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Information technology – Pathways and spaces for customer premises cabling

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INFORMATION TECHNOLOGY – PATHWAYS AND SPACES FOR CUSTOMER PREMISES CABLING

FOREWORD

1) ISO (International Organization for Standardization) and IEC (International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

2) In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

3) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 18010 was prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

Annexes A and B are for information only.

The committee has decided that this publication remains valid until 2007. At this date, in accordance with the committee's decision, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

The telecommunications infrastructure is an integral part of building design. It may include voice, data, environmental control, security, audio, television, sensing, alarms, paging and other low voltage and power limited signal systems. These systems are subject to frequent changes. Design of the pathways and spaces should accommodate this dynamic behaviour. This Standard significantly influences the design of other building services, such as electrical power and heating, ventilation and air conditioning (HVAC).

ISO/IEC 18010 generally makes no specific recommendations among the design options available for telecommunications pathways and spaces. For example, the choice between a conduit system versus a tray system is not delineated. It is up to the telecommunications designer to properly select among the options based upon the applications at hand and the constraints imposed.

This standard generally imposes no specific requirements for the dimensions of pathways and spaces. The reader should refer to

- local regulations and standards,
- telecommunications service providers' rules,
- manufacturers' guidelines.

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INFORMATION TECHNOLOGY – PATHWAYS AND SPACES FOR CUSTOMER PREMISES CABLING

1 Scope

This International Standard specifies the structure and requirements for pathways and spaces within or between buildings for information exchange and telecommunications cabling according to ISO/IEC 11801 and ISO/IEC 15018.

This International Standard also influences space allocation within the building. Both single- and multi-tenant buildings are considered by this Standard.

This standard does not cover safety aspects of the building design, fire stopping measures or telecommunications systems that require any special types of security measures.

2 Normative references

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

IEC 60050(826), *International Electrotechnical Vocabulary – Chapter 826: Electrical installations of buildings*

IEC 60364-4-41, *Electrical installations of buildings – Part 4-41: Protection for safety – Protection against electric shock*

IEC 60364-4-44, *Electrical installations of buildings – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*

IEC 60364-5-52, *Electrical installations of buildings – Part 5-52: Selection and erection of electrical equipment – Wiring systems*

IEC 61084 (all parts), *Cable trunking and ducting systems for electrical installations*

IEC 61386 (all parts), *Conduit systems for electrical installations – Part 1: General requirements*

ISO/IEC 11801, *Information technology – Generic cabling for customer premises*

ISO/IEC 14763-1, *Information technology – Implementation and operation of Customer Premises Cabling – Part 1: Administration*

ISO/IEC 15018,– *Information technology – Integrated cabling for all services other than mains power in homes, SOHO (Small Office, Home Office), and buildings*[1]

[1)] Under consideration.

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3 Definitions and abbreviations

3.1 Definitions

For the purposes of this International Standard, the following definitions apply in addition to those of ISO/IEC 11801 and the IEC 60050(826).

3.1.1
access floor
system consisting of completely removable and interchangeable floor panels that are supported on pedestals or stringers (or both) to allow access to the area beneath

3.1.2
aerial facility
component of the building entrance facility consisting of poles, cable-support strand and support system

3.1.3
alternate entrance
supplementary building entrance facility into a building using a different routing to provide diversity of building entrance facilities for assurance of service continuity

3.1.4
antenna entrance
pathway facility from the antenna to the associated equipment

3.1.5
building pathway
pathway facility for interconnecting telecommunications entrance rooms, equipment rooms, and telecommunications rooms within a building

3.1.6
cable ducting system
a system of closed enclosures of non-circular section, for insulated conductors, cables and cords in electrical installations, allowing them to be drawn in and replaced

3.1.7
cable management system
assembly comprising cable trunking, cable ducting or conduit system to provide an enclosure for the accommodation of insulated conductors and (or) cables

3.1.8
cable trunking system
a system of closed enclosures comprising a base with a removable cover, intended for the complete surrounding of insulated conductors, cables, cords and/or for the accommodation of other electrical accessories

3.1.9
campus pathway
pathway facility for interconnecting telecommunications entrance rooms or spaces of different buildings, as in a campus environment, as well as to the property line for connection off the premises

3.1.10
customer premises
building(s), grounds and appurtenances (belongings) under the control of the customer

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3.1.11
device (as related to a work area)
item such as a telephone, personal computer, graphic or video terminal, sensor

3.1.12
directly buried cable
cable installed under the surface of the ground in direct contact with the soil

3.1.13
entrance point (telecommunications)
point of emergence for telecommunications cabling through an exterior wall, a floor, or from a conduit

3.1.14
entrance room or space
space, preferably a room, in which the joining of campus and building backbone facilities takes place

NOTE The entrance room may also house electronic equipment serving any telecommunications (IT) function.

3.1.15
handhole
structure similar to a small maintenance hole in which it is expected that a person cannot enter to perform work

3.1.16
header ducting
cable ducting placed within the floor to consolidate cables from the distribution ducting to the telecommunications (IT) room

3.1.17
infrastructure (telecommunications)
collection of those telecommunications components, excluding active equipment, that together provide the basic support for the distribution of all information within a building or campus

3.1.18
inner duct
duct placed within a duct

NOTE Also known as subduct.

3.1.19
main terminal space
location of the cross-connect point of incoming cables from the telecommunications external network and the premises cable system

3.1.20
maintenance hole (telecommunications)
vault located in the ground or earth as part of an underground distribution system and used to facilitate placing, connectorization and maintenance of cables as well as the placing of associated equipment, in which it is expected that a person will enter to perform work

3.1.21
open office furniture system
contiguous group(s) of work areas, typically including space divisions, work surfaces, storage and seating within an open office environment

NOTE The space divisions, also known as partitions often contain pathways for telecommunications cabling and power wiring.

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3.1.22
pathway
facility for the placement of telecommunications cable

3.1.23
plenum
compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system

3.1.24
service pole
enclosed pathway extending from the ceiling to furniture or to the floor, that forms a pathway for electrical wiring or telecommunications cable, or both

NOTE It may also be used to mount or contain connecting hardware.

3.1.25
space (telecommunications)
area used for housing the installation and termination of telecommunications equipment (IT) and cabling

NOTE Examples of spaces are equipment rooms, telecommunications rooms, work areas and maintenance holes/ handholes.

3.1.26
suspended ceiling
ceiling that creates an area or space between ceiling material and the structure above

3.2 Abbreviations

EMI Electromagnetic Interference

HVAC Heating, Ventilation, and Air Conditioning

IT Information Technology

4 Conformance

For a pathways and spaces infrastructure to conform to this International Standard the following shall apply:

a) the telecommunications infrastructure within a building is designed and installed around and including the spaces described in clause 6 and utilises one or more pathway systems outlined in clause 7;

b) the telecommunications infrastructure between buildings on a customer's premises (campus) is designed and installed with one or more pathway systems around and including related spaces as outlined in clause 8.

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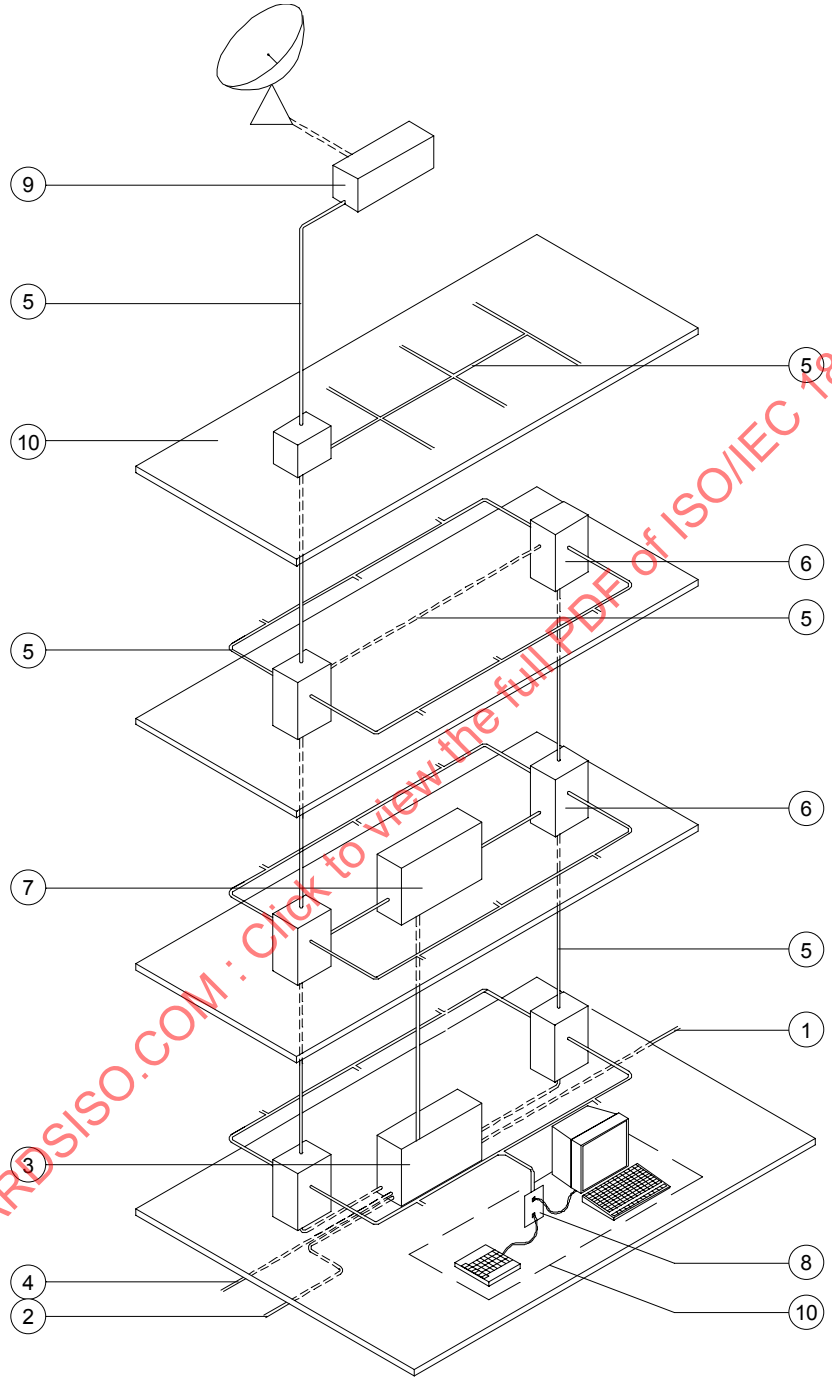
5 Structure of a pathways' and spaces' infrastructure

Figure 1 illustrates the relationships between the major telecommunications pathway and space elements within a building.



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Key

1	Source entrance	6	Telecommunications room
2	Alternate entrance	7	Equipment room
3	Entrance room/Main terminal space	8	Telecommunications outlet
4	Campus pathways	9	Antenna entrance
5	Building pathways	10	Work area

Figure 1 – Basic elements of a pathways' and spaces' infrastructure

6 Building telecommunications spaces

6.1 General

The spaces shall be adequately lit and protected from dust.

6.2 Work area

For building areas where it is difficult to add telecommunications outlets at a later date (for example, private offices), a minimum of two separate outlet locations should be provided in the initial design for that area. They shall be located to offer maximum flexibility for change within the work area, for example on opposing walls in private office space.

Telecommunications outlet locations should be co-ordinated with the furniture layout. A minimum of one power outlet should be installed near each telecommunications outlet.

Independent and direct pathways shall be provided from areas with heavy demands for telecommunications equipment, for example control centres, to the serving telecommunications room or equipment room.

6.3 Telecommunications room

The telecommunications room shall be able to contain telecommunications equipment, cable terminations and associated cross-connect cables.

The telecommunications room should be located as close as practicable to the centre of the area served and preferably in the core area. Horizontal pathways should terminate in the telecommunications room located on the same floor as the area being served.

The telecommunications room space shall be dedicated to the telecommunications function and related support facilities. The telecommunications room space should not be shared with electrical installations other than those for telecommunications.

A minimum of two dedicated electrical outlets shall be provided for equipment power each on a separate circuit. Additional outlets shall be placed around the room at regular intervals.

NOTE Local regulations shall be followed for electrical power distribution.

Equipment not related to the support of the telecommunications room (for example, piping, ductwork, etc.) shall not be installed in, pass through, or enter the telecommunications room.

The following environmental requirements apply only to cabling based on ISO/IEC 11801. HVAC should be included in the design considerations of the telecommunications room to maintain a temperature the same as the adjacent office area. Planning for eventual provisioning, as required, of continuous HVAC (24 hours per day and 365 days per year) shall be included in the initial design. A positive pressure shall be maintained with a minimum of one air change per hour, or as required by local regulations. When active devices (heat producing equipment) are present, a sufficient number of air changes should be provided to dissipate the heat. If a standby power source is available in the building, the HVAC system serving the telecommunications room should also be connected to the standby supply.

6.4 Equipment room

Any or all of the functions of a telecommunications room or building entrance facility may alternatively be provided by an equipment room.

The room shall house only equipment directly related to the telecommunications system and its environmental support systems.

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Equipment room locations that are restricted by building components limiting expansion, such as elevators or fixed building walls shall be avoided. Accessibility for the delivery of large equipment to the equipment room should be provided. Access to shared-use space shall be controlled by the building owner or agent. It is desirable to locate the equipment room close to the backbone pathway.

Floor loading capacity in the equipment room shall be sufficient to bear both the distributed and concentrated load of the installed equipment.

The equipment room shall not be located below water level unless preventive measures against water infiltration are employed. The room shall be free of water or drain pipes not directly required in support of the equipment within the room. A floor drain shall be provided within the room if risk of water ingress exists.

The equipment room shall undergo the same design considerations concerning the main HVAC delivery system as the telecommunications room (see 6.3).

The room shall be located away from sources of electromagnetic interference. Special attention shall be given to electrical power supply transformers, motors and generators, x-ray equipment, radio or radar transmitters and induction sealing devices.

The equipment room shall be sized to meet the known requirements of specific equipment. Sizing shall include projected future as well as present requirements.

Where a room or space is intended to be used for more than equipment (for example, the main terminal and/or entrance facility), it shall be increased in size accordingly and meet the requirements specified in the respective clauses for these facilities.

6.5 Main terminal space

The main terminal space may combine features of a building entrance facility and equipment room. It is commonly used as a separate space in multi-tenant buildings to serve all tenants.

The space shall house only facilities directly related to the telecommunications system and its environmental support systems.

6.6 Entrance room or space

If network interface devices and telecommunications equipment are required in the entrance room, additional space will be needed.

The entrance room or space shall be located in a dry area not subject to flooding and should be as close as practicable to the building entrance point and next to the electrical service room in order to reduce the length of equipotential bonding conductors to the electrical earthing system. See applicable standards and local regulations.

The decision whether a room or open area is provided shall be based on security, quantity, type of protectors, size of building and physical location within the building.

The entrance room shall be sized to meet the known requirements of the specific protectors. Sizing shall include projected future as well as present requirements.

Access shall be made available to the telecommunications earthing system specified by applicable standards and local regulations.

Antenna field entrance rooms shall be designed per applicable standards and local regulations, if any. The antenna entrance room shall be located as close as practicable to the antenna field.

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6.7 Consolidation points

Consolidation points shall be located in accessible, permanent locations. Consolidation points shall not be installed in open office furniture systems unless that unit of furniture is permanently secured to the building structure. The use of suspended ceiling space or access floor space for consolidation points may be acceptable, provided that the space is accessible without moving building fixtures, equipment, or heavy furniture, and without disturbing building occupants. In all cases, the use of consolidation points in plenum spaces used for environmental air shall conform to local regulations.

Consolidation points shall be administered in the same manner as telecommunications cabling, hardware, pathways and spaces as described in ISO/IEC 14763-1.

6.8 Multi-user telecommunications outlet assemblies

Multi-user telecommunications outlet assemblies shall be located in accessible, permanent locations. These assemblies shall not be installed in open office furniture systems unless that unit of furniture is secured to the building structure.

Multi-user telecommunications outlet assemblies shall be administered in the same manner as telecommunications cabling, hardware, pathways and spaces as described in ISO/IEC 14763-1.

6.9 Pull boxes and splice boxes

Pull boxes and splice boxes may be associated with pathways. For the purposes of this Standard, both pull boxes and splice boxes are considered as spaces.

Pull boxes for cable management systems shall be used for the following purposes.

- Installing a draw rope or cable.
- Pulling the cable to the box and then looping the cable to be pulled into the next length of the cable management system. This is usually done only with smaller cables.
- Pull boxes shall not be used for splicing cable.

Splice boxes are intended to be used for splicing in addition to pulling cable.

Pull and splice boxes shall be readily accessible.

Pull and splice boxes should be placed in a straight section of the cable management system and not used in lieu of a bend. The corresponding ends of the cable management system should be aligned with each other. Conduit fittings shall not be used in place of pull or splice boxes.

7 Building pathways

7.1 General

Building pathways are created through pathway systems for horizontal and backbone cabling. Some systems can be used for zone cabling. Several systems may be subdivided by inner duct (also called subduct).

For safety rules for equipotential bonding and earthing of metal pathways, see local regulations and consider referring to IEC 61000-5-1[2] and IEC 61000-5-2[3].

The pathway facility, as a minimum, shall be designed to handle all telecommunications media recognised in ISO/IEC 11801 and ISO/IEC 15018. When determining the size of the

[2] IEC 61000-5-1, *Electromagnetic compatibility (EMC) – Part 5: Installation and mitigation guidelines – Section 1: General considerations*

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

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pathway, the quantity and size of cables, bend radius requirements and allowance for future expansion shall be considered. Unless local regulations permit, pathways shall not be located in elevator shafts.

Building pathways shall be installed in dry locations that protect cables from moisture levels that are beyond the intended operating range of inside premises. All pathway systems shall comply with local regulations.

Co-installation of telecommunication cable and power cable is governed by IEC 60364-4-41, IEC 60364-4-44 as well as IEC 60364-5-52 for safety. The separation for EMI aspects should consider the following:

- separation from power cores;
- separation and barriers within trunking; and
- separation within outlet boxes or compartments.

The separation shall be maintained when the support direction changes (within the horizontal or vertical plane) and/or when going through walls.

The following pathway systems are sorted in alphabetical order.

7.2 Access floor

Access flooring is used in computer and equipment rooms, telecommunications rooms and in general office areas. It is available in combustible, non-combustible and composite panels. There are two types of access flooring: standard height floors and low profile floors. Where access floor is used, give consideration to the impact of also using the space under the access flooring for air handling. Low profile access floors are not recommended for use where the under floor area is a plenum space.

In new construction, the area to receive access flooring should be depressed. The depth of depression should equal the height of the finished access floor.

Where the slab is not depressed, or where the depth of the depression is not equal to the height of the finished access floor, provision shall be made for ramps or steps to the access floor. Building codes shall be followed for both ramp and step assemblies.

Service outlet placements shall be co-ordinated with work area location to provide adequate access. Service outlets shall not be placed in traffic areas or where they create a hazard to the occupants.

Care should be taken to ensure there is sufficient clearance below the access floor surface. Consideration should be given to the following:

- quantity of cables, especially in areas with restricted access;
- secondary pathway system, if any;
- crossings of cable runs;
- bend radius limitations of the cable to enable cable exit;
- sufficient space for access;
- other services.

The access floor layout shall be determined prior to the installation of any equipment or telecommunications cabling.

The telecommunications room and access floor area served should be located adjacent to each other.

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7.3 Cable trunking systems

Cable trunking system types include

- wall and ceiling cable trunking systems,
- floor cable trunking systems,
- service poles made from cable trunking.

NOTE For trunking/ducting systems for floor installation, see 7.10

Cable trunking systems shall conform to IEC 61084.

Cable trunking systems can be used to create perimeter pathways to serve areas where telecommunications devices can be reached from the walls. Cable trunking systems, consisting of cable trunking, couplings, elbows and similar fittings and apparatus mounting devices is mounted directly on wall surfaces at appropriate levels to provide a continuous perimeter pathway. Telecommunications outlets are located along the pathway and may be moved or added after initial installation.

With perimeter pathways the devices in the room depend on services from fixed wall areas. In large rooms with partitions, the pathway may be extended to the work area.

Systems mounted flush to the floor surface shall have removable cover plates through its entire length so that cables may be placed rather than pulled in. The cover plates shall have means for levelling to the intended finished floor surface and shall be designed to prevent entry of water into the system.

7.4 Cable tray and ladder systems

Cable tray and ladder systems are prefabricated structures for supporting cables or conductors, which are pulled or laid in place after the pathway has been installed.

Typical examples of cable trays:

- channel cable tray;
- ladder cable tray;
- solid-bottom cable tray;
- perforated cable tray;
- spine cable tray (centre rail construction);
- wire tray (welded wire construction);
- mesh cable tray (wire or plastic mesh).

Cable tray and ladder may be located below or above the ceiling or within an access floor.

The specified bend radii limitations of the cables and the weight loading of the pathway shall be observed.

7.5 Conduit systems and cable ducting systems

Conduit system types include

- rigid conduit systems,
- pliable conduit systems,
- flexible conduit systems.

Conduit systems shall conform to IEC 61386.

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Cable ducting systems shall conform to IEC 61084.

The use of conduit systems or cable ducting systems as a pathway system for telecommunication cabling is only considered when

– it is required by local regulations,

– outlet locations are permanent,

– device densities are low,

– flexibility is not required.

In-floor conduit systems or cable ducting systems are especially inflexible as they are usually buried in concrete.

Minimum requirements for installed conduits, such as support, end protection and continuity, are found in relevant standards or local regulation.

No section of conduit should be longer than 15 m between pull points. No section of conduit shall contain more than two 90° bends, or equivalent, between pull points (for example, outlets, telecommunications rooms or pull boxes). Any reverse (U-shaped) bend in the section shall be made accessible with a pull box.

The inside radius of a bend in conduit shall be at least 6 times the internal diameter. Bends in the conduit shall not contain any kinks or other discontinuities that may have a detrimental effect on the cable sheath during cable pulling operations.

Any single conduit run extending from a telecommunications room shall not serve more than three outlet boxes. Conduits should be incrementally increased in size from the furthest outlet box toward the telecommunications room.

Conduits protruding through the floor in the telecommunications room shall be terminated 25 mm to 75 mm above the floor surface. This protrusion aids in preventing poured concrete from entering the conduit during construction and protects cabling and fire-stop materials from water and other liquid spills.

7.6 Furniture pathways

Pathways for open office furniture systems are entered from building walls, columns, ceilings, or floors.

The following information is generally needed to be shared among manufacturer, customer /designer and installer:

- the number, type and location of cable connections required in each work area;
- the diameter and minimum bend radius of each cable type;
- the strategy for connecting building pathways to furniture pathways, including the number, placement and cross-sectional area of the required interfaces;
- furniture pathway cross-sections and cable capacities;
- the number of work areas in each furniture cluster.

Physical tests are the preferred method to determine pathway cable capacity. Pathways used to interconnect the furniture with building pathways shall have sufficient cross-sectional area to serve the work area or work area cluster.

Sweeping bends are not required, as most furniture pathways allow laying-in the cable. The effective cross-section of furniture pathways may be reduced at corners or behind telecommunications outlets/connectors. Furniture manufacturers shall publish information on their products allowing users to determine effective pathway cross-section reduction for representative cables.

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Furniture pathways often run parallel to power pathways. In these cases, separation between channels and compartments of a multi-channel pathway may be required by local regulations.

Where demountable partitions are used to conceal the cables, a snap-in panel or cover shall be provided. Alternatively, a hollow wall may be used to conceal the cable if an accessible space or conduit of sufficient size is provided.

7.7 In-wall cabling

If permitted by local regulations the space in drywalls may be used to run telecommunications cabling horizontally through openings in the studs or vertically between studs. Conduit or fasteners can be employed to guide and support the cables.

7.8 Pathways with non-continuous fasteners and fixings

Specially designed fasteners and fixings may be used to create pathways in ceiling and access floor areas. Rules covering installations in both air plenums and nonplenum areas may be found in local regulations.

Pathway systems with fasteners and fixings shall meet the following conditions:

- inaccessible areas, such as those covered by lock-in type tiles, drywall or plaster, shall not be used for distribution pathways. The tiles shall be removable;
- adequate and suitable space is available in the ceiling or access floor area for the designed layout.

The design shall provide a suitable means and method for supporting cables from the telecommunications room to the work areas to be served or for backbone cables between telecommunications rooms. Fasteners and fixings may be attached to the building structure or substructures, for example, beams, flanges, strut, messenger wire (catenary system). Cable shall not be laid directly on the ceiling tile or rails.

A clearance of at least 75 mm shall be available above the suspended ceiling to enable removal of the tiles and access to the horizontal cabling and pathway.

Fastener and fixings should be spaced 1,2 m to 1,5 m apart. The sag of the cables at the midpoint between supports should not exceed 0,3 m. The design of the fastener and fixings shall provide a sufficient bending radius for the cables.

7.9 Service poles

Service poles provide pathways for the wires and cables from the ceiling to the work area. Service poles used for both telecommunications and power distribution shall comply with local regulations.

Service poles shall be rigidly attached to a suitable structural member, preferably the main ceiling support channel. They should not be attached to the transverse or short length channels unless they are also rigidly secured to the main support channel. When service poles are used, the main ceiling rails shall be rigidly installed and braced to overcome movement, both vertical and horizontal.

7.10 Trunking/ducting systems for floor installation

Trunking/ducting systems for floor installation are a cable management system embedded in the floor. Access or handhole units shall be placed in distribution runs to permit changes in direction and provide access for pulling cables.

The floor structure affects the type of system that can be accommodated in the floor. The total depth of concrete and method of pour will dictate the selection of the system.

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- In a monolithic pour, the system is typically installed in the midpoint of the slab.
- In slab-on-grade construction, special consideration should be given to maintaining the level of the system.
- In a double-pour floor, the system is installed on the structural slab. The second pour buries the system.
- In a prestressed concrete pour, pre-set inserts shall be used with the system.
- When prefabricated concrete members are utilised, the system is buried in the concrete topping.

NOTE For floor cable trunking systems, see 7.3.

After the parallel distribution runs have been designed, the cross runs of header ducting and access units are determined by the density of the service requirements and the area to be supplied from each telecommunications room. Provisions shall be made to connect the system to the telecommunications rooms by a number of enclosed header ducting home runs. The systems shall terminate in the telecommunications room with a slot or elbow, as applicable.

The access or handhole unit provides access at the point of intersection of two or more ducts. In multiducting layouts, the interior of the access unit shall be partitioned to allow complete separation of the systems. The cover plate shall be designed to prevent entry of water and shall have a means of levelling it to the surrounding floor area.

Service fittings are available in several different types that serve from one to many different services. If electrical power is one of the services in a combined fitting, the fitting shall be fully partitioned.

Dedicated in-floor boxes are installed in the floor on a predetermined grid of the distribution layout, providing access to all services. When services are required, assemblies containing the connecting devices for each system are installed along with a floor finish egress plate.

8 Campus pathways and related spaces

8.1 General

Campus pathways link entrance rooms of different buildings and consist of underground, buried, aerial and tunnel pathways. The pathway facility, at a minimum, shall be designed to handle all cable media recognised in ISO/IEC 11801.

A campus entrance pathway shall be provided in a campus. As a minimum, this facility shall provide access for the local service provider. Where several service providers require access to a campus/building, an example of a pathway system provided by the building owner is shown in Annex C.

In determining the total number of pathways required, the planner shall consider the following:

a) type and use of building;

b) expected expansion;

c) difficulty of adding pathways in the future;

d) alternate entrance;

e) type and size of cables likely to be installed.

Easements, permits, or right-of-ways may be required for construction of the pathway. An alternate building entrance facility should be provided where security, continuity of service, or other special needs exist.

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8.2 Directly buried pathways

A directly buried facility is a component of the building entrance facility where the telecommunications service cables are completely encased in the earth. Direct burial is achieved by trenching, augering or boring, or plowing. The designer should consider that although direct burial may be more economical initially, the cable facilities cannot be reinforced or replaced easily. Even though directly buried facilities are recognised by this Standard, they are not recommended for customer premises' cabling.

8.3 Underground pathways

Underground entrance preplanning shall include land development, topographical limitations and grading of underground facility to permit drainage. The facility may require venting of gaseous vapours. Vehicular traffic and landscaping shall be considered in order to determine depth of cover over the facility and whether concrete encasement is necessary.

It is recommended that underground telecommunications facilities be not in the same vertical plane as other utilities, such as water or power that share the same trench. Utility services should be located horizontally with respect to each other, in compliance with local regulations.

8.4 Tunnels

The service entrance to a building in a campus environment may be via a utility tunnel.

8.5 Aerial

When contemplating the use of aerial facilities, consider:

a) aesthetics of the building and surrounding location;
b) storm or ice loading;
c) tree placement and growth;
d) applicable local regulations;
e) clearances and separation from electrical wiring and road;
f) mechanical protection;
g) span lengths;
h) building attachments;
i) future cable plant reinforcements;
j) number of cables involved.

8.6 Building entrance facility

The building entrance facility consists of the telecommunications service entrance to the building, including the entrance through the building wall, and continuing to the entrance room or space. The building entrance facility may contain the backbone pathways that link to the main terminal space and to other buildings in campus situations. Antenna entrances may also constitute part of the building entrance facility.

All carriers and telecommunications providers involved in providing service to the building shall be contacted to establish their requirements and explore options for delivering service. The location of other utilities, such as electricity, water, gas and sewer, shall be considered in the selection of the telecommunications building entrance facility location. An alternate building entrance facility should be provided where security, continuity of service or other special needs exist.

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A service entrance pathway shall be provided. In determining the total number of pathways required, the planner shall consider

a) the type and use of building,

b) the growth,

c) the difficulty of adding pathways in the future;

d) an alternate entrance,

e) the type and size of cables likely to be installed.

A pull box shall be installed inside the building at the entrance point for cable pulling and splicing when

f) the building conduit is extended from the entrance conduit, or

g) warranted by excessive conduit length, or

h) the quantity of bends exceeds the equivalent of two 90° bends.

8.7 Maintenance holes

A maintenance hole is used to pull in and splice cables in an underground, concealed manner. Maintenance holes shall be equipped with a sump, corrosion-resistant pulling iron, cable racks and ladders that are earthed according to local regulations. Telecommunications maintenance holes shall not be used as a pathway for power and light conductors, except where required for support of telecommunications equipment.

Considerations referring to the size of maintenance holes shall include

– the ultimate duct structure,

– the need for equipment located in the maintenance hole,

– coexistence with other utilities.

Maintenance hole frames and covers shall meet the requirements of the location. These include types for heavy vehicular traffic and those for lighter loads.

8.8 Handholes

Considerations referring to the use of handholes are the following.

a) A handhole may be used to aid cable pulling when:
   1) the bends exceed either two 90° bends or a total of 180°; or,
   2) the section length of conduit requires the pulling in of cable in two segments.

b) A handhole shall not be used in place of a maintenance hole in a main system facility.

c) A handhole should not be utilised for splicing cables.

d) Conduits entering the handhole shall be aligned on opposite walls of the hole at the same elevation.

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Annex A
(informative)

Pathway and cable stresses

Table A.1 – Pathways and cable stresses

Cable Stress → Pathway ↓	Pulling Strength	Crush Resistance	Sheath Abrasion	Cable Weight	Solar UV Exposure	Pollution/ chemical attack	Moisture	Vermin attack	Temperature range	Comments
Hollow wall cavity	–	–	X	–	–	–	–	–		Bushings required around sharp edges, holes through studs
Duct in wall or on wall	X	–	X	–	–	–	–	–		
Cable embedded in wall under plaster	–	X	X	–	–	–	*	–		* Moisture during plaster application only
Ceiling space duct/conduit	X	–	–	–	–	–	–	–		
Ceiling space suspended tray	X	X	–	X	–	–	–	*	*	* In space between upper floor ceiling and roof
Ceiling space catenary wire	X	X	X	X	–	–	–	*	*	* In space between upper floor ceiling and roof
Ceiling space support hooks	X	–	X	X	–	–	–	*	*	* In space between upper floor ceiling and roof
In-slab or under floor duct/conduit	X	–	X	–	–	–	–	–	–	
Tray under raised access floor	–	–	X	X	–	–	*	–	–	*Tray should be above floor drain level to prevent immersion in the event of accidental flooding
Catenary suspended under lowest floor *	X	X	X	X	–	–	–	XX	–	*May be used where space exists between lowest floor and earth
Vertical riser	X	X	X	X	–	–	–	–	–	
Vertical duct	X	–	X	X	–	–	–	–	*	*Consider temperature if duct external to building

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Table A.1 (*continued*)

Cable Stress → Pathway ↓	Pulling Strength	Crush Resistance	Sheath Abrasion	Cable Weight	Solar UV Exposure	Pollution/ chemical attack	Moisture	Vermin attack	Temperature range	Comments
Underground duct	XX	–	XX	–	–	*	XX	XX	X	* Danger in contaminated ground
Directly buried underground	–	XX	X	–	–	*	XX	X	XX	* Danger in contaminated ground
Ploughed-in underground	X	XX	XX	–	–	*	XX	X	XX	* Danger in contaminated ground
Trench duct with removable covers	–	–	X	–	–	–	X	XX	XX	
Outdoor over-head gantry/tray	–	XX	X	X	XX	X	X	XX	XX	
Overhead gantry in conduit	XX	–	X	X	–	–	–	–	XX	
Aerial outdoor*	X	–	–	XX	XX	X	X	X	XX	*Drip loop required at entry into buildings

Bend Radius: For minimum bend radius of the cables refer to the manufacturer's specifications.

Site Conditions: During construction cable may be lying on the ground or floor off the cable drum or reel prior to being pulled through or placed into pathway. Mechanical protection is required to ensure cable is not driven over by vehicles or damaged by foot traffic and use of tools.

Electrical and physical safety: It is assumed that the pathway is installed to meet regulation safety segregation and safety or EMC clearance.

Cable type selection: The selection of correct cable type for the application is assumed. For example:

- Plenum rated
- Halogen free
- UV stabilised
- Moisture barrier/gel filled
- Steel armoured
- Screened
- Chemical resistant
- Liquid tight
- Fire rated

Pathway selection: The selection of the correct pathway system is also assumed. For example:

- Liquid tight
- Chemical resistant
- Gas tight
- Explosion proof/intrinsically safe
- UV stabilised
- Strength to withstand road traffic or falling hard objects
- Waterproof/steam proof

X = Important XX = Very important

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