SLOVENSKI STANDARD
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Informacijska tehnologija - Univerzalni sistemi pokablenja

Information technology - Generic cabling systems

Informationstechnik - Anwendungsneutrale Verkabelungssysteme

Technologies de l'information - Systèmes génériques de câblage

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33.040.50	Vodi, zveze in tokokrogi	Lines, connections and circuits
35.110	Omreževanje	Networking

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Descriptors: Link performance, channel model, cabling topology, structured cabling, component requirements, test procedure

English version

Information technology
Generic cabling systems

Technologies de l'information
Systèmes génériques de câblage

Informationstechnik
Anwendungsneutrale
Verkabelungssysteme

This European Standard was approved by CENELEC on 1995-07-04. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

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Foreword

This European Standard has been developed by CENELEC TC 115 *Electrotechnical aspects of telecommunications equipment*. It is a generic standard for customer premises cabling for information technology. TC 115 will develop more standards on this subject and has already prepared EN 50098-1 and prEN 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
- latest date by which national standards conflicting with the EN have to be withdrawn	(dow)	1996-03-01

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, annexes B and C are normative, annexes A, D, E, F, G, and 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.

Contents

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 organisation'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 minimised.

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 refurnishment;

d) industry and standardisation 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-T [1]; 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 optimised for premises having a geographical span of up to 3000 m, with up to 1000000 m^2 of office space, and a population between 50 and 50000 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.

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[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 workman like 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 emmission standard - Part 1: Residential, commercial and light industry
EN 50082-1	Electromagnetic compatibility - Generic immunity standard - Part 1: Residential, commercial and light industry
EN 55022	Limits and methods of measurement of radio interference characteristics of information technology equipment (CISPR 22:1993)
EN 60068-2-2	Basic environmental testing procedures - Part 2: Tests - Tests B: Dry heat (IEC 68-2-2:1974 + IEC 68-2-2A:1976)
EN 60068-2-6	Basic environmental testing procedures - Part 2: Tests - Test Fc and guidance: Vibration (sinusoidal) (IEC 68-2-6:1995)
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 603-7:1990)

EN 60794-3 (EN 187100)	Optical fibre cables - Part 3: Telecommunication cables - Sectional specification (IEC 794-3:1994)
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 811-1-1:1993)
EN 60825-2	Safety of laser products - Part 2: Safety of optical fibre communication systems (IEC 825-2:1993)
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	Familiy 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
HD 323.2.14	Basic environmental testing procedures - Part 2: Tests - Test N: Change of temperature (IEC 68-2-14: 1984 + A1:1986)
HD 323.2.38	Basic environmental testing procedures - Part 2: Tests - Test Z/AD: Composite temperature/humidity cyclic test (IEC 68-2-38:1974)
HD 384.5.54	Electrical installations of buildings -Part 5: Selection and erection of electrical equipment- Chapter 54: Earthing arrangements and protective conductors (IEC 364-5-54 modified)
HD 608	Generic specification for symmetric pair/quad and multicore cables for digital communication
IEC 68-2-60	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 96-1	Radio-frequency cables - Part 1: General requirements and measuring methods
IEC 189-1	Low-frequency cables and wires with p.v.c. insulation and p.v.c. sheath - Part 1: General test and measuring methods
IEC 512-2	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 793-2	Optical fibres - Part 2: Product specifications
IEC 794-2	Optical fibre cables - Part 2: Product specifications
IEC 807-8	Rectangular connectors for frequencies below 3 MHz - Part 8: Detail specification for connectors, four signal contacts and earthing contacts for cable screen
IEC 874-10	Connectors for optical fibres and cables - Part 10: Sectional specification for fibre optic connector - Type BFOC/2,5
IEC 874-14	Connectors for optical fibres and cables - Part 14: Sectional specification for fibre optic connector - Type SC
IEC 1073-1	Splices for optical fibres and cables - Part 1: Generic specification - Hardware and accessories
ISO/IEC 8802-5	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. O.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
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
EQP	Equipment
ER	Equipment room
FD	Floor distributor
FDDI	Fibre distributed data interface
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
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 are 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.

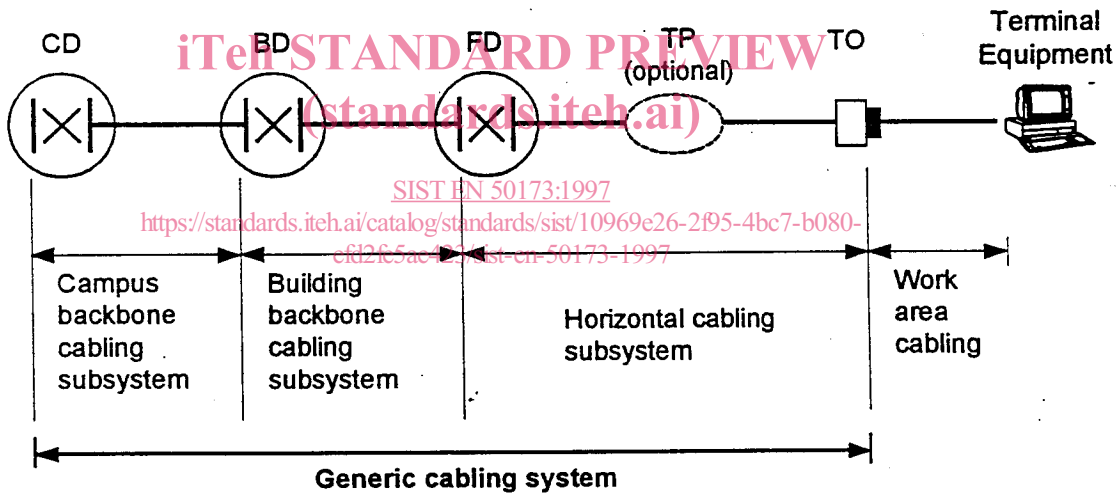

Figure 1: Structure of generic cabling

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-connects 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 depends 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 cabling 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.

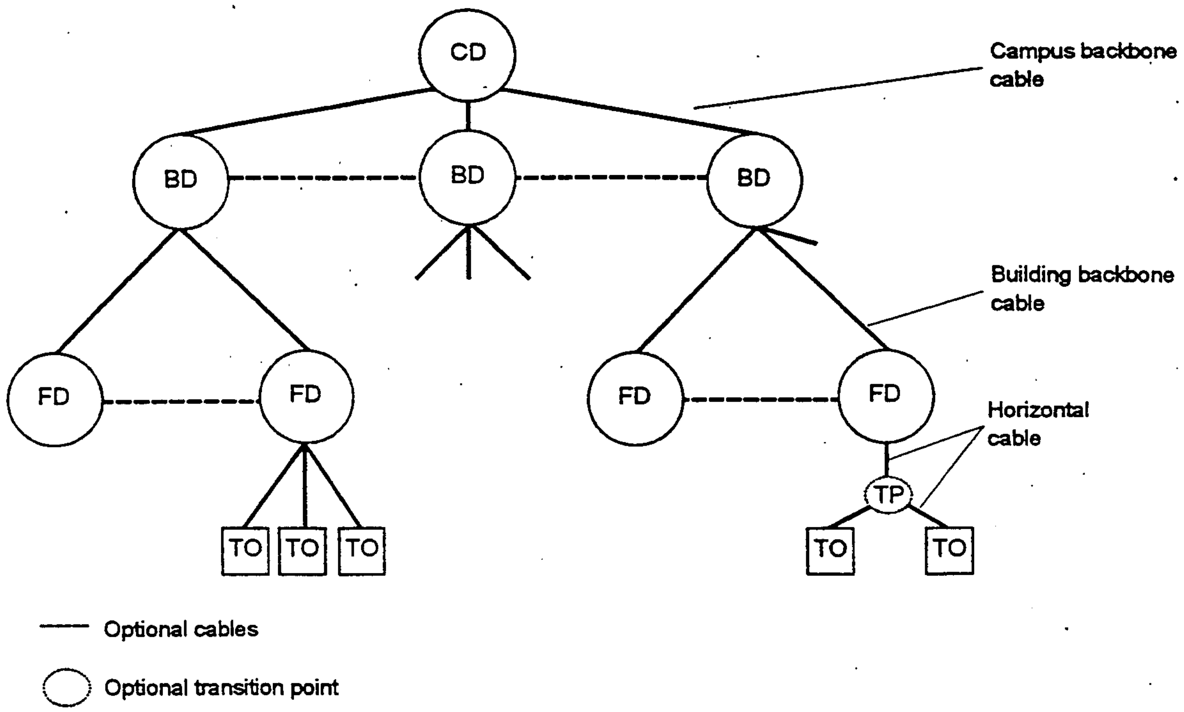

Figure 2: Inter-relationship of functional elements

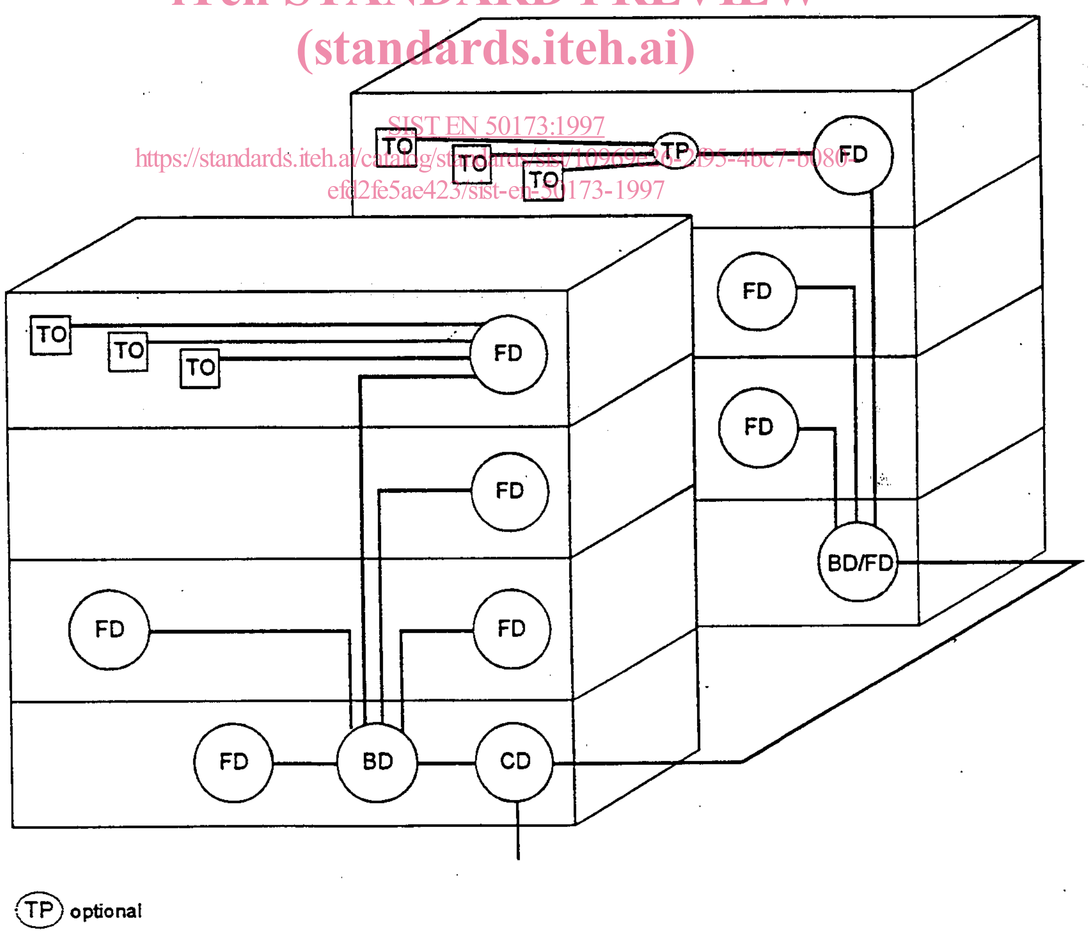

Figure 3: Example of a generic cabling system