taking into account predicted growth in the number and type of services to be supported by the cabling. This will minimise the disruption and cost of cable installation to those locations.

Cabling should be installed to support the predicted quantity of SCPs and SOs.

See Annex B for further information regarding the distribution and location of SCP and SOs for different services.

4.4.5.2 Area feeder cabling subsystem (Type B generic cabling)

Area feeder cabling should be designed to support the broadest set of existing and emerging applications within the environmental conditions defined in Clause 5 and therefore provide the longest operational life. This will minimise disruption and the high cost of re-cabling.

Pathways shall be selected and pathway systems shall be installed in accordance with EN 50174 series to support the predicted quantity of SCPs taking into account predicted growth in the number and type of services to be supported by the cabling. This will minimise the disruption and cost of cable installation to those locations.

Cabling should be installed to support the predicted quantity of SCPs.

See Annex B for further information regarding the distribution and location of SCP for different services.

4.4.5.3 Backbone cabling

See EN 50173-1.

4.5 Accommodation of functional elements

4.5.1 General

Figure 6 shows an example of how the functional elements are accommodated in a building.

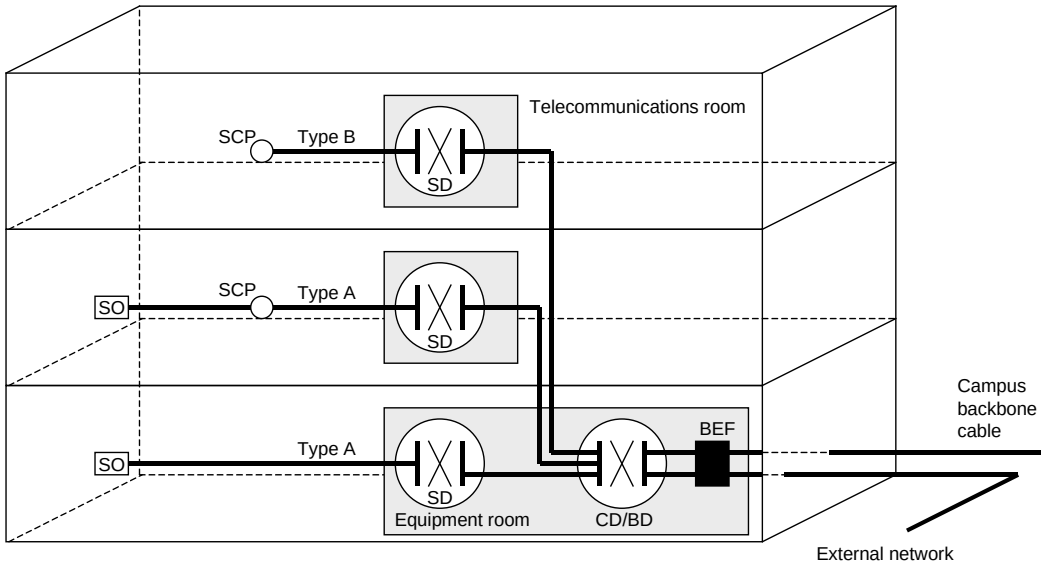


Figure 6 — Accommodation of functional elements

4.5.2 Accommodation of SOs

4.5.2.1 Type A generic cabling

SOs are located in the service area, depending on the design of the building.

4.5.2.2 Type B generic cabling

Figure 7 shows examples of how terminal equipment may be interconnected to the network conversion interface installed at the SCP.

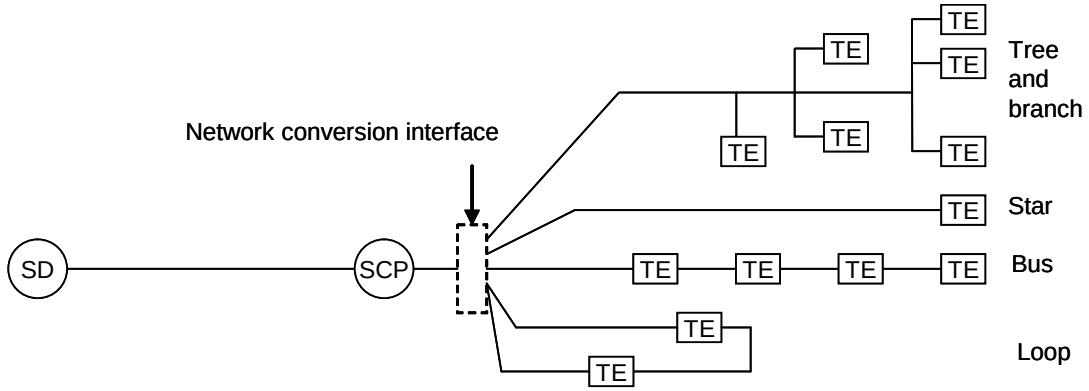


Figure 7 — Accommodation of TEs (Type B generic cabling)

4.5.3 Accommodation of SCPs

4.5.3.1 Type A generic cabling

An SCP in generic cabling shall not be used to insert transmission equipment.

4.5.3.2 Type B generic cabling

An SCP may be used to insert transmission equipment. Any resulting cabling extending from the transmission equipment to the SO is not considered to be generic (i.e. outside the scope of this European Standard). If the use of transmission equipment is anticipated, the location of the SCP shall take into

consideration the availability of an adequate power supply and local safety regulations relating to the positioning of the transmission equipment.

If the terminal equipment (e.g. a security camera) is to be connected without the use of a plug-socket configuration (see Figure 2) then the SCP shall be implemented in close proximity to the terminal equipment to simplify maintenance should damage occur at, or between the SO, and the terminal equipment.

4.5.4 Accommodation of other functional elements

See EN 50173-1.

4.6 Interfaces

4.6.1 Equipment interfaces and test interfaces

4.6.1.1 Type A generic cabling

In addition to the equipment interfaces specified in EN 50173-1, potential equipment interfaces are located at the ends of the service distribution cabling subsystem (as shown in Figure 8). An SCP does not provide an equipment interface to the generic cabling system.

In addition to the test interfaces specified in EN 50173-1, potential test interfaces are located at the ends of the service distribution cabling subsystem (as shown in Figure 8).

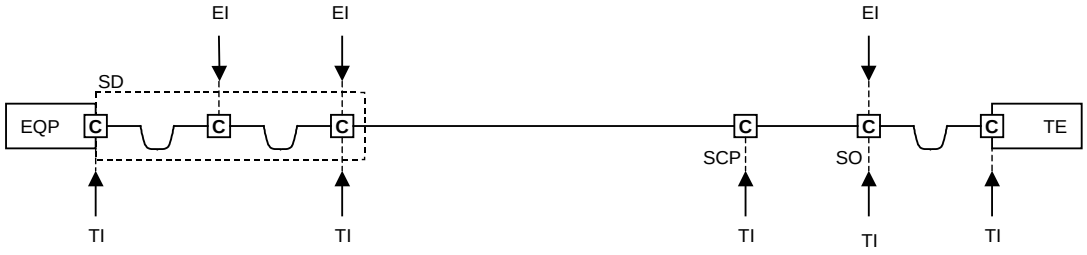


Figure 8 — Test and equipment interfaces (Type A generic cabling)

4.6.1.2 Type B generic cabling

In addition to the equipment interfaces specified in EN 50173-1, potential equipment interfaces are located at the ends of the area feeder cabling subsystem (as shown in Figure 9).

In addition to the test interfaces specified in EN 50173-1, potential test interfaces are located at the ends of the area feeder cabling subsystem (as shown in Figure 9).

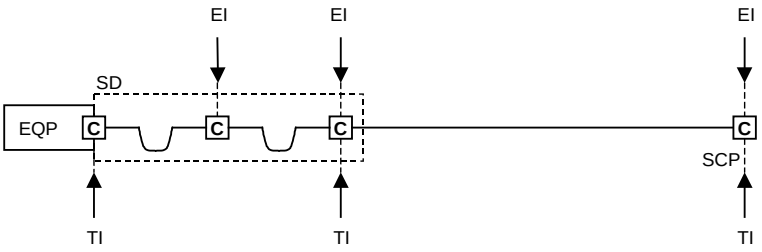


Figure 9 — Test and equipment interfaces (Type B generic cabling)

4.6.2 Channels and links

4.6.2.1 Type A generic cabling

The transmission performance of Type A generic cabling is detailed in Clause 5 in terms of the channel and in Annex A for links.

The channel is the transmission path between IT equipment such as a LAN hub (EQP in Figure 8) and the terminal equipment. A typical channel would consist of the service distribution cabling subsystem together with service area and equipment cords. For longer reach services, the channel would be formed by the connection of two or more subsystems (including service area cords and/or equipment cords). It is important that the generic cabling channel is designed to meet the required Class of performance for the applications that are to be run. For the purposes of testing, the channel excludes the connections at the application-specific equipment.

Links may be tested either during commissioning or for the detection of faults that are suspected in the cabling. For the purposes of testing, the link includes the connections at the ends of the cabling link under test.

4.6.2.2 Type B generic cabling

The transmission performance of Type B generic cabling is detailed in Annex A for links.

Links may be tested either during commissioning or for the detection of faults that are suspected in the cabling. For the purposes of testing, the link includes the connections at the ends of the cabling link under test.

4.7 Dimensioning and configuring

4.7.1 General

The number and type of subsystems that are included in a generic cabling implementation depends upon the geography and size of the campus or building, and upon the strategy of the user. Usually there would be one campus distributor per campus, one building distributor per building, and one service distributor per floor. If the premises comprise only a single building that is small enough to be served by a single building distributor, there is no need for a campus backbone cabling subsystem. Similarly, larger buildings may be served by multiple building distributors interconnected via a campus distributor.

The design of distributors should ensure that the lengths of patch cords, jumpers and equipment cords are minimised. The design lengths of the cords should be maintained during operation.

There should be a minimum of one service distributor for every 1 000 m^2 of floor space. A minimum of one service distributor should be provided for every floor. If a floor is sparsely populated (e.g. a lobby), it is permissible to serve this floor from the service distributor located on an adjacent floor.

If a floor area extends beyond 1 000 m^2, additional service distributors may be need to be installed to more effectively service the service area.

The functions of multiple distributors may be combined.

Figure 10 shows an example of Type A generic cabling (the same general principles are applicable to Type B). The building in the foreground shows each distributor housed separately. The building in the background shows that the functions of a service distributor and the building distributor have been combined into a single distributor.

In certain circumstances, for example for security or reliability reasons, redundancy may be built into a cabling design. Figure 11 is a schematic diagram showing one of many possible examples of the connection of functional elements within the structured framework to provide such protection against failure in one or

more parts of the cabling infrastructure. This might form the basis for the design of generic cabling for a building, providing some protection against such hazards as fire damage or the failure of the external network feeder cable.

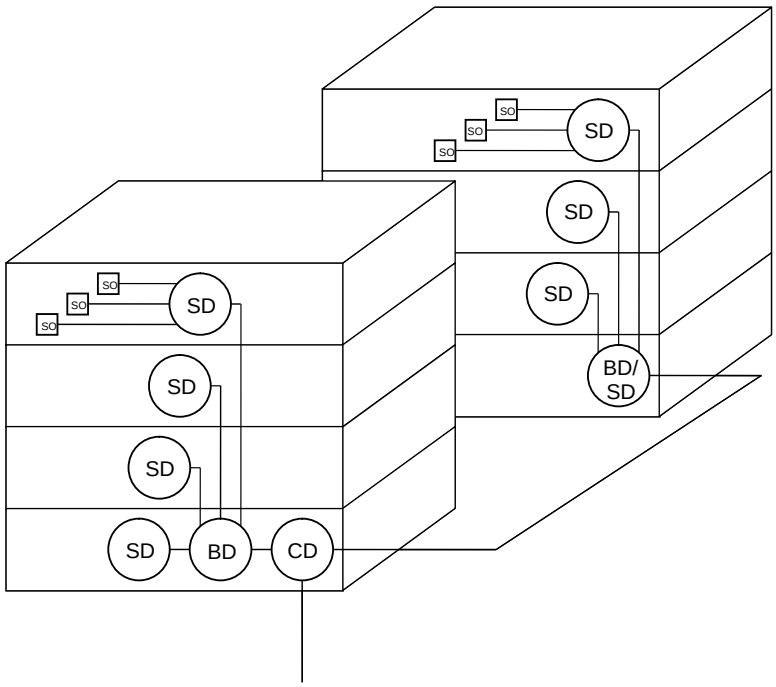


Figure 10 — Example of a Type A generic cabling system with combined BD and SD

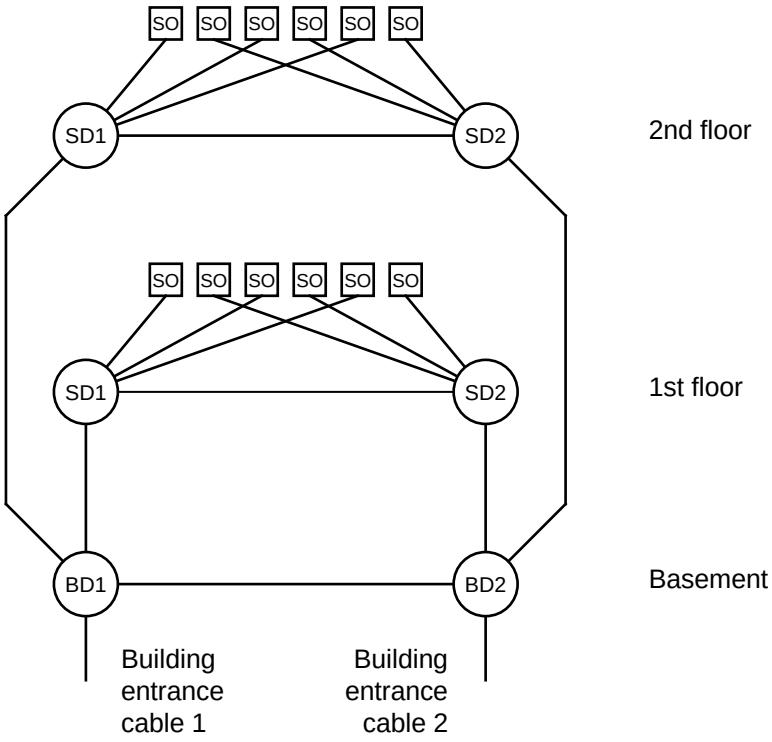


Figure 11 — Connection of functional elements providing redundancy for Type A generic cabling

4.7.2 Type A generic cabling

4.7.2.1 Distributors

Distributors should be located such that the resulting cable lengths are consistent with the channel performance requirements of Clause 5.

For the implementations described in Clause 6, using the components of Clause 7, Clause 8 and Clause 9, the maximum channel lengths in Table 2 shall be observed. In the case of the reference implementations described in Clause 6, distributors shall be located to ensure that the channel lengths in Table 2 are not exceeded.

Table 2 – Maximum channel lengths for Type A reference implementations

Channel	Length m
Service distribution	100
Service distribution + building backbone + campus backbone	10 000
NOTE In some implementations of the service distribution cabling subsystem in Clause 5, the SD may not support SOs up to the maximum distance shown.	

4.7.2.2 Service area cords and equipment cords

The service area cord connects the SO to the terminal equipment. Equipment cords connect transmission equipment to the generic cabling at distributors. Both are non-permanent and can be application-specific. Assumptions have been made concerning the length and the transmission performance of these cords; the assumptions are identified when relevant.

The performance contribution of these cords shall be taken into account in the design of the channel. Clause 6 provides guidance on cord lengths for reference implementations of generic cabling.

Where service area cords are located so that access to, and flexure of, the cords is uncommon during operation, the cords are not required to be constructed using flexible cables of the EN 50288 series.

4.7.2.3 Patch cords and jumpers

Patch cords and jumpers are used within cross-connect implementations at distributors. The performance contribution of these cords shall be taken into account in the design of the channel. Clause 6 provides guidance on cord/jumper lengths for reference implementations of generic cabling.

4.7.2.4 Service outlet (SO)

The design of generic cabling should provide for SOs to be installed throughout the premises. A wide distribution of SOs will enhance the ability of the cabling to accommodate changes.

Each individual service area shall be served by a minimum of one SO and

a) the SO shall terminate a four pair balanced cable in accordance with 8.2;

b) each SO shall have a permanent means of identification that is visible to the user;

c) the location of the SO should take into account any need to prevent unauthorised access, disconnection and/or reconfiguration;

d) devices such as baluns and impedance matching adapters, if used, shall be external to the SO;

e) the performance contribution of service area cords, patch cords, jumpers and equipment cords shall be taken into account to ensure that the channel requirements of Clause 5 are met.

4.7.3 Type B generic cabling

4.7.3.1 Distributors

Distributors should be located such that the resulting cable lengths enable the channel performance requirements of Clause 5 to be met, if SCP and SO connecting hardware, service concentration point cable and service area cord are installed.

For the implementations described in Clause 6, using the components of Clauses 7, 8 and 9, the maximum channel lengths in Table 3 shall be observed. In the case of the reference implementations described in Clause 6, distributors shall be located to ensure that the channel lengths in Table 3 are not exceeded.

Table 3 – Maximum channel lengths for Type B reference implementations

Channel	Length m
Area feeder + distance to connected TE	100
Area feeder + distance to connected TE + building backbone + campus backbone	10 000

4.7.3.2 Equipment cords

Equipment cords connect transmission equipment to the generic cabling at distributors and are non-permanent and can be application-specific.

4.7.3.3 Patch cords and jumpers

Patch cords and jumpers are used within cross-connect implementations at distributors. The performance contribution of these cords shall be taken into account in the design of the channel. Clause 6 provides guidance on cord/jumper lengths for reference implementations of generic cabling.

4.7.4 External network interface

See EN 50173-1.

4.7.5 Cables

Cable types used in the reference implementations of Clause 6 are given in Clause 7. Hardware for connecting cables shall only provide direct onward attachment for each conductor and shall not provide any contact between more than one incoming or outgoing conductor (e.g. bridge taps shall not be used).

4.7.6 Service concentration point (SCP)

Where an SCP is used:

a) the SCP shall be located so that each service area is served by at least one SCP;

b) the SCP should be limited to serving a maximum of 36 service areas;

c) an SCP should be located in accessible permanent locations such as ceiling voids and under floors;

d) for balanced cabling, the effect of multiple connections in close proximity on transmission performance should be taken into consideration when planning the cable lengths between the service distributor and the SCP;

e) an SCP has labelling and documentation requirements and shall be covered in the cabling administration system.

4.7.7 Telecommunications rooms and equipment rooms

See EN 50173-1.

4.8 Relevant building services

Typical building services include:

a) telecommunications, e.g. wireless access points;

b) energy management, e.g. lighting, power distribution, incoming utility metering;

c) environmental control, e.g. temperature, humidity;

d) personnel management, e.g. access control, cameras, PIR detectors, time and attendance monitoring. electronic signage, AV projectors;

e) personal information and alarms, e.g. paging, patient monitoring, nurse call, infant security.

5 Channel performance for generic cabling for distributed building services

5.1 General

Clause 5 specifies the minimum channel performance for balanced and optical fibre cabling in terms of the Classes as specified in 5.3. The environmental and transmission performance of a channel is specified at and between the connections to active equipment as shown in Figure 12. The channel comprises only passive sections of cable, connections, service area cords, equipment cords, patch cords and jumpers.

The environmental classification of premises is typically:

a) $M_1I_1C_1E_1$ for office areas;

b) $M_2I_2C_2E_2$ for a light industrial environment;

c) $M_3I_3C_3E_3$ for a typical heavy industrial environment.

Where applications listed in EN 50173-1:2011, Annex F, are to be supported, the transmission and environmental performance of the connections at the active equipment are the responsibility of the equipment supplier.

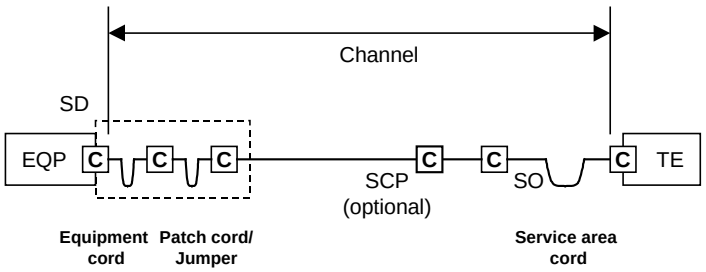


Figure 12 — Transmission performance of a service distribution channel

Application support depends on channel transmission performance only, which in turn depends on cable length, number of connections and performance of the components within the environments to which the channel is subjected.

Channels are implemented using either:

1) service distribution cabling only;

2) building backbone cabling only;

3) campus backbone cabling only;

4) combinations of the above.

Figure 13 shows an example of terminal equipment in the work area connected to transmission equipment using two channels, an optical fibre channel and a balanced cabling channel. The optical fibre and balanced cabling channels are connected together using an optical fibre to balanced copper cable converter. There are four channel interfaces; one at each end of the balanced channel, and one at each end of the optical fibre channel.

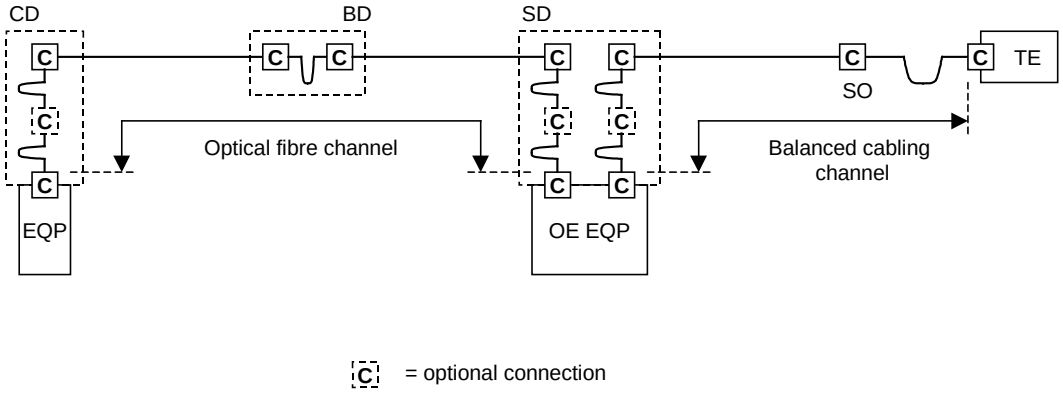


Figure 13 — Example of a system showing the location of cabling interfaces

5.2 Environmental performance

See EN 50173-1.

5.3 Transmission performance

5.3.1 General

The channel transmission performance specifications are separated into Classes that allow for the transmission of the applications in EN 50173-1:2011, Annex F.

The channel performance requirements described in this clause shall be used for the design and may be used for verification of any implementation of this European Standard, using the test methods defined, or referred to, by this clause. In addition, these requirements can be used for application development and troubleshooting.

The channel specifications in this clause allow for the transmission of defined Classes of applications over distances other than those of Clause 6, and/or using media and components with different transmission performance than those of Clause 7, Clause 8 and Clause 9.

Consideration should be given to measuring performance at worst case temperatures, or calculating worst case performance based on measurements made at other temperatures.

Link performance requirements are specified in Annex A.

5.3.2 Balanced cabling

5.3.2.1 Service distribution cabling (Type A generic cabling)

Service distribution cabling shall be designed to provide a channel performance as required from Classes D or higher as specified in EN 50173-1:2011, taking into consideration the requirements for application support over the lifetime of the cabling.

In the case of cable sharing, additional requirements shall be taken into account for balanced cabling. The additional crosstalk requirements are specified in 7.2.

5.3.2.2 Area feeder cabling (Type B generic cabling)

Area feeder cabling shall be designed to provide link performance as required from Classes D or higher as specified in Annex A with appropriate connecting hardware, meeting the requirements of Clause 8, at the SD and SCP.

In the case of cable sharing, additional requirements shall be taken into account for balanced cabling. The additional crosstalk requirements are specified in 7.2.

Annex D describes the implementation of optical fibre within the area feeder cabling.

5.3.2.3 Backbone cabling

Backbone cabling shall be designed to provide channel performance as required from Classes A or higher as specified in EN 50173-1:2011.

In the case of cable sharing, additional requirements shall be taken into account for balanced cabling. The additional crosstalk requirements are specified in 7.2.

5.3.3 Optical fibre backbone cabling

Cabling shall be designed using the cabled optical fibre Categories referenced in Clause 7 to provide channel performance as required from Classes OF-100, OF-300, OF-500, OF-2000, OF-5000 and OF-10000 as specified in EN 50173-1:2011.

6 Reference implementations for distributed building services

6.1 General

Clause 6 describes implementations of generic cabling that utilise components referenced in Clause 7, Clause 8 and Clause 9. These reference implementations meet the requirements of Clause 4 and, when installed in accordance with EN 50174 series of standards, comply with the channel performance requirements of 5.3, when subjected to the relevant environmental classifications of 5.2.

To ensure the integrity of the environmental performance of the cabling components, compatibility between cabling components shall be assured by design and in accordance with EN 50174-1.

6.2 Balanced cabling

6.2.1 General

Balanced cabling components referenced in Clause 7, Clause 8 and 9.2 are defined in terms of Category. In the reference implementations of this clause, the components used in each cabling channel shall have the same nominal characteristic impedance in accordance with EN 50173-1:2011, 7.3.

6.2.2 Service distribution cabling (Type A generic cabling)

6.2.2.1 Component choice

The selection of balanced cabling components will be determined by the Class of applications to be supported by the cabling. Refer to EN 50173-1:2011, Annex F, for guidance.

Using the models of Figure 14:

a) Category 5 components provide Class D balanced cabling performance;

b) Category 6 components provide Class E balanced cabling performance;

c) Category 6_A components provide Class E_A balanced cabling performance;

d) Category 7 components provide Class F balanced cabling performance;

e) Category 7_A components provide Class F_A balanced cabling performance.

Cables and connections of different Categories may be mixed within a channel, however the resultant cabling performance will be determined by the Category of the lowest performing component.

6.2.2.2 Dimensions

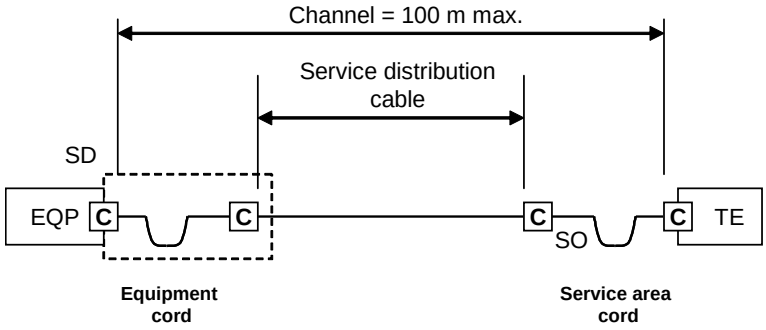
Figure 14 shows the models used to correlate service distribution cabling dimensions specified in this clause with the channel specifications in Clause 5.

Figure 14 a) shows a channel containing only an interconnect and an SO. Figure 14 b) contains an additional connection as a cross-connect. In both cases the fixed service distribution cable connects the SD to the SO. The channel includes cords comprising patch, equipment and service area cords. For the purposes of this sub-clause, jumpers used in place of patch cords are treated as cords.

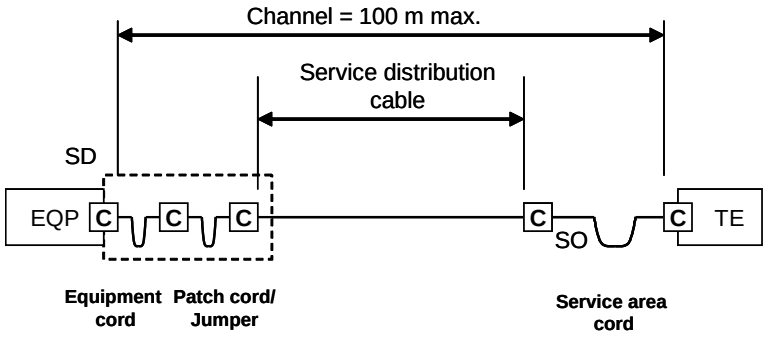
Figure 14 c) shows a channel containing an interconnect, an SCP and an SO. Figure 14 d) contains an additional connection as a cross-connect. In both cases the fixed service distribution cable connects the SD to the SCP. The channel includes cords comprising patch, equipment and service area cords. For the purposes of this sub-clause, jumpers used in place of patch cords are treated as cords.

In addition to the cords, the channels shown in Figure 14 c) and Figure 14 d) contain an SCP cable. The insertion loss specification for the SCP cable may differ from that of both the fixed service distribution cable and the flexible cables. The channel of Figure 14 d) is recognised as the maximum implementation used to define the channel performance limits of Clause 5.

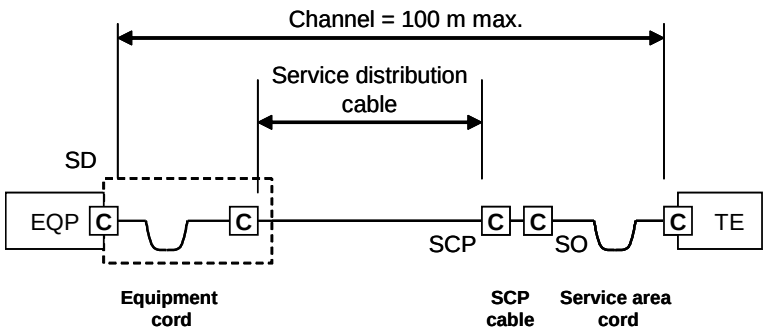
In order to accommodate cables used for service area cords, SCP cables, patch cords, jumpers and equipment cords with different insertion loss specifications, the length of the cables used within a channel shall be determined by the formulae shown in Table 4.



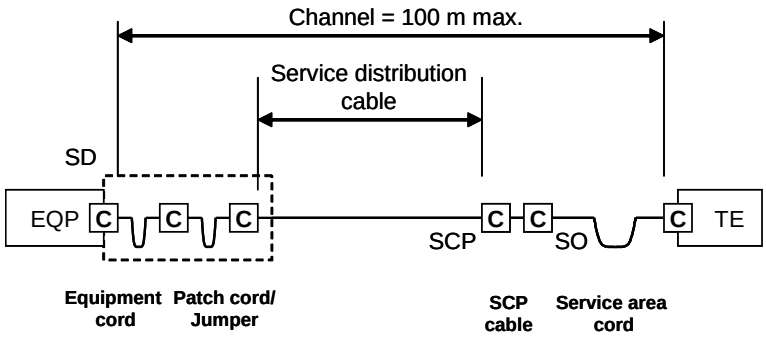
a) Interconnect – SO model



b) Crossconnect – SO model



c) Interconnect – SCP – SO model



d) Crossconnect – SCP – SO model

Figure 14 — Service distribution cabling models

In Table 4, it is assumed that:

a) the flexible cable within these cords has a higher insertion loss specification than that used in the fixed service distribution cable (see 9.2);

b) the cables within these cords in the channel have a common insertion loss specification.

The implementations are based on component performance at 20 °C. The effect of temperature on the performance of cables shall be taken into account as shown in Table 4.

The following general restrictions apply:

— the physical length of the channel shall not exceed 100 m;

— the physical length of the fixed service distribution cable shall not exceed 90 m and may be less depending on the length of SCP cables and cords used and the number of connections;

— when an SCP is used, the fixed service distribution cable length should be at least 15 m in order to reduce the effect of multiple connections in close proximity on NEXT and return loss;

— the length of individual patch cords or jumpers shall not exceed 5 m.

The maximum length of the fixed service distribution cable will depend on the total length of SCP cables and cords to be supported within a channel. During the operation of the installed cabling, a management system should be implemented to ensure that the cords and, where appropriate, the SCP cables used to create the channel conform with the design rules for the floor, building or installation.

Table 4 – Service distribution channel formulae

Model	Figure	Implementation formulae		
		Class D	**Class E**	**Class E_A**
Interconnect – SO	14 a)	$S = 109 - F \times X$	$S = 107 - 3^a - F \times X$	$S = 107 - 3^a - F \times X$
Cross-connect – SO	14 b)	$S = 107 - F \times X$	$S = 106 - 3^a - F \times X$	$S = 106 - 3^a - F \times X$
Interconnect - SCP –SO	14 c)	$S = 107 - F \times X - C \times Y$	$S = 106 - 3^a - F \times X - C \times Y$	$S = 106 - 3^a - F \times X - C \times Y$
Cross-connect - sCP – SO	14 d)	$S = 105 - F \times X - C \times Y$	$S = 105 - 3^a - F \times X - C \times Y$	$S = 105 - 3^a - F \times X - C \times Y$
		Class F	**Class F_A**	
Interconnect – SO	14 a)	$S = 107 - 2^a - F \times X$	$S = 107 - 2^a - F \times X$	
Cross-connect – SO	14 b)	$S = 106 - 3^a - F \times X$	$S = 106 - 3^a - F \times X$	
Interconnect – SCP –SO	14 c)	$S = 106 - 3^a - F \times X - C \times Y$	$S = 106 - 3^a - F \times X - C \times Y$	
Cross-connect – SCP – SO	14 d)	$S = 105 - 3^a - F \times X - C \times Y$	$S = 105 - 3^a - F \times X - C \times Y$	

Key
S maximum length of the service distribution cable (m)
F combined length of patch cords, jumpers, equipment and service area cords (m)
C length of the SCP cable (m)
X ratio of the cable insertion loss (dB/m) within the cords/jumpers (see Clause 9) to the insertion loss of the service distribution cable (dB/m) of 7.2. Where the ratio differs in each cord/jumper, the value X shall take account of the relative lengths of the cords.
Y ratio of the insertion loss (dB/m) of the SCP cable – see Clause 9 - to the insertion loss (dB/m) of the service distribution cable of 7.2

For operating temperatures above 20 °C, S should be reduced by 0,2 % per °C for screened cables and 0,4 % per °C (20 °C to 40 °C) and 0,6 % per °C (> 40 °C to 60 °C) for unscreened cables. Manufacturers'/suppliers' information shall be consulted where the intended operating temperature exceeds 60 °C.

[a] This length reduction is to provide an allocated margin to accommodate insertion loss deviation.

6.2.3 Area feeder cabling (Type B generic cabling)

6.2.3.1 Component choice

The Category of balanced cabling components within the area feeder cabling shall ensure that the link achieves a minimum of Class D performance in accordance with Annex A.

Using the model of Figure A.1, Configuration D:

a) Category 5 components provide Class D balanced cabling performance;

b) Category 6 components provide Class E balanced cabling performance;

c) Category 6_A components provide Class E_A balanced cabling performance;

d) Category 7 components provide Class F balanced cabling performance;

e) Category 7_A components provide Class F_A balanced cabling performance.

Cables and connections of different Categories may be mixed within a channel; however, the resultant cabling performance will be determined by the Category of the lowest performing component.

6.2.3.2 Dimensions

The following general restrictions apply:

a) the physical length of the channel between the equipment located in the SD and the terminal equipment shall not exceed 100 m;

b) the physical length of the fixed area feeder cable:

   1) shall not exceed 90 m;

   2) should be at least 15 m in order to reduce the effect of multiple connections in close proximity on NEXT and return loss;

c) the length of individual patch cords or jumpers at the SD shall not exceed 5 m.

6.2.4 Backbone cabling

See EN 50173-1:2011 for reference implementations of Classes A to F_A channels.

6.3 Optical fibre backbone cabling

See EN 50173-1:2011 for reference implementations of Classes OF-100, OF-300, OF-500 and OF-2000, OF-5000 and OF-10000 channels.

7 Cable requirements

7.1 General

Clause 7 defines the minimum requirements for:

a) cables installed in the service distribution, area feeder and backbone cabling subsystems specified in Clause 4 and used in the reference implementations of Clause 6;

b) flexible balanced cables to be assembled as cords as specified in 9.2 and used in the reference implementations of Clause 6;

c) balanced cables or cable elements to be used as jumpers.

7.2 Balanced cables

The electrical performance of balanced cables shall meet the Category 5, 6, 6_A, 7 or 7_A requirements of EN 50173-1:2011, 7.3.

7.3 Optical fibre cables

See EN 50173-1:2011, 7.7.1.

8 Connecting hardware requirements

8.1 General requirements

In addition to those locations specified in EN 50173-1:2011, 8.1.2, connecting hardware is installed:

a) at the SCP (if provided);

b) at the SO.

8.2 Connecting hardware for balanced cabling

8.2.1 General requirements

See EN 50173-1:2011, 8.1.

8.2.2 Electrical, mechanical and environmental performance

8.2.2.1 Connecting hardware at the SCP for Type A generic cabling

The SCP shall be a fixed connector in accordance with EN 50173-1:2011, 8.2 and 8.6.

Where required by the design or the environmental classification of the location, the protective housing shall meet the general requirements of this clause and the mechanical and physical requirements of EN 61076-3-106:2006, Variant 04.

When two physically similar cabling links are used in the same installation (for example, different performance Categories and cables with different nominal impedance), special precautions are required to ensure that they are properly identified.

8.2.2.2 Connecting hardware at the SO for Type A generic cabling

For implementations of the SO as a plug-socket connection, the SO shall be a fixed connector in accordance with EN 50173-1:2011, 8.2 and 8.6.

Where required by the design or the environmental classification of the location, the protective housing shall meet the general requirements of this clause and the mechanical and physical requirements of EN 61076-3-106:2006, Variant 04.

When two physically similar cabling links are used in the same installation (for example, different performance Categories and cables with different nominal impedance), special precautions are required to ensure that they are properly identified.

8.2.2.3 Connecting hardware at other locations

See EN 50173-1:2011, D.3. Additionally, for reference implementations of Clause 6, see EN 50173-1:2011, 8.2 and 8.6.

8.3 Connecting hardware for optical fibre cabling

8.3.1 General requirements

See EN 50173-1:2011, 8.1.

8.3.2 Optical, mechanical and environmental performance

See EN 50173-1:2011, 8.5.1.

9 Requirements for cords and jumpers

9.1 Jumpers

See Clause 7.

9.2 Balanced cords

See EN 50173-1:2011, 9.3.

9.3 Optical fibre cords

See EN 50173-1:2011, 9.5.

Annex A
(normative)

Link performance limits

A.1 General

Annex A contains performance requirement formulae for permanent links and SCP links as shown in Figure A.1, and relates to EN 50173-1:2011, Annex A.

The cabling under test in Configurations A, B and C is termed the permanent link:

a) Configurations A and B comprise fixed cabling only.

b) Configuration C comprises fixed cabling and an SCP cable. Measurements made for this configuration are invalid if the SCP cable is changed.

The cabling under test in Configuration D contains fixed cabling only and is termed the SCP link.

In all configurations, the test configuration reference plane of a link is within the test cord cable next to, and including, the test cord connection which mates to the termination point of the link under test.

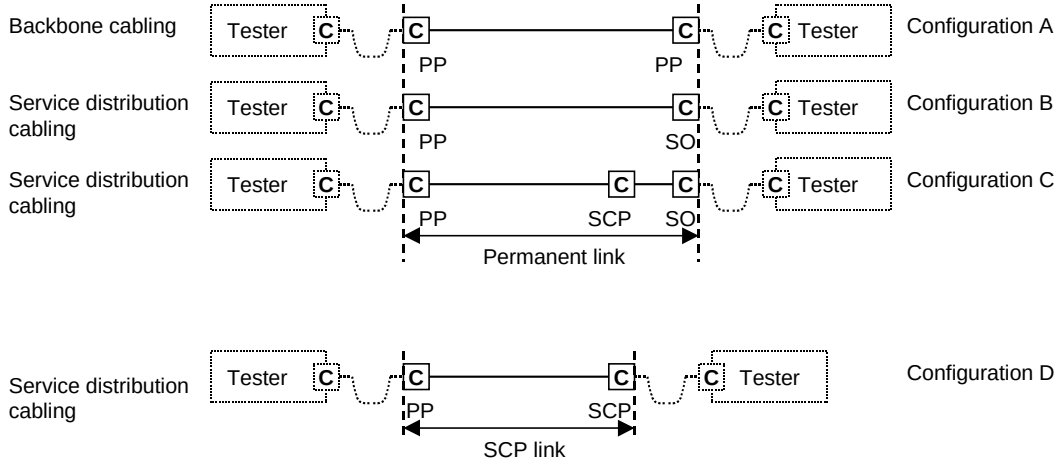


Figure A.1 — Link options

A.2 Balanced cabling

Consideration should be given to measuring performance at worst case temperatures, or calculating worst case performance based on measurements made at other temperatures.

Link performance shall meet the requirements of EN 50173-1:2011, A.1.

In the case of cable sharing, additional requirements shall be taken into account for balanced cabling. The additional crosstalk requirements are specified in 7.2.

A.3 Optical fibre cabling

Link performance shall meet the requirements of EN 50173-1:2011, A.3.1.

Annex B
(informative)

Services and applications

B.1 Introduction

Annex B contains information to assist the implementation of cabling in accordance with this European Standard to support a range of diverse services. In particular, Annex B provides recommendations in relation to the distribution, location and dimensioning of SCPs and SOs for specific services.

B.2 Telecommunications – Wireless networks

B.2.1 General

B.2 is applicable to, but not restricted to, the wireless applications listed in Table B.1.

Table B.1 – Supported wireless applications

Application	Standard Description	Typical indoor range (radius)
IEEE 802.11	Wireless Local Area Networks (2 Mbit/s at 2,4 GHz or infrared)	30 m
IEEE 802.11a	Wireless Local Area Networks (54 Mbit/s at 5 GHz)	12 m
IEEE 802.11b	Wireless Local Area Networks (11 Mbit/s at 2,4 GHz)	30 m
IEEE 802.11g	Wireless Local Area Networks (54 Mbit/s at 2,4 GHz)	12 m
DECT	Digital European Cordless Telephony (1 Mbit/s at 1,8 GHz)	30 m (ffs)
Bluetooth II	ISM Band 1 Mbit/s at 2,4 GHz	12 m (ffs)

Certain proprietary wireless equipment has a typical indoor range less than 12 m.

B.2.2 SO distribution to support wireless access points

Wireless access points connected to an SO provide an interface to two distinct networking applications:

a) an application supported by the cabling, as detailed in EN 50173-1:2011, Annex F;

b) a wireless application serving a specific area.

To ensure the longevity of cabling intended to support wireless networks consideration should be given to installing cabling meeting the requirements of EN 50173-1:2011, Class E_A, to meet the anticipated requirements for a backbone supporting data rates of 10 Gbit/s.

Operating range performance prediction provides valuable input for the determination of SO locations and should be performed and taken into account in the design of the service distribution cabling subsystem. Similarly, a site survey should be performed prior to location selection and installation of wireless access points.

Where multiple wireless access points are located to provide coverage areas that serve the same building space (e.g. to provide additional bandwidth), it is necessary to provide multiple service distribution cabling channels to the SOs.

During planning, consideration of a logical boundary between areas served from different service distributors should be considered. For example, such a boundary may be at a fixed structural boundary within the building or at areas that do not require coverage.

As shown in Figure B.1:

— SOs that serve coverage areas in a uniform open space should be located to support a “honeycomb” or hexagonal wireless grid geometry;

— the number and placement of SOs should enable connections to a coverage area grid based on a maximum coverage area radius of 12 m;

— SOs should be centrally located in their associated coverage areas.

A "honeycomb” grid provides the most efficient coverage. Other grid shapes, such as squares or rectangles may be used.

Ceiling height should be considered when designing the coverage area grid to be served by the horizontal cabling. For example, placement of wireless access points on ceilings that exceed a 3 m height may result in a lower coverage area radius at floor height.

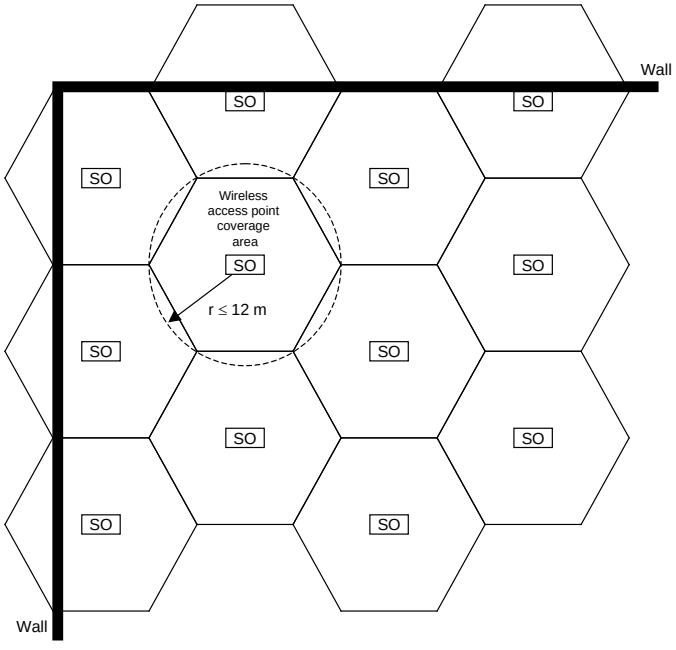


Figure B.1 — Wireless application coverage area grid

B.3 Energy management

B.3.1 Lighting control

Under consideration.

B.3.2 Power distribution

Under consideration.

B.3.3 Incoming utility metering

Under consideration.

B.3.4 SCP distribution

The location of SCPs for each service should take into account the areas to be served with reference to Table B.2.

Table B.2 – Areas served by SCPs

Premises/areas	Area served by SCP [a]	Notes
Plant room	5 m^2	Plant rooms contain air handlers, chillers, boilers, pumps, fans, compressors etc. Air handlers will typically require a higher density of SOs.
Dedicated office	25 m^2	The area served in open office areas may be greater than 25 m^2
Retail	25 m^2	Personnel management services may require reduction in the area served
Hotel	25 m^2	Area served may vary if service is centrally managed
Hospital	25 m^2	Average value only: each type of hospital environment should be specifically designed
Classroom	25 m^2	Average value only: each type of classroom environment should be specifically designed. Area served may vary if service is centrally managed.
Indoor parking	25 m^2	
Industrial (factory)	50 m^2	Area served may depend upon manufacturing process, environment and building design

[a] The area served by the SCP should comprise either a room with an area not greater than that specified or an area not greater than that specified within a larger room/space.

B.4 Environmental control

B.4.1 Temperature

Under consideration.

B.4.2 Humidity

Under consideration.

B.4.3 SCP distribution

See B.3.4.

B.5 Personnel management

B.5.1 Access control

Under consideration.

B.5.2 Cameras

Under consideration.

B.5.3 Time and attendance monitoring

Under consideration.

B.5.4 Electronic signage

Under consideration.

B.5.5 AV projectors

Under consideration.

B.5.6 SCP distribution

See B.3.4. In addition, two SCPs should be installed to serve each side of a building.

B.6 Personal information and alarms

B.6.1 Paging

Under consideration.

B.6.2 Patient monitoring

Under consideration.

B.6.3 Nurse call

Under consideration.

B.6.4 Infant security

Under consideration.

B.6.5 SCP distribution

See B.3.4.

Annex C
(informative)

Overlay

C.1 Functional elements

C.1.1 Type A generic cabling

Type A generic cabling from the SD to the SO is logically equivalent to that:

a) from the FD to the TO in EN 50173-2;
b) from the ID to the TO in EN 50173-3;
c) from the HD (or SHD) to the TO in EN 50173-4;
d) from the ZD to the EO in EN 50173-5.

The SCP is logically equivalent to:

1) the CP in EN 50173-2;
2) the LDP in EN 50173-5.

C.1.2 Type B generic cabling

Type B generic cabling from the SD to the SCP is logically equivalent to that:

a) from the FD to the CP in EN 50173-2;
b) from the HD (or SHD) to the ACP in EN 50173-4;
c) from the ZD to the LDP in EN 50173-5.

C.2 General structure and hierarchy

C.2.1 Type A generic cabling

The overlay structure depends upon the premises-specific design standard with which the distributed building services cabling is to be integrated.

The service distribution cabling described in 4.4.3 is the logical equivalent of the:

a) horizontal cabling in EN 50173-2;
b) intermediate cabling in EN 50173-3;
c) home cabling (or secondary home cabling) for ICT cabling in EN 50173-4;
d) zone distribution cabling in EN 50173-5.

C.2.2 Type B generic cabling

The overlay structure depends upon the premises-specific design standard with which the distributed building services cabling is to be integrated.

The area feeder cabling described in 4.4.4 is the logical equivalent of the area feeder cabling for CCCB applications in EN 50173-4.

Annex D
(informative)

Optical fibre within the Type B area feeder cabling subsystem

D.1 Overview

The opportunity to install equipment at the SCP offers the possibility of installing optical fibre cabling from the SD to the SCP and using the equipment installed at the SCP to perform opto-electronic conversion to balanced or other cabling as required.

While technically possible, the pre-installation of optical fibre only in the area feeder cabling subsystem would represent a considerable restriction of flexibility and cannot be considered to provide generic application support.

However, if an appropriate risk analysis has been undertaken then the recommendations of D.2 should be applied to implement an effective solution.

D.2 Implementation recommendations

D.2.1 Channel performance

Cabling should be designed using the cabled optical fibre Categories referenced in D.2.2 to provide channel performance as required from Classes OF-100, OF-300, OF-500, OF-2000, OF-5000 and OF-10000 as specified in EN 50173-1:2011.

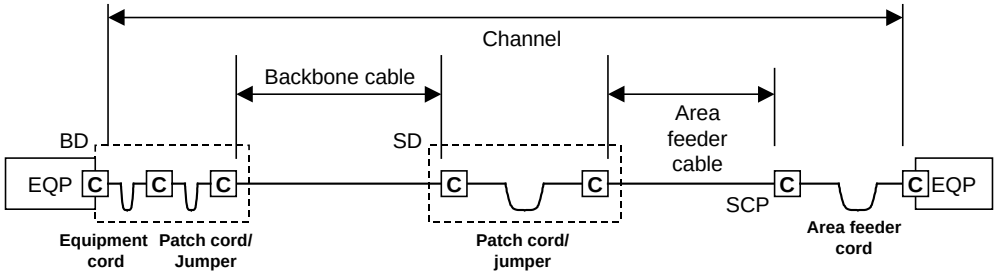
D.2.2 Reference implementation

Optical fibre components are referenced in D.2.3, D.2.4 and D.2.5. The optical fibres are defined in terms of physical construction (core/cladding diameter) and their transmission performance Category within a cable. Within the reference implementations of this clause, the optical fibres used in each cabling channel should have the same physical construction specification and the cabled optical fibres should be of the same Category.

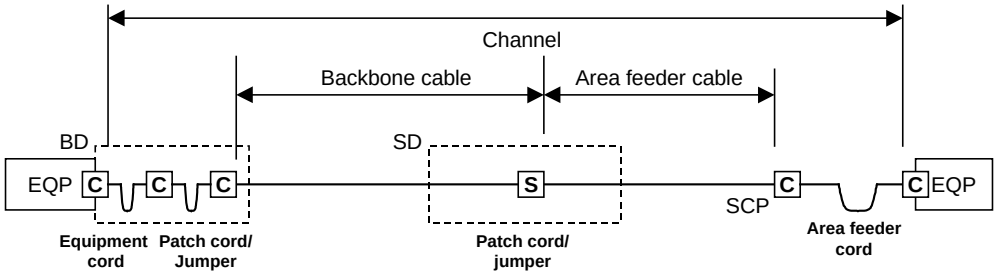
When more than one physical construction or cabled optical fibre Category is used in a cabling subsystem, the cabling should be marked to allow each cabling type to be clearly identified.

The selection of optical fibre components should be determined by the channel lengths required and the applications to be supported. Refer to EN 50173-1:2011, Annex F, for guidance.

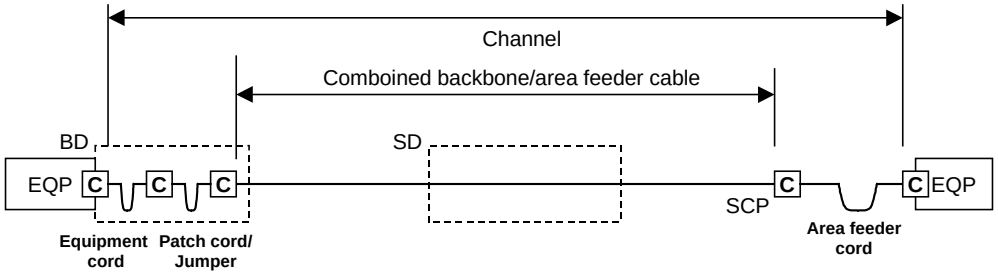
The models of Figure D.1 are applicable to optical fibre cabling within the area feeder cabling subsystem. It should be noted that the connection systems used to terminate fixed optical cabling may contain mated connections and splices (permanent or re-useable) and that cross-connects may comprise re-useable splices.



a) "Patched" combined channel



b) "Spliced" combined channel



c) "Direct" combined channel

Figure D.1 — Combined optical fibre backbone/horizontal channels

In order to accommodate differing quantities of mated connections and splices of the cables used within a channel of a given Class of D.2.1, the total channel length should be determined by the formulae shown in Table D.1.

NOTE The formulae of Table D.1 may not support the implementation of all the channel configurations shown in Figure D.1.

The number and overall attenuation of connections and splices may be restricted by application standards.

Table D.1 - Channel length formulae for optical fibre cabling

Cabled optical fibre Category	Class	Implementation formulae		
		Wavelength		Maximum length m
Multimode		**850 nm**	**1 300 nm**	
OM1/ OM2/OM3/OM4	OF-100	$L = 535 - 214 \times x - 90 \times y$	$L = 1100 - 500 \times x - 200 \times y$	100
	OF-300	$L = 735 - 214 \times x - 90 \times y$	$L = 1300 - 500 \times x - 200 \times y$	300
	OF-500	$L = 935 - 214 \times x - 90 \times y$	$L = 1500 - 500 \times x - 200 \times y$	500
	OF-2000	$L = 2435 - 214 \times x - 90 \times y$	$L = 3\,000 - 500 \times x - 200 \times y$	2 000
Singlemode		**1 310 nm**	**1 550 nm**	
OS1	OF-300	$L = 1800 - 750 \times x - 300 \times y$	$L = 1800 - 750 \times x - 300 \times y$	300
	OF-500	$L = 2\,000 - 750 \times x - 300 \times y$	$L = 2\,000 - 750 \times x - 300 \times y$	500
	OF-2000	$L = 3\,500 - 750 \times x - 300 \times y$	$L = 3\,500 - 750 \times x - 300 \times y$	2 000
OS2	OF-300	$L = 4\,500 - 1875 \times x - 750 \times y$	$L = 4\,500 - 1875 \times x - 750 \times y$	300
	OF-500	$L = 5\,000 - 1875 \times x - 750 \times y$	$L = 5\,000 - 1875 \times x - 750 \times y$	500
	OF-2000	$L = 8\,750 - 1875 \times x - 750 \times y$	$L = 8\,750 - 1875 \times x - 750 \times y$	2 000
	OF-5000	$L = 10\,000 - 1875 \times x - 750 \times y$	$L = 10\,000 - 1875 \times x - 750 \times y$	5 000
	OF-10000	$L = 15\,000 - 1875 \times x - 750 \times y$	$L = 15\,000 - 1875 \times x - 750 \times y$	10 000

Key

L = the length of the channel (m)

x = total number of mated connections in the channel

y = total number of splices in the channel

Additional connections/splices may be used if the maximum channel insertion loss (or optical power budget, as applicable) of the application allows (see EN 50173-1:2011, Annex F).

D.2.3 Cables

See EN 50173-1:2011, 7.7.1.

D.2.4 Connecting hardware

See EN 50173-1:2011, 8.1 and 8.5.1.

D.2.5 Cords

See EN 50173-1:2011, 9.5.

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