

SECTION 1000 -- COMMUNICATIONS

A. GENERAL

1. Every Specification Section is required to include in Part 2 (as the first item), “SUBSTITUTIONS: Materials shall be as specified...” (refer to “SECTION 100 -- GENERAL” for the entire statement).
2. Make sure all specification sections are coordinated with the Bureau’s General Conditions, Document 000708.
3. Penetration Firestopping: Provide penetration firestopping in fire-resistance-rated walls, horizontal assemblies, and smoke barriers in accordance with building and fire code requirements. Firestop systems will be UL Classified to ASTM E814 (UL 1479). Submittals are required, including for product data, product schedule, qualification data, and product test reports (with locations).
 - a. Projects with Architect: Firestopping specifications are required in Division 7. Include requirement for firestopping in fire sprinkler, plumbing, HVAC, electrical, and communications specification sections with reference to the firestopping specification located in Division 7.
 - b. Projects with Engineer (and no Architect): For fire sprinkler, plumbing, HVAC, electrical, and communication projects where there is no Architect involved in the project, firestopping specifications are required and may be located in and are required to be coordinated with all corresponding specification sections.
4. For additions and renovation work, specify that the Contractor shall be responsible to remove any and all cable, which is removed from equipment terminations and/or no longer services the facility.

B. COMMUNICATIONS DESIGN GUIDELINES

1. The goal of the communications design is to describe dedicated spaces for telecommunications equipment and a system of pathways from every communications outlet in the building to the nearest horizontal cross-connect (HC) and from every HC to an intermediate cross-connect (IC) or the main cross-connect (MC). This design shall be based on nationally recognized ANSI/EIA/TIA commercial building standards and current NEC code (New Hampshire State Electrical Code with amendments) described further below.
2. Meet seismic restraint requirements for communications equipment and systems in accordance with the requirements of the New Hampshire State Building Code. Refer to *Design Guidelines* “Section 100 -- General” paragraph pertaining to seismic requirements.
3. The Architectural and Engineering Firm (A&E) will design the Communications Infrastructure and Cable Plant. For some projects the cable plant may be handled as a separate contract, but telecommunications spaces should always be handled as part of the A&E design.
4. Coordinate the design with the Using Agency and the Department of Safety, Bureau of Statewide Telecommunications, Division of Emergency Services, Communications and Management, through the Contract Administrator.

5. The Design shall consist of detailed specifications, as well as detailed drawings that reflect project specific requirements. As in Division 27 (CSI Master Format), the A&E design shall include and is not limited to:
 - 1) Separate infrastructure specifications and drawings where applicable.
 - 2) Entrance Facility (EF), MC/IC/HC room locations and layout.
 - 3) Vertical and Horizontal Riser Distribution Schematic.
 - 4) Construction Details to include:
 - a) T1 - Site Plan.
 - b) T2 - Serving Zones.
 - c) T3 - Communications Equipment Rooms.
 - d) T4 - Typical Detail (faceplates/cable tray/power poles/patch panels/etc).
6. The A&E design responsibility does NOT include:
 - 1) Provision of active data or multimedia services.
 - 2) Specifying voice, data, or multimedia equipment.
 - 3) Arranging public network access for telephone or multimedia.
7. Industry References: The A&E shall refer to the following industry standards for a more complete understanding of communications requirements:
 - a. NEC - Article 800 Communications Circuits.
 - b. EIA/TIA - 568 Commercial Building Wiring Standard.
 - c. EIA/TIA - 569 Communications Standard for Telecommunication Pathways and Spaces.
 - d. EIA/TIA - 607 Commercial Building Grounding and Bonding Requirements for Telecommunications.
 - e. BICSI Telecommunications Distribution Methods Manual.
 - f. ADA - The Americans with Disabilities Act may also affect design.
 - g. ANSI/NFPA-70: National Electrical Code (NH State electrical code with amendments).
 - h. ANSI/NFPA-780: Lightning Protection Code.

C. TELECOMMUNICATIONS ENTRANCE FACILITY (TEF)

1. The Entrance Facility (EF) is the point where the LEC, campus backbone, or wireless telecommunications cabling physically enter the building and interface with the internal backbone cabling. After the exact building location is selected, the A&E must meet with the Local Exchange Carrier (LEC) or Service Provider engineer regarding building access. At that time, the following LEC or service provider responsibilities and requirements must be decided including the following.
 - a. Floor and wall space needed for equipment:
 - 1) Rack space approximately equivalent to the size of an 18 cubic foot refrigerator must be provided for equipment. If a digital fiber interface is to be installed, average floor space required is 6 feet x 5 feet. For buildings with over 200 occupants, increase the size of the room accordingly.
 - b. EF shall allow space for UPS equipment sized to meet operating requirements of future equipment. Space shall be estimated at the above requirements.
 - c. Electrical power (120V and/or 208/240V) (to be verified with the equipment) and environmental needs of equipment:
 - 1) Back-up power circuit is required if building is provided with a backup power generator.
 - 2) Central Office based Local Exchange Interfaces require 120V, 20 or 30A feed provided through a NEMA standard L5 twist-lock power connector per the discretion of the building owner or tenant. Coordinate NEMA configuration with the equipment.
 - d. Method of access (underground is preferred).

- e. Conduit(s) for building access including size, type, and quantity.
- f. Interface type (fiber or copper). Also, consider roof antennae or dishes for wireless communications.

D. TELECOMMUNICATIONS EQUIPMENT ROOM (ER)

1. An equipment room (ER) usually houses equipment of higher complexity than a telecommunications closet (TC), but may serve as both. The design aspects of the equipment room are defined by the Owner and the EIA/TIA-569 Standard.
 - a. Continuous HVAC shall be designed for 24 hr, 365 day, 70 deg - 75 deg room temperature, 30%-55% humidity, and positive pressure. This will require the collection of environmental specifications for the Owner's equipment to be placed in that room.
 - b. ERs shall be centrally located for the following reasons:
 - 1) Minimize horizontal cable length (cannot exceed 90m or 295ft). Distance shall be actual cable distance, not straight line, including vertical wall and horizontal pathway.
 - 2) Reduced heat load on HVAC system (heat gained through building exterior walls and windows).
 - c. Each ER shall be provided with at least one dedicated 120V, 20A, quad outlet per wall. Back-up power circuit is required if building is provided with a backup power generator.
 - d. Each ER shall be provided with a telecommunications grounding busbar (TGB) connected to the TMGB via the telecommunications bonding backbone (TBB), a No. 6 AWG stranded copper cable with green insulation.
 - e. The ER may be combined with the MC.
 - f. Each ER shall be provided with a fire extinguisher outside of the door. Fire suppression systems should be considered.
 - g. Two walls each with the minimum coverage of 4' x 8', 3/4" thickness, A-C grade plywood, painted with two coats black fire retardant paint. If fire-retardant plywood is used (for code purposes and/or where required by authorities having jurisdiction), one of the stamps indicating fire retardant certification must not be painted.
 - h. Rack height cable ladder connecting to each equipment rack and fastened to opposite walls for support. One of the opposite walls must be the same location as the entrance conduit.
 - i. ER shall allow space for UPS equipment sized to meet operating requirements of future equipment. Space shall be similar to that estimated for the EF.

E. TELECOMMUNICATIONS CLOSET (TC)

1. Telecommunications closets (TC) are dedicated to telecommunications function and support closets within the building that houses the telecommunications cabling and system equipment. This includes the mechanical terminations and or cross-connect for the horizontal and backbone cabling system. The design aspects of the telecommunications closet are specified in the EIA/TIA-569 Standard.
 - a. Continuous HVAC shall be designed for 24 hr, 365 day, 64 deg - 75 deg room temperature, 30%-55% humidity, and positive pressure. This will require the collection of environmental specifications for the Owner's equipment.
 - b. TCs shall be centrally located for the following reasons:
 - 1) Minimize horizontal cable length (can not exceed 90m or 295 feet).
 - a) Distance shall be actual cable distance, not straight line, including vertical wall and horizontal pathway.
 - b) Buildings must contain two TCs or more per floor if the distance from a considered TC to the extreme outside building wall, in any direction from the TC, is greater than 150 feet or building design will require cabling pathways to be beyond 200 feet.

- 2) Reduced heat load on HVAC system (heat gained through building exterior walls and windows).
 - c. Each TC shall be provided with at least one dedicated 120V, 20A, quad outlet per wall. Back-up power circuit is required if building is provided with a backup power generator.
 - d. Each TC shall be provided with a telecommunications grounding busbar (TGB) connected to the TMGB via the telecommunications bonding backbone (TBB), a No. 6 AWG stranded copper cable with green insulation.
 - e. TCs should be stacked, one above the other, or located to allow the least expense in conduit, cable installation and future maintenance.
 - 1) There should be a minimum of two 4" EMT conduits from the MC to each IC and to the ER.
 - 2) There should also be a minimum of one 4" EMT conduit or cable tray from each IC to each of its respective floor HCs.
 - 3) Each conduit shall be marked as to the origin and termination points. The floor and room number must be included.
 - 4) Conduit from lower levels shall appear near the floor in each TC.
 - 5) Conduit from upper levels shall appear near the ceiling of each TC.
 - 6) Conduit shall be bonded to multiground neutral using No. 6 AWG stranded copper cable (with green insulation preferred).
 - f. TCs should have four 4" conduit sleeves or 12" tray shall be installed as penetration openings to accessible hallway ceilings to each TC. This opening shall be used for communications station cable installation.
 - g. Telephone backboards (located per Owner's requests) should be 4' x 8', 5/8" or 3/4" thickness, A-C grade plywood painted with two coats fire retardant paint. If fire-retardant plywood is used (for code purposes and/or where required by authorities having jurisdiction), one of the stamps indicating fire retardant certification must not be painted.
 - h. Include specific information regarding room size, quantity and size of riser sleeves, and cable tray size.
 - i. Floor and wall space needed for equipment:
 - 1) Rack space approximately equivalent to the size of an 18 cubic foot refrigerator must be provided for equipment. If a digital fiber interface is to be installed, average floor space required is 6 feet x 5 feet. For buildings with over 200 occupants, increase the size of the room accordingly.
 - j. EF shall allow space for UPS equipment sized to meet operating requirements of future equipment. Space shall be estimated at the above requirements.
2. There are three types of Telecommunications Closets:
- a. Main Cross-connect (MC): This room is the center of the hierarchical star topology for backbone cabling.
 - 1) There is only one per building but it may also serve as the EF, an ER, and/or a HC.
 - 2) Provide for a grounding busbar with #6 AWG stranded copper cable with green insulation.
 - b. Intermediate Cross-connect (IC): This room is the center of the hierarchical star topology on each floor for backbone cabling to be distributed to each HC
 - 1) Minimum of one closet per floor and it may also serve as the HC
 - c. Horizontal Cross-connect (HC): This room is the furthest point from the center of the hierarchical star topology for backbone cabling, but it is the central distribution point for horizontal cabling to all workstations and offices.

F. OTHER CONSIDERATIONS FOR ALL TELECOMMUNICATIONS SPACES

1. Non-associated plumbing or HVAC piping shall not run through or over any telecommunications space. No plumbing, HVAC, or electrical conduit shall pass through, or be directly above, the communications room. In renovation projects where new Communications rooms are established, all overhead utilities will be relocated out of room.
2. All communications rooms shall be environmentally controlled to maintain the room environment at a temperature range of 65 to 75 degrees Fahrenheit, with a maximum relative humidity level of 50 percent. Communications rooms shall be conditioned with a fresh air exchange of four (4) air changes per hour. Room cooling ability must be provided to remove a minimum of 7000 BTUs per hour 24 hours a day, 7 days a week.
3. Use of fluorescent lighting (3500K lamping) or LED lighting in telecommunications spaces is acceptable, but shall be kept clear of trays and close proximity to major cabling pathways.
4. Three walls of communications rooms should be covered with 4' x 8', 5/8" or 3/4" thickness, A-C grade, plywood painted with two coats fire retardant paint. If fire-retardant plywood is used (for code purposes and/or where required by authorities having jurisdiction), one of the stamps indicating fire retardant certification must not be painted.
5. The EF may contain electronic equipment (requiring HVAC) and primary protection devices required by the LEC or service provider. The EF should also contain the Telecommunications Main Grounding Busbar (TMGB) for the grounding and bonding requirements of all telecommunications closets (TC) and equipment rooms (ER) per the EIA/TIA-607 Standard.
6. No. 6 AWG stranded copper cable with green insulation shall be provided from the TMGB to the Main Cross-connect (MC).
7. The EF may be combined with the Main Cross-connect (MC).
8. Detailed physical requirements of the EF room equipment and layout are defined by the Owner and the EIA/TIA-569 Standard. Provide for a minimum of 0.75 sq ft of equipment floor space for every 100 square feet of user space.

G. GENERAL TELECOMMUNICATIONS REQUIREMENTS

1. Communications Facilities: Unless directed otherwise, the design shall include all cable and materials necessary for the installation of a communications system. This shall encompass cable, cable attachment and support devices, jacks, termination blocks, patch panels, backboards, equipment racks, and any and all items necessary for a complete installation.
2. Station Location Requirements:
 - a. A minimum of one 3/4" conduit shall be installed from each station to accessible ceiling locations. Accessible ceilings are those with maintenance access hatches within 5 feet of the conduit end or drop ceilings with removable tiles.
 - b. Conduits shall terminate in a 4x4 workbox with single gang mud ring, providing adequate space for two telephone jacks and two computer jacks at each location.
 - c. Conduits shall not be installed with elbow connections; all directional transitions shall be accomplished with a minimum of 3" sweeps.

3. Station Outlet and Device Jacks:
 - a. Communication work station outlets should be agreed upon with the Using Agency. At a minimum each communication work station location, except as noted otherwise, shall consist of the following.
 - 1) Two each double gang bezel. Bezels must have label strips and clear label strip plastic covers top or bottom. Machine lettering is required, hand lettering WILL NOT be accepted.
NOTE: The bezel for the communication cable shall be the same color and height above the floor (approximately 18 in.) as the electrical face plate. Only one color shall be used throughout the project. Only flush mount type jacks are to be used on this project, unless otherwise noted on the drawings.
 - 2) Two each Category 6 110 style double modular jacks, T568B, with wire caps to provide strain relief and contamination protection.
 - b. One dual data station jack, colored differently than telephone jacks. Tenant may have a color preference; confirm color with Contract Administrator and Using Agency.
NOTE: All jacks shall be terminated using a single position 110 punchdown tool. Stuffer caps shall be affixed after termination has been affected, in order to provide strain relief to each conductor at the point of termination.
4. Communications Cabling:
 - a. Unshielded twisted pair, 24 gauge, Category 6 cable must be installed from each TC to each Station location. Plenum rated cable must be used where required by code. Contractor and installer shall abide by NEC code, BICSI and EIA/TIA standards to distinguish application requirements.
 - b. Station cabling shall be terminated utilizing Category 6 568B configuration jacks.
 - c. All computer / data cabling terminating in any TC shall be punched down on Category 6 patch panels utilizing a 110 style IDC interface supported with a hinged wall mount bracket, equipment cabinet, or floor mounted equipment rack.
 - d. Fiber optic riser cabling must be placed from the EF to the MC and to each subsequent TC.
 - 1) Pair count to each TC should be 4 or more single mode fiber pairs further defined by the building occupants.
 - 2) All telephone riser cabling shall be terminated on 6 pin 66 type 25 pair cross-connect blocks mounted on standoff brackets, unless otherwise requested by Owner.
 - e. Fiber optic cabling pathways shall include use of (orange) inner duct when not installed within conduit and caution tags at entrance and exit points.
 - f. Copper rise cable should also be installed from the EF to each ER and each TC. Cable shall be 25 pair rise rated, terminating on 110 blocks in each room. Cable shall be dedicated to analog service operation and require horizontal station cabling prior to tenant occupancy.
5. Labeling:
 - a. All cables must be labeled using indelible ink, printed labels.
 - b. Each cable must be labeled at each terminating end.
 - c. All cables must be labeled as follows:
 - 1) First two characters indicating floor level (00 for basement, 01 for first level, 02 for second level, etc.).
 - 2) Third character indicating the TC (A, B, C, etc., on the noted building level).
 - 3) Fourth, fifth, and sixth characters listing the station number.
 - 4) Seventh and eighth characters listing the jack identifier.
 - 5) Example: 01-B-012-A meaning 1st level, closet B, station 12, jack A

6. Cable Installation:
 - a. All cable shall be supported utilizing cable tray, J-hooks, conduit, or surface mount raceway. Proper radius bends must be maintained at all points. The contractor shall provide as-built diagrams defining cable paths throughout the building upon completion.
 - b. No cable shall be laid upon or tie-wrapped to ceiling tiles, pipes, conduits or other building facilities.
 - c. All cable shall be laid at least 18 inch away from electrical services including power duplexes, power feeds, lighting, AC security systems, cable television, and other services creating harmonics, which may bleed into the communications cable.
 - d. Provide penetration fire-stopping at all penetration holes made for cable installation through fire-resistance rated walls, horizontal assemblies, and smoke barriers. Architect / Engineer to coordinate fire-stopping description and location(s) in the Specification. Refer to Article A "General" in this Section for more information.
 - e. All computer station runs must be tested for Category 6 compliance. Printed test results must be provided upon completion.
 - f. All cabling and associated equipment shall be installed by qualified technicians only. The Contractor shall provide proof of the above prior to construction.