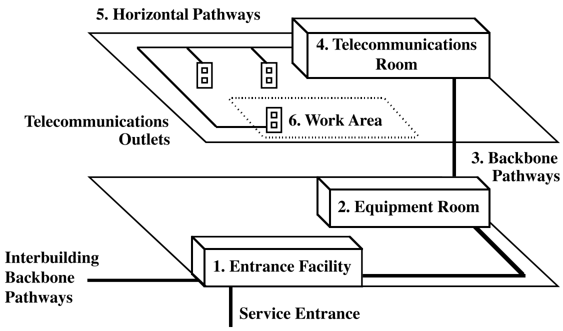
ANSI/TIA/EIA-569-A (CSA T530)

The primary focus of this standard is to provide design specifications and guidance for all building facilities relating to telecommunications cabling systems and components. This standard identifies and addresses six prominent components of the building infrastructure: building entrance facility, equipment room(s), backbone pathways, telecommunications rooms, horizontal pathways and work areas.



Scope of ANSI/TIA/EIA-569-A (CSA T530)

ENTRANCE FACILITY

ANSI/TIA/EIA-569-A (CSA T530) defines an entrance facility as any location where telecommunications service enters into a building and/or where backbone pathways linking to other buildings in a campus environment are located. The entrance facility may contain public network interface devices as well as telecommunications equipment. The standard recommends that the location of the entrance facility should be in a dry area, close to the vertical backbone pathways.

EQUIPMENT ROOM

An equipment room (ER) is defined as any space where telecommunications equipment common to the occupants of a building resides. In the design and location of the equipment room, one should provide room for expansion and should consider water infiltration. Since the telecommunications equipment in this room is usually of a large size, delivery accessibility should be a consideration as well. The minimum recommended size for this room is 14 m^2 (150 ft.^{2}).

General Design Considerations

- Equipment room: a single centralized space housing telecommunications equipment that serves a building.
- Common equipment including PBXs, computing equipment such as a mainframe and video switches.
- Only equipment directly related to the telecommunications system, control system and its environmental support system is to be housed in the equipment room.
- Ideally, the equipment room should be located close to the main backbone pathway to allow for easier connection to the backbone pathway.

Sizing Issues

An equipment room is sized to meet the known requirements of specific types of equipment.

- Expected future requirements should also be considered
- Equipment room design should allow for non uniform building occupancy
- The recommended practice is to provide 0.07 m^2 (0.75 ft.^{2}) of equipment room space for every 10 m^2 (100 ft.^{2}) of usable floor space (work areas)
  - If work area density is expected to be greater, provide more equipment room space.

Other Equipment Room Design Issues

Make sure that the floor loading capacity is sufficient to bear both the distributed and concentrated load of installed equipment. The equipment room should not be located below water level; preventative measures should be taken to prevent water infiltration. Sources of electromagnetic interference, vibration, room height, contaminants, sprinkler systems, HVAC equipment dedicated to the equipment room, interior finishes, lighting, power, grounding and fire prevention shall be taken in consideration. Access to the ER shall be provided by a minimum of one door of 910 mm (36 in.) wide and 2000 mm (80 in.) high.

INTER-BUILDING PATHWAYS

In a campus environment, inter-building pathways are required to connect separate buildings. The ANSI/TIA/EIA-569-A (CSA T530) standard lists underground, buried, aerial and tunnel as the main pathway types used. This information is contained in normative Annex C of the ANSI/TIA/EIA-569-A standard. Additional requirements for customer-owned outside plant can be found in the standard ANSI/TIA/EIA-758 Customer-Owned Outside Plant Telecommunications Cabling Standard.

Underground Inter-building Backbone Pathways

An underground pathway is considered to be a component of the entrance facility.

Pathway planning must consider the following:

- Limitations dictated by the topology (this includes land development)
- Grading of the underground pathway to permit proper drainage
- Need to vent gaseous vapors
- Amount of vehicle traffic to determine the amount of cover over the pathway and whether or not concrete encasement is required.

Underground pathways consist of conduit, ducts and troughs; possibly including manholes.

- All conduit and duct are to have a diameter of 100 mm (4 in.)
- Bends are not recommended; if required there should be no more than two 90° bends.

Direct Buried Inter-building Backbone Pathways

A direct buried pathway is considered to be a component of the entrance facility.

- In such cases, the telecommunications cables are completely covered in earth.

Direct burial of telecommunications cables is achieved by trenching, augering or boring (pipe-pushing).

- Plowing is not covered by the standard.

When selecting a route for the pathway, it is important to consider the landscaping, fencing, trees, paved areas and other possible services.

Aerial Inter-building Backbone Pathways

An aerial pathway is considered to be a component of the entrance facility.

- In such cases, the facility consists of poles, cable-support strand and support system.

Some considerations to make when using aerial backbone include the following:

- Appearance of the building and surrounding areas
- Applicable codes
- Separation and clearances for electrical and roads
- Span length, building attachments, storm loading and mechanical protection
- Number of cables currently and future growth potential.

Tunnel Inter-building Backbone Pathways

Tunnels provide pathways for conduit, trays, wireways or support strand.

- The location of pathways within a tunnel should be planned to allow for accessibility as well as for separation from other services.

INTRA-BUILDING (IN-BUILDING) PATHWAYS

Intra-building backbone pathways are used to place backbone cables between the equipment room and the entrance facility, the entrance facility and the telecommunications room or the equipment room and the telecommunications room. Pathways can be either conduit, sleeves, slots or cable trays. It is very important to ensure that all backbone pathways are properly firestopped as required by applicable codes.

Vertical Backbone Pathways

Made up of vertically aligned telecommunications rooms.

- Rooms located on separate floors are connected with sleeves or slots.

Elevator shafts are NOT to be used to locate backbone pathways.

Horizontal Backbone Pathways

If a telecommunications room can not be vertically aligned with the one above or below, or if a room cannot be vertically aligned with the entrance facility room, a horizontal backbone pathway is used to connect them.

Design Issues

When using conduit (100 mm [4 in.]) or sleeves, the following amount of backbone pathway is recommended:

- One sleeve or conduit per 5000 m^2 (50 000 $ft.^2$) of usable floor space to be served by that backbone system
- In addition, two spare sleeves or conduits for a minimum of three.

Conduit, sleeve, and tray fill specifications can be found in this standard.

TELECOMMUNICATIONS ROOM

The telecommunications room (TR) formally known as telecommunications closet (TC) is defined as the space that acts as the common access point between backbone and horizontal distribution pathways. TR's contain telecommunications equipment, control equipment, cable terminations and cross-connect wiring.

General Design Considerations

The location of the telecommunications room should be as close as practical to the center of the floor area to be served:

- It is preferable to locate the TR in the core area.

Room space should not be shared with electrical equipment.

Size and Spacing Issues

It is recommended to have at least one TR per floor; additional TR's are recommended when:

- The usable floor area to be served is greater than 1000 m^2 (10 000 ft.^{2})
- A rule-of-thumb estimates usable floor space at 75% of total floor space
- The length of horizontal distribution cable required to reach the work area is greater than 90 m (295 ft.).

When there are multiple TR's on a single floor, it is recommended to interconnect these rooms with at least one conduit (trade size 3) or equivalent. Assuming one work area per 10 m^2 (100 ft.^{2}), the TR should be sized as follows:

Usable floor area		Room size	
m^2	ft.^{2}	m	ft.
1 000	10 000	3 x 3.4	10 x 11
800	8 000	3 x 2.8	10 x 9
500	5 000	3 x 2.2	10 x 7

Other TR design issues

Floor loading is to be at least 2.4 kPa (50 lbf/ft.^{2}).

Two walls are to be covered with 2.6 m (8 ft.) high, 20 mm (3/4 in.) A-C plywood to attach equipment. Sufficient lighting is to be provided. Wall, floor and ceiling finishes should be light in color to enhance room lighting. No false ceilings. For powering equipment, at least two dedicated duplex electrical outlets on separate circuits are to be provided. For convenience, duplex electrical outlets should be placed at 1.8 m (6 ft.) intervals around perimeter walls.

- There are instances when it is desirable to have a power panel installed in the TR.

Room penetrations (sleeves, slots, horizontal pathways) must be properly firestopped in compliance with applicable codes. Security and fire protection are to be provided. It is recommended to have continuous Heating, Ventilation and Air Conditioning (HVAC) – 24 hours per day, 365 days a year. When active equipment are present, a sufficient number of air changes should be provided to dissipate the heat.

Access to the TR shall be provided by a minimum of one door of 910 mm (36 in.) wide and 2000 mm (80 in.) high.

HORIZONTAL PATHWAYS

Horizontal pathways are facilities used in the installation of horizontal cabling from the work area outlet to the telecommunications room. These pathways must be designed to handle all types of cables including: unshielded twisted-pair, and optical fiber. When looking over the size of the pathway, always consider the quantity and size of the cables to be used and allow room for growth. The following is a list and brief description of pathways recognized by the ANSI/TIA/EIA-569-A (CSA T530) standard.

Underfloor Duct

Underfloor ducts may be a system of rectangular distribution and feeder ducts or a network of raceways embedded in concrete.

- Distribution ducts are those ducts from which the wires and cables emerge to a specific work area
- Feeder ducts are those ducts which connect the distribution ducts to the telecommunications room.

For general office use, the practice is to provide 650 mm^2 (1 in.^{2}) of cross-sectional underfloor duct area per 10 m^2 (100 ft.^{2}) of usable floor space. This applies to both distribution and feeder ducts.

This is based on the following assumptions:

- Three devices per work area
- One work area per 10 m^2 (100 ft.^{2}).

Access Floor

The access floor is made up of modular floor panels supported by pedestals with or without lateral bracing.

- Used in computer and equipment rooms as well as general office areas.

It is necessary to design floor penetrations for the type and number of work areas.

- Penetrations may be located anywhere on the access floor
- Service outlets must not be placed in traffic areas or other areas where they may create a hazard to the occupants.

Conduit
Conduit types include electrical metallic tubing, rigid metal conduit and rigid PVC.
- The type of conduit used must meet local building and electrical codes
- Metal flex conduit is not recommended, due to possible cable abrasion problems.

Using conduit for a horizontal raceway system for telecommunications cabling should be considered only when:
- Telecommunications outlet locations are permanent
- Device densities are low
- Flexibility is not a requirement.

Installed conduit requirements for support, end protection and continuity are specified in appropriate electrical codes.
- No section of conduit can be longer than 30 m (100 ft.)
- No section of conduit can contain more than two 90° bends between pull points or pull boxes.

Cable Trays and Wireways
These are prefabricated, rigid structures consisting of side rails and a solid or ventilated bottom, used for the containment of telecommunications cables.

Trays and wireways can be located above or below the ceiling in plenum or non-plenum applications. For general office use, the practice is to provide 650 mm^2 (1 $in.^2$) of cross-sectional tray or wireway area per 10 m^2 (100 $ft.^2$) of usable floor space.

This is based on the following assumptions:
- Three devices per work area
- One work area per 10 m^2 (100 $ft.^2$).

Ceiling Pathways
Conditions for ceiling distribution systems include the following:
- Inaccessible ceiling areas (lock-in ceiling tiles, drywall, plaster) are not to be used as distribution pathways
- Ceiling tiles must be removable and placed at a maximum height of 3.4 m (11 ft.) above the floor
- There should be adequate and suitable space available in the ceiling area for the recommended distribution layout. A minimum of 75 mm (3 in.) of clear vertical space above the ceiling tiles must be available
- There should be a suitable means for supporting cables and wires. They are not to be laid directly on the ceiling tiles or rails
- Raceways are to be provided where required by codes or design.

Perimeter Raceways
Used to serve work areas where telecommunications devices can be reached from walls at convenient levels. The determining factor for using perimeter pathways is room size.
- All devices in the room depend on services from fixed wall areas
- Practical capacity for perimeter raceways is 20% to 40% fill depending on cable-bending radius.

Power Separation
Co-installation of telecommunications cable and power cable is governed by applicable electrical code for safety. In addition, the following precautions should be considered in order to reduce noise coupling from sources such as electrical power wiring, radio frequency (RF) sources, large motors and generators, induction heaters, and arc welders;
- Increased physical separation
- Electrical branch circuit line, neutral, and grounding conductors should be maintained close together (e.g., twisted, sheathed, taped, or bundled together) for minimizing inductive coupling into telecommunications cabling
- Use of surge protectors in branch circuits can further limit the propagation of electrical surges.

Use of fully enclosed, grounded metallic raceway or grounded conduit or use of cable installed close to a grounded metallic surface will also limit inductive noise coupling.

WORK AREA
Work areas are generally described as locations where building occupants interact with telecommunications devices. Work areas should have sufficient room for the occupant and required equipment. Typical work area is 10 m^2 (100 $ft.^2$) in size. The telecommunications outlet represents the connection between horizontal cable and the cables connecting devices in the work area.

Work Area recommendations
Recommendations for work areas cover only specifications for telecommunications pathways and telecommunications outlets.

Work area telecommunications pathways
Furniture pathways:
- Manufacturers should be consulted to determine raceway capabilities and optional features available
- Pathway capacity may be estimated to be approximately 20-40% of the pathway cross-section (this is a rough guide and does not account for corners and other factors).

Reception areas, control centers, attendant areas:
- Theses areas typically have heavy demands for telecommunications equipment
- It is recommended to have independent, direct pathways to these areas from the telecommunications room.

Telecommunications Outlets
An example of such a connection point is a 100 mm x 100 mm (4 in. x 4 in.) electrical box with horizontal cable terminated on faceplate connectors.
- Telecommunications devices in the work area are connected to the faceplate.

It is necessary to consider the number and type of devices to be connected.
- Typical telecommunications devices include telephones, personal computers, graphic or video terminals, fax machines, modems.

At least one outlet box or plaster ring should be provided to each work area.
- For areas where it will be difficult to add outlet boxes or plaster rings at a later time, at least two outlets or plaster rings are recommended for initial installation.

NEW ADDENDA TO ANSI/TIA/EIA-569-A

At the time of this writing, six addenda to ANSI/TIA/EIA-569-A are published and the seventh one is a working draft addenda, addenda 7. These addenda provide additional requirements for:

Addendum 1: Surface Raceways
This document is an amendment to replace section 4.7 of ANSI/TIA/EIA-569-A. It provides additional guidelines for perimeter pathways.

Addendum 2: Furniture Pathways and Spaces
This document is an amendment to replace section 6.3.3 of ANSI/TIA/EIA-569-A. It provides additional guidelines for furniture pathways.

Addendum 3: Access Floors
This document is a revision of the subclause 4.3 of ANSI/TIA/EIA-569-A. It provides information in regards to access flooring systems.

Addendum 4: Poke-Thru fittings
This document provides information on poke-thru devices. A poke-thru is a device that allows telecommunications and power cabling to be installed through above-grade concrete floors or steel deck flooring.

Addendum 5: Underfloor Pathways
This document is a revision of the subclause 4.2 of ANSI/TIA/EIA-569-A. It provides information in regards to underfloor pathways.

Addendum 6: Multi-Tenant Pathways and Spaces
This document is the latest addenda published. It discusses the pathways and spaces requirement for a multi-tenant commercial office buildings.

Elements of multi-tenant spaces discussed in this document are:
- Entrance room
- Access provider space
- Service provider space
- Common equipment room (CER)
- Common telecommunications room (CTR)
- Intrabuilding and interbuilding pathway requirements.

*** Not covered by the ANSI/TIA/EIA-569-A Standard**
- Overfloor raceways
- Exposed wiring.

ANSI/TIA/EIA-607 (CSA T527)

The primary objective of this standard is to provide guidance around the issue of bonding and grounding as it relates to building telecommunications infrastructure. Before reviewing the highlights of this standard, it is important to understand a few basic terms used throughout the bonding and grounding specifications. **Bonding** means permanent joining of metallic parts for the purpose of forming an electrically conductive path to ensure electrical continuity and capacity to safely conduct any current likely to be imposed. **Bonding conductor for telecommunications** is a conductor used to interconnect the telecommunications bonding infrastructure to the service equipment (power) ground of the building. **Effectively grounded** refers to an intentional connection to earth through a ground connection of sufficiently low impedance. It must have sufficient current-carrying capacity to be able to prevent the buildup of voltages that could potentially result in unnecessary hazard to connected equipment or persons. **Ground** is an intentional or accidental conducting connection between an electrical circuit or equipment and earth or conducting body serving in place of earth. **Ground electrode conductor** is a conductor used to connect the grounding electrode to:

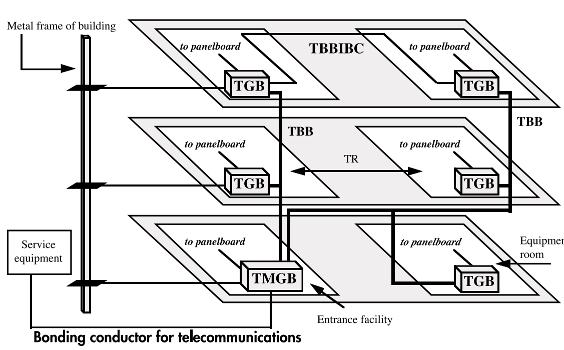
- The equipment grounding conductor
- The grounded conductor of the circuit at the service equipment
- The source of a separate system.

Telecommunications bonding backbone (TBB) is a copper conductor used to connect the telecommunications main grounding busbar (TMGB) to the telecommunications grounding busbar (TGB) located on the floor farthest away.

Telecommunications bonding backbone interconnecting bonding conductor (TBBIBC) is a conductor used to interconnect telecommunications bonding backbones.

Telecommunications main grounding busbar (TMGB) refers to a busbar bonded to the service equipment (power) ground by the bonding conductor for telecommunications. The TMGB should be placed in a location that is convenient and accessible.

BONDING AND GROUNDING



Scope of ANSI/TIA/EIA-607 (CSA T527)

COMPONENTS

Bonding Conductor for Telecommunications

This conductor is used to bond the TMGB to the service equipment (power) ground which is in turn connected to the grounding electrode conductor.

There are three important design considerations to remember about bonding conductors:

- The copper core conductor must be insulated and be at least No. 6 AWG in size
- These conductors should not be placed in metallic conduit. If this can not be avoided, the conductors must be bonded to each end of the conduit if the run is longer than 1 m (3 ft.) in length
- Ensure that bonding conductors are marked appropriately by using a green label.

Telecommunications Bonding Backbone (TBB)

This is an insulated conductor used to interconnect all TGB's with the TMGB.

- The TBB starts at the TMGB and extends throughout the building using telecommunications backbone pathways.

The TBB connects to TGB's in all telecommunication rooms and the equipment room.

The primary function of the TBB is to reduce or equalize differences between telecommunications systems bonded to it.

TBB design considerations include:

- Consistency in the design of the telecommunications backbone cabling system
- Permit multiple TBBs as dictated by building size
- Plan route to minimize TBB length
- Do no use interior water pipe system of the building as a TBB
- Do not use metallic cable shield as a TBB in new installations
- Minimum conductor size is No. 6 AWG, consideration should be given to using a TBB as large as No. 3 AWG
- Multiple, vertical TBBs must be bonded together at the top floor and at a minimum of every third floor in between using a TBB interconnecting bonding conductor
- TBBs shall be installed without splices.