# Communications Infrastructure Guidelines

## For Designers and Engineers

**Version 2013.11.26**

Telecommunications wiring, pathway, and service design guidelines for capital construction projects and renovations at the University of North Carolina at Chapel Hill.

*Information Technology Services Division*
*Communication Technologies Department*
*Engineering Group*

http://its.unc.edu/commtechnology/communication-technologies/engineering-and-operations/engineering/

THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL

## About This Document

This document is for architects, engineers, and designers who are developing construction plans and specifications for new buildings and renovations for the University of North Carolina at Chapel Hill.

The document provides information about telecommunications services, standards, and practices for communications systems at the University. It covers topics such as copper and fiber optic cabling, duct banks, internal raceways and conduits, data communications, voice telephony systems, and cable television services.

The document describes guidelines that designers should follow when creating plans and specifications. It is organized according to the Construction Standards Institute (CSI) MasterFormat 2011 specification.

## Scope: CSI Divisions and Groups

This document describes only guidelines related to CSI Division 27 (Communications). Where references to other sections are important, those references are included in the section text.

- Procurement and Contracting Requirements *[Not Used]*
- Specifications
    - General Requirements *[Not Used]*
    - Facility Construction *[Not Used]*
    - Facility Services
        - Division 20 – Reserved *[Not Used]*
        - Division 21 – Fire Suppression *[Not Used]*
        - Division 22 – Plumbing *[Not Used]*
        - Division 23 – Heating, Ventilation, and Air Conditioning *[Not Used]*
        - Division 24 – Reserved *[Not Used]*
        - Division 25 – Integrated Automation *[Not Used]*
        - Division 26 – Electrical *[Not Used]*
        - Division 27 – Communications
        - Division 28 – Electronic Safety and Security *[Not Used]*
        - Division 29 – Reserved *[Not Used]*
    - Site and Infrastructure *[Not Used]*
    - Process Equipment *[Not Used]*

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# References

## 1. Abbreviations

| | |
|---|---|
| ADA | Americans with Disabilities Act |
| AFF | Above Finished Floor |
| ANSI | American National Standards Institute |
| ATS | Automatic Transfer Switch |
| AWG | American Wire Gauge |
| BCT | Bonding Conductor for Telecommunications |
| BICSI | Building Industry Consulting Services International |
| CATV | Cable Access Television System (sometimes called Master Antenna Television System) |
| CommTech Engineering | The Communications Technologies Engineering group in the Information Technologies Division at the University of North Carolina at Chapel Hill |
| EIDF | Extended Intermediate Distribution Frame |
| ELFEXT | Equal Level Far End Crosstalk |
| EMT | Electrical Metallic Tubing |
| GE | Grounding Equalizer |
| IDF | Intermediate Distribution Frame |
| ITS | Information Technology Services department at the University of North Carolina at Chapel Hill |
| MDF | Main Distribution Frame |
| MM | Multi Mode (fiber optic cable) |
| NEC | National Electrical Code |
| NEXT | Near End Cross Talk |
| NFPA | National Fire Protection Association |

| | |
|---|---|
| OCC | Optical Cable Corporation |
| OEM | Original Equipment Manufacturer |
| OTDR | Optical Time Domain Reflectometer |
| PDF | Portable Document Format from Adobe Corporation |
| PLAR | Private Line Automatic Ringdown |
| PSTN | Public Switched Telephone Network |
| RCDD | Registered Communications Distribution Designer (via BICSI) |
| RF | Radio Frequency |
| RG | Radio Guide |
| RGS | Rigid Galvanized Steel |
| SCO | State Construction Office |
| SEP | Service Entrance Passthrough |
| SER | Service Entrance Room |
| SM | Single Mode (fiber optic cable) |
| TBB | Telecommunications Bonding Backbone |
| TDMM | Telecommunications Distribution Methods Manual |
| TGB | Telecommunications Grounding Busbar |
| TIA | Telecommunications Industry Association |
| TMGB | Telecommunications Main Grounding Busbar |
| TR | Telecommunications Room |
| UL | Underwriter's Laboratory |
| UNC-CH | University of North Carolina at Chapel Hill |
| VoIP | Voice over IP |

## 2. Definitions

- **Bonding Conductor for Telecommunications (BCT):** A conductor that interconnects the telecommunications bonding system to the main electrical service (power) grounding system.
- **Contingency Phone**: A wall-mounted analog phone connected to the local phone service provider central office with generator backed-up dial tone provided by the central office that remains in service in the event the electric service to the building/campus has been disrupted. These phones are typically installed in corridors and break rooms. Contingency phones provide voice communications service to buildings in the event of a failure of the VoIP network.
- **Extended Intermediate Distribution Frame (EIDF):** A space in a building that houses a small set of telecommunications equipment intended for a limited and specific purpose. EIDFs often consist of ceiling or wall-mounted enclosures.
- **Faceplate**: A frame into which communication inserts, blanks, and jacks are secured in support of voice, data, and video services.
- **Fiber Manager**: A computer program used by the University to manage fiber optic deployments in a Geographic Information System.
- **Floor Boxes**: Opening in floor intended to provide electrical and communications service for a conference table or workstation.
- **Grounding Equalizer (GE):** A conductor that interconnects two of more TBBs within a multistory building.
- **Intermediate Distribution Frame (IDF):** A room in a building that houses telecommunications equipment for distribution of signals on a specific floor. This is sometimes referred to as a satellite distribution room (SDR) in the industry.
- **Main Distribution Frame (MDF):** The primary room in a building in which active telecommunications equipment is located. Typically this equipment provides service to IDFs located on other floors. This is sometimes referred to as a primary distribution room (PDR) in the industry.
- **Patch Panel**: Passive communications hardware utilized to terminate voice, data, security and signaling cable with the purpose of identification and patching. Most often used to patch passive cabling to active components, patch panels may be mounted in equipment racks or be wall-mounted.
- **Poke Through**: Conduit sleeve through floor providing pathway for communications services typically utilized to serve conference rooms or modular furniture.
- **Power Pole**: Vertical metallic raceway with a dedicated channel for electrical service and communications cabling typically utilized to extend electrical and communications service to modular furniture situated in open floor areas with no wall nearby to provide chase for cabling.
- **Ring-Down Emergency Phone**: A wall-mounted or free standing tower analog emergency phone with central office generator backed up dial tone installed in parking

decks and on campus grounds. These emergency devices are equipped with a push button activation hook-switch that when activated automatically dials the UNC Department of Public Safety Emergency Operations Center.

- **SER-MDF**: A combined service entrance room (SER) and main distribution frame (MDF). i.e. a room that houses both the cable termination and primary electronic distribution equipment.
- **Service Entrance Passthrough (SEP):** A room in a building in which a telecommunications cable transitions from outside to inside and thence passes to a separate service entrance room.
- **Service Entrance Room (SER):** The primary room in a building in which telecommunications cables terminate from their outside origin.
- **Static Load**: In cable tray systems, the weight of the empty installed cable tray system together with the weight of the installed cables.
- **Telecommunications Bonding Backbone (TBB):** A BCT that bonds all TGBs in a building back to the TMGB in the MDF. Typically 6 AWG or larger.
- **Telecommunications Grounding Busbar (TGB):** The primary electrical grounding point in an IDF.
- **Telecommunications Main Grounding Busbar (TMGB):** The primary electrical grounding connection point in a building for telecommunications services. The TMGB is located in the MDF and connects to the main building service equipment ground.
- **Telecommunications Room (TR):** Any room whose primary function is to contain telecommunications equipment, e.g. an SER, MDF, or IDF (but not necessarily a SEP or EIDF).
- **Termination Block**: Passive communications hardware utilized to terminate voice, data, security and signaling cables with the purpose of identification and cross-connection. Typically wall mounted and most often used to cross-connect voice circuits.

## 3. Reference Documents

Designers shall utilize the following standards when developing specifications for communication systems at the University of North Carolina at Chapel Hill.

- BICSI, Telecommunications Distribution Methods Manual, 12th Edition
- National Fire Protection Association, NFPA-70 (2011), National Electrical Code
- Telecommunications Industry Association, TIA-568-C.0 (February 2012), Generic Telecommunications Cabling for Customer Premises
- Telecommunications Industry Association, TIA-568-C.1 (February 2009), Commercial Building Telecommunications Cabling Standard
- Telecommunications Industry Association, TIA-568-C.2 (August 2009), Balanced Twisted-Pair Telecommunications Cabling and Components Standards
- Telecommunications Industry Association, TIA-568-C.3 (June 2008), Optical Fiber Cabling Components Standard

- Telecommunications Industry Association, TIA-568-C.4 (July 2011), Broadband Coaxial Cabling and Components Standard
- Telecommunications Industry Association, TIA-598-C (January 2005), Optical Fiber Cable Color Coding
- Telecommunications Industry Association, TIA-606-B (June 2012), Administration Standard for Telecommunications Infrastructure
- Telecommunications Industry Association, TIA-607-B (September 2011), Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
- Telecommunications Industry Association, TSB-140 (February 2004), Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems

# CIG01 – Communications

## 1. Introduction

The telecommunications infrastructure of the University of North Carolina at Chapel Hill is a foundational element of the institution's academic, research, and service environments. The scale of this infrastructure is a reflection of the size of the campus, including over 720 acres and millions of square feet of buildings. In many respects, the University's telecommunications infrastructure is comparable to that of a small city, with similar requirements and challenges. Its complexity is a reflection of the long history and evolution of voice, data, and video technologies throughout the campus.

Communications infrastructure guidelines (including this document) are managed on behalf of the University by the Communications Technologies Engineering Group (CommTech Engineering) in the Information Technology Services (ITS) Division of the University. Of course, wiring standards are complex and evolve rapidly to keep pace with the technology requirements of the University. As a result, designers and contractors must consult with CommTech Engineering for clarification about current cable types and standards before completing telecom designs and specifications, purchasing materials, and commencing work.

This Communications Infrastructure Guidelines document is of a general nature and is intended to inform the development of a project's design documents and guide the construction process. Specifications may be modified by the University's Communication Technologies Office as necessary to accommodate design or functional requirements of specific projects.

For all new and renovated building and facilities, the scope of this guideline includes but is not limited to underground service entrance ducts and cables, telecommunication rooms, pathway and conduit riser systems, and building telecommunications wiring.

## 2. The Campus Communications Environment

The campus is provisioned with an extensive underground ductbank system and outside cable plant. The outside cable plant includes legacy copper trunk cables, legacy coaxial cables, and an extensive network of fiber optic cables. Going forward the outside cable plant will consist exclusively of fiber optic cables except in rare instances. In some cases, locations remote from the campus are served by broadband RF microwave systems.

Each building is typically provisioned internally with fiber, copper, and coaxial cables. Outside plant cables terminate in a service entrance room, providing connectivity to a main distribution frame. Intermediate distribution frames on each floor provide horizontal connectivity.

Together, the outside and inside cable plants support multiple services including Ethernet for data and VoIP telephony, backhaul for mobile data services, security systems and cameras, CATV, energy management, and traditional POTS telephony.

## 3. Designer of Record Responsibilities

At the beginning of the design process, the Designer of Record shall review in detail the current Communications Infrastructure Guidelines, and contact CommTech Engineering to determine if there are any unusual criteria that pertain to the project.

The Designer of Record shall harmonize the Communications Infrastructure Guidelines with the overall project contract requirements, along with national, state, and local regulations.

All exceptions to the guidelines must be reviewed and approved by CommTech Engineering prior to implementation.

The full body and content of the University Design Guidelines are hereby attached by reference (http://maps.unc.edu/guidelines.asp).

The Designer of Record shall be required to attend at least one face-to-face meeting between the Designer's telecommunications experts and CommTech Engineering, prior to commencing telecommunications infrastructure design activities on any project. This shall be coordinated through the UNC-CH Facilities Planning and Construction Office.

The Designer of Record shall ensure that all design documents and drawings are provided to CommTech Engineering as specified in the Submittals section of this document. This is a critical requirement of design acceptance. A key reason for this requirement is that CommTech Engineering will utilize both design and construction documents from the Designer to manage owner-performed work as a part of turning up new construction.

The Designer of Record is responsible for ensuring that specifications are appropriately communicated and enforced across trades. In particular, electrical and telecommunications systems shall be closely coordinated, especially with regard to grounding and conduit systems.

## 4. Contractor of Record Responsibilities

The Contractor of Record will be required to purchase, install, test, and document all communications infrastructure system components as specified by this document. The Contractor of Record may be required to provide communications manholes/duct bank within the scope of selected projects and associated construction contract documents.

The Contractor of Record shall be required to attend at least one face-to-face meeting between the Contractor's telecommunications experts and CommTech Engineering, prior to commencing procurement or other telecommunications infrastructure work on any project. This meeting shall be coordinated through the UNC-CH Facilities Planning and Construction Office.

The Contractor of Record shall submit all communications materials for review and approval by the Designer of Record and CommTech Engineering prior to any procurement as described in the Submittals sections of this document. Items of telecommunications electronic equipment are typically purchased and installed by the Owner. The Contractor of Record shall refer to the project bid document and the construction contract documents for all details of scope and responsibility.

The Contractor of Record is responsible for all testing. See "Execution>Testing and Acceptance" of this section for full requirements.

The Contractor of Record is responsible for ensuring proper coordination across subcontract trades. In particular, coordination between electrical subcontractors and telecommunications subcontractors is critical. For example, in some cases bonding systems and conduit systems may be installed either by the electrical or telecommunications contractor. Both must be kept abreast of the specifications and contract requirements.

## 5. Owner Performed Work

The University generally handles the design, installation, and operation of network services itself, or accomplishes that through contracts with third parties. This includes the data network, POTS voice, and Voice-over-IP services. As a general rule, designers and contractors will not be asked to include the development of these services as part of a project. Rather, these services will be transported via the transport-layer telecommunications infrastructure described in this document.

## 6. Qualifications

### 6.1. Designer Qualifications

The Designer of Record must have at least five (5) years of experience in the successful development of specifications and designs for telecommunications infrastructure in projects of a similar scale and complexity as the proposed project. UNC prefers that the Designer of Record maintain a currently-certified RCDD on the project team that can be available for all project meetings and significant communications with CommTech Engineering.

### 6.2. Installer Qualifications

Installation contractors must be licensed in the state of North Carolina for the installation of electrical conductors. Installation contractors must have at least 5 years of successful installation experience with projects utilizing unshielded twisted pair (UTP), Category 5e, and Category 6 cabling in compliance with TIA-568-C. UNC prefers that installation contractors have at least one RCDD on staff. UNC prefers that the project lead technician be BICSI certified at the technician level. The same technician should be the lead technician for duration of the project or be replaced by a technician with the same credentials.

Grounding and bonding systems shall be installed by a contractor licensed in the State of North Carolina for the installation of electrical conductors.

Where the installation of rooftop access assemblies penetrates or compromises an existing building roof assembly, the installation contractor shall be certified to perform work on the roof type presented.

### 6.3. Manufacturer Qualifications

Unless otherwise approved by CommTech Engineering, all materials shall be provided by manufacturers regularly engaged in the manufacture of unshielded twisted pair, coaxial cables, fiber optics, connectors, hardware, and related systems. Manufacturers must have products in satisfactory use for a minimum of five years.

## 7. Execution

### 7.1. Pre-installation Meeting

The communications contractor shall attend a meeting with CommTech Engineering prior to commencing installation activities. This meeting will be held at UNC at a location determined by CommTech Engineering and may include a site visit. The purpose of the meeting is to review project specifics and requirements. See Appendix 2 for details.

## 7.2. Installation Methods Governance

Installation of all systems and materials shall be accomplished in accordance with this document. Installations shall comply with all applicable national, state, and local regulations, including the NEC.

## 7.3. Submittals

Submittals shall be prepared in a line-by-line format corresponding to the applicable section of the contract document specifications and shall indicate compliance with each requirement specified herein. Indicate deviations, if any, from the Communications Infrastructure Guidelines.

Drawings and product data sheets shall be enumerated and referenced for easy identification.

Complete and accurate submittal data for each individual section shall be submitted as a single package.

No installation work may begin until submittals are received, reviewed, and accepted by CommTech Engineering and the Designer of Record.

A comprehensive table of submittal requirements is detailed in Appendix 1.

### 7.3.1. AutoCAD Drawings

All AutoCAD drawings shall be provided to CommTech Engineering as electronic files in version 2000 or later format.

All telecommunications elements shall be on a distinct layer of the drawing so that they can be easily isolated.

All plan view drawings shall be georeferenced with respect to the State Plane Coordinate System. Details on georeferencing standards can be found in the document "The University Of North Carolina At Chapel Hill Surface Location & Topographic Survey Standards" at http://www.maps.unc.edu. A listing and map of campus control points can be found at http://www.maps.unc.edu.

### 7.3.2. Product Data Sheets

Product data sheets are required for ALL components proposed for use. Product data sheets shall be submitted in PDF format.

The submittal of product data sheets is a key component of the design process. Any products for which we require data sheets must be approved by CommTech Engineering prior to installation.

Product data sheet submittals shall include manufacturer installation instructions.

## 7.4. Testing and Acceptance

The Designer of Record shall create a testing and acceptance plan for each communications infrastructure component as a part of the design phase. CommTech Engineering must

approve the testing and acceptance plan before any installation work can commence. The test plan submittal shall include a sample of testing documentation and proposed test equipment.

The Contractor of Record shall conduct all testing and document results. The Contractor of record shall supply all personnel, materials, and equipment required to conduct testing.

Contractor of Record shall notify CommTech Engineering through UNC Facilities Planning and Construction a minimum of twenty-one (21) work days in advance of any testing to be performed with details about the specific location of the test and functions to be testing. CommTech Engineering may be present for none, any, or all tests performed.

At the request of CommTech Engineering, the Contractor of Record will re-test any component that CommTech Engineering deems not acceptable by virtue of the component in question failing the prescribed test or for which the testing methodology is in question. CommTech Engineering must be present for any re-testing that it requests. All personnel, materials, and equipment required for re-testing shall be provided by the Contractor of Record without additional cost to the University. CommTech Engineering reserves the right to independently perform its own testing of materials and systems.

Test procedures shall confirm that each specification statement has been met or exceeded. The Contractor of Record shall provide an actual demonstration of each system requirement. All tests are subject to validation by means of a re-test, by Contractor, in the presence of the Owner's Representative.

Owner reserves the right to reject any component, work, or system that does not comply with the specifications described herein.

These are general test criteria that apply to all testing and acceptance activities. Testing criteria for specific components are defined in their respective sections in this document. Note that some wiring components are best tested as a system. Details on this type of testing can be found in CIG02 – Testing and Acceptance of Cabling Systems.

## 8. Contacts

Designers, contractors and vendors are encouraged to communicate directly and proactively with the CommTech Engineering staff. Contact information including staff locations, direct phone numbers, mailing addresses, and email addresses can be found at the following link:

http://its.unc.edu/CommTechnology/engineering_and_operations/engineering/index.htm

# CIG02 – Testing and Acceptance of Cabling Systems

## 1. General

Cabling systems consist of the cable itself, patch panels, and faceplate terminations. These individual components are difficult to test and document in isolation. Rather, it is more effective to perform end-to-end testing on completely terminated cable segments.

This document defines end to end testing requirements for the subsystem components described in the following specifications:

- CIG17 - Communications Termination Blocks and Patch Panels
- CIG21 - Communications Copper Cable Splicing and Terminations
- CIG22 - Communications Optical Fiber Backbone Cabling
- CIG23 - Communications Optical Fiber Splicing and Terminations
- CIG25 Communications Copper Horizontal Cabling

## 2. Execution

### 2.1. Testing

All testing shall be accomplished in accordance with CIG01.

If the test results are unsatisfactory the contractor shall replace the entire cable and retest.

Testing shall consist of an end-to-end system test, encompassing the cable, patch panel termination, and faceplate termination, as appropriate.

The contractor shall test UTP cable in accordance with TIA-568-C series standards, including TIA-568-C.0, TIA-568-C.1, TIA-568-C.2, TIA-568-C.3, TIA-568-C.4, and TSB-140. Each UTP cable shall be tested and the results documented and delivered to the owner's representative for review/acceptance.

Copper cabling shall be fully tested for Cat6e compliance in the TIA specifications, including the following parameters:

- DC resistance
- Open pairs
- Shorted pairs
- Split pairs
- Reversed conductors
- NEXT (test from both ends)

- ELFEXT
- Return loss
- Delay skew

# CIG03 - Grounding and Bonding for Communications Systems

## 1. General

Grounding and bonding for communications systems are supplemental to the electrical power grounding system and devoted to the communications system infrastructure. Bonding and grounding of telecommunications systems is a requirement in each building on campus. Its purpose is to protect personnel and equipment from unwanted electrical currents associated with the communications infrastructure and equipment.

Grounding and bonding responsibilities are divided and shared between the electrical contractor and the communications contractor. The designer of record shall be responsible for coordinating the activities of these groups and ensuring that specifications are consistent across trades.

Grounding and Bonding applies to all communications systems elements, but especially to the following specifications:

- CIG04 Pathways for Communications Systems
- CIG06 Conduits and Backboxes for Communications Systems
- CIG07 Cable Trays for Communications Systems
- CIG16 Communications Cabinets, Racks, Frames and Enclosures
- CIG18 Communications Cable Management and Ladder Rack

## 2. Execution

### 2.1. Bonding Conductor for Telecommunications (BCT)

The bonding conductor for communications shall bond the TMGB to the main electrical service (power) grounding system. The BCT originates in the MDF and terminates at the electrical service ground for the building. The BCT shall be a continuous copper conductor sized according to length. This conductor shall be installed in EMT, bonded to the conduit at each end and be sized, as a minimum, the same size as the TBB.

### 2.2. Telecommunications Bonding Backbone (TBB)

This conductor interconnects the TGB with the TMGB. The TBB shall be routed in a separate conduit alongside the telecommunications riser cables. The TBB shall be insulated and be a continuous conductor without splices. The TBB shall be a copper conductor with a minimum conductor size of 6 AWG.

### 2.3. Installation Compliance.

Provide grounding connections for cable systems as required by manufacturer's recommendations and in compliance with TIA-568-C.0 and TIA-607-B, and as required by the NEC.

## 2.4. Telecom Room Infrastructure Bonding

Bond all installed equipment racks, cable tray, and other metallic components to grounding bus bar in telecom room with a minimum 6 AWG copper conductor with green colored insulation.

## 2.5. TBB Sizing Requirements

The TBB should be sized per the table below with the TBB length calculated from the last TGB in the run to the TMGB.

| TBB Length (LF) | TBB Size (AWG) |
|---|---|
| Less than 13 | 6 |
| 14-20 | 4 |
| 21-26 | 3 |
| 27-33 | 2 |
| 34-41 | 1 |
| 42-52 | 1/0 |
| 53-66 | 2/0 |
| Greater than 66 | 3/0 |

## 2.6. Telecommunications Main Grounding Busbar (TMGB)

The TMGB is located in the BDF and is bonded by means of a bonding conductor for telecommunications to the main building service equipment ground. It should be installed at 7' 6" AFF onto the wall-mounted plywood. The bar should be electrically insulated from its mounting hardware. In addition to being bonded to the main electrical service ground, the TMGB should be bonded to building steel if available. This does not apply to buildings constructed of reinforced concrete.

## 2.7. Telecommunications Grounding Busbar (TGB)

The TGB is the interface to the building telecommunications grounding system located in each IDF and serves as the communications grounding system for that room. It shall be installed onto the wall-mounted plywood at 7' 6"" AFF. The bar shall be electrically insulated from its mounting hardware. In addition to being bonded to the TMGB, the TGB shall be bonded to building steel if available. This does not apply to buildings constructed of reinforced concrete.

## 2.8. Grounding Equalizer (GE)

Whenever two of more TBBs are installed in a building the TBBs shall be bonded together with a GE. This conductor connects the TGBs in IDFs on the same floor in a building at the top floor and at a minimum of every third floor in between per TIA-607-B.

### 2.9. Cable Tray

A #6 AWG TBB conductor shall be installed for the TGB to the cable tray with each section bonded together per manufacturer and NEC requirements.

### 2.10. Pathway Components

A #6 AWG TBB insulated grounding conductor shall be installed to each pathway component per manufacturer and NEC requirements.

### 2.11. Equipment Cabinets and Racks

A #6 AWG TBB insulated grounding conductor shall be installed between the TMGB or TGB and all equipment racks.

### 2.12. Interconnection with Building Ground

The grounding system for telecommunications is for telecommunications systems only. No other building or system grounds may be made to the TMGB, TGB, or communications systems components.

## 3. Testing

Resistance to building ground shall be measured from each TGB/TMGB to building ground and shall not exceed maximum allowable fall of potential as determined by project electrical engineer.

# CIG04 - Pathways for Communications Systems

## 1. General

This section provides direction to designers regarding communications pathways installed through walls and floors to facilitate the placement of communications cabling in new construction and renovations. These pathways are also referred to as sleeves and typically provide a pathway between stacked telecommunication rooms, telecommunication rooms and cable trays routing through corridors, and pathways through inaccessible ceilings between sections of cable trays or equipment rooms. This section also covers firestopping of penetrations.

## 2. Execution

### 2.1. Sleeves

#### 2.1.1. EMT Use

EMT conduit shall be used as sleeves in the following areas:

1. Interior partitions.
2. Above suspended ceilings.
3. Above solid ceilings with limited access.
4. Floor penetrations.

EMT conduit shall not be used where tubing, couplings, elbows and fittings would be in direct contact with the earth or underground.

#### 2.1.2. RGS Use

RGS conduit will be used as sleeves in the following areas:

1. Corrosive environments.
2. Building entrance sleeves extending from the duct-bank system that exceed 50’ to the SER shall have one (1) of the compliment of sleeves be RGS.

### 2.2. Bushings

All conduit sleeves larger than 2” shall be fitted with "screw-on" type plastic bushings (installed on an EMT connector when EMT is used). Push-on type bushings are permitted on conduits 2” or smaller.

### 2.3. Specific Deployment Requirements

All sleeves shall be sized for the number connections required plus an additional 15% for future growth.

### 2.3.1. In Telecommunications Rooms

In telecommunications rooms sleeves shall be installed 4" AFF and 4" off of the wall with adequate separation to support installation of faceplate hardware and bushings.

### 2.3.2. Ceiling Penetrations

Sleeves that penetrate ceilings shall extend to 10' AFF so that they can be accessed easily via ladder.

### 2.3.3. Horizontal Sleeves in Telecommunications Rooms

Sleeves that reach into telecommunications rooms shall extend 2" into the room. On the outside of the telecommunications room the sleeve shall extend to 4" from the edge of the cable tray.

## 2.4. Penetration Seals for Fire Stopping

All seals shall utilized UL approved fire stopping assemblies that are approved for that penetration type.

Communications pathways shall be fire stopped according to all state and local code requirements and per the NEC. Non-cementicious firestopping shall be used to seal the interior of sleeves and must be of a type that will remain pliable for ease of removal in future cable installations.

## 2.5. Grounding

Communications pathways should be bonded to the telecommunications grounding system per section CIG03.

## CIG05 - Hangers and Supports for Communications Systems

### 1. General

Communications cabling hangers and supports are only to be used in isolated instances such as minor renovations or moves, adds, and changes where there are no cable trays and conduit raceways available to support cable installations.

Use of cable hangers and J-hooks is only permitted with approval by CommTech Engineering.

### 2. Execution

All communications cabling must be supported with hangers and supports such as open-top J-hooks. J-hooks should be located on 4'-5' centers to adequately support the communications cabling and typically attached to steel beams or direct to structure.

# CIG06 - Conduits and Backboxes for Communications Systems

## 1. General

Conduits and backboxes provide a pathway and physical protection for all horizontal communications cabling between the MDF/IDF and workplace outlet locations. Unless otherwise noted, all cabling for University properties will be housed in conduit/backbox systems (as opposed to surface mounted or hung cabling). The scope of conduit/backbox use includes cabling for voice and data communications, CATV, elevator emergency phone, security cameras, fire alarm phone lines, automatic transfer switches, emergency generators, and miscellaneous building and freezer alarm lines.

## 2. Execution

### 2.1. Conduit Bends

A maximum of 180 degrees will be allowed between pull points. Conduit runs exceeding 180 degrees of turns require the installation of a fully accessible pull box to facilitate cable installation. The use of LB-type or similar conduits is not permissible.

### 2.2. Looping

Telecommunications outlets may not be "looped" in the same run of conduit.

### 2.3. EMT

Each Telecommunications outlet will have a 1"minimum EMT conduit routed from the recessed outlet box that extends to within 4" of a cable tray or home run back to the nearest Telecommunication Room. RGS conduit should be used in corrosive environments.

### 2.4. Box Size

Telecommunications outlets shall be double gang 4" X 4" X 2-1/8" deep and shall be fitted with a double gang plaster ring to facilitate the installation of a double gang telecommunications faceplate. Outlets shall be installed at 18" AFF and/or shall be level with nearby electrical outlets. In cases where outlets are installed above countertops the outlet height shall be determined by the designer and noted on the drawings.

### 2.5. Surface Mounting

Surface mounted raceways in labs or classroom environments must be designed per room based on number of connections and outlet locations. See Section CIG09 - Surface Raceways for Communications Systems for details. **Note that this is not the preferred architecture.**

### 2.6. Special Purpose Links

Conduits serving elevator emergency phones, fire alarm phone lines, alarm lines for research freezers, and emergency generator/ATS alarm lines shall home run back to the MDF/IDF or UNC-CH Life-Safety designated equipment location.

## 2.7. Wall Phones

Outlets for wall phones shall be 4" X 2-1/4" X 2-1/8" single gang with height noted for each location on drawings. Wall phone heights shall comply with ADA accessibility guidelines where applicable.

## 2.8. Penetration Seals

Penetrations shall utilize UL approved fire stopping assemblies as described in section CIG04, including the use of non-cementicious firestopping to seal the interior of sleeves and remain pliable for ease of removal in future cable installations.

# CIG07 - Cable Trays for Communications Systems

## 1. General

Cable tray for communications systems provide a pathway, physical protection, and support for communications cabling.

## 2. Execution

The cable tray system is intended to carry telecommunications cable only; power wiring, control wiring, and fire alarm system cabling are not permitted in the cable tray system.

The system shall be installed according to the drawings and shall consist of a complete cable tray system including straight tray sections, horizontal elbows, vertical risers, crosses, tees, wyes, reducers, coupling accessories, splice plates, and cable tray supports.

### 2.1. Implementation

#### 2.1.1. General

Cable tray shall be top rung type and shall be installed with rung-caps sized to meet or exceed cable fill requirement.

Wall-mounted cable tray of similar manufacture may be presented to CommTech Engineering as a proposed alternative if field conditions dictate.

Intersections, bends, tees, etc. shall use fittings of the same type and model series as straight run sections.

Cable tray system sections shall be joined using only manufacturer-supplied prefabricated splice plates.

Blind end plates shall be provided for trays that dead end. Full width dropouts shall be provided where cables exit from trays.

Nicks, scratches and ends of cut sections in galvanized components shall be deburred and coated with a cold galvanizing compound after tray installation. Application of cold galvanizing compound shall be performed in a manner so as to produce a smooth finish and in accordance with the manufacturer's recommendations.

#### 2.1.2. Accessibility

Tray system shall be easily accessible and with at least 12" of space maintained about the top and sides of cable trays to permit access for installation and maintenance of cables.

Contractor shall utilize cable tray manufacturer's hardware to accomplish bends and intersections. Connections shall maintain full accessibility and full use of both sides of cable tray once installed.

### 2.1.3. Expansion

Contractor shall install a set of manufacturer prefabricated expansion splice plates at intervals of 48 ft in straight runs and where cable tray systems cross building expansion joints.

Contractor shall provide a minimum of one (1) expansion splice plate in straight runs which exceed 12 ft for tray installations in exterior areas.

### 2.1.4. Support

Trapeze hangers are not permitted to support cable tray.

Cable tray shall be supported by threaded rods that comply with manufacturer's recommended support and loading requirements.

Total vertical tray deflection shall not exceed manufacturer's recommendations.

Cable shall be equally distributed between both sides of the cable tray to equally distribute weight of cables.

## 2.2. Grounding

Each cable tray system subassembly shall be connected to building ground as described in section CIG03.

# CIG08 - Power Poles, Floor Boxes, and Poke Throughs for Communications Systems

## 1. General

This section provides direction to designers and contractors for new construction and renovation projects for the installation of power poles, floor boxes, and poke throughs for Communications Systems. These devices are typically utilized to provide communications cabling to classroom podiums, conference room tables, and modular furniture.

# CIG09 - Surface Raceways for Communications Systems

## 1. General

Surface raceways are intended to provide a pathway, physical protection, and support for communications cabling. Surface raceways are typically installed in laboratory or classroom environments to route communications cabling on solid walls and ceiling structure. The use of surface raceway is discouraged except in instances where internal wiring is impractical.

## 2. Execution

### 2.1. General

Surface raceways shall be sized for the number of connections required per the manufacturer's requirements.

Surface raceways shall be installed with factory fittings to maintain proper cable bend radius and provide physical separation from electrical wiring.

### 2.2. Coordination with Electrical Contractor

If the raceway is installed by an electrical contractor (by code or contractual requirement) then the electrical contractor shall provide the faceplates to the communications contractor.

# CIG10 - Underground Ducts and Raceways for Communications Systems

## 1. General

In order to preserve the historic aesthetic of the campus, nearly all utilities and services are underground. The University is its own utility service provider for electricity, steam, chilled water, storm water and telecommunications. Electrical primary cables, electrical secondary cables and telecommunications cables are routed underground in a network of manholes and concrete-encased ducts.

The Communications Technology (CommTech) office of UNC's Information Technology Services is responsible for telephone, CATV and computer network connections, including the majority of the University's underground communications cable plant. While ITS CommTech administers this cable plant, it is the Electric Distribution System (EDS) division of the campus Energy Services Department that administers the underground pathways in which the cable plant resides. EDS plans, installs, repairs and maintains the campus electrical and communications duct bank and manhole network. CommTech and EDS maintain a formal interdepartmental agreement that describes the technical scope and terms of their relationship.

University documents supporting this section of the CommTech guideline can be found at the following websites:

- Facilities Planning and Construction Guideline Section " IV. UNIVERSITY GENERAL REQUIREMENTS; C. UTILITIES; 1. Site Utilities"
  http://maps.unc.edu/guidelinespdf/IV-C-1_10-10-13.pdf
- Energy Services Department, Electric Distribution Systems Guideline Section "TECHNICAL DESIGN AND CONSTRUCTION GUIDELINES AND STANDARDS"
  http://maps.unc.edu/guidelinespdf/ElectricalDistributionDesignStandards.pdf

The above design standards are to be strictly adhered to regardless of the circumstance or purpose of the parties engaged in duct bank design, construction or use. Furthermore, these design standards are to be used when planning, designing and constructing telecommunications duct bank system including but not limited to the following system components.

## 2. Execution

Execution of duct bank design and construction shall include coordination of exterior duct bank construction with EDS and in-building routing with CommTech Engineering.

### 2.1. Service Entrance Facilities:

Campus buildings and facilities are generally fed by a duct bank lateral from the primary duct back distribution trunks throughout campus. These laterals are comprised of more granular conduit systems than the trunks. CommTech Engineering will identify the closest manhole for each facility and the Designer shall develop plans for getting from that point to the building. Generally, the duct bank should terminate directly in the building's service entrance room (SER). However, in some cases it may be necessary to for the duct bank to transition to a conduit system and traverse a Service Entrance Passthrough (SEP). Use of a SEP must be approved by CommTech Engineering.

## 2.2. Communications Manholes:

All communications manholes shall be constructed in accordance with the plan and section view drawings in the UNC-Chapel Hill University Design and Construction Guidelines. All new manholes shall be fitted with cable racking hardware.

## 2.3. Service Entrance Ducts:

Unless specifically directed by the UNC-Chapel Hill ITS-Communication Technologies Office, all new buildings will be designed with a minimum quantity of four 4" entrance conduits. These conduits will be of rigid metallic construction or 4" Schedule 40 PVC encased in concrete, as determined by CommTech Engineering and EDS. These entrance conduits shall extend from a communications manhole, designated by CommTech Engineering, to the service entrance room in the building.

No more than two 90 degree bends between the manhole and the building will be permitted.

One of the service entrance conduits shall be fitted with two MaxCell 3" 3-Cell fabric innerducts. MaxCell innerduct has unique installation requirements and shall be installed according to manufacturer's specifications. All conduits and inner ducts shall be installed with marked pull tapes.

The service entrance conduits shall appear and be positioned in the right rear corner of the SER, 4" from the rear wall and shall be stubbed 4" above the finished floor, unless otherwise approved by CommTech Engineering.

Plastic bushings shall be installed on each entrance duct. The use of LB, LL, or LR fittings will not be approved. All metallic entrance conduits shall be installed in accordance with the National Electrical Code.

If the service entrance ducts penetrate or appear in the building before they finally terminate in the building SER, they should transition to metallic conduit (if PVC) in an accessible and appropriately sized junction box per the NEC. If the distance between the point of transition and the building SER exceeds 50 ft, then at least one of the quantity of exposed entrance conduits MUST be rigid. In addition, where a transition junction box is installed, one of the non-rigid conduits that extends to the SER shall be fitted with two MaxCell 3" 3-Cell fabric innerducts. Contractor shall consult with CommTech Engineering when special pull boxes or junction boxes are required.

## 2.4. Duct Bank between Manholes:

Reference EDS' specification section for Manholes and Duct bank for a further description of duct bank construction practices. Special thermal protection design considerations must be employed when telecommunications duct bank crosses or runs in same vicinity as steam lines. See the University guidelines for infrastructure in proximity to steam lines.

## 2.5. Acceptance of Duct Banks:

All duct bank both from the manhole to the building, and between manholes shall be inspected and approved by an Electric Distribution Systems representative prior to the placement of any concrete.

## 2.6. Capital Building Projects:

When utility extensions are required as a part of the scope of work for a capital building project, the Designer of Record shall reference the guidelines published for Electric Distribution Systems.

## CIG11 - Rooftop Access for Communication Systems

### 1. General

Rooftop access for communications systems is a growing requirement at UNC-CH, particularly in support of RF applications. Building roofs may host towers for point-to-point microwave, cellular telephony, and related applications. As a result UNC-CH requires rooftop access readiness as a general requirement for buildings in anticipation of future needs.

### 2. Execution

All new building and complete renovation project designs shall provide some level of rooftop cabling access system assembly as part of design components. The minimum access shall be two (2) penetrations of 2" diameter each, however, access assemblies may range in complexity from simple weather head / pitch-pocket assemblies to fully engineered rooftop "huts." The Designer of Record shall discuss the rooftop access requirements for each project early in the design phase to have a good understanding of the programming requirements.

Type, quantity and location of cable access devices shall be determined by function of building and in consultation with CommTech Engineering

In a renovation, the contractor shall be required to work with the original roofer in an effort to maintain the roof warranty.

All work shall be inspected by UNC Facilities Services prior to project acceptance.

## CIG12 – Utility Poles for Communications Systems

### 1. General

To provide the best physical cable protection and for aesthetic appearances, utility poles for communications system are typically not allowed on the UNC Chapel Hill campus. There may be instances on capital projects where a temporary aerial segment of fiber optic or telephone cable is required as a work-around during site preparation and that cable segment will be removed as soon as the buried duct bank system is completed and the permanent fiber optic and telephone service has been restored. In capital projects where a temporary aerial segment of cable is required to maintain telephone and network connectivity the project is responsible for all design, installation, and cut-over costs associated.

# CIG13 - Identification for Communications Systems

## 1. General

This section describes labeling requirements for communications systems. Labeling is a critical requirement and should be attended to in detail.

## 2. Execution

The Designer of Record shall communicate with CommTech Engineering to obtain precise naming details for communications systems components, and these names shall be used on all drawings.

The University prescribes a detailed labeling methodology. When the University's cable identification methods do not specify format, cable identification method shall comply with TIA-606-B as a minimum and be coordinated with the University's Representative.

Unless otherwise specified, professional, non-erasable, adhesive, machine-printed labels shall be used and bear the approved cable identification method. Labels for stainless steel faceplates shall be clear adhesive type with black lettering.

### 2.1. Buildings and Rooms

BuildingIDs and room numbers are assigned by UNC Facilities. The Contractor should check with the UNC project manager to ensure the proper building ID and room numbers are used when labeling communications systems components. Note that the Building ID is generally a 3-digit code. This should always be used instead of the common name, which can change.

### 2.2. Racks

Racks in TRs shall be labeled sequentially starting with 1. The label shall be machine generated, at least 1.5" high and have black letters on a white background. The label shall be plastic or vinyl and adhered to the upper right corner of the rack if possible.

### 2.3. Risers

All riser communications cabling such as Category 6e, Single Mode OS2 Fiber, Multi-mode 50 Micron OM3 Fiber, Multi-pair Category 3 telephone riser, and .500" Coax trunk shall be labeled on each end. This is to include originating and terminating Telecom room information, individual fiber strand, telephone pair, and Cat 6e copper riser patch panel port information. Riser patch panel labeling shall be consecutive.

### 2.4. Fiber Optic Cabling and Systems

Fiber optic cables and segments have a long lifespan at the University and must conform to University labeling requirements to support identification and computerized management systems already in place.

### 2.4.1. Segments

#### 2.4.1.1. Naming

A fiber segment is a jacketed set of fiber optic cables, themselves generally enclosed in buffer tubes. A fiber segment is intended to represent the physical cable itself, irrespective of mid-span connections. Mid-spans are given their own segment name. Segments are assigned a unique index of the form:

*FS.index*

FS indicates that the cable is a fiber optic cable segment. Index is a unique integer. Index does not include leading zeros.

Examples:

FS.400

FS.32

FS.1022

Note that in Fiber Manager, each portion of a cable segment must be renamed whenever an existing cable is spliced in order to maintain unique names. By convention, these segments shall be renamed with a lowercase alphabetic postfix, segment.a, segment.b, etc. within Fiber Manager. This index shall not be carried into the field on labels, but is an internal Fiber Manager issue only.

Examples:

FS.400.b – indicates the second segment in Fiber Manager of cable FS.400.

#### 2.4.1.2. Labeling

Cable segments shall be labeled within 24 inches of any entrance or exit to a conduit, splice enclosure, patch panel, manhole, hand hole, or other transition from visible to concealed location.

All external labels shall be constructed of embossed stainless steel tags. Internal labels shall be made of plastic and machine-generated.

The label shall indicate the segment number.

### 2.4.2. Individual Fibers

#### 2.4.2.1. Naming

Individual fibers are referred to by the segment name, followed by a fiber identifier. The fiber identifier may either be an index, starting with 1, or a fiber color indicator as specified in TIA-598-C.

Both naming forms are acceptable. In general, the color form is more useful for macro-level design drawings and communications with field technicians. The index form may be more useful when referring to specific fibers singled out from a bundle.

The syntax is of the index form is:

*segment.index*

The syntax is of the fiber color indicator is:

*segment.buffer_tube.strand_color*

Examples:

FS.400.1

FS.400.blue.blue // equivalent form of FS.400.1

FS.32.144

FS.32.aqua.aqua // equivalent form of FS.aqua.aqua

#### 2.4.2.2. Labeling

Individual fibers are not generally labeled.

### 2.4.3. Patch Panels

#### 2.4.3.1. Naming

Patch panels are assigned a unique numeric number of the form:

*FP.building_number.room.index.[module].[port]*

The *building_number* element is the official UNC building number. The *room* element is the room number where the patch panel is located. Note that leading zeros shall only be included if included in the official building or room name in the EIS documentation. The *index* element distinguishes between multiple patch panels in the same room. Indices start at 1 for the first patch panel in each room and increment. An index of 1 is required in the name even if there is only a single patch panel in the room. The *module* is a letter indicating the module or card number in the panel frame. The *port* element is the specific port on the patch panel. Note that module port numbers are not needed when naming patch panels, but are included when specifying individual ports for patching or termination purposes.

Examples:

FP.039.29.3 – indicates a patch panel in ITS Phillips (building 039), room 29, patch panel number 3.

FP.625.2905.2.G.5 – indicates a patch panel in ITS Manning (building 625), room 2905, patch panel #2, module G. port 5.

#### 2.4.3.2. Labeling

All patch panels shall be labeled to indicate the patch panel name. Labels shall be machine-generated, high contrast and between 1/2" and 1" high.

### 2.4.4. Splice Enclosures

#### 2.4.4.1. Naming

Splice enclosures are named according to the form:

*FE.location.room.index*

The location element is generally the building number, but if MH is present it indicates instead that the location is a manhole. This taxonomy can be extended to include other structures (e.g. TW for tower, etc.) The room element is the room number in which the splice enclosure is located. If MH is present in the location field then the room element shall be populated with the manhole name.

Examples:

FE.039.29.1 – Indicates fiber enclosure #1 in room 29 of Phillips Hall.

FE.MH.U11-B.1 – Indicates fiber enclosure #1 in manhole U11-B.1

*Note that there is a potential name space collision if Facilities ever changes the namespace for building numbers.*

#### 2.4.4.2. Labeling

Splice enclosures in manholes and exposed areas shall be labeled on their exteriors with embossed stainless steel tags. Interior splice enclosure labels shall be constructed of plastic and be machine-generated.

### 2.4.5. Splice Trays

#### 2.4.5.1. Naming

Splice trays names are optional and can be specified by appending a number index to the fiber enclosure name.

Example:

FE.039.29.1.4 – Indicates the 4th splice tray in fiber enclosure #1 in room 29 of Phillips Hall.

#### 2.4.5.2. Labeling

Splice trays may be optionally required to be labeled by Engineering using a machine-generated plastic label. Because of space constraints the label may exclude the full fiber enclosure name and simply display the index (e.g. 1, 2, 3, etc.)

## 2.5. Copper Data Cabling and Systems

### 2.5.1. System Drawings

Contractor shall provide three (3) sets of drawings marked with jack numbers. Drawings shall also be provided on a CD in AutoCAD format. One set of cable drawings shall be installed in each telecommunications room. This is a pre-construction submittal requirement due 120 days prior to beneficial occupancy.

### 2.5.2. Labeling

All cable shall be labeled both at the outlet and the patch panel with an alpha/numeric identification code using the following format: (T-1) indicates telephone one, (T-2) indicates telephone two, (D-1) indicates data one, (D-2) indicates data two, (R-1 indicates riser one, R-2 indicates riser two) etc. In the event a floor is served by more than one Telecom room due to cable distances exceeding 90 meters or other physical restraints, each communications outlet shall be labeled with serving Telecom room number.

Communication outlets served from a TR not on that floor or where more than one TR is required per floor shall be labeled with the serving TR room number on the telecomm outlet faceplate.

Each horizontal cable shall be labeled within 6" of cable termination.

### 2.5.3. Data Horizontal Cabling

#### 2.5.3.1. Cable Destination Chart

Each TR shall contain a Cable Destination Chart that shows the room number destination of each cable leaving that TR. The Cable Destination Chart shall be printed on 8.5" x 11" paper, placed in a clear, plastic sleeve, and hung from the primary rack housing patch panels.

Additionally, Contractor shall submit a chart of installed cables in Microsoft Excel spreadsheet (or .csv) format.

The chart shall have one worksheet for each TR showing the destination label of each cable as indicated on the faceplate. All worksheets for a building shall be integrated into a single building spreadsheet. The name of the worksheet shall be the TR room number. A sample is shown below.

| Termination | Room Number |
|---|---|
| D100 | G013 |
| D101 | G013 |
| D102 | G015 |
| D103 | G015 |
| D104 | G110 |

#### 2.5.3.2. Data Patch Panels

48 port Category 6e data patch panels shall be labeled consecutively beginning with port 1 through 48. Subsequent patch panel port shall be labeled 49-96, 97-144 etc.

### 2.5.4. Voice Cabling and Systems

Voice connections requiring analog service for Life Safety such as Fire Alarm lines, Elevator Phones, Emergency Phones and Contingency phones shall be labeled with standard "T" numbers at each end. Where voice cables are terminated on 66M1-50 terminating blocks in the Telecomm room, those "T" numbers shall be supplemented with additional labeling on the 66M1-50 termination identifying where each cable is utilized. For Fire Alarm lines “FA-1 / FA-2”, for Elevator phones “Elev 1 / Elev 2”, for Emergency phones “Emer 1 /Emer 2” and for Contingency phones “Ctgy 1 / Ctgy 2”.

## CIG14 - Schedules for Communications

The Designer of Record is responsible for including the identified components (or their equivalents) in the design package.

The Designer of Record is responsible for ensuring that all components are properly justified, along with the identification of acceptable alternates, in compliance with all State of North Carolina purchasing regulations.

Components and approved vendors are listed by section/functional area.

Preferred products are listed below.

### 1. CIG17 Communications Termination Blocks and Patch Panels

| Item | Component | Description | Manufacturer | Part Number |
|---|---|---|---|---|
| 1 | patch panel | Category 6 patch panel for horizontal data connections in each telecom room | Hubbell | P648U |
| 2 | patch panel | Category 6 patch panel for horizontal data connections in each telecom room | Hubbell | P624U |

### 2. CIG21 - Communications Copper Cable Splicing and Terminations

| Item | Component | Description | Manufacturer | Part Number |
|---|---|---|---|---|
| 1 | Data Jack | Category 6 - 568 A/B | Hubbell | HXJ6BK (Black) |

### 3. CIG27 Communications Faceplates and Connectors

| Item | Component | Description | Manufacturer | Part Number |
|---|---|---|---|---|
| 1 | 2-Gang Cover Plate | Flush or Surface outlet faceplate | Hubbell | IFP26OW |
| 2 | Blank Connector | Blank Faceplate Insert | Hubbell | SFB10 |
| 3 | Video Jack | F- Connector | Hubbell | SFFX |
| 4 | Dust Cover | Data Jack Dust Cover | Hubbell | HXJDC25 |

## CIG15 - Communications Entrance Protection

### 1. General

Cables that enter a building from outside require electrical surge protection. Generally, communication cables that enter a building are provided by service providers under contract with the University. It is therefore not the responsibility of the Designer of Record to provide communications entrance protection for capital construction projects and renovations. However, it is the responsibility of the Designer of Record to coordinate with the owner and service provider to ensure that adequate space exists in telecommunications areas for protective equipment.

# CIG16 - Communications Cabinets, Racks, Frames, and Enclosures

## 1. General

Communications cabinets, racks, frames, and enclosures are intended to provide physical protection and mounting support for active and passive communications hardware.

## 2. Execution

Communications cabinets, racks, frames and enclosures shall be grounded and bonded as described in section CIG03.

All cabinets, racks, frames, and enclosures shall be installed according to manufacturer's recommendations, including secure mounting to the floor or other structure as appropriate.

### 2.1. Equipment Racks

Owner's preferred item: Hubbell Part No. HPW84RR19 or equal.

Racks shall be constructed of aluminum and painted in black at the factory.

Channel uprights shall be spaced to accommodate industry standard 19" mounting.

Each rack shall be supplied with spare screws.

Each rack shall be 84" in height and shall be self-supporting.

Each rack shall be double-side drilled and tapped to accept 12-24 screws.

Uprights shall be drilled on the back to accept cable brackets, clamps, power strip(s), etc.

### 2.2. Cable Management for Equipment Racks

Owner preferred front horizontal wire management module Panduit part number CMPHH2 and rear horizontal manager WMPHF2E or equal. Front and rear managers shall be placed above and below each Cat 6e data patch panel.

Owner preferred vertical wire management bracket OCC part number VCM6 or equal. Vertical wire manager shall be placed between each equipment rack.

### 2.3. Placement

Final placement of telecommunications components shall be determined by CommTech during an on-site meeting.

# CIG17 - Communications Termination Blocks and Patch Panels

## 1. General

Communications termination blocks and patch panels are utilized to terminate voice, data, security and signaling cable with the purpose of identification, patching and cross-connection of passive communications cabling.

## 2. Execution

Termination blocks and patch panels shall be installed per Designer's detailed telecom room layout drawings and as directed by UNC ITS Engineering at the pre-installation meeting and throughout the duration of the project.

Provide front and rear horizontal cable management and vertical cable management as directed in section CIG18 Communications Cable Management and Ladder Rack.

### 2.1. Copper Cabling for Data

Each Category 6e data vertical/riser cable shall be terminated in a 24-port Category 6 patch panel – Hubbell Part No. P6E24U. Quantity of riser links specified will vary with project. Typical quantity is 15 Category 6e links to each IDF from the building MDF.

Each Category 6e data station cable shall be terminated in a 48-port Category 6 patch panel – Hubbell Part No. P6E48U. Patch panels supporting station cabling shall be mounted in 7' floor rack dedicated to horizontal/station cabling. Horizontal (rear and front side) and vertical cable management devices, as indicated and listed in Section CIG18, shall be installed on those floor racks carrying horizontal/station cable termination patch panels.

### 2.2. Copper Cabling for Voice

All voice riser/backbone cables shall terminate in a "riser cable field" on a 66M1-50 terminating block. Each 66M1-50 terminating block shall be secured to an 89D mounting bracket which in turn shall be secured to a 183A1 metal mounting backboard. Location or placement of the "riser cable field" shall be as indicated on project drawings/details and/or as directed by UNC-Chapel Hill – ITS-Communication Technology representative(s).

Provide sufficient Category 5e 66M1-50 termination blocks to terminate all voice pairs to be located in each equipment room. Mount blocks on 183 series metal backboards with 89D brackets. Use 187B1 metal backboards with mushroom spools for wire management. Backboards shall be double stacked vertically.

Each voice station/horizontal cable shall be terminated in a "station cable field" on a 66M1-50 terminating block. Each 66M1-50 terminating block shall be secured to an 89D mounting bracket which in turn shall be secured to a 183A1 metal mounting backboard. Location or placement of the "station cable field" shall be as indicated on project drawings/details and/or as directed by UNC-Chapel Hill – ITS-Communication Technology representative(s).

### 2.3. Fiber Optic Cabling

Fiber Optic Patch Panels and coupling assemblies shall be installed at the MDF and IDFs. Blank covers for unused coupling assembly spaces in panels. Assembly spaces shall be utilized in consecutive order, without skipping module spaces.

Panels shall be enclosed assemblies affording protection to cable subassemblies and terminated fiber strand ends. Enclosures shall incorporate hinged or retractable front cover designed to protect

Mount patch panels and horizontal cable management in 19" equipment racks.

Owner's preferred item: Optical Cable Corporation (OCC) Fiberopticx Cabinets RTC Series, with OCC 616SMDLC or 616DLC50G termination hardware (as appropriate) and series 600 blank coupler plates as required.

## 3. Testing

All communications cabling system components shall be tested per section CIG02.

# CIG18 - Communications Cable Management and Ladder Rack

## 1. General

This section provides direction to designers for new construction and renovation projects for the installation of communications cable management and ladder rack. Communications cable management and ladder rack are utilized to route voice and data cabling in telecom rooms for the purpose of providing routing and support for communications cabling.

## 2. Execution

### 2.1. Ladder Rack

Ladder rack shall be black in color and sized based on the projected amount of cable it supports.

Ladder rack shall be grounded per CIG03.

Cable runway shall be tubular stringer style B-Line SB-17-18, or equal by Chalfant, Globe.

Cable Runway shall be constructed of 0.065" thick steel and utilize tubular stringers to support rungs.

Cable Runway stringers shall be 1-1/2" high. Rungs shall be welded to stringers and shall

be spaced 9" on center.

Cable Runway width(s) shall be 12" unless otherwise noted on drawings.

Cable Runway shall be UL Classified. Black Powder Coat is an acceptable color option for ladder runway.

Cable runways shall be supported from the wall, using hardware from cable runway manufacturer specifically intended for that purpose, with 4" separation from edge of tray to the edge of mounting wall.

### 2.2. Cable Management

Cable management for racks shall include both vertical and horizontal components.

#### 2.2.1. Vertical Cable Management

Vertical Cable management shall be 6" wide, 7'-0" tall, double sided, with black finish and

"D" rings approximately 8" on center.

- Approved products: Panduit, Superior Modular Products, Ortronics, or Chatsworth.
- Owner's preferred item: Panduit VCM6x6.

### 2.2.2. Horizontal Cable Management (Front of Rack)

Horizontal Cable Management (front of rack) shall be 3.5" high, 5.7" deep, 19" wide, two rack unit device with four horizontal split distribution ("D") rings.

- Approved products: Panduit, Superior Modular Products, Ortronics, or Chatsworth.
- Owner's preferred item: Panduit CMPHH2.

### 2.2.3. Horizontal Cable Management (Front of Rack)

Horizontal Cable Management (rear of rack) shall be 3" high, 3" deep, 19" wide, device with cable management fingers, cable pass-throughs and hinged solid cover.

- Approved products: Panduit, Superior Modular Products, Ortronics, or Chatsworth.
- Owner's preferred item: Panduit WMPHF2E.

# CIG19 - Communications Equipment Room Fittings

## 1. General

This section provides direction to designers and contractors when 'provisioning' a telecommunications room (TR). It covers general configuration details for the room, including size, materials, and power requirements.

This section applies to Main Distribution Frame (MDF) and Intermediate Distribution Frame (IDF) rooms.

## 2. Execution

### 2.1. Physical

TRs shall be 10' X 10' minimum in size.

TRs shall be "stacked" vertically between floors if possible.

Buildings with multiple floors shall have one (1) TR per floor when possible.

TRs shall be centrally located to limit cable distances when possible. TR placement shall limit installed cable distances to a maximum of 90 meters. Multiple TRs may need to exist on a floor to meet this requirement.

TR floor covering shall be low static, VCT flooring. Sealed concrete shall not be allowed in TRs.

3/4" AC grade plywood shall be installed on all walls from the floor to 8' AFF and painted white with fire-rated stamp taped off for building inspector approval. Plywood shall be attached to walls utilizing flush-mounted hardware.

Entry doors to TRs shall open out.

Buildings with tenants not associated with UNC shall have a dedicated and securely divisible TR on each floor for tenants.

Ceiling height shall be minimum 8' with 10' being preferable and be open to deck above for maximum accessibility. Lay-in type ceilings are not allowed in TR rooms.

Telecomm room doors shall have UNC ONE CARD access reader and door locks installed.

### 2.2. Environmental

TRs must maintain continuous and dedicated 24 hour/ 365 days TR environmental control not to be affected by building HVAC shut down. Branch electrical circuits serving TR environmental control equipment shall be fed from building emergency generator/ building UPS if available. Environmental control shall maintain positive pressure with one air change per hour required.

## 2.3. Power Requirements

In buildings with multiple TRs, the MDF shall be fitted with a dedicated 100 amp panel that will serve all IDFs throughout the building. Dedicated electrical panels shall be fed from building emergency generator/building UPS if available.

In some cases it may not be practical to have a dedicated electrical panel in the MDF. All circuits serving TR's that do not have a dedicated electrical panel in the MDF shall be fitted with mechanical breaker locks to prevent TR electrical circuits from being inadvertently switched to the off position. TR electrical circuits shall be fed from building emergency generator/building UPS if available.

Each TR shall be served with three (3) 20-amp electrical circuits dedicated exclusively to the TR.

With the exception of walls where the entry door is located, each TR wall shall be fitted with a flush-mounted, double gang, 110 volt, 20 amp, double duplex, electrical outlet mounted at 72" AFF. Each double duplex electrical outlet shall be fed by two (2) distinct, dedicated electrical circuits.

The Contractor shall supply one Wiremold-Perma (part number R5BZ-20 or equivalent) power strip/surge protector with a minimum 15' cord for each installed rack. These shall be delivered directly to the CommTech Engineering project manager.

## 2.4. Bonding and Grounding

All equipment and cable shields shall be properly bonded as described in CIG03.

The TMGB shall be mounted at 7' 6" AFF in the MDF.

The TGB shall be mounted at 7' 6" AFF in the IDF.

## 2.5. Lighting

Provide adequate lighting fixtures to provide a minimum 500 lux (50 footcandles) measured at 1 meter AFF. Lighting fixtures shall be mounted at a minimum of 8.5" AFF and be fitted with wire guard to prevent accidental bulb damage.

TR lighting circuits shall be on emergency power if available.

## 2.6. Fire Protection

Provide fire sprinkler pipes per applicable code requirements. Where sprinkler heads are installed, install wire sprinkler cages to prevent accidental operation. Drainage troughs shall be installed to prevent equipment damage in the event of accidental leakage.

TRs shall not be located below potential sources of flooding like restrooms, roof drains, or kitchens.

All penetrations shall be firestopped as described in CIG04.

## 2.7. Equipment Racks

TRs shall be fitted with a minimum of three (3) equipment racks with front and rear horizontal and vertical cable management as detailed in section CIG16 Communications Cabinets, Racks, Frames, and Enclosures.

## 2.8. Cable Pathway in TRs

A minimum of four (4) 4" conduits are required from the serving manhole to the SER with one 4" conduit containing 3 Maxcell innerducts (part number MXD3456XX500). In the event that the conduit distance exceeds 50' from serving manhole to SER, one 4" conduit shall be Rigid Galvanized Steel (RGS).

Horizontal cable trays and sleeves shall enter TR no lower than 7'6" and no higher than 10'. Cable trays, horizontal and vertical sleeves shall extend 4" into TR. Conduits and sleeves entering TRs shall have screw-on type bushings. Vertical sleeves shall be 4" off wall and trimmed to 4" AFF of TR that sleeve stubs up into and 10' AFF of TR that sleeve stubs down into.

Cable runway shall be tubular stringer style B-Line SB-17-12, or equal.

Cable runway shall be constructed of 0.065" thick steel and utilize tubular stringers to support rungs.

Cable runway stringers shall be 1-1/2" high. Rungs shall be welded to stringers and shall be spaced 9" on center.

Cable runway width(s) shall be 12" unless otherwise noted on drawings. Cable runway width shall be calculated based on manufacture's requirements for number of cables to be supported plus 15% growth capacity.

Provide runway and accessories necessary for complete system.

Provide cable drop-outs at all equipment rack locations and as required in design drawings.

Fasten runway to top of equipment racks with equipment manufactured for this purpose.

Provide wall support kits to support runway from building walls and provide cable runway support kits to secure runway to equipment rack.

Contractor shall install the cable runway so that it is 4" off the surface of the wall in each TR.

## 2.9. Cabling

Velcro style reusable self-gripping cable ties shall be used to route and secure communications cabling in the PDR/SDR.

## 2.10. Cable Destination Charts

Each TR shall have a cable destination chart as described CIG13 - Identification for Communications Systems, section 2.5.3.1.

# CIG20 - Communications Copper Backbone Cabling

## 1. General

Copper backbone cabling supports risers for legacy voice and Ethernet data connectivity.

## 2. Execution

### 2.1. Data

Installation of copper backbone cabling shall follow the same procedures as horizontal cable installation as described in CIG25.

### 2.2. Voice

Installation of copper backbone cabling shall follow the same procedures as horizontal cable installation as described in CIG25 except that Category 3 multi-pair riser cable shall be used.

## 3. Testing

All communications cabling system components shall be tested per section CIG02.

# CIG21 - Communications Copper Cable Splicing and Terminations

## 1. General

This Section describes work associated with terminating copper UTP cable. For the purpose of this document, copper cable shall refer to Category 6e UTP cable used and installed for voice and data applications.

## 2. Execution

Splicing of copper UTP cables is NOT permitted for any permanent work.

### 2.1. At Faceplate

#### 2.1.1. Data Cables

Each Category 6e data cable shall be terminated in a Category 6 jack. Jacks shall be Hubbell Part No. HXJ6BK and shall be wired as per TIA- 568-C.0. Data jacks shall be secured in faceplate in top and middle position on right side of six-position faceplate.

#### 2.1.2. Voice Cables

In those faceplates where analog voice connections are required, each Category 6e voice cable shall be terminated in a USOC jack. Jacks shall be Hubbell Part No. HXJU8OW and shall be wired utilizing the USOC defined pin-out. Where a voice jack is required, it shall be secured in a wall telephone faceplate or in the top position on the left side of a six-position two-gang faceplate

### 2.2. In Telecommunications Room

Termination of cables in telecommunications rooms is described in section CIG17 - Communications Termination Blocks and Patch Panels.

## 3. Testing

All communications cabling system components shall be tested per section CIG02.

# CIG22 - Communications Optical Fiber Backbone Cabling

## 1. General

This section describes design requirements associated with the installation of building backbone/riser optical fiber cables. In general, Campus building Telecommunications Room cable riser systems shall be fitted with some calculated strand-count of both single-mode and 50-micron OM3 or OM4 multi-mode fiber.

## 2. Execution

All cable, equipment and hardware shall be arranged to provide a neat appearance and accessibility for servicing.

Designer shall supply estimated loss measurements for each cable run.

### 2.1. Inner Duct

Fiber optic cabling shall be installed in 1-inch inner duct when:

- Installed in 4"conduit runs.
- Installed in cable tray.
- Installed in riser sleeves and spaces.

### 2.2. Riser Conduit Sleeve

Install all riser fiber optic cabling in a stacked riser conduit sleeve separately from the other riser cables.

Completely utilize full placement capacities of each riser conduit sleeve before placing cable in the next empty conduit sleeve.

### 2.3. Splicing and Connection

Install fiber optic cable runs continuous and un-spliced, from outlet boxes to termination panels.

Provide sufficient cable in each termination location to properly terminate cables.

### 2.4. Preparation of Interior Raceway Systems

Ensure that all cable tray, conduit and other confined routing are free and clear of all debris before cable placement.

Cable shall not be installed into conduit ends that are not reamed and bushed.

### 2.5. Specifications

Maximum allowable connector loss: 0.75dB

Maximum allowable splice loss: 0.3dB

### 2.6. Cable Identification

Cables shall be labeled as described in section CIG13.

## 3. Testing

Link testing shall not include any active or passive devices other than the cable, connectors, and splices.

### 3.1. Presentation of Test Results

Installation Contractor shall utilize test equipment capable of saving results in electronic and printed form. Test results shall be presented in PDF form. Test results shall be saved and labeled according to UNC naming conventions (see CIG13), typically FS.[sheath_number].[strand_number]. For example, cable segment FS.801 shall have strands FS.801.1, FS.801.2, FS.801.3, etc. Contact CommTech Engineering for naming specifics prior to testing.

OTDR traces shall not show backscatter beyond the end of the fiber.

In addition to PDF requirements, OTDR traces shall be provide in digital form. Contractor shall supply CommTech Engineering with a fully-licensed copy of software capable of viewing the trace details.

### 3.2. Testing Requirements

Test equipment shall be within the calibration period recommended by the vendor in order to achieve vendor-specified measurement accuracy.

#### 3.2.1. Power Meter Testing

Power meter testing shall be required of all fiber optic cable.

#### 3.2.2. OTDR Testing

OTDR testing shall be required of all fiber optic cable exceeding 100m (328').

Traces shall be taken from both ends of the fiber.

Launch jumpers shall be used at each end of the fiber. Launch jumpers shall be 100m (328') in length.

Reflected ghost patters that obscure critical trace information are not permitted.

For each test, ensure that that traces are viewable at the same linear scale.

Traces shall be taken at 850nm and 1300nm for multimode fiber, and at 1310nm and 1550nm for singlemode fiber.

The OTDR pulse width shall be set small enough to resolve the launch cable connection to the fiber under test.

### 3.2.3. Unsatisfactory Test Results

Any measurements that show attenuation in excess of the calculated loss shall require the cable in question to be completely removed and a new cable to be installed at no expense to UNC.

# CIG23 - Communications Optical Fiber Splicing and Terminations

## 1. General

This section describes design requirements associated with the splicing and termination of optical fiber cable.

## 2. Execution

### 2.1. Connectors

Unless otherwise specified, fiber shall be terminated in duplex LC type connectors.

### 2.2. Patch Panels

Termination of cables in telecommunications rooms is described in section CIG17 - Communications Termination Blocks and Patch Panels.

### 2.3. Splices

Splices are not allowed unless specifically requested and/or approved by CommTech Engineering.

## 3. Testing

See CIG22 for testing requirements.

## CIG24 - Communications Coaxial Backbone Cabling

### 1. General

The University utilizes a hybrid fiber/coax system for CATV. Signals are delivered to a building via optical fiber and converted to coax in the PDF. The coaxial riser backbone system transports the CATV signal between floors.

### 2. Execution

A single segment of CommScope P3 500 JCAR or equivalent coaxial cable shall be installed between the MDF and each IDF. A 30-foot coil shall be left at each end (entering and exiting) of the cable segment(s).

### 3. Testing

No testing requirement.

# CIG25 - Communications Copper Horizontal Cabling

## 1. General

This Section details product and execution requirements for Horizontal Coaxial Cable for the University of North Carolina at Chapel Hill for both voice and data.

## 2. Execution

### 2.1. Cable Type

All horizontal cable for voice and data shall be Category 6e Unshielded Twisted Pair (UTP).

### 2.2. Cable Pulling

Install cables splice-free unless otherwise specified.

Contractor shall provide all required installation tools to facilitate cable pulling without damage to cable jacket.

Pull all cable by hand unless installation conditions require mechanical assistance. Where mechanical assistance is used, care shall be taken to insure that maximum tensile load for cable as defined by these specifications is not exceeded. This may be in the form of continuous monitoring of pulling tension, use of "break-away" or other approved method.

Pull cables in accordance with cable manufacturer's recommendations and NFPA-70. All cabling shall be installed in compliance with TIA- 568-C series standards. Manufacturer's recommendations shall be part of cable submittal. Recommended pulling tensions and pulling bending radius shall not be exceeded. Any cables bent or kinked to radius less than recommended dimension will not be allowed.

During pulling operation adequate number of workers shall be present to allow cable observation at all points of raceway entry and exit, as well as to feed cable and operate pulling machinery.

Pulling lubricant may be used to ease pulling tensions. Lubricant shall be of type that is non-injurious to cable jacket and other materials used. Lubricant shall not harden or become adhesive with age.

Pull string (nylon; 1/8" minimum) shall be installed with cable installed in all conduits and innerducts. Pull strings shall be tagged in PDR and SDR and at each corresponding outlet to identify where the string terminates on each floor.

### 2.3. Cable Dressing and Placement

Cable tray shall be loaded equally.

Install cable in conduit or secured metal raceway system (enclosed wireway) in public areas or as designated on plans. All other routing, such as that found in typical MDF/IDF, shall be kept clear of other trades work and supported according to code utilizing overhead cable runway.

Cabling shall be neatly laced, dressed, and supported. Work not done to the satisfaction of the UNC - Telecommunications Office and the Designer shall be reworked at no cost to the Owner.

### 2.4. Damage

Contractor shall be responsible for identifying and reporting to Designer any existing damage to walls, flooring, tiles and furnishings in work area prior to start of work. Repair damage to interior spaces caused by installation of cable, raceway or other hardware. Repairs must match preexisting color and finish of walls, floors and ceilings. Replace any contractor-damaged ceiling tiles to match color, size, style and texture.

## 3. Testing

Testing shall be accomplished as described in CIG02

## CIG26 - Communications Coaxial Horizontal Cabling

### 1. General

This Section details product and execution requirements for Horizontal Coaxial Cable for the University of North Carolina at Chapel Hill.

### 2. Execution

All horizontal coaxial cable and associated termination hardware shall be installed in compliance with an F-type connector.

### 3. Testing

All horizontal coaxial cabling shall be tested after termination for continuity, DC resistance, length, and attenuation sweeps from DC to 5000MHz.

## CIG27 - Communications Faceplates and Connectors

### 1. General

This Section provides direction with regards to communication outlet faceplates and connectors that typically are installed in those faceplates.

### 2. Execution

All faceplates and associated termination hardware shall be installed in compliance with TIA-568-C series standards.

Faceplates shall be labeled as describe in CIG13.

### 3. Testing

All communications cabling system components shall be tested per section CIG02.

## CIG28 - Communications Custom Cable Assemblies

### 1. General

Communications Custom Cable Assemblies are special and unique cable requirements above and beyond the standard building wiring specified in this document. These may include nursing station cables, audio-visual system cables, and specialty networking cables.

Unless otherwise specified for the project, Communications Custom Cable Assemblies are not the responsibility of the Communications Contractor.

See CIG29 for patch cords, station cords and cross-connect wire.

## CIG29 - Communications Patch Cords, Station Cords, and Cross Connect Wire

### 1. General

Neither the Designer of Record nor the Contractor of Record is responsible for the following items. These will be provided by the University.

1. **Patch cords**: short cables that connect between two ports on the front side of a patch panel, or between patch panels.
2. **Station cords**: short cables that connect telephony instruments to a communication outlet.
3. **Cross connect wire**: short wires to interconnect telephony signals on punch-down terminals.

# CIG30 – Data Communications

## 1. General

Active electronics for data communications, including routers, switches, supporting UPS system, and related equipment are designed, procured, installed, and maintained by the University. The Designer of Record shall not provide work in this area.

## 2. Scheduled Access

Data communications is a fundamental campus utility and must precede most other building occupation activities. Therefore, the Designer of Record and Contractor of Record shall work with CommTech Engineering to support building access by University personnel to install and test data communications equipment in telecommunications rooms in the weeks leading up to final building acceptance. This support shall consist of the following activities.

- Inclusion of data networking electronics installation in the project schedule.
- Early keying of locks on telecommunications rooms to allow the equipment to be securely placed.
- Access to telecommunications rooms by University personnel to install the electronics.

# CIG31 - Voice Communications

## 1. General

The University of North Carolina has for many years utilized Centrex voice services provided by a third party carrier. More recently, the University has begun to deliver voice services via VoIP, also provided by a third party carrier.

The University maintains a staff of customer service and technical support personnel to manage service delivery and instrument deployments. Thus, the Designer need not consider general purpose voice services in a project design. However, there are a number of exceptions at the periphery of the voice services network for which the Designer must account. These include elevator phones, emergency phones, contingency phones, alarm lines, and similar ancillary connections. These are discussed in specific sections of this document.

Related sections:

CIG19 Communications Equipment Room Fittings

27 15 00 Communications Horizontal Cabling

CIG33 Elevator Telephones

CIG34 Ring-Down Emergency Telephones

# CIG32 – Telephone Sets

## 1. General

Telephone sets are provided as an available service option to UNC ITS customers and are not included as part of the capital project designers responsibility. Horizontal cabling for phone connectivity is to be included in capital project design as referenced in sections 27 15 00 Communications Horizontal Cabling, CIG33 Elevator Telephones, and CIG34 Ring-Down Emergency Telephones.

## CIG33 – Elevator Telephones

### 1. General

This section provides direction to designers for new construction and renovation projects for the installation of emergency telephones for elevators and chairlifts. Emergency telephone for elevators and chairlifts are required and operate as ring-down telephones, contacting the Department Of Public Safety**.** These systems operate using dedicated PSTN telephony and are not a part of the campus VoIP system.

### 2. Execution

Elevator phones are to be provided and installed by the elevator manufacturer or their contractor as part of the elevator installation.

The installation of a ¾" homerun conduit from the nearest Telecom room to each elevator control cabinet is required with a Category 6e cable installed to each elevator control cabinet as described in section CIG25 Communications Copper Horizontal Cabling.

CommTech Engineering must be notified 15 days in advance of elevator phone service dial tone requirement to provide service provider adequate time to complete service order.

### 3. Testing

Testing of elevator phones shall comply with State Construction Office and NC Department of Insurance requirements.

# CIG34 – Ring-Down Emergency Telephones

## 1. General

This section provides direction to designers for new construction and renovation projects for the installation of Ring-Down Emergency Telephones and Contingency Phones. Emergency telephones are required at designated areas on campus as determined by the Department of Public Safety. Contingency phones are required in buildings on campus as determined by building occupant requirements.

## 2. Execution

### 2.1. Ring-Down Emergency Phones

During project design the designer, building owner, and DPS representative shall meet to discuss requirements for wall-mounted or free standing ring-down emergency phones. Any required ring-down emergency phones shall be referenced in the project contract documentation including marked drawings of emergency phone location and installation details.

The installation of a ¾" homerun conduit from the nearest telecom room to each ring-down emergency phone is required with a Category 6e cable installed to each emergency phone as described in section CIG25 Communications Copper Horizontal Cabling. In the event underground conduit is required the cable shall be rated for direct bury/ duct placement with no splice points allowed between the emergency phone and nearest telecom room.

Each emergency phone requires the installation of a 110 volt 20 amp circuit served from the dedicated telecom room electrical panel if possible. If there is no dedicated electric panel in the serving telecom room the circuit breaker serving the emergency phone should be fitted with a mechanical lock to prevent the emergency phone power from being inadvertently disconnected.

### 2.2. Contingency Phones

During project design the designer, building owner/representative and UNC ITS Engineering representative shall meet to discuss requirements for contingency phones. Any required contingency phones shall be referenced in the project contract documentation including marked drawings of contingency phone location and installation details.

Contingency phones require the installation of a Category 6e cable from the nearest telecom room out to each device location with single gang outlet terminated with Category 6e rated (as specified in TIA-568-C) eight-position jack mounted in a single gang wall-mounted faceplate at 42" AFF.

Each contingency phone shall be labeled with a 3"x5" glow-in-the-dark label that reads "CONTINGENCY PHONE For use during a network or power outage" in black letters on a white/green background.

Contingency phone instruments shall be provided and installed by UNC ITS with the costs associated included in the project reserve totals.

### 3. Testing

Upon Emergency phone installation completion UNC ITS technicians completing the service order for analog phone service shall test the ring-down circuit and verify that caller ID information appears appropriately at the Department of Public Safety operations center. Contingency phones shall be installed and tested by UNC ITS in a similar manner.

# CIG35 - Master Antenna Television Systems

## 1. General

The University operates its own campus-wide cable television service that delivers over 100 channels of standard definition and HDTV programming. Programming is collected at a headend facility and distributed via a hybrid fiber-coax system. Each building receives CATV signals via fiber. These optical signals are converted to electrical signals, typically in the MDF, and distributed via coaxial riser and horizontal cables.

Designers and Contractors are responsible for identifying areas that require service and installing cables. Taps and amplifiers are installed as appropriate by University technicians to distribute the signal. The University then provides the signal to the building.

More information on the CATV system can be found at http://its.unc.edu/commtechnology/communication-technologies/engineering-and-operations/customer-services/cable-tv-channel-lineup/

# Appendix 1: Submittals

## 1. Submittal Requirements

The following tables summarize all submittals required for telecommunications infrastructure described in this document. Submittals shall follow the format requirements described in CIG01.

### 1.1. Prior to Installation

| Section | Description | Format |
|---|---|---|
| **CIG02 – Testing and Acceptance of Cabling Systems** | The test plan. | PDF |
| **CIG03 - Grounding and Bonding for Communications Systems** | Product data sheets for TMGB and TGB. | PDF |
| **CIG03 - Grounding and Bonding for Communications Systems** | Telecommunications grounding riser diagrams. | PDF |
| **CIG05 - Hangers and Supports for Communications Systems** | Product data sheets for all components used. | PDF |
| **CIG05 - Hangers and Supports for Communications Systems** | Plan view drawings down to outlet level showing the location of cable pathway segments that utilize hangars and supports and the type. | PDF |
| **CIG06 - Conduits and Backboxes for Communications Systems** | Plan view drawings showing all horizontal and vertical conduit routing, cable trays, and pull box locations. Conduit runs to individual outlets need not be indicated. | PDF |

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| **CIG07 - Cable Trays for Communications Systems** | Plan view drawings showing all horizontal and vertical conduit routing, cable trays, and pull box locations. Conduit runs to individual outlets need not be indicated. | PDF |
| **CIG07 - Cable Trays for Communications Systems** | Elevation/coordination drawings showing relationship between cable trays, HVAC, fire suppression, etc. | PDF |
| **CIG07 - Cable Trays for Communications Systems** | Cable tray product data sheets and supplemental information showing:<br>Type of tray<br>Width, depth, length, thicknesses, and radius of bends (where applicable)<br>Rung spacing<br>Cable-bearing surface dimensions<br>Material construction and finish<br>Accessories | PDF |
| **CIG08 - Power Poles, Floor Boxes, and Poke Throughs for Communications Systems** | Prior to procurement and installation, all materials intended to be used in association with power poles, floor boxes, and poke throughs shall be submitted for review and approval by the designer and CommTech Engineering. | PDF |
| **cCIG08 - Power Poles, Floor Boxes, and Poke Throughs for Communications Systems** | Detailed plan and elevation view drawings showing room layout to include power pole, floor box, and poke through location. | PDF |
| **cCIG08 - Power Poles, Floor Boxes, and Poke Throughs for Communications Systems** | Detailed drawings showing product description and recommended manufacturer installation details to be included. | PDF |

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|---|---|---|
| **CIG09 - Surface Raceways for Communications Systems** | Product data sheets showing<br>Raceway part numbers with details on size and cable capacity<br>Raceway fittings part numbers<br>Raceway outlet box part numbers with details on faceplate capacity | PDF |
| **CIG10 - Underground Ducts and Raceways for Communications Systems** | As per EDS requirements | |
| **CIG11 - Rooftop Access for Communication Systems** | Elevation drawings showing penetration detail. | PDF |
| **CIG11 - Rooftop Access for Communication Systems** | Plan view drawings showing penetration detail. | PDF |
| **CIG13 - Identification for Communications Systems** | Provide a detailed sketch to CommTech Engineering of the faceplate identification and labeling method to be used if it deviates from that described herein. | PDF |
| **CIG16 - Communications Cabinets, Racks, Frames, and Enclosures** | Detailed rack elevation drawings showing all components. | PDF |
| **CIG16 - Communications Cabinets, Racks, Frames, and Enclosures** | Plan view room layout drawings showing rack placements. | PDF |
| **CIG16 - Communications Cabinets, Racks, Frames, and Enclosures** | Product data sheets for all racks, frames, enclosures, and related elements. | PDF |
| **CIG17 - Communications Termination Blocks and Patch Panels** | Detailed elevation drawings showing termination blocks and patch panels. | PDF |

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|---|---|---|
| **CIG17 - Communications Termination Blocks and Patch Panels** | Product data sheets for all termination blocks, patch panels, and accessories. | PDF |
| **CIG18 - Communications Cable Management and Ladder Rack** | Product data sheets for all materials. | PDF |
| **CIG19 - Communications Equipment Room Fittings** | Detailed plan and elevation view drawings showing equipment room size/layout to include equipment rack locations, equipment rack configuration, door size, environmental supply/return, TMGB/TGB location, electric outlet locations, cable pathways, sleeve locations, lighting, voice horizontal and riser backboard location, cable ladder routing, HVAC supply and return location, copper and fiber optic termination hardware, and plywood location and installation requirements. These drawings shall be reviewed and approved by UNC ITS Engineering project manager prior to contractor beginning project. | PDF |
| **CIG19 - Communications Equipment Room Fittings** | In buildings with multiple TRs Designer shall include in contract documents detailed riser drawing showing distance from PDR to each TR, number of Cat 6e copper riser connections, number of strands of single-mode and multi-mode fiber riser, CATV coax riser, multi pair telephone riser pairs and number and size of riser conduit from PDR to each TR. | PDF |
| **CIG20 - Communications Copper Backbone Cabling** | Product data sheet for cable | PDF |
| **CIG21 - Communications Copper Cable Splicing and Terminations** | Product data sheets for all materials | PDF |
| **CIG22 - Communications Optical Fiber Backbone Cabling** | Product data sheet for all components. | PDF |

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|---|---|---|
| **CIG22 - Communications Optical Fiber Backbone Cabling** | Plan view drawings of fiber routes | PDF |
| **CIG22 - Communications Optical Fiber Backbone Cabling** | Elevation drawings showing fiber routes, cabinets, and installation details. | PDF |
| **CIG23 - Communications Optical Fiber Splicing and Terminations** | Product data sheets for all components | PDF |
| **CIG24 - Communications Coaxial Backbone Cabling** | Product data sheets for selected cable | PDF |
| **CIG25 - Communications Copper Horizontal Cabling** | Product data sheet for selected cable | PDF |
| **CIG26 - Communications Coaxial Horizontal Cabling** | Product data sheets for<br>RG-6 coaxial cable<br>RG-6 F-connector<br>RG-6 faceplate bulkhead | PDF |
| **CIG27 - Communications Faceplates and Connectors** | Faceplate details drawing shall indicate faceplate and faceplate termination hardware layout. | PDF |
| **CIG27 - Communications Faceplates and Connectors** | Plan view drawing showing location of each faceplate with a letter designating the type of connection as follows:<br>D – data<br>T – telephone<br>V – video | PDF |

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|---|---|---|
| **CIG27 - Communications Faceplates and Connectors** | Product data sheets for all faceplates and connector types | PDF |
| **CIG33 – Elevator Telephones** | Product data sheets for all proposed instruments and components. | PDF |
| **CIG34 – Ring-Down Emergency Telephones** | Product data sheets for all proposed instruments and components. | PDF |

### 1.2. After Installation

| Section | Description | Format |
|---|---|---|
| **CIG02 – Testing and Acceptance of Cabling Systems** | Test results for each component, organized by location, and clearly labeled. | PDF |
| **CIG03 - Grounding and Bonding for Communications Systems** | Telecommunications grounding riser diagrams. | AutoCAD |
| **CIG03 - Grounding and Bonding for Communications Systems** | Ground resistance test results. | PDF |
| **CIG05 - Hangers and Supports for Communications Systems** | Plan view drawings down to outlet level showing the location of cable pathway segments that utilize hangars and supports and the type. | AutoCAD |
| **CIG06 - Conduits and Backboxes for Communications Systems** | Plan view drawings showing all horizontal and vertical conduit routing, cable trays, and pull box locations. Conduit runs to individual outlets need not be indicated. | AutoCAD |
| **CIG07 - Cable Trays for Communications Systems** | Plan view drawings showing all horizontal and vertical conduit routing, cable trays, and pull box locations. Conduit runs to individual outlets need not be indicated. | AutoCAD |
| **CIG07 - Cable Trays for Communications Systems** | Elevation/coordination drawings showing relationship between cable trays, HVAC, fire suppression, etc. | AutoCAD |
| **CIG08 - Power Poles, Floor Boxes, and Poke Throughs for Communications Systems** | Elevation drawings showing penetration detail. | AutoCAD |

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|---|---|---|
| **CIG08 - Power Poles, Floor Boxes, and Poke Throughs for Communications Systems** | Plan view drawings showing penetration detail. | AutoCAD |
| **CIG10 - Underground Ducts and Raceways for Communications Systems** | Survey quality, plan view duct bank route maps. | AutoCAD |
| **CIG10 - Underground Ducts and Raceways for Communications Systems** | Butterfly drawings showing elevations of each surface (North, East, South, West) of each utility vault and the type and arrangement of conduits on each face. | AutoCAD |
| **CIG11 - Rooftop Access for Communication Systems** | Elevation drawings showing penetration detail. | AutoCAD |
| **CIG11 - Rooftop Access for Communication Systems** | Plan view drawings showing penetration detail. | AutoCAD |
| **CIG13 - Identification for Communications Systems** | Cable Destination Chart | MS Excel |
| **CIG16 - Communications Cabinets, Racks, Frames, and Enclosures** | Detailed rack elevation drawings showing all components. | AutoCAD |
| **CIG16 - Communications Cabinets, Racks, Frames, and Enclosures** | Plan view room layout drawings showing rack placements. | AutoCAD |
| **CIG17 - Communications Termination Blocks and Patch Panels** | Testing results | PDF |
| **CIG19 - Communications Equipment Room Fittings** | As-built plan and elevation drawings showing the same elements in the design drawings. | AutoCAD |
| **CIG19 - Communications Equipment Room Fittings** | As-built documentation shall include serving TR when multiple floors are served with a single TR or where a floor has multiple TR's. | AutoCAD |

| | | |
|---|---|---|
| **CIG19 - Communications Equipment Room Fittings** | Cable destination chart in each TR | printed and installed in TRs |
| **CIG20 - Communications Copper Backbone Cabling** | Test results using the same methodology as CIG25. | PDF |
| **CIG20 - Communications Copper Backbone Cabling** | System drawings using the same methodology as CIG25. | AutoCAD |
| **CIG22 - Communications Optical Fiber Backbone Cabling** | OTDT test results | PDF and digital with reader software |
| **CIG25 - Communications Copper Horizontal Cabling** | Testing results as described in CIG02. | PDF |
| **CIG26 - Communications Coaxial Horizontal Cabling** | Test result | PDF |
| **CIG27 - Communications Faceplates and Connectors** | Plan view as-built drawing showing location of each faceplate with a letter designating the type of connection as follows:<br>D – data<br>T – telephone<br>V – video | |
| **CIG27 - Communications Faceplates and Connectors** | Testing results as described in CIG02. | |

# Appendix 2: Pre-Installation Meeting

## 1. Submittal Requirements

A pre-installation meeting is required between the communications subcontractor and CommTech Engineering to review details of the work and procedural requirements.

The following topics will be covered in this meeting.

- Review the overall installation and review processes, including submittals, State Construction meetings, etc.
- Describe the role of ITS Communication Technologies Engineering and Operations representative.
- Review project responsibilities for ITS and communications contractors.
- Review scope and timetables.
- Review/confirm cable types. (color, CMR/CMP, etc.)
- Review telecom room layout and equipment placement.
- Review testing plan and procedures.
- Review labeling requirements.
- Review general installation practices.
- Review project-specific issues.

**Style Guide**

This document makes use of the following Microsoft Word styles.

**1. Section 1 Title**

Section 1 Text

**1.1. Section 2 Title**

Section 2 Text

**1.1.1. Section 3 Title**

Section 3 Text

**1.1.1.1. Section 4 Title**

Section 4 Text

**1.1.1.1.1. Section 5 Title**

Section 5 Text

**1.1.1.1.1.1. Section 6 Title**

Section 6 Text

**1.1.1.1.1.1.1. Section 7 Title**

Section 7 Text

**1.1.1.1.1.1.1.1. Section 8 Title**

Section 8 Text

**1.1.1.1.1.1.1.1.1. Section 9 Title**

Section 9 Text

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