

Standard for
**Installing Commerical Building
Telecommunications Cabling**



Published by
National Electrical
Contractors Association



Jointly developed with
BICSI®—
A Telecommunications Association



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NECA/BICSI 568-2006

Standard for
**Installing Commercial Building
Telecommunications Cabling**

**An American
National Standard**



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Contractors Association



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Table of Contents

Foreword	v
1. Scope	1
1.1 Products and Applications Included	1
1.2 Regulatory and Other Requirements	1
1.3 Local Code Requirements	2
2. Definitions, Acronyms, Abbreviations, and Units of Measure	3
2.1 Definitions	3
2.2 Acronyms, Abbreviations, and Units of Measure	13
3. Support Structures	14
3.1 General	14
3.2 Pathways	14
3.2.1 General	14
3.2.2 Cable trays	14
3.2.3 D-rings and mushrooms	16
3.2.4 Conduits	16
3.2.5 Supports	18
3.2.6 Surface raceway	18
3.3 Spaces	18
3.3.1 Plywood	18
3.3.2 Equipment racks	19
3.3.3 Floor-mounted cabinets	20
3.3.4 Wall-mounted equipment racks and cabinets	20
3.4 Bonding Infrastructure	20
3.4.1 General	20
3.4.2 Bonding conductor	20
3.5 Installing Cable Support Systems	20
3.5.1 General	20
4. Pulling Cable	24
4.1 General	24
4.2 Cable Pulling Setup	24
4.2.1 Overview	24
4.2.2 Pulling horizontal cable in conduit	25
4.2.3 Pulling horizontal cable in open ceiling	25
4.2.4 Pulling backbone in vertical pathway—from top down	25
4.2.5 Pulling backbone in vertical pathway—from bottom up	25

4.2.6	Pulling backbone—horizontal	25
4.2.7	Cable pulling precautions	25
5.	Firestopping	26
5.1	General	26
5.2	Typical Installations	27
5.2.1	Sealing a floor penetration with putty	27
5.2.2	Sealing an outlet box with putty	28
5.2.3	Steps—restore penetrations (general)	29
6.	Cable Terminations	31
6.1	General	31
6.2	Pre-termination Functions	31
6.3	Copper IDC Termination	31
6.3.1	General	31
6.3.2	Steps—IDC termination	32
6.4	Fiber Termination	33
6.5	Copper Cable Splicing	33
6.6	Optical Fiber Cable Splicing	34
7.	Installation Verification	35
Annex A:	Field Test Requirements	36
A.1	General	36
A.2	100-Ohm Balanced UTP Cabling	36
A.2.1	Test instruments	36
A.2.2	Performance parameters	36
A.2.3	Permanent link test configuration	36
A.2.4	Channel test configuration	37
A.2.5	Backbone and other cabling test configuration	37
A.3	Optical Fiber Cabling	37
A.3.1	Test instruments	38
A.3.2	Performance parameters	38
A.3.3	Cabling test configuration	38
A.3.4	Verifying test jumper quality	38
Annex B:	Reference Standards	41

List of Tables

Table 1	Minimum conduit bend radius	17
Table 2	Minimum separation distances from possible sources of EMI exceeding 5kVA	22
Table 3	Preferred color coding scheme for premises cable jackets (ANSI/TIA-598-C)	24
Table 4	Color-code chart up to 600 pair	32
Table 5	Optical fiber color code chart (ANSI/TIA-598-C)	33
Table 6	Acceptable mandrel diameters for common multimode cable types (five wraps)	38

List of Figures

Figure 1	Example of structured cable system	1
Figure 2	Suspended cable tray (tubular)	14
Figure 3	Wall bracket support (tubular)	15
Figure 4	Mesh cable tray	15
Figure 5	Elevation view of cable tray installed on the rear wall of a telecommunications room	15
Figure 6	Typical backboard layout using distribution-rings	16
Figure 7	Spools (Mushrooms)	16
Figure 8	Plywood installation over drywall using toggle bolts	19
Figure 9	Tear off putty	27
Figure 10	Building bottom of penetration seal	27
Figure 11	Filling the penetration	27
Figure 12	Building top on penetration	28
Figure 13	Overlap the pad on outlet box	28
Figure 14	Second pad of putty on outlet box	28
Figure 15	Joining the pads on outlet box	28
Figure 16	Conduit penetration through masonry wall or floor	29
Figure 17	Fire seal of drywall	29
Figure 18	Fire seal cable tray penetration	30
Figure 19	Wiring schemes	31
Figure 20	Shield bond connector and braid	34
Figure 21	In-line splice configuration	34
Figure 22	Foldback splice configuration	34
Figure 23	Permanent link test configuration	36
Figure 24	Channel test configuration	37
Figure 25	Example of OLTS reference measurement (P1) with one test jumper (multimode)	39
Figure 26	Example of a measurement (P2) when verifying OLTS test jumpers (multimode)	39
Figure 27	Example of OLTS reference measurement (P1) with one test jumper (multimode)	40
Figure 28	Example of a multimode link attenuation measurement (P2)	40

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(This foreword is not a part of the standard)

Foreword

National Electrical Installation Standards™ (NEIS®) are designed to improve communication among specifiers, purchasers, and suppliers of electrical construction services. They define a minimum baseline of quality and workmanship for installing electrical products and systems. *NEIS* are intended to be referenced in contract documents for electrical construction projects. The following language is recommended:

Commercial building telecommunications cabling shall be installed in accordance with NECA/BICSI 568-2006, *Standard for Installing Commercial Building Telecommunications Cabling* (ANSI).

In 1998, a large number of companies representing the telecommunications and electrical industry expressed concern over the lack of a standard for installation of telecommunications premises cabling systems. The National Electrical Contractors Association (NECA) asked BICSI®, A Telecommunications Association, to jointly undertake the task of developing the required standard. BICSI accepted the task and the project was assigned to BICSI/NECA Joint Technical Committee 1 for the Development of Telecommunications Cabling Installation Guidelines.

BICSI and NECA standards documents are developed within the Technical Committees of BICSI and NECA. Members of these committees serve voluntarily and without compensation. The companies they represent are not necessarily members of BICSI or NECA. The standards developed within these committees represent a consensus of the broad expertise on the subject. This expertise comes from within BICSI and NECA as well as from those out-

side that have an expressed interest. The viewpoint expressed at the time this standard was approved was from the contributors' experience and the state of the art at that time. Users are encouraged to confirm that they have the latest revision of the standard.

BICSI/NECA/JTC1 reviews its standards, at the minimum, every 5 years. At that time standards are reaffirmed, rescinded or revised according to the submitted updates. Updates to be included in the next revision should be sent to the committee chair or to BICSI/NECA/JTC1.

This standard has been prepared by BICSI/NECA/JTC1 under the joint jurisdiction of BICSI and NECA and approved by consensus ballot.

Use of *NEIS* is voluntary, and neither NECA nor BICSI assume any obligation or liability to users of this publication. Existence of a standard shall not preclude any member or nonmember of either organization from specifying or using alternate construction methods permitted by applicable regulations.

This publication is intended to comply with the edition of the *National Electrical Code®* (NEC®) in effect at the time of publication. Because they are quality standards, *NEIS* may in some cases go beyond the minimum safety requirements of the NEC. It is the responsibility of users of this publication to comply with state and local regulatory codes when installing electrical products and systems.

Suggestions for revisions and improvements to this standard are welcome. They should be addressed to:

NECA/BICSI 568 Standard for Installing Commercial Building Telecommunications Cabling

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1. Scope

1.1 Products and Applications Included

A structured cabling system is a complete collective configuration of cabling and associated hardware on a premises which, when installed, provides a comprehensive telecommunications infrastructure. This infrastructure is intended to support a wide range of telecommunications services such as telephone and computer networks. Figure 1 illustrates an example of components that comprise a structured cabling system.

This Standard describes minimum requirements and procedures for installing the infrastructure for telecommunications including balanced twisted pair copper cabling and optical fiber cabling that transport telecommunications signals (e.g., voice, data, video). Installers should always follow applicable codes and manufacturers' instructions. This Standard is intended to be used in describing a "neat and workmanlike manner" as referenced by ANSI/NFPA 70, the National Electrical Code (NEC).

1.2 Regulatory and Other Requirements

- All information in this publication is intended to conform to the National Electrical Safety Code (ANSI/IEEE C2) and National Electrical Code (ANSI/NFPA 70). Installers should always follow the NESC, NEC, applicable state and local codes, manufacturer's instructions, and contract documents when installing telecommunications cabling.
- Only qualified persons familiar with telecommunications cabling should perform the work described in this publication. It is recommended that all work be performed in accordance with NFPA 70E, *Standard for the Electrical Safety in the Workplace*.
- General requirements for installing electrical products and systems are described in the latest version of NECA 1, *Standard Practices for Good Workmanship in Electrical Contracting* (ANSI). Other *NEIS* provide additional guidance for installing particular types of electrical products and systems. A complete list of *NEIS* is provided in Annex B. The installation should follow the NEC, applicable state

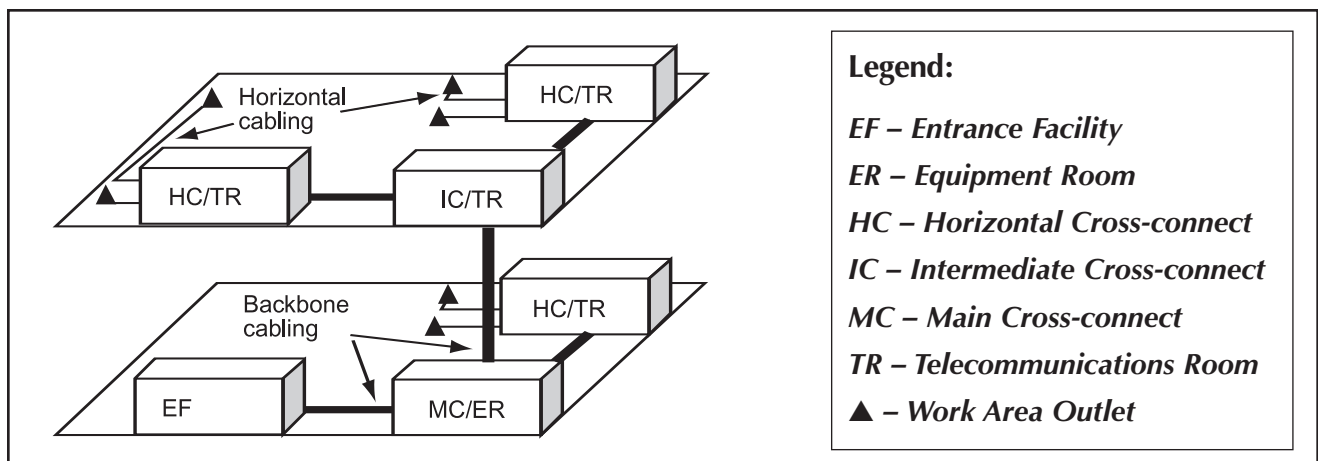


Figure 1—Example of structured cabling system

and local codes, and manufacturers' instructions for the installation of electrical and telecommunications products and systems.

d) Information within this standard is intended to comply with the following standards.

- ANSI/NFPA 70-2005; *National Electrical Code*
- ANSI/TIA 455-78-B-2002; *Optical Fibres – Part 1-40: Measurement Methods and Test Procedures – Attenuation*
- ANSI/TIA 598-C-2005; *Optical Fiber Cable Color Coding*
- ANSI/TIA 526-7-1998; *Optical Power Loss Measurements Of Installed Single-mode Fiber Cable Plant*
- ANSI/TIA 526-14-A-1998; *Optical Power Loss Measurements Of Installed Multimode Fiber Cable Plant*
- ANSI/TIA 568-B Series-2001; *Commercial Building Telecommunications Cabling Standard*
- ANSI/TIA 606-A-2002; *Administration Standard for the Telecommunications Infrastructure of Commercial Buildings*
- ANSI/J-STD 607-A-2002; *Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications*
- ANSI/TIA 569-B-2004; *Commercial Building Standard for Telecommunications Pathways and Spaces*
- TIA/TSB 140-2004; *Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems*

erning authority. Most of the code requirements for the job should be included in the scope of work documents. The installer should never take this information for granted, since the telecommunications contractor is fully responsible for all work done on the project.

If no code has been adopted locally, consult with the fire marshal's office to determine what agency is responsible for that geographic area and what codes are in effect. Do not depend on other installers, contractors, or even company personnel in making these determinations.

1.3 Local code requirements

Local code requirements shall be followed. Always review the local code requirements with the local AHJ before proceeding with the installation. This includes reviewing what code and edition is adopted, and what, if any, exceptions to the code are adopted by the gov-

2. Definitions, Acronyms, Abbreviations, and Units of Measure

2.1 Definitions

For the purposes of this standard, the following definitions apply:

Administration The method for labeling, documentation, and usage needed to implement moves, additions, and changes of the telecommunications infrastructure.

Alien Crosstalk A measure of the unwanted signal coupling between adjacent cabling or components.

All-Thread-Rod A straight section of round rod stock that has threads installed over its entire length. Also known as a threaded rod. American wire gauge:

Anchor

1. A fastening device.
2. In an outside plant environment, a device made up of a single plate or series of flat plates and combined with a rod having a connecting eye.

Architectural Structures Walls, floors, floor/ceilings, and roof/ceilings that are load bearing.

As-built The documentation of measurements, location, and quantities of material work performed. May be in the form of marked up documents or other work order forms.

Attenuation

The decrease in magnitude of transmission signal strength between points, expressed as the ratio of output to input. Measured in decibels (dB), usually at a specific frequency for copper or wavelength for optical fiber, the signal strength may be power or voltage.

Authority Having Jurisdiction (AHJ)

The entities responsible for interpretation and enforcement of local building and electrical codes.

Backboard

A panel (e.g., wood, metal) used for mounting connecting hardware and equipment.

Backbone

1. A facility (e.g., pathway, cable, conductors) between any of the following spaces: telecommunications rooms, telecommunications enclosures, common telecommunications rooms, floor-serving terminals, entrance facilities, equipment rooms, and common equipment rooms.
2. In a data center, a facility (e.g., pathway, cable, conductors) between any of the following spaces: entrance rooms or spaces, main distribution areas, horizontal distribution areas, and telecommunications rooms.

Backbone Cable	See <i>Backbone</i> and <i>Backbone Cabling</i> .	Bonding	The permanent joining of metallic parts to form an electrically conductive path that will ensure electrical continuity and the capacity to conduct safely any current likely to be imposed.
Backbone Cabling	Cable and connecting hardware that provides interconnections between telecommunications rooms, equipment rooms, and entrance facilities. See <i>backbone</i> .	Bonding Conductor	A conductor used specifically for the purpose of bonding.
Backbone Pathway	The portion of the pathway system that permits the placing of backbone cables between the entrance location and all cross-connect points within a building and between buildings.	Bonding Conductor for Telecommunications	A conductor that interconnects the building's service equipment (power) ground to the telecommunications grounding system.
Bandwidth	1. A range of frequencies available for signaling expressed in hertz. 2. The information handling capability of a medium, expressed in units of frequency (hertz).	Braid	A group of non-insulated conductors interwoven to surround one or more insulated conductors.
Beam Clamp	A device attached to a building structure to hold cable supports or equipment.	Bullwheel	A large wheel used to maintain an arc when feeding large cables into a backbone pathway.
Bend Radius	The radius of curvature that a media can bend without signal degradation.	Bundle	1. Many individual optical fibers contained within a single jacket or buffer tube. Also, a group of buffered optical fibers distinguished in some fashion from another group in the same cable core. 2. Also used to indicate time and common handling of multiple cables routed together.
Binder Group	One of two or more bound copper pairs or optical fiber strands within a cable.	Cabinet	A container that may enclose connection devices, terminations, apparatus, wiring, and equipment.
Blueprint	A reproduction of an architectural plan and/or technical drawing that provides details of a construction project or an existing structure.	Cable	An assembly of one or more insulated conductors or optical fibers within an enveloping sheath.

Cable Run	A length of installed media, which may include other components along its path.	Cabling System	A specific system of cables, equipment/patch cords, connecting hardware, and other components supplied as a single entity.
Cable Sheath	A covering over the optical fiber or conductor assembly that may include one or more metallic members, strength members, or jackets.	Channel	1. The end-to-end transmission path connecting interfaces of any two pieces of application-specific equipment. Equipment cords and work area cords are included in the channel. 2. In frequency division multiplexing, a band in the frequency spectrum that is assigned to a specific logical connection. 3. In time division multiplexing, a time that is assigned to a specific logical connection.
Cable Support System	A combination of conduits, cable trays, support hooks, tie wraps, and any other hardware pieces used in a cabling installation to support cables. Cable support systems keep excess stress off the cables and may provide some mechanical protection to the cables being supported.		
Cable Termination	The connecting or termination hardware applied to the end of a cable for the purpose of facilitating connection to active or passive transmission equipment.	Channel Stock	A metallic U-shaped bar with or without evenly spaced holes. Often hung in a trapeze configuration for support of pathway systems, such as conduits and cable trays.
Cable Tray	A rigid structure for supporting, housing and protecting cables or conductors. Usually consists of one-piece solid or ventilated bottom or individual transverse members with two side rails.	Circuit	The electrical or optical path used for communications between two devices.
		Code	A rule intended to ensure safety during the installation and use of materials, components, fixtures, systems, premises, and related subjects. Codes are typically invoked and enforced through government regulation.
Cable Tree	A vertical rack with multiple arms for holding small reels of cable.		
Cabling	A system of cables, cords, and connecting hardware. equipment/patch cords, and connecting hardware.	Commercial Building	A building, or portion thereof, that is intended for office use.

Conduit	1. A raceway of circular cross-section. 2. A structure containing one or more ducts.	Cross-connect	A facility enabling the termination of cable elements and their inter-connection or cross-connection.
Conduit Stub-out	A short section of conduit that is installed from a receptacle box, usually in a wall, curved into an accessible ceiling space.	Cross-connection	A connection scheme between cabling runs, subsystems, and equipment using patch cords or jumpers that attach to connecting hardware on each end.
Conduit Stub-up	A short section of conduit that is installed from a receptacle box, usually in a wall, into an accessible ceiling space directly above the receptacle box.	Crossed Pairs	An error condition where physical connection of a wire or wires in a pair of wires is made to another wire or wires in yet another pair of wires generally found in the same cable.
Cone	Safety marker that is used to designate a secure off-limits area for non-workers.	Decibel	A logarithmic unit for measuring the relative voltage, power (in watts) or strength (in voltage or current) of a signal. A decibel is one tenth of a bel.
Connecting Hardware	A device, or combination of devices, used to connect two cables or cable elements.	Distribution Ring	Wire management ring shaped like the letter D for routing and supporting distribution cables and jumpers/patch cables on a backboard.
Connector	A mechanical device used to provide a means for aligning, attaching, and achieving continuity between conductors or optical fibers.	Dressing	Placing cables into a neat and symmetrical pattern for proper alignment and positioning for termination.
Consolidation Point	A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.	Drywall	An interior wall construction consisting of gypsum or plasterboard.
Core	The central, light-carrying part of an optical fiber through which light pulses are transmitted.	Duct	1. A single enclosed raceway for conductors, wires, or cables. See also raceway. 2. An enclosure in which air is moved. Generally part of the heating, ventilating, and air-conditioning system of a building.
Crimp	The act of clamping connectors to a cable.		

Entrance Facility (Telecommunications)	An entrance to a building for both public and private network service cables (including antennae) including the entrance point at the building wall and continuing to the entrance room or space.	Firewall	1. A continuous barrier used to prevent fire spreading from one fire zone or area to another. 2. One or more security mechanisms (hardware and/or software) designed to prevent, detect, suppress, and/or contain unauthorized access to a network.
Entrance Room (Telecommunications)	A space in which the joining of campus or building telecommunications backbone facilities takes place.	Floor Slab	1. That part of a reinforced concrete floor, which is carried on beams below. 2. A concrete mat poured on subgrade serving as a floor rather than as a structural member.
Equipment Room (Telecommunications)	An environmentally controlled centralized space for telecommunications equipment that usually houses a main or intermediate cross-connect.	Foldback Splicing	Process of folding back conductors in a splice for future maintenance or rearrangements.
Fire Retardant	Any substance added to delay the start of fire ignition or to slow the spread of flame by the burning material.	Ground	A conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth, or to some conducting body that serves in place of earth.
Firestop	A fire-rated material, device, or assembly of parts installed in a penetration of a fire-rated barrier.	Ground Electrode	A conductor, usually a rod, pipe, or plate (or group of such conductors), in direct contact with the earth for the purpose of providing a low-impedance connection to earth.
Firestop System	A specific listed assembly consisting of the material(s) (firestop penetration seals) that fill the opening in the wall or floor assembly, and around and between any items that penetrate the wall or floor (e.g., cables, cable trays, conduit, ducts, pipes), and any termination devices (e.g., electrical outlet boxes) along with their means of support.	Grounded	Connected to earth or to some conducting body that serves in place of the earth.
		Ground Wire	See <i>bonding conductor</i> and <i>bonding conductor for telecommunications</i> .

Grounding System	A system of hardware and wiring that provides an electrical path from a specified location to an earth ground point.	Insulation	The dielectric material that physically separates wires and prevents conduction between them.
Horizontal Cable	Distribution media that connect the telecommunications outlet/ connector at the work area and the first piece of connecting hardware in the horizontal cross-connect.	Insulation Displacement Contact	A type of wire termination in which the insulation that is surrounding a conductor is displaced at the connection point without physically stripping the insulation from the conductor and consequently makes a gas-tight connection to the conductor.
Horizontal Cross-connect	A group of connectors (e.g., patch panel, punch-down block) that allows equipment and backbone cabling to be cross-connected with patch cords or jumpers. Floor distributor is the international equivalent term for horizontal cross-connect.	Interconnection	1. A connection scheme that employs connecting hardware for the direct connection of a cable to another cable without a patch cord or jumper. 2. A type of connection in which single-port equipment connections (e.g., 4-pair and optical fiber connectors) attach to horizontal or backbone cabling by means of patch cord or jumper.
Infrastructure (Telecommunications)	A collection of those telecommunications components, excluding equipment, that together provide the basic support for the distribution of all information within a building or campus.	Intermediate Cross-connect	The connection point between a backbone cable that extends from the main cross-connect (first-level backbone) and the backbone cable from the horizontal cross-connect (second-level backbone).
In-line Splice	A splice in which cable enters one endcap and, after splicing the cable, exits the other endcap of the closure.	Jacket	The outer layer of a cable. See <i>Cable Sheath</i> .
Innerduct	A non-metallic pathway, usually circular, placed within a larger pathway.	J-hook	A supporting device for horizontal cables that is shaped like a "J." It is attached to some building structures. Horizontal cables are laid in the opening formed by the "J" to provide support for the cables.
Insertion Loss	The signal loss resulting from the insertion of a component, or link, or channel, between a transmitter and receiver (compare "Jumper" and "Mushroom"). See <i>Attenuation</i> .		

Jumper	1. An assembly of twisted pairs without connectors, used to join telecommunications circuits/links at the cross-connect. 2. An optical fiber cable with connectors installed on both ends. See <i>Cable Assembly</i> .	Mushroom	See <i>Spool</i> .
Ladder Rack	A device similar to a cable tray but more closely resembles a single section of a ladder. It is constructed of metal with two sides affixed to horizontal cross members.	Network	A series of controllers, all connected via a telecommunications cable.
Link	A transmission path between two points, not including terminal equipment, work area cables, patch cables, and equipment cables. Can be up to 90 m (295 ft) in length for horizontal cabling.	Optical Fiber	A transmission media using a thin filament of glass or plastic to transmit pulse light signals. Its bandwidth is higher than copper and not subject to electromagnetic interference. The optical fiber consists of a central core (glass or plastic) and an outer cladding.
Local Area Network	The standard industry term for a network installation that serves a relatively small area (e.g., structured cabling installation serving a building).	Optical Fiber Cable	Cable made up of one or more strands of glass consisting of a central core and outer cladding (optical fibers), strength members, and an outer jacket.
Loss	Attenuation of a signal, usually measured in dB.	Outlet Box (Telecommunications)	A metallic or non-metallic box mounted within a floor, wall, or ceiling and used to hold telecommunications outlets/connectors or transition devices.
Main Cross-connect	The cross-connect normally located in the (main) equipment room for cross-connection and interconnection of entrance cables, first-level backbone cables, and equipment cables.	Outlet/Connector (Telecommunications)	A connecting device in the work area on which horizontal cable or outlet cable terminates.
Membrane Penetration	An opening through only one surface or side of a barrier.	Pair	1. Two insulated wires commonly joined. They can be twisted around each other or mated together as in flat cable. 2. One side circuit (two diametrically facing conductors) in a star quad.
Multimode Optical Fiber	An optical wave guide that allows many bound modes to propagate.		