

Information technology — Generic cabling systems

The European Standard EN 50173:1995, with the incorporation of amendments A1:2000, has the status of a British Standard

ICS 33.040.50

Committees responsible for this British Standard

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- BR Telecommunications Ltd.
- British Approvals Board for Telecommunications
- British Telecommunications plc
- Department of Trade and Industry (Telecommunications and Posts Division)
- Electrical Contractors' Association
- Electricity Association
- Federation of the Electronics Industry
- Institution of Electrical and Electronics Incorporation Engineers
- Mercury Communications Ltd.
- National Communications Union
- OFTEL (Office of Telecommunications)
- Telecommunications Industry Association
- Telecommunications Users' Association (TUA)

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National foreword

This British Standard has been prepared by Technical Committee TCT/7 and is the English language version of EN 50173:1995 *Information technology — Generic cabling systems*, including amendment A1:2000, published by the European Committee for Electrotechnical Standardization (CENELEC).

Cross-references

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English version

Information technology — Generic cabling systems

(includes amendment A1:2000)

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Systèmes génériques de câblage
(inclut l'amendement A1:2000)

Informationstechnik —
Anwendungsneutrale Verkabelungssysteme
(enthält Änderung A1:2000)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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CENELEC

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Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

This European Standard has been developed by CENELEC TC 215, Electrotechnical aspects of telecommunications equipment. It is a generic standard for customer premises cabling for information technology. TC 215 will develop more standards on this subject and has already prepared EN 50098-1 and EN 50098-2 for ISDN applications (see Annex H).

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50173 on 1995-07-04.

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) 1996-03-01
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This European Standard contains eight annexes. Annexes designated “normative” are part of the body of the standard. Annexes designated “informative” are given for information only. In this standard, Annex B and Annex C are normative, Annex A, Annex D, Annex E, Annex F, Annex G, and Annex H are informative.

This European Standard is derived from the text of the International Standard ISO/IEC 11801 *Information technology — Generic cabling for customer premises*, which has been established by ISO/IEC JTC 1/SC 25.

Foreword to amendment A1

This amendment was prepared by CENELEC Technical Committee TC 215, Electrotechnical aspects of telecommunication equipment, under the framework of Mandate M/212 on telecommunication cables and cabling systems.

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Introduction

Within customer premises, the importance of the cabling infrastructure is similar to that of other fundamental building utilities such as heating, lighting and mains power. As with other utilities, interruptions to service can have serious impact. Poor quality of service due to lack of design foresight, use of inappropriate components, incorrect installation, poor administration or inadequate support can threaten an organization's effectiveness.

Historically, the cabling within a premises comprised both application-specific and multipurpose networks. Appropriate use of this European Standard will enable a controlled migration to generic cabling. Certain circumstances may warrant the introduction of application-specific cabling; these instances should be minimized.

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 for applications with a cabling system which supports current products and provides a basis for future product development.

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

- a) standards for cabling components developed by Technical Committees of CENELEC and/or IEC;
- b) applications developed by the subcommittees of ISO/IEC JTC 1 and study groups of ITU-T¹⁾; for example, Local Area Networks (LANs): ISO/IEC JTC 1/SC 6 and SC 25/WG 4; Integrated Services Digital Network (ISDN): ITU-T SG 13;
- c) planning and installation guides for the implementation and use of generic cabling systems.

The applications listed in 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 model described in 5.2.1, 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, the general office environment.

It is anticipated that the generic cabling system defined by this European Standard will have a life expectancy in excess of ten years.

1 Scope and conformance

1.1 Scope

This European Standard specifies generic cabling for use within commercial premises which may comprise single or multiple buildings on a campus. It covers balanced copper cabling and optical fibre cabling.

The standard is optimized for premises having a geographical span of up to 3000 m, with up to 1 000 000 m² of office space, and a population of between 50 and 50 000 persons. The principles of this European Standard may be applied to installations that do not fall within this range.

Cabling defined by this standard supports a wide range of services including voice, data, text, image and video.

This European Standard specifies:

- a) the structure and minimum configuration for generic cabling;
- b) implementation requirements;
- c) performance requirements for individual cabling links;
- d) conformance requirements and verification procedures.

¹⁾ International Telecommunication Union — Telecommunications Standardization Sector, formerly CCITT

Cables and cords used to connect application-specific equipment to the generic cabling system are outside the scope of this European Standard. Since they have significant effect on the transmission characteristics of the channel, assumptions and guidance are provided on their performance and length. Safety (electrical safety and protection, 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 installation to conform to this European Standard:

- a) the configuration shall conform to the requirements outlined in clause 4;
- b) the interfaces to the cabling shall conform to the requirements of clause 8;
- c) the entire cabling system shall be composed of links that meet the necessary level of performance specified in clause 6. This shall be achieved by either installing components which meet the requirements given in clauses 7 and 8 according to the design parameters of clause 5 or by a system design and implementation ensuring that the prescribed performance class of clause 6 and the reliability requirements of clause 8 and annex B.3 are met;
- d) system administration shall meet the requirements of clause 10;
- e) local regulations concerning safety and electromagnetic compatibility shall be met.

The link performance specified in clause 6 is in accordance with clause 5. The link performance is met when components specified in clauses 7 and 8 are installed in a workmanlike manner and in accordance with supplier's and designer's instructions, over distances not exceeding those specified in clause 5. It is not required to test the transmission characteristics of the link in this case.

Conformance testing to the specifications of clause 6 should be used in the following cases:

- a) the design of links with lengths exceeding those specified in clause 5;
- b) the design of links using components different from those described in clauses 7 and 8;
- c) the evaluation of installed cabling to determine its capacity to support a certain group of applications;
- d) performance verification, as required, of an installed system designed in accordance with clauses 5, 7 and 8;

Specifications marked "ffs" (for further study) are preliminary and are not required for conformance to this European Standard.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 50081-1, *Electromagnetic compatibility — Generic emission standard — Part 1: Residential, commercial and light industry*.

EN 50082-1, *Electromagnetic compatibility — Generic immunity standard — Part 1: Residential, commercial and light industry*.

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

EN 50289-1-6 (in preparation), *Communication cables — Specifications for test methods — Part 1-6: Electrical test methods — Electromagnetic performance*.

EN 50289-1-9 (in preparation), *Communication cables — Specifications for test methods — Part 1-9: Electrical test methods — Longitudinal conversion loss (unbalance attenuation)*.

EN 55022, *Limits and methods of measurement of radio interference characteristics of information technology equipment* (IEC/CISPR 22:1997).

EN 55024, *Information technology equipment — Immunity characteristics — Limits and methods of measurement* (IEC/CISPR 24:1997).

EN 60068-2-2, *Basic environmental testing procedures — Part 2: Tests — Tests B: Dry heat* (IEC 60068-2-2:1974 + IEC 60068-2-2A:1976).

EN 60068-2-6, *Basic environmental testing procedures — Part 2: Tests — Test Fc and guidance: Vibration (sinusoidal)* (IEC 60068-2-6:1995).

EN 60603-7, *Connectors for frequencies below 3 MHz for use with printed boards — Part 7: Detail specification for connectors, 8 way, including fixed and free connectors with common mating features* (IEC 60603-7:1996).

EN 60794-3 (EN 187100), *Optical fibre cables — Part 3: Telecommunication cables — Sectional specification* (IEC 60794-3:1994).

EN 60811-1-1, *Insulating and sheathing of electric cables — Common test methods — Part 1: General application — Section 1: Measurement of thickness and overall dimensions — Tests for determining the mechanical properties* (IEC 60811-1-1:1993).

EN 60825-2, *Safety of laser products — Part 2: Safety of optical fibre communication systems* (IEC 60825-2:1993).

EN 61935-1 (in preparation), *Generic specification for the testing of balanced generic cabling in accordance with ISO/IEC 11801 — Part 1: Test methods* (IEC 61935-1).

EN 186000-1, *Generic specification: Connector sets for optical fibres and cables — Part 1: Requirements, test methods and qualification approval procedures.*

EN 187000, *Generic specification — Optical fibre cables.*

EN 188000, *Generic specification — Optical fibres.*

EN 188100, *Sectional specification — Single-mode (SM) optical fibres.*

EN 188101, *Family specification — Single-mode dispersion unshifted (B1.1) optical fibres.*

EN 188201, *Family specification: A1a graded index multimode optical fibres.*

EN 188202, *Family specification: A1b graded index multimode optical fibres.*

EN 60068-2-14, *Environmental testing — Part 2: Tests — Test N: Change of temperature* (IEC 60068-2-14:1984 + A1:1986).

EN 60068-2-38, *Environmental testing — Part 2: Tests — Test Z/AD: Composite temperature/humidity cyclic test* (IEC 60068-2-38:1974).

HD 384.5.54, *Electrical installations of buildings — Part 5: Selection and erection of electrical equipment — Chapter 54: Earthing arrangements and protective conductors* (IEC 60364-5-54 modified).

HD 608, *Generic specification for symmetric pair/quad and multicore cables for digital communication.*

IEC 60068-2-60, *Basic environmental testing procedures — Part 2: Tests — Test Ke: Corrosion test in artificial atmosphere at very low concentration of polluting gas(es)* (Technical Trend Document).

IEC 60096-1, *Radio-frequency cables — Part 1: General requirements and measuring methods.*

IEC 60189-1, *Low-frequency cables and wires with p.v.c. insulation and p.v.c. sheath — Part 1: General test and measuring methods.*

IEC 60512-2, *Electromechanical components for electronic equipment; Basic testing procedures and measuring methods — Part 2: General examination, electrical continuity and contact resistance tests, insulation tests and voltage stress tests.*

IEC 60793-2, *Optical fibres — Part 2: Product specifications.*

IEC 60794-2, *Optical fibre cables — Part 2: Product specifications.*

IEC 60807-8, *Rectangular connectors for frequencies below 3 MHz — Part 8: Detail specification for connectors, four-signal contacts and earthing contacts for cable screen.*

IEC 60874-10, *Connectors for optical fibres and cables — Part 10: Sectional specification for fibre optic connector — Type BFOC/2,5.*

IEC 60874-14, *Connectors for optical fibres and cables — Part 14: Sectional specification for fibre optic connector — Type SC.*

IEC 61073-1, *Splices for optical fibres and cables — Part 1: Generic specification — Hardware and accessories*.

ISO/IEC 68802-5, *Information technology — Telecommunications and information exchange between systems — Local and Metropolitan Area Networks — Specific requirements — Part 5: Token ring access method and physical layer specifications*.

ITU-T Rec. G.117, *Transmission aspects of unbalance about earth (definitions and methods)*.

ITU-T Rec. 0.9 (Blue Book), *Measuring arrangements to assess the degree of unbalance about earth*.

3 Definitions and abbreviations

3.1

Definitions

For the purposes of this standard the following definitions apply.

3.1.1

application

a system, with its associated transmission method which is supported by telecommunications cabling

3.1.2

balanced cable

a cable consisting of one or more metallic symmetrical cable elements (twisted pairs or quads)

3.1.3

building backbone cable

a cable that connects the building distributor to a floor distributor

building backbone cables may also connect floor distributors in the same building

3.1.4

building distributor

a distributor in which the building backbone cable(s) terminate(s) and at which connections to the campus backbone cable(s) may be made

3.1.5

building entrance facility

a facility that provides all necessary mechanical and electrical services, that complies with all relevant regulations, for the entry of telecommunications cables into a building

3.1.6

cable

an assembly of one or more cable units of the same type and category in an overall sheath

it may include an overall screen

3.1.7

cable element

the smallest construction unit in a cable

a cable element may have a screen

NOTE A pair, a quad and a single fibre are examples of a cable element.

3.1.8

cable unit

a single assembly of one or more cable elements usually of the same type or category

the cable unit may have a screen

NOTE A binder group is an example of a cable unit.

3.1.9

cabling

a system of telecommunications cables, cords and connecting hardware that can support the connection of information technology equipment

3.1.10**campus**

a premises containing one or more buildings

3.1.11**campus backbone cable**

a cable that connects the campus distributor to the building distributor(s)

campus backbone cables may also connect building distributors directly

3.1.12**campus distributor**

the distributor from which the campus backbone cabling emanates

3.1.13**channel**

the end to end transmission path connecting any two pieces of application-specific equipment

equipment cables and work area cables are included in the channel

3.1.14**cross-connect**

a facility enabling the termination of cable elements and their connection, primarily by means of patch cords or jumpers

3.1.15**distributor**

the term used for the functions of a collection of components (for example, patch panels, patch cords) used to connect cables

3.1.16**equipment cable**

a cable connecting equipment to a distributor

3.1.17**equipment room**

a room dedicated for housing distributors and application-specific equipment

3.1.18**floor distributor**

the distributor used to make connections between the horizontal cable, other cabling subsystems and active equipment (see telecommunications closet)

3.1.19**generic cabling**

a structured telecommunications cabling system, capable of supporting a wide range of applications

generic cabling can be installed without prior knowledge of the required applications

application-specific hardware is not a part of generic cabling

3.1.20**horizontal cable**

a cable connecting the floor distributor to the telecommunications outlet(s)

3.1.21**hybrid cable**

an assembly of two or more different types of cable units, cables or categories covered by an overall sheath

it may be covered by an overall screen

3.1.22**individual work area**

the minimum building space which would be reserved for an occupant

3.1.23

interconnect

a location at which equipment cables are terminated and interconnected to the cabling subsystems without using a patch cord or jumper

3.1.24

interface

a point at which connections are made to the generic cabling

3.1.25

jumper

a cable unit or cable element without connectors used to make a connection on a cross-connect

3.1.26

keying

a mechanical feature of a connector system which guarantees correct orientation of a connection or prevents the connection to a jack or optical fibre adapter of the same type intended for another purpose

3.1.27

link

the transmission path between any two interfaces of generic cabling

it excludes equipment cables and work area cables

3.1.28

optical fibre cable (or optical cable)

a cable comprising one or more optical fibre cable elements

3.1.29

optical fibre duplex adapter

a mechanical device designed to align and join two duplex connectors

3.1.30

optical fibre duplex connector

a mechanical termination device designed to transfer optical power between two pairs of optical fibres

3.1.31

pair

a twisted pair or one side circuit (two diametrically facing conductors) in a star quad

3.1.32

patch cord

flexible cable unit or element with connector(s), used to establish connections on a patch panel

3.1.33

patch panel

a cross-connect designed to accommodate the use of patch cords

it facilitates administration for moves and changes

3.1.34

public network interface

a point of demarcation between public and private network

in many cases the public network interface is the point of connection between the network provider's facilities and the customer premises cabling

3.1.35

screened cable

an assembly of two or more balanced twisted pair cable elements or one or more quad cable elements wrapped by an overall screen or screen contained within a common sheath or tube

3.1.36**screened twisted pair cable**

an electrically conducting cable comprising one or more elements each of which is individually screened
there may be an overall screen in which case the cable is referred to as a screened twisted pair cable with an overall screen

3.1.37**splice**

a joining of conductors or fibres, generally from separate cables

3.1.38**star quad**

a cable element which comprises four insulated conductors twisted together

two diametrically facing conductors form a transmission pair

NOTE 1 Cables containing star quads can be used interchangeably with cables consisting of pairs, provided the electrical characteristics meet the same specifications.

NOTE 2 Often, the term quad is used instead of star quad.

3.1.39**telecommunications**

a branch of technology concerned with the transmission, emission and reception of signs, signals, writing, images and sounds; that is, information of any nature by cable, radio, optical or other electromagnetic systems

the term telecommunications has no legal meaning when used in this document

3.1.40**telecommunications closet**

an enclosed space for housing telecommunications equipment, cable terminations, and cross-connect cabling

the telecommunications closet is a recognized cross-connect point between the backbone and horizontal cabling subsystems

3.1.41**telecommunications outlet**

a fixed connecting device where the horizontal cable terminates

the telecommunications outlet provides the interface to the work area cabling

3.1.42**transition point**

a location in the horizontal cabling where a change of cable form takes place

NOTE For example, where a flat cable connects to round cable or cables with differing numbers of elements are joined.

3.1.43**twisted pair**

a cable element which consists of two insulated conductors twisted together in a determined fashion to form a balanced transmission line

3.1.44**unscreened twisted pair cable**

an electrically conducting cable comprising one or more pairs none of which is screened

NOTE There may be an overall screen, in which case the cable is referred to as unscreened twisted pair cable with an overall screen.

3.1.45**work area**

a building space where the occupants interact with telecommunications terminal equipment

3.1.46**work area cable**

a cable connecting the telecommunications outlet to the terminal equipment

3.2

Abbreviations

a.c.	Alternating current
ACR	Attenuation to crosstalk ratio
ATM	Asynchronous transfer mode
BD	Building distributor
BFOC	Bayonet fibre optic connector
B-ISDN	Broadband ISDN
c	Velocity of propagation in free space
C	Connection
CD	Campus distributor
CSMA/CD	Carrier sense multiple access with collision detection
d.c.	Direct current
DUT	Device under test
ELED	Edge light emitting diode
ELFEXT	Equal level far-end crosstalk loss
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
EQP	Equipment
ER	Equipment room
FD	Floor distributor
FDDI	Fibre distributed data interface
FEXT	Far-end crosstalk loss
ffs	For further study
FOIRL	Fibre optic inter-repeater link
FWHM	Full width half maximum
KS	Key system
IC	Integrated circuit
IDC	Insulation displacement connection
ISDN	Integrated services digital network
LAN	Local area network
LCL	Longitudinal conversion loss
LCTL	Longitudinal conversion transfer loss
LED	Light emitting diode
MUX	Multiplexer
N/A	Not applicable
N-BNC	N type to BNC convertor
NEXT	Near-end crosstalk loss
PBX	Private branch exchange
PMD	Physical Layer Medium Dependent
PSACR	Power sum attenuation to crosstalk loss ratio
PSSELFEXT	Power sum equal level far-end crosstalk loss
PSNEXT	Power sum near-end crosstalk loss
S	Splice
SC	Optical fibre connector (subscriber connector)
SC-D	Duplex SC connector
STI	Surface transfer impedance
TC	Telecommunications closet
TE	Terminal equipment
TO	Telecommunications outlet
TOC	Terminated open circuit
TP	Transition point
TP-PMD	Twisted Pair Physical Layer Medium Dependent

4 Structure of the generic cabling system

4.1 General

This clause 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 by the generic cabling. General requirements for implementing generic cabling are also provided.

Applications are supported by connecting equipment to the telecommunications outlets and distributors. The components used to make these connections do not form part of generic cabling.

4.2 Structure

4.2.1 *Functional elements*

The functional elements of generic cabling are as follows:

- campus distributor (CD);
- campus backbone cable;
- building distributor (BD);
- building backbone cable;
- floor distributor (FD);
- horizontal cable;
- transition point (optional) (TP);
- telecommunications outlet (TO).

Groups of these functional elements are connected together to form cabling subsystems.

4.2.2 *Cabling subsystems*

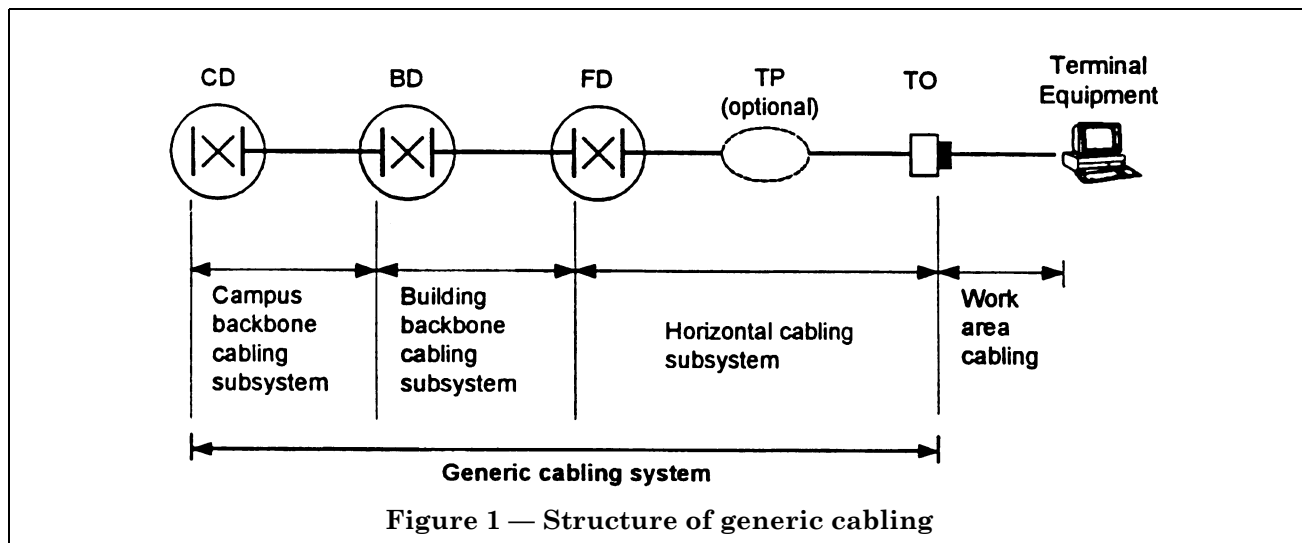
Generic cabling schemes contain three cabling subsystems: campus backbone, building backbone and horizontal cabling. The composition of the subsystems is described in 4.2.3, 4.2.4 and 4.2.5. The cabling subsystems are connected together to create a generic cabling structure as shown in Figure 1. The distributors provide the means to configure the cabling to support different topologies like bus, star and ring.

4.2.3 *Campus backbone cabling subsystem*

The campus backbone cabling subsystem extends from the campus distributor to the building distributor(s) usually located in separate buildings. When present, it includes the campus backbone cables, the mechanical termination of the campus backbone cables (at both the campus and building distributors) and the cross-connections at the campus distributor. The campus backbone cable may also interconnect building distributors.

4.2.4 *Building backbone cabling subsystem*

A building backbone cabling subsystem extends from building distributor(s) to the floor distributor(s). The subsystem includes the building backbone cables, the mechanical termination of the building backbone cables (at both the building and floor distributors) and the cross-connections at the building distributor. The building backbone cables shall not contain transition points and copper cables should not contain splices.



4.2.5 Horizontal cabling subsystem

The horizontal cabling subsystem extends from a floor distributor to the telecommunications outlet(s) connected to it. The subsystem includes the horizontal cables, the mechanical termination of the horizontal cables at the floor distributor, the cross-connections at the floor distributor and the telecommunications outlets.

Horizontal cables should be continuous from the floor distributor to the telecommunications outlets. If necessary, one transition point is permitted between a floor distributor and any telecommunications outlet. The transmission characteristics of the horizontal cabling shall be maintained. The incoming and outgoing pairs and fibres at the transition point shall be connected such that a 1:1 correspondence is maintained. All cable elements at the transition point shall be mechanically terminated. The transition point shall not be used as a point of administration (i.e., not used as a cross-connect), and active equipment shall not be located there. The transition point may only contain passive connecting hardware. Refer to 7.3 for restrictions on the use of multi-unit cables.

4.2.6 Work area cabling

The work area cabling connects the telecommunications outlet to the terminal equipment. It is non-permanent and application-specific and therefore lies outside the scope of this European Standard. Assumptions have been made concerning the length and the transmission performance of the work area cable; these assumptions are identified when relevant.

4.3 Overall structure

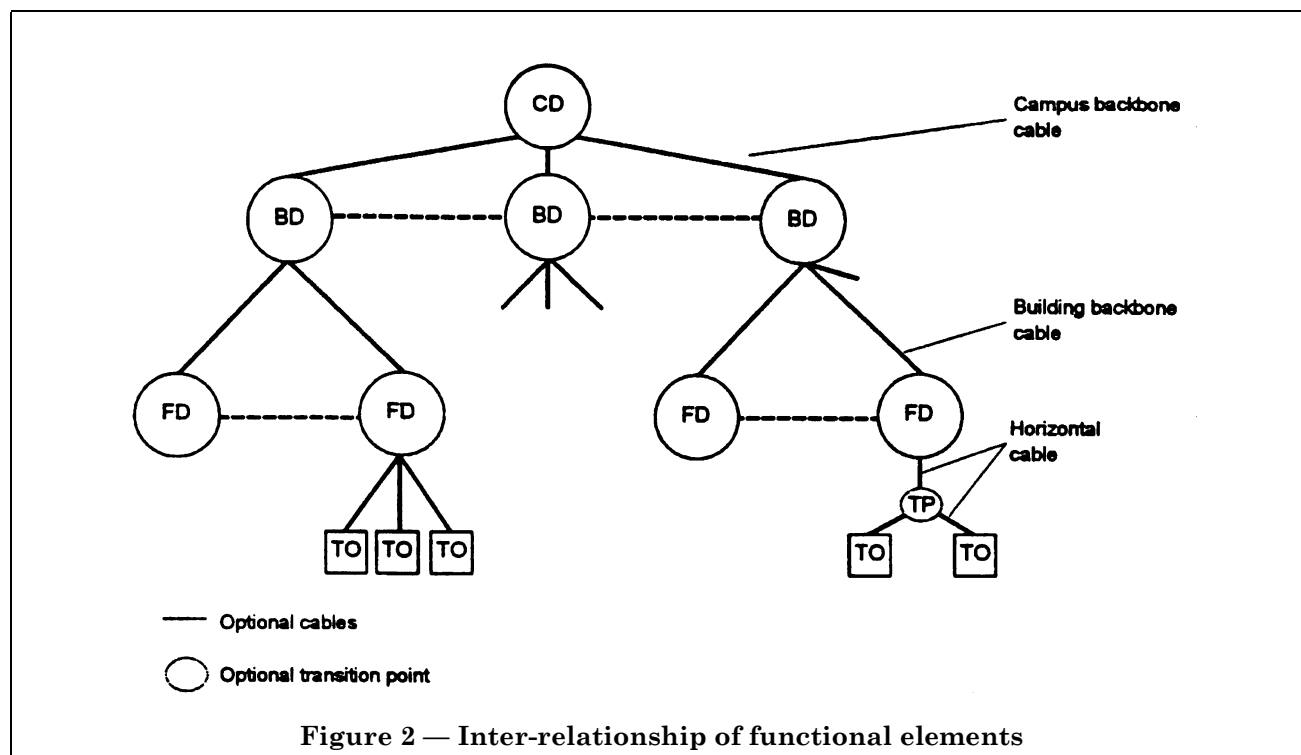
The generic cabling is a hierarchical star structure which may take the form shown in Figure 2. The number and type of subsystems that are included in a generic cabling implementation depend upon the geography and size of the campus or building, and upon the strategy of the user. For example, in a campus having only one building the primary distribution point is the building distributor, and there is no need for a campus backbone subsystem. On the other hand, one large building may be treated as a campus, with a campus backbone subsystem and several building distributors. Further information on the application of the cabling structure is given in Annex D.

Cables shall be installed between adjacent levels in the structure. This forms a hierarchical star as shown in Figure 2 and provides the high degree of flexibility needed to accommodate a variety of applications. Annex D details how to configure various networks within the boundaries of the hierarchical star topology. These topologies are established by the interconnection of the cable elements at cross-connects and at the application-specific equipment.

For some applications, additional direct connections between floor distributors or building distributors are desirable and are permitted. The building backbone cable may also connect floor distributors. However, such connections shall be in addition to those required for the basic hierarchical star topology.

The functions of multiple distributors may be combined. Figure 3 shows an example of generic cabling. The building in the foreground shows each distributor housed separately. The building in the background shows that the functions of the floor distributor and the building distributor have been combined into a single distributor.

Information about additional cabling for fault tolerance can be found in Annex D.



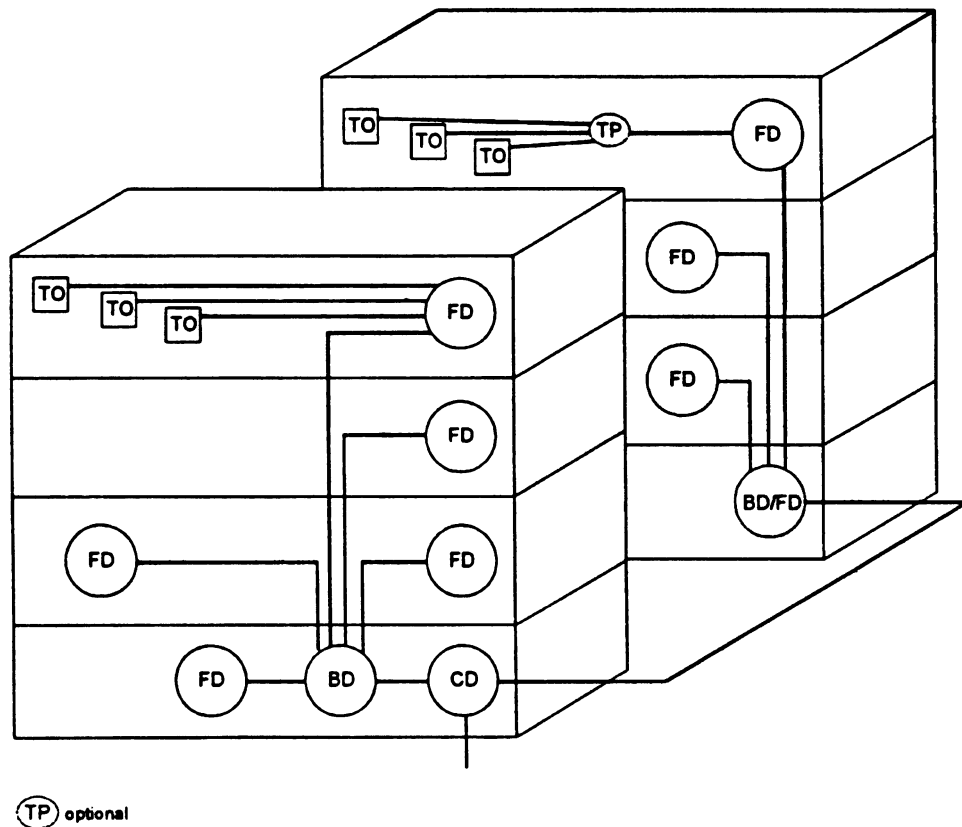


Figure 3 — Example of a generic cabling system

4.4 Location of distributors

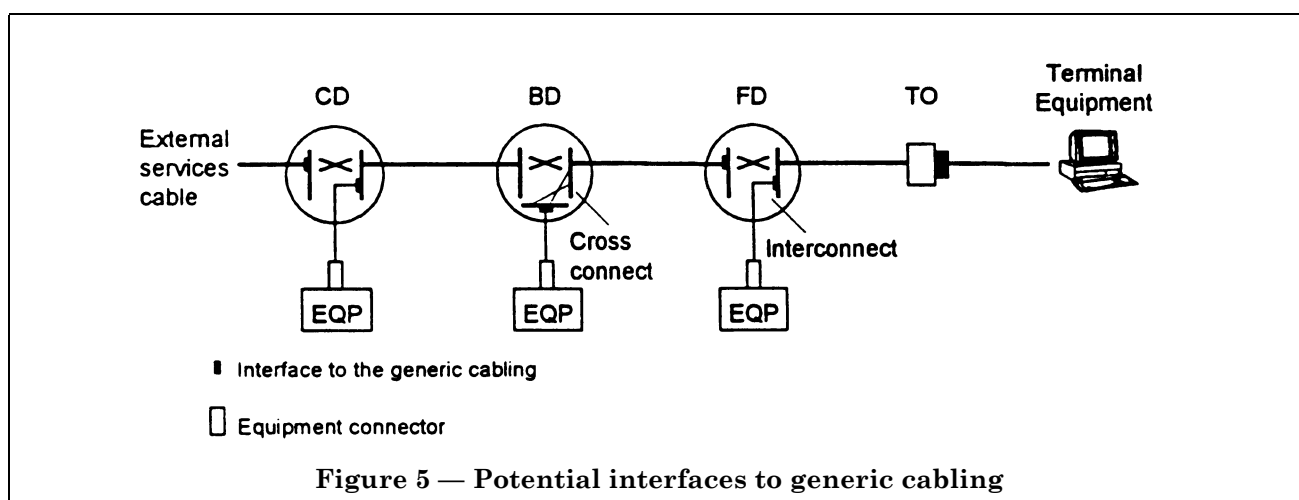
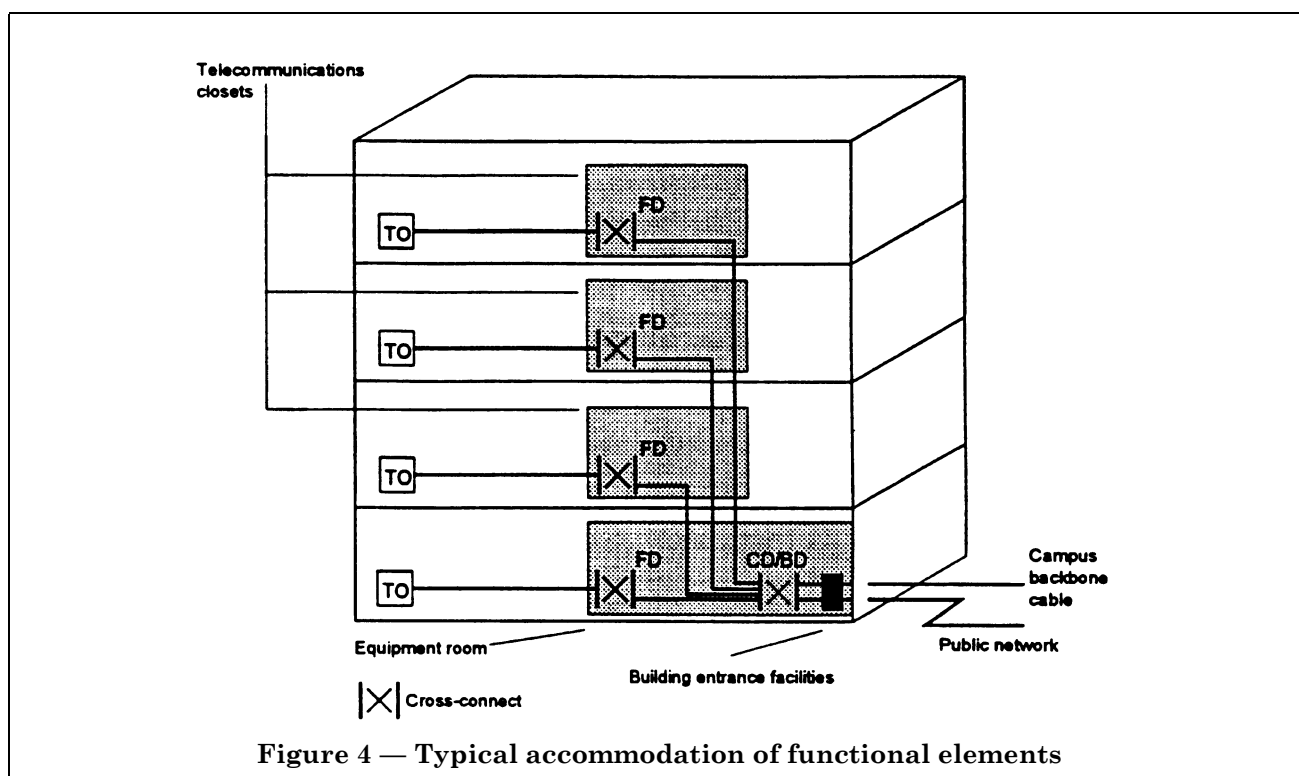
Distributors are located in equipment rooms or telecommunications closets. Figure 4 shows how the functional elements are typically accommodated in a building. Cables are placed in appropriate pathways which may take a variety of forms including ducts, tunnels, cable trays, etc.

4.5 Interfaces to the generic cabling system

4.5.1 General

Interfaces to generic cabling are located at the ends of each subsystem. Application-specific equipment can be connected at these points. Figure 5 shows potential interfaces at the distributors and the telecommunications outlet. Any distributor may have an interface to an external services cable, and may use either interconnects or cross-connects.

The distance from external services to the campus distributor can be significant. The performance of the cable between these points should be considered as part of the initial design and implementation of customer applications.



4.5.2 Public network interface

Connections to the public network for the provision of public telecommunications services are made at the public network interface. The location of the public network interface, if present, and the facilities which shall be provided may be regulated by national, regional, and local regulations. If the public network interface is not connected directly to a generic cabling interface the performance of the intermediate cabling should be taken into account. The type of cross-connect and the intermediate cable may be governed by national regulations. These regulations should be considered in planning the generic cabling.

4.6 Dimensioning and configuring

4.6.1 Floor distributor

There should be a minimum of one floor distributor for every 1000 m² of floor space reserved for offices. A minimum of one floor 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 floor distributor located on an adjacent floor.

4.6.2 Preferred cable types for pre-cabling and recommended use

Table 1 gives general guidelines regarding the use of different media in a particular subsystem for pre-cabling applications.

4.6.3 Telecommunications outlet

Telecommunications outlets are located on the wall, floor, or elsewhere in the work area, depending on the design of the building. The design of generic cabling should provide for telecommunications outlets to be installed in readily accessible locations throughout the usable floor space. A high density of telecommunications outlets will enhance the flexibility of the cabling to accommodate changes. In many countries two telecommunications outlets are provided to serve a maximum of 10 m² of usable floor space.

Telecommunications outlets may be presented singly, or in groups, but each individual work area shall be served by a minimum of two.

A minimum of one telecommunications outlet served by 100 Ω or 120 Ω cable shall be provided at each work area (100 Ω recommended). Other telecommunications outlets shall be supported by either balanced cable or by optical fibre cable. When a telecommunications outlet is supported by balanced cable, two pairs or four pairs shall be provided at each telecommunications outlet; all pairs shall be terminated. If less than four pairs are provided, the outlet shall be clearly marked. See clause 8 for telecommunications outlets requirements that correspond to each of the cables listed above.

Telecommunications outlets shall be marked with a permanent label that is visible to the user. Care should be taken that the initial pair assignment, and all subsequent changes, are recorded (see clause 10). Devices such as baluns and impedance matching adapters, if used, shall be external to the outlet. Pair reassignment by means of inserts is allowed.

4.6.4 Telecommunications closets and equipment rooms

A telecommunications closet should provide all the facilities (space, power, environmental control etc.) for passive components, active devices, and public network interfaces housed within it. Each telecommunications closet should have direct access to the backbone.

An equipment room is an area within a building where telecommunications equipment is housed and may or may not contain distributors. Equipment rooms are treated differently from telecommunications closets because of the nature or complexity of the equipment (e.g. PBXs or extensive computer installations). More than one distributor may be located in an equipment room. If a telecommunications space houses more than one distributor it should be considered an equipment room.

Table 1 — Recommended media for pre-cabling

Subsystem	Media type	Recommended use
Horizontal cabling	Balanced cables	Voice and data ^a
	Optical fibre	Data ^a
Building backbone cabling	Balanced cables	Voice and low to medium speed data
	Optical fibre	Medium to high speed data
Campus backbone cabling	Optical fibre	For most applications; by using optical fibre, the problems due to ground potential differences and other interfering sources can be overcome
	Balanced cables	As needed ^b

^a Under certain conditions, (e.g. environmental conditions, security concerns, etc.) installation of optical fibre in the horizontal cabling subsystem should be considered.

^b Balanced cables can be used in the campus backbone cabling subsystem in cases when the bandwidth of optical fibre is not required, e.g. PBX lines.

4.6.5 Building entrance facilities

Building entrance facilities are required whenever campus backbone, public and private network cables (including antennae) enter buildings and a transition is made to internal cables. It comprises an entrance point at a building wall and the pathway leading to the campus or building distributor. Local regulations may require special facilities where the external cables are terminated. At this termination point, a change from external to internal cable can take place.

4.7 Electromagnetic compatibility

European Standards on electromagnetic emission and immunity (e.g. EN 50081-1, EN 50082-1, EN 55022, EN 55024) shall be taken into account when designing a generic cabling system. Premises cabling is considered as a passive system and cannot be tested for EMC compliance individually. Application-specific equipment which is designed for one or more media is required to meet relevant EMC standards on those media. Care should be taken that the installation of any of those media in a cabling system does not degrade the characteristics of the system.

NOTE CENELEC is developing a series of European Standards on the erection and installation of telecommunications and information technology cabling, which will also address this topic. As these standards become available, EN 50173 will refer accordingly.

4.8 Earthing and bonding

Earthing shall meet the requirements of HD 384.5.54. Where compatible with required electrical codes, the earthing instructions and requirements of the equipment manufacturers should also be followed.

NOTE CENELEC is developing a series of European Standards on the erection and installation of telecommunications and information technology cabling, which will also address this topic. As these standards become available, EN 50173 will refer accordingly.

5 Implementation

5.1 General

This clause specifies a cabling design that, when properly installed, conforms to the requirements of this European Standard. The design should be applicable to the majority of installations where the maximum lengths for the horizontal and backbone cabling subsystems are as defined in Figure 6.

The requirements for the cabling components to be used within this clause can be found in clause 7 (for cables) and clause 8 (for connecting hardware). Balanced cables of 100 Ω and 120 Ω characteristic impedance and the connecting hardware for these cables are classified by categories of increasing performance. The transmission characteristics of category 3 and 5 components are specified up to 16 MHz and 100 MHz respectively.

Cables and connecting hardware of different categories may be mixed within a subsystem and/or the cabling link, but the transmission characteristics of the link will be determined by the category of the least performing component.

Cables of different nominal characteristic impedances shall not be mixed within a cabling link. Optical fibres of different core diameters shall not be mixed within a cabling link.

100 Ω and 120 Ω connecting hardware shall only provide a single direct onward connection for each conductor and shall not provide any electrical contact between conductors. For example bridged taps shall not be used.

5.2 Horizontal cabling

5.2.1 Horizontal distances

The maximum horizontal cable length shall be 90 m independent of medium (see Figure 6). This is the cable length from the mechanical termination of the cable in the floor distributor to the telecommunications outlet in the work area.

In establishing the maximum length of the horizontal channel, the optional use of a cross-connect or an interconnect places different requirements on the total length of the flexible cables used.

Figure 7 shows examples of horizontal channel implementations which reflect these differing requirements of maximum cable length.

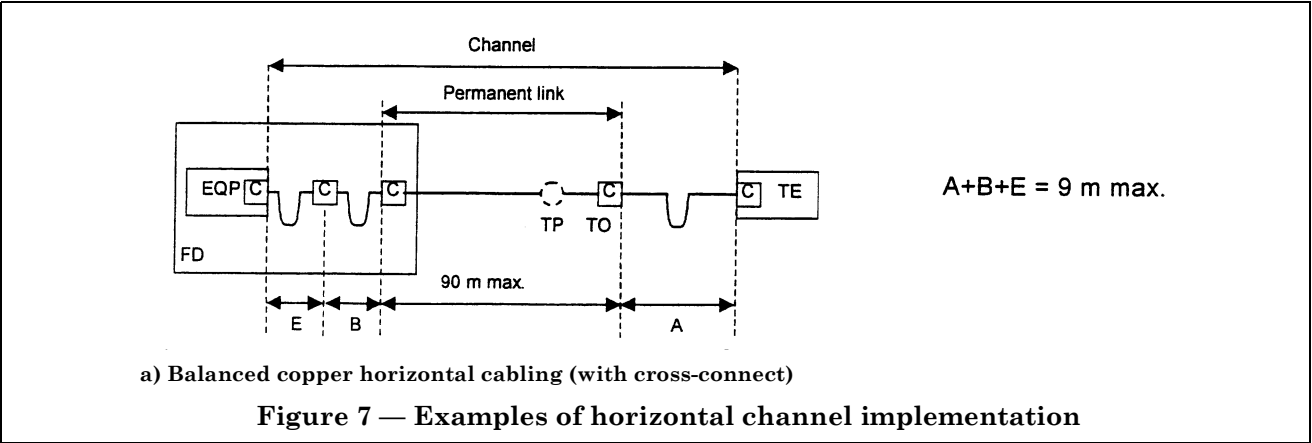
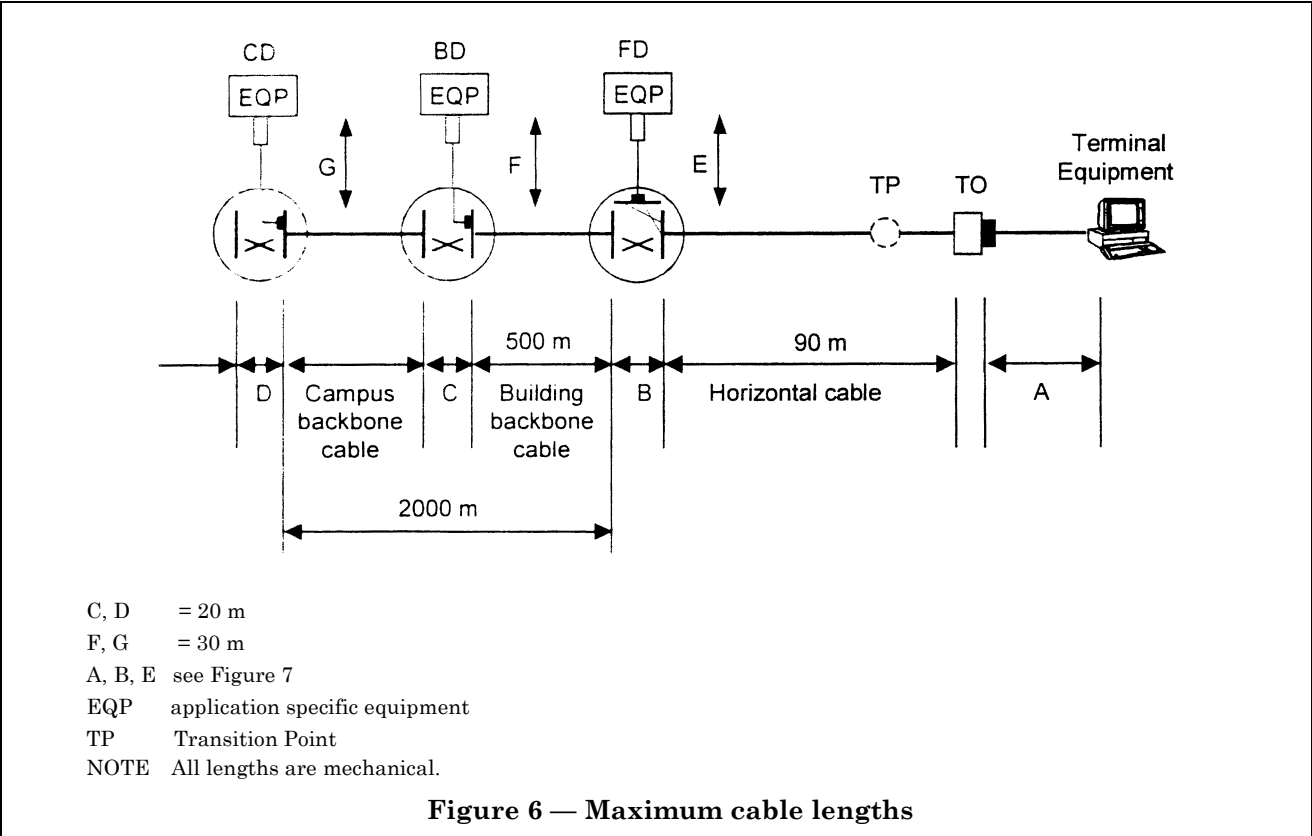
In Figure 7a, the maximum total length of work area cable, equipment cable and patch cord is 9 m based upon flexible cables with 50 % greater attenuation (dB/m) than the horizontal cable and includes a crossconnect in the floor distributor.

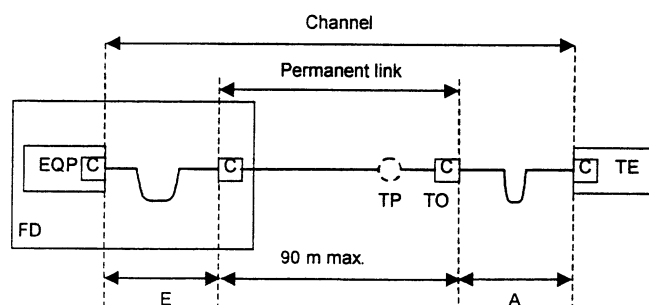
In Figure 7b, the maximum total length of work area cable and equipment cable is 10 m also based upon flexible cables with 50 % greater attenuation (dB/m) than the horizontal cable and includes an interconnect in the floor distributor.

In both cases the transition point is optional. It is required that the performance of the horizontal cabling is not degraded by the inclusion of the transition point.

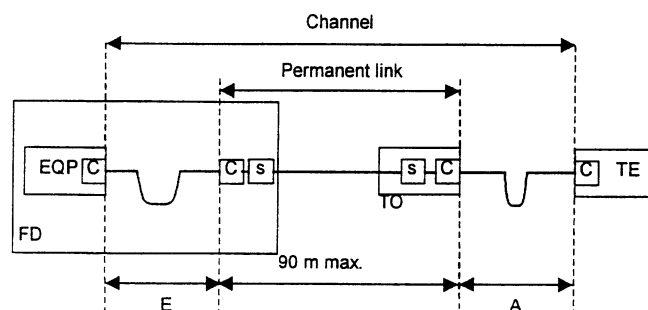
For optical fibre, the implementation is shown in Figure 7c. An optional fibre splice, in accordance with clause 8, is allowed at both ends of the horizontal cable.

See clause 8 and Annex C for requirements for patch cords and other flexible cables. In all cases, equipment cables that meet or have better performance characteristics than patch cord requirements are recommended.





b) Balanced copper horizontal cabling (with interconnect)



c) Optical fibre cabling (with interconnect)

C connection (e.g. plug and jack or mated optical connection)

S optical fibre splice

EQP application specific equipment

NOTE 1 All lengths are mechanical lengths.

NOTE 2 See Annex C for further information on flexible cables.

Figure 7 — Examples of horizontal channel implementation (concluded)

For balanced cabling the design of the channel should also take into account the effect of elevated operating temperatures on attenuation.

NOTE Copper cable attenuation (dB/m) increases by approximately 2 % for screened cable and 4 % for unscreened cable for a temperature increase of 10 °C.

5.2.2 *Choosing cable types*

The following cable types are recommended for use in the horizontal cabling subsystem:

- a) 100 Ω balanced cable according to 7.2;
- b) 62,5/125 μm multimode optical fibres according to 7.4.

As an alternative 120 Ω or 150 Ω balanced cable according to 7.2 and 50/125 μm multimode optical fibres according to 7.4 may be used. The performance requirements of installed cables, associated connecting hardware and cross-connects are described in clauses 7 and 8.

Hybrid and multi-unit cables that meet the requirements of 7.3 may be used in the horizontal cabling subsystem for serving more than one telecommunications outlet.

If screens or grounded metallic parts are present, refer to clause 9.

5.2.3 *Configuring telecommunications outlets*

The two telecommunications outlets in a work area corresponding to the minimum configuration of clause 4 are configured as follows:

- a) One telecommunications outlet shall be supported by 100 Ω or 120 Ω balanced cable (category 5 recommended) according to 7.2;
- b) A second telecommunications outlet shall be supported either by balanced cable of category 5 according to 7.2, or an optical fibre cable according to 7.4.

NOTE See 8.2.5, 8.3.5 and 8.4.4 for telecommunications outlets requirements that correspond to each of the cables listed above.

A typical horizontal and work area cabling scenario is represented in Figure 8.

5.3 *Backbone cabling*

5.3.1 *Physical topology*

There shall be no more than two hierarchical levels of cross-connects in the backbone cabling to limit signal degradation for passive systems and to simplify administration with regard to keeping track of cables and connections. No more than one cross-connect shall be passed through to reach the campus distributor when starting from a floor distributor.

It is possible that a single backbone cabling cross-connect meets the cross-connect needs of the entire backbone subsystem. Backbone cabling cross-connects may be located in telecommunications closets or equipment rooms. See Annex D for guidance on accommodating ring, bus, tree, etc. configurations within the hierarchical star.

The star topology is applicable to the cable elements of the transmission medium, such as individual fibres or pairs. Hybrid and multi-unit cables that meet the requirements of 7.4 may be used in the backbone cabling subsystem. An example of a backbone star topology is given in Figure 9.