

## COMMUNICATION SYSTEMS

**General:** Each new building or addition to an existing building shall include spaces designated for the location of communications equipment. These spaces will be called Telecommunication Rooms (TR's). Such spaces must be specifically considered in the Program Statement phase or other planning or planning processes used to define the scope of the project. These spaces shall be designated exclusively for the location of terminal points and equipment associated with the following communication systems:

- Voice systems
- Data network systems
- Wireless network systems
- Closed circuit television (CCTV) systems
- Fire alarm panels
- Card access panels
- Cable television (CATV) systems
- Un-Interruptible Power Supplies (UPS) for these systems
- Telephone company demarcation points
- Wireless network system
- Wireless access points
- Life Safety Radio System

**Use Restriction:** TRs shall not be used as passageways to other equipment rooms, power transformers, custodial equipment, or any other function that would require access for reasons other than communications maintenance.

**Location and Size of Telecommunication Rooms (TR's):** Using the following two criteria the designer or architect can predetermine the quantity and size of the TRs needed in a building using the assignable square footage as a starting point.

- **Criteria #1 – Quantity of TR's to serve the building:** The maximum wiring run from the TR to the most distant "Communications Location" (CL) served from the TR shall not exceed 275 feet. NOTE: A CL is a wall plate or termination box with one or more communications cables, usually 2 - 3 cables are installed at each CL. The TR will be the origination point for wiring to all CLs within the area served.
  - Determine the "TR Service Area" by calculating the area of the building that can be served within a maximum pathway distance of 275 feet. The TR can service multiple floors, with sufficient pathway, as long as the maximum pathway distance remains less than 275 feet.
  - Once the TR Service Area is determined, calculate the following two TR elements:
    - TR Service Area Square Feet = the assignable square footage within the TR Service Area.
    - Communication Location (CL) Quantity = the count of CL locations within the TR Service Area. NOTE: If the quantity of CLs is not known, then divide the TR Service Area Square Feet by the number 90 to obtain an estimated CL quantity.
- **Criteria #2 – Size of the TR's:** A TR sizing matrix is shown in the "Telecommunication Room Sizing Matrix" located at the end of this narrative. Find the TR Service Area Square Feet for the TR in the table and follow the table row over to the TR Size Needed. Do the same for the CL Quantity. Use the larger TR size for the actual TR that will be planned into the architectural drawings. TR must be a rectangular

University of North Dakota

room as specified in the table below with no obstructions or protrusions (beams, columns, etc.) that decrease the amount of square footage available in the room.

Telecommunications Room Sizing Matrix			
TR Service Area Square Feet	CL Quantity	TR Cabling Racks Needed (Based on 1 Rack per 240 CLs)	TR Size Needed
0 – 21,600	0 - 240	1	10 ft x 12 ft
21,601 – 43,200	241 - 480	2	10 ft x 15 ft
43201 – 64,800	481 - 720	3	10 ft - 18 ft

**Structured Cabling System:** A certified Structured Cabling System with a 25-year CAT6 link performance compliance warranty is required.

**TR Room Construction Requirements:** See “Equipment Rooms, Communications” within these design guidelines for TR room construction requirements.

**Outside Pathway Requirements:** - A minimum of two 4” entrance conduits will be installed into any building. –

- Outside plant copper, fiber, and coaxial cable shall be installed together in one of the conduits while the other conduit is for future services and disaster mitigation.
- Outside plant copper, fiber, and coaxial cable shall be installed together in one of the conduits while the other conduit is for future services and disaster mitigation.
- Dual entrances are very desirable where possible, especially for buildings that house emergency services, data core systems, disaster recovery systems, or designated as an essential services building on campus.

**Riser Pathways (from one TR to another):** When more than one TR is needed in a building, two 4” conduits will be installed from the main TR to the other TRs in the building. These conduits will be used to connect all communication services between the TRs.

**Primary horizontal pathways for each floor (conduits and cable tray):** - Primary pathways are major pathways for cable routed floor-to-floor, through corridors, and pathways that carry cables feeding multiple areas that are likely to be used to support growth in those areas.

- Primary pathways carry cable to secondary pathways.
- Primary floor to floor pathways shall be vertical sleeve conduits with at least two 4” conduits to each floor.
- Floor-to-floor conduits will connect the TR to cable trays on the other floors.

**Secondary pathways to each CL (conduits to CL backboxes):** - Conduits will be installed from within 3 feet of a cable tray to each CL backbox.

- Backboxes are defined as the communications metallic box (single gang, double gang, 4 square, handy-box, or device box) with appropriate cover that are mounted in the wall and the conduit is attached for cabling. The Backbox is used to mount the CL and voice/data jacks.
- Conduits to each CL will be sized depending on the number of cables at the CL, but generally, most CL conduits will be 1” conduits.

University of North Dakota

- All cable to each CL will be homerun through the pathway system described. The CL cable will travel through the secondary pathway (conduit), then the primary pathway (cable tray and conduits), then to the serving TR.

**Wireless Network System:** - Include a Predictive Site Analysis (PSA) to guide the design of the wireless network inside the building. The wireless network shall provide reliable connectivity for staff, faculty, students, and visitors throughout the building.

- The wireless design shall provide a network that supports a mixture of end user devices that are typical of a campus environment. The network shall provide sufficient throughput to all users connected.
- The Predictive Site Analysis shall include the following tasks (minimum):
  - Wireless design throughout designated spaces via software utilizing project drawings (CAD files) and data to build software models. Wireless design within the spaces shall be tailored to the various types of spaces within the building (i.e. offices vs. classrooms vs. hallways vs. lounges, etc.)
  - The PSA incorporates building characteristics including all applicable wall, floor, ceiling construction types, complete space geometries, as well as expected occupant loads. Information needed for this effort will be provided by design team.
  - Design shall be mindful of maintenance, security, and vandalism concerns in locating wireless network components within public spaces.
  - Design shall include complete wireless coverage at and within all building entrance spaces including vestibules, covered walkways, etc.
  - The design shall provide spare capacity for added network loads in the future.
  - Findings of the PSA shall be delivered in a report format with drawings depicting physical component installation locations, cable routing paths, power requirements for components, interconnections needed with ITS infrastructure, floor-by-floor heat maps of RF coverage, and a complete bill of material that was used in developing the PSA documents.
  - Design included in the PSA shall be based on the following access point (AP) devices or approved equal. Ensure design incorporates Aps with performance characteristics matching the following or better:
    - Interior APs: Cisco AIR-AP2802I-X-K9
    - Interior APs: Cisco AIR-AP1810W-X-K9
    - Exterior APs: Cisco AIR-AP1562D-X-K9 (directional)
    - Exterior APs: Cisco AIR-AP1562I-X-K9 (omni-directional pole mount)
  - Design shall include labels for all APs matching NU requirements. Naming convention as follows: 'AP MODEL NO'-'4 DIGIT BUILDING NO'-'ROOM NO'. Verify label scheme with NU-Wireless and include labels on design plan sheets. Include with PSA an excel file with AP designations for review and editing by NUWireless.
- Unless otherwise instructed by NU, a PSA shall be provided for all projects, including all renovations, additions, and new building construction projects.
- The wireless configuration shall be approved by NU-Wireless prior to design completion.

**Wireless Access Points:** - Provide dedicated communication cables and all required rough-in work for wireless access points (WAPs). WAPs provided by UND.

University of North Dakota

- Each WAP location will have one (1) EQUIPMENT OUTLET (EO) with two (2) dedicated CAT 6 cables.
- Project shall test all WAP cable installations and certify all cables for proper performance. Share all testing results with UIT Wireless staff.
- Provide data cable labels, at both ends of cable, per UND Wireless UIT requirements.
- In all cases cables shall not be painted

**Life Safety Radio System**

UND Police will test the operability of life safety radio systems within structures and provide project managers with specifications for any enhancements necessary to ensure full functionality of such systems