

BUILDING DISTRIBUTION SYSTEMS

Guidelines for Equipment and Materials for Installation of Communications media:

All equipment shall conform to current applicable EIA/TIA standards, and must be Underwriter's Laboratories listed and labeled. Unless the University establishes more rigid specifications for a specific project, all equipment and materials shall comply with current standards, codes and regulations. The National Electric Code shall be used as a basis to establish minimum requirements, though not design criteria. All applicable state, and federal construction regulations, standards and practices associated with a project shall apply and be followed. Where requirements of the specifications or these guidelines conflict with existing rules, codes, etc, the University shall be notified in writing and will render a decision prior to the commencement of said work.

INSIDE CABLE PLANT

General Description:

Cable location: The University will provide cable-locating services for all types of communications systems. Location of cables shall be noted during contractor walk-through, on as-built drawings, or in the case of outside plant, with an appropriate color of stake, or paint.

Asbestos: Many university buildings contain asbestos. The University will provide information as to location of known asbestos in work areas prior to project commencement. If asbestos is located during construction, the contractor will immediately cease work and notify the University so that necessary action may be undertaken to remove the asbestos, or reroute the cabling

Main Data Frame (MDF): The main data frame provides termination of wire and cable, inbound from the outside plant, to the building's riser cables. It may also contain network interface devices and telecommunications equipment. If additional active electronic components are located or planned, the room or space must meet the requirements for an equipment room, since additional space, electricity, security, and environmental controls will be required.

Riser Cable: The riser cable connects floors of a multiple floor building to the MDF in multi-floor buildings, and horizontally, extending services to other sections on a single floor of a large building. The size of telephone riser cable should equal, at minimum, all telephone station pairs, plus 30% for growth. This cable from the MDF ends in secondary distribution locations known as Intermediate Distribution Frames. (IDFs)

Intermediate Distribution Frame (IDF): The IDF is the designation for the terminal blocks located at the end of a riser cable. The number of IDFs in a given building shall depend upon the size and occupancy of the building. In all new construction, the location of IDFs will be planned so that they exist within approximately 150 feet of any station served by the IDF; that is, the cable run from IDF to user jack should not exceed 150 feet in length. In retrofit of older buildings, the maximum distance allowable is 290 feet.

Internal Cabling and Terminations: 110-type termination devices will be used as MDF/IDF terminal devices in all new building construction and renovation. Leviton “QuickPort” devices will terminate wire and cable at the user location. Further specifications will be found in the appropriate section of this document.

TELECOMMUNICATIONS CLOSETS AND EQUIPMENT ROOMS

General: The telecommunications closet on each floor is a transition point between the vertical riser system and the horizontal distribution system, containing the mechanical terminations for that portion of the riser wiring providing services to that floor or segment of the building. It may also provide intermediate cross-connects for additional portions of the vertical riser wiring system. Equipment rooms are defined as facilities housing active electronics used to alter, distribute, or monitor telecommunications, CATV, and other internetworked systems or facilities. For the purpose of this document, differentiation between a closet and an equipment room will only be made when necessary.

Design Considerations: The University must approve the design and layout of backboards and associated equipment prior to the start of installation.

The telecommunications closet spaces shall, ideally, be dedicated to the telecommunications function and should not be shared with other facilities. If the equipment must be installed in a shared facility or exposed area, such as hallway, work space, mechanical room, or janitor / custodial closet, the termination equipment must be housed in self-contained, lockable cabinets of sufficient size to house all telecommunications wire and cable, with space to accommodate 50% growth. Cable Television distribution equipment must be similarly housed if located in a hallway, work room, or other space that experiences public traffic, or in the event that the environment is such that having the distribution equipment exposed could create a hazardous condition or shorten its life.

Designing rooms to contain equipment: In provisioning rooms to hold active electronics, the following should be considered during the design and selection process:

- The room should be easily accessible for the purposes of installing and removing equipment and to the end-users.
- The room should be dry, above the water table, and not prone to flooding. A floor drain shall be provided if **any** risk of water ingress exists. The room should be free of water and drain pipes not directly related to support of the equipment housed therein. If the room is located below a parking area, washroom, or toilet, a waterproofed ceiling is required. Moisture detection sensors, connected to the building’s environmental system, would be considered appropriate.
- The room should be as close as practical to the building riser pathway.

- The room should have ready access to the HVAC delivery system.
- The room should have emergency generator power and lighting.
- The room should be located away from sources of electromagnetic interference, such as power transformers, motors, generators, and transmitters.

Security: All closets shall have door locks to provide a minimal level of security, with keying of such coordinated with those with demonstrable need to enter the area.

Ventilation/environment: A method to insure air circulation or building air conditioning to telecommunications closets must be provided. This circulation must be capable of dissipation of a constant 150 BTU/hr of heat; more if active CATV or additional networking equipment is to be housed there. The temperature in any closet must be maintained between 55 and 78 degrees, Fahrenheit, with non-condensing humidity: Normal daily operation should avoid the extremes of this operational range.

In the event that tighter specifications are required, for either the type of equipment or purpose of the facility; the university will develop these specifications at the time of room design.

Provisioning: At minimum, one wall will be covered with rigidly fixed 5/8 inch, A-C plywood, preferably void free, from a height of 3 ft to a height of 7 feet. Both sides and all edges will be painted with a light color fire-retardant paint. More wall space will be provisioned in a similar manner dependant on the amount of cable to be terminated and network equipment to be installed. The Vendor will supply all required materials to construct the terminal system, including plywood panels, paint, metal frames, cross-connect distribution rings, ground wires and rods, mounting brackets, terminal housings and blocks, and any and all other required items.

The university will describe and supply any network equipment to be installed in the closet: It will be the vendor's responsibility to insure that the space required for this equipment is duly reserved and maintained in a usable state, so the equipment can be installed upon completion of construction.

Grounding: Grounding and bonding shall comply with EIA/TIA 607. Each telecommunications closet shall be equipped with a grounding bar. Multiple grounding bars within a closet shall be bonded together with a conductor sized appropriately. All cross-connect frames, patch panel racks, and other metallic devices shall be grounded per standard practice. Telecommunications grounds in each closet shall be tied to the main grounding bar located at or near the MDF of the building with a minimum #6 AWG copper ground cable. This ground shall be connected to the building's main power grounding electrode, or alternate approved grounding location. The vendor will insure that no ground loops or extraneous voltages exist within the grounding system, or that no

DC resistance greater than 5 ohms exists between any ground bar and the main building electrical grounding electrode.

Power: Unless otherwise specified, one dedicated, surge-suppressed 20-amp, duplex electrical outlet shall be supplied to provide power to network equipment. This electrical circuit shall be supplied by building emergency power from the generator through an appropriate transfer switch. In the event the IDF/MDF supports more than 50 stations, a second dedicated 20-amp circuit is required. Power from the second circuit shall be distributed along the backboard, one duplex outlet every six feet.

Lighting: A minimum of 50 foot candles measured three feet above the finished floor, located approximately eight feet above the finished floor is required. Installed equipment or cabinets shall not obstruct the lighting fixture(s). Minimal lighting by emergency power supply to provide safe access is required.

Ceilings: False ceilings shall not be installed. A minimum ceiling height is eight feet, six inches for all new construction.

Installed Termination Equipment: All telecommunications' terminations must be of a modular design, utilizing 110-type type high-density termination equipment. The MDF must be wall-mounted as previously specified and equipped with components adhering to Category-6 standards for connector and terminal blocks.

Connections intended for voice use shall be terminated on 110-type terminal blocks, from the riser and the terminal side, appropriately labeled to match the number on the terminating wall jack.

Connections intended for data use shall be terminated on 110-type, RJ45 jack panels, appropriately labeled to match the number on the terminating wall jack.

110 blocks shall be oriented so that the terminating connectors or terminal blocks are run horizontally.

Use of 66-type connector blocks is not acceptable unless required to repair existing systems.

Cross-connects: The following color combinations will be used for cross-connects:

Blue/White – voice circuit cross connects

Green/White – all data cross connects except fire, security, or building management

Red/White – all fire alarm and building management system cross connects.

Orange/White – any other cross connects.

Additional MDF considerations:

- Metallic raceway or conduit should be used whenever possible to run cables point-to-point when intermediate splices or terminations are not required, for signal isolation and to provide a high level of security. All conduits will be equipped with a minimum 3/32 inch, 200 pound test, polyethylene pull rope. All conduits leaving a building must be appropriately plugged to prevent water intrusion.
- All copper entrance cable must be terminated on lightning protection on one end. AT&T type 189 BI-100 units with hybrid or solid-state protectors are specified.
- Riser cables must be designed to allow 30% growth to individual IDF locations, each considering a minimum of two pairs of riser to be available for each voice outlet planned.
- Any copper riser cable intended for data service will be category 6, 24 AWG with standard color coding, unless otherwise specified.
- Fiber optic riser cable should provide a minimum of 12 strands of single mode and 6 strands of multi-mode to each IDF location.
- All riser cable will be terminated and tagged at each end with a labeling scheme agreed to by the vendor and the university.

TESTING AND CERTIFICATION: All new construction will be certified as fully compliant with current specification for end use. All cable will be end-to-end tested and certified to UL Cat-6 in all respects, utilizing adapters attached to a university-approved level-III scanner/certification device utilizing a 2-way injector or tested from both ends: All wire and cable for telecommunications use will be fully tested in both directions prior to acceptance. The vendor will make available a hard copy of their test results at the time of completion. The university will perform random checks on any vendor-installed wire or cable prior to final acceptance.

All CATV outlets will be tested for nominal loss and each building or floor will be checked for spurious leakage. All losses beyond those expected as normal line loss, and leakage in excess of acceptable standards will be repaired at the vendor's expense prior to final acceptance.

Workmanship: Workmanship and finished appearance will be considered as important as the electrical and mechanical integrity and efficiency of the system.

Station wiring must present a clean, professional appearance when complete, using wall-mounted or modular furniture outlet boxes.

Outlet boxes and wiremold (or equivalent) shall be painted to closely match existing wall color and a surface mount outlet must be used where flush mount boxes cannot be installed.

The University must approve wiremold and surface mount jack use prior to installation.

Outlet boxes that cannot be flush mounted may be secured to University-approved surfaces by installing sheet metal or other appropriate screws through the rear housing of the unit. Magnetic mounts to metallic surfaces or adhesive-backed surface mounting of wiremold and outlets is unacceptable and will not be allowed, except as a variance, obtained in writing prior to commencement of construction, from the University.

Approval and Review Procedures: No deviations from the requirements and/or intent of this document will be permitted unless approved by the University. Specifically, any changes or requested changes to an approved PLAN, including substitution of material from that specified, will require the approval of the University by written change order before use in a project.

Warranty: The University shall require that the contractor performing construction work for the University must warrant that all work, materials, equipment and support services is free from defects of materials and workmanship for at least two years from the date of acceptance. The vendor must, at their expense, correct, repair, or replace all such defective work and materials. Accompanying the vendor's warranty must be a statement as to the availability of parts and qualified service personnel to maintain the distribution system.

HORIZONTAL DISTRIBUTION SYSTEM

General: The horizontal subsystem is the physical wiring connecting telephone sets, terminals, personal computers and workstations back to the IDF. These are, preferably, located on each building floor, with horizontal runs consisting of unshielded twisted pair wire of a CAT 6 rating or better, with one 4-pair cable to be used for telephony, and a second 4-pair cable to be used for data, per station location, unless otherwise specified. Coaxial cable of type RG-6 is required for CATV distribution.

Wherever possible, ceiling cavities shall be used as a pathway for telecommunication cables in University buildings. The design shall provide a suitable method for supporting cables and wires from the IDF in the telecommunications closet to the workstation to be served. Utility columns, walls, wiremold, etc. will provide pathways for the wires and cables from the ceiling to the workstation.

Distribution Considerations: When determining the sizing for a pathway, the quantity and size of cables, including reasonable growth capacity shall be considered. The system shall be sized to allow at least twice the total number of cables that perfect layering would allow at time of initial installation. Ceiling distribution systems shall meet the following additional conditions:

- Distribution will take place above suspended ceilings whenever possible: Ceiling tiles shall be a removable or lie-in type, at a maximum height no greater than 11 feet above the floor.
- Cable trays shall be installed above suspended ceilings in the hallways of each floor.
- Inaccessible ceiling areas, such as lock-in type ceiling tiles, drywall, or plaster ceilings shall not be used as distribution pathways.
- Suitable space is available in the ceiling area for the distribution layout recommended: A minimum of three inches of clear vertical space shall be available above the ceiling tiles for a distribution wiring pathway.
- Raceways will be provided where required by code or design.
- Suspended ceiling support wires and rods shall not be used for supporting telecommunications cable and wire. Under no circumstances shall wire or cable be laid directly on the ceiling tile or rails.

In the event that ceiling distribution is not possible, the University will assist the vendor in specifying wiremold appropriate to the circumstance of the particular installation. The rules regarding provisioning of spare capacity, previously noted, shall apply.

Circuit Pathways: Cable trays shall be installed above suspended ceilings on each floor. In all office spaces, there will be at least one box with conduit stubbed six inches above the suspended ceiling for installation of horizontal wire. Outlet boxes shall be installed near an electrical outlet, and level with that outlet, to provide a uniform appearance. At minimum, two outlets are to be provided per room, on opposing walls, consisting of one voice and one data termination. One CATV termination per room will also be provided.

If a cable tray crosses a fire barrier or enters a plenum area, the cable must be continuously plenum rated from origin to its point of termination, enclosed in a continuous plenum-rated sheathing or metal conduit.

Loading of cable trays shall comply with the applicable electrical code and shall be properly fire stopped.

Plenum rated cable conforming to the current NEC or NFPA codes must be used in return air plenums or for cable installations that penetrate a fire barrier where no conduit exists or is planned. The cable must be labeled with the "UL" designation as it pertains to this cable type.

Cable trays shall be grounded in accordance with the TIA 607 standard.

Cable trays must be routed in such a way as to not interfere with the operation or maintenance of any device along its path. The vendor shall be responsible for correcting any malfunction resulting from improper cable tray installation.

Trays and conduit within the ceiling shall protrude into the wiring closet from one to two inches.

The inside of the cable tray shall be free of burrs, sharp edges or projections that could damage cable being installed.

Cables must be routed in such a way as to minimize interference with cross-connect wiring on connector blocks and termination hardware. Installation hardware must be utilized to route cable away from the top and sides of the terminal blocks. Riser and horizontal distribution cables must enter the standoffs/termination blocks from/through the bottom.

Workstation Cable Runs: Four-pair copper wire shall be the media of choice. Each cable shall be unshielded twisted pair, and will have an overall cable sheath that meets the appropriate code for the installation environment. All twisted-pair cable shall have a minimum transmission rating of **LEVEL 6** as described by Underwriters Laboratories LAN Cable Certification Program, and meet the requirements of the EIA/TIA 568 Commercial Building Telecommunications Wire Standard for Horizontal Unshielded Twisted-Pair (UTP) Cable.

One voice and one data cable shall be installed from each workstation location to the corresponding IDF. The telecommunications outlet will be configured as follows:

One telecommunications jack for voice and low speed data shall be supported by a four-pair category 6 rated cable.

One telecommunications jack for high-speed network access shall be supported by a second four-pair, category 6 rated cable.

For CATV configurations, source to destination runs in the horizontal subsystem shall consist of quad-shielded RG-6 cable, without splices, splitters, or other devices between the distribution closet and termination jack.

Termination Connections:

All communications cabling will terminate in Communications Modular Outlets. A single two-gang outlet box will be used for terminating all copper media. The University specifies Leviton Telecom "QuickPort" brand hardware for termination, but will accept a functional equivalent if it has been demonstrated to be fully compatible with components of the Leviton wiring system. Service will be terminated on Catalog Number 41106-RI6 jacks for voice connections, and Catalog Number 41108-RI5 jacks for data connections.

Face plate, Catalog Number 41080-2IP shall be used where no additional termination is contemplated, or Catalog number 41080-3IP shall be used when coaxial cable is intended to be terminated at the same outlet box. CATV jacks shall be Catalog number 41084-FIF. The Leviton product catalog should be referenced for additional items, updated part numbers, or equipment to be used in special circumstances.

Voice jacks shall be wired using the USOC 8-pin wiring convention designed for the RJ45 jack, the last pair left unterminated in the open spaces reserved for such on the jack. Data jacks shall be wired per EIA/TIA 568B specification, unless otherwise noted.

Outlet Mounting: Surface-mount boxes shall be attached to a solid surface using screws. Duplex outlets will consist of a flush-mounted faceplate, duplex modular 6- and 8-pin jacks, and optionally, a CATV 'F'-type connector. Faceplates shall be configured in the following manner:

The voice jack shall be positioned to the left when set in a horizontal position, or on top in a vertical mounting. The data jack shall be positioned to the right, or below, the voice jack. CATV jacks, where installed, will be mounted furthest to the right, or bottom, in installations specifying CATV service.

Numbering/Labeling: All faceplates will be labeled with a unique number, matching the termination points in the wiring closet/IDF. The University will supply the vendor with a plan for creation of these numbers in new construction, or existing number schemes may be used during renovation. In any case, the Vendor and the University will mutually agree upon the final numbering scheme prior to the commencement of work.

Some applications may require outlets designed for modular furniture.

Height of outlets shall be as-follows:

- Standard outlet: 1.5ft above the floor, or parallel to adjacent electrical outlets.
- Wall-mounted telephone/data outlets: 4.5ft above floor level, or parallel to adjacent, existing electrical outlets.

Structural conditions, obstructions, or other local details may govern the exact location of outlets and equipment. The University shall verify the final location of all outlets, panels, equipment, etc when a standard height cannot be reasonably maintained.

All outlets and faceplates shall be securely installed as a permanent fixture of the building or structure. Temporary outlet placements are not permitted without prior written approval of the University.