**STANDARD FOR BUILDING AND CAMPUS**

 **DISTRIBUTION SYSTEMS**

*New Mexico Tech*

*Information Technology & Communications (ITC)*

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1. **INTRODUCTION**

This document establishes criteria intended to standardize voice, data, and low voltage infrastructure systems inside and outside buildings by setting specific guidelines and standards. The intent of this standard is to define requirements and procedures based on the current industry standards. New Mexico Tech Information Technology & Communications (ITC) will be updating this standard as technologies emerge (fiber, wireless, and copper). This document is intended for use as a technical reference for RFP’s and planning building and campus wiring. It is required for use by anyone designing, planning, installing or repairing New Mexico Tech campus wiring and/or infrastructure.

**1.2 PLANNING**

1. All planning for buildings (new, retrofit, remodel, or lease) must include outside and inside facilities for telephone, data, video, and all low voltage systems (security/alarm services, sound, etc.). It is recommended that New Mexico Tech ITC is consulted early in the process so that all requirements are met including those required by the Americans with Disabilities Act.
2. Specifically, planning must consider:
* The quality and competence level of the distribution system and associated external equipment necessary to meet immediate and long-term requirements. Some basic planning in the early stages of a project will avoid expensive material and labor costs.
* ITC has established a policy of installing distribution systems and the associated connecting hardware meeting the following criteria:
* Fiber to the desktop (multi-mode/single-mode).
* For 10 gigabit applications Category 6a or fiber is recommended.
* Presently, Category 7 is not an EIA/TIA standard but is an ISO standard and must have an exception for approval.
* Minimum of Category 6 for new installations.
* Category 5e is NOT to be used for new or existing voice and data installations except by approval only.
* Video, alarm, security, and other low voltage systems should be installed with minimum requirements to assure correct operation of such devices.
* Other media may be used as required by special request and approved by ITC.
* Main Communications Equipment Rooms and Telecommunication Rooms for equipment, protection, termination (punch-down) blocks, patch panels, grounding, servers, satellite equipment racks, environmental conditioning, lighting, room access, etc., as needed.
* Pathways for inter and intra-building cabling. (E.g. conduits, raceways, structural design.)
* Entrance facilities shall be in accordance with the NEC and local codes for the any application requiring aerial, direct burial or conduit feeds to the building. This includes codes covering grounding, bonding, protection, and demarcation point. These must be documented on the architectural drawings.
* Special power requirements for the desktop and or the Main Communications Equipment Room may be considered.
* Environmental concerns must be considered (heating, cooling, and lighting).
* Other considerations as floor loading, door opening and working space - required by the NEC code if by an electrical panel.

**MAIN COMMUNICATIONS EQUIPMENT ROOM (MCER)**

**Any room serving as the main location for data, telephone, and low voltage systems that house main wiring cross connects shall be deemed the Main Communications Equipment Room. Generally the Main Communications Equipment Room will be the entrance point for facilities that enters the building. Local Telco, Alarm Company, video services, data POP, and other communication services may appear within the MCER. Entrance facilities may be extended to the MCER if required to keep the wiring plant within specification. The MCER may also serve as a Telecommunication Room. The MCER generally serves an entire building, other Telecommunications Rooms, external buildings or campus. The MCER specifications for satellite or outlying locations may be adjusted to incorporate Telecommunications Room with the approval of ITC.**

**1. There must be one MCER in each building located in proximity to but not co-located or adjacent with an electrical room for power and grounding requirements.**

**2. Sized at a minimum of 150 square feet (10’ x 15’) Note: Contact ITC for any exceptions.**

**3. Ceilings should be of a solid design, (no false ceilings except where HVAC concerns are necessary) at least 8 feet, 6 inches high, painted with low gloss paint non-reflective.**

**4. The walls must go to the roof deck for security. Sleeves must be installed for cable access to the Main Communications Equipment Room with appropriate fire stopping.**

**5. Lighting must be equivalent to 50 foot-candles as measured 3 feet from the finished floor.**

**6. If the MCER is to be used as a Telecommunications Room, locate as near as possible to the center of the building.**

**7. Fire suppression should be a part of the design and is dependent of cost, equipment, and local codes. The following are recommended:**

* **An approved water free fire suppression system is recommended as the first choice.**
* **If water is used a dry pipe system using misters is recommended to reduce equipment damage in the Main Communications Equipment Room.**
* **A wire cage or recessed heads should be installed to prevent accidental breakage of sprinkler heads or misters if a dry pipe system is not used. A drainage trough should also be installed under sprinkler pipes to prevent them from leaking onto telecommunications equipment.**
* **Portable fire extinguishers (carbon dioxide or non-aqueous) must be mounted as close to the entrance away from the door.**
* **The contractor must always adhere to local fire codes.**

**8. Do not locate the MCER in any place that may be subjected to:**

**• Water infiltration**

* **Steam infiltration**
* **Humidity from nearby water or steam**
* **Heat (i.e., direct sunlight)**
* **Any other corrosive atmosphere**
* **Overhead water supply systems/plumbing**
* **Electro magnetic interference (EMI)**

**9. Locations which are unsatisfactory for MCER include space in or adjacent to:**

**• Boiler rooms**

* **Washrooms**
* **Janitor’s closets**
* **Any place that contains steam pipes, drains, or clean-outs**
* **High voltage transformers/ high voltage lines**

**10. The Main Communications Equipment Room also must be equipped with adequate environmental control for heating, ventilation, and air conditioning (HVAC). Environmental control needs to allow for a temperature range of 64 to 75 degrees Fahrenheit, 30 to 55% relative humidity with a minimum of one air exchange per hour. A thermostat MUST be provided in the Main Communications Equipment Room regulating this room only. NOTE: Environmental controls MUST be operational at all times (24x7). Deviations to this specification must be coordinated through ITC.**

**11. The walls in the Main Communications Equipment Room must extend to the roof or next floor. It must be sealed all the way around with conduits feeding into the room for security.**

**12. A lock must be provided to allow only limited access.**

**MAIN COMMUNICATIONS EQUIPMENT ROOM (MCER) CONTENTS**

**The Main Communications Equipment Room must be equipped with the following:**

**1. A minimum of three dedicated non-switched 3-wire 120V AC quad electrical outlets and one dedicated L520R outlet all of which are on separate 20 ampere circuits and are supplied according to the following:**

**• Dedicated electrical outlets or plates must be orange and labeled with the panel and circuit breaker numbers.**

* **This is an important item and location of these outlets must be coordinated with ITC.**
* **Separate ground minimum of #6 solid copper green wires with a grounding buss bar (with a minimum of 12 lug taps) run back to the main building ground. NOTE: If length is excessive (over 20 feet) the current NEC code must be followed. A “DO NOT REMOVE” label must be put on the ground wire at the power panel end to avoid damage to equipment and safety. Isolated grounds are NOT permitted.**
* **Air conditioning units should be a non-condensing refrigerated air type. Swamp coolers are not acceptable.**
* **Reference Equipment Rack in Illustration A for location of power.**
* **Must be equipped with a ground buss bar that is tied back to the building ground using a minimum of #6 copper green wire. The grounding conductor must be attached to an approved electrode per NEC 2003 or must meet current standards, as referenced in TIA 607.**
* **All dedicated A/C outlets must only be used to power communications equipment.**
* **Any additional dedicated circuits maybe required dependent on equipment requirements.**

**2. Additionally, one utility/common use 120-volt AC outlet should be provided on each wall of the room. This outlet should be labeled as a utility outlet.**

**3. Two adjacent walls must be covered completely with ¾ inch A-C plywood (finished on one side) 8 feet high. This must be painted with two coats of a fire resistant, low gloss, light colored paint. (Note: fire rated plywood may be substituted)**

**4. There must be at least one 19” communications/equipment rack located in the Main Communications Equipment Room. (See Equipment Rack section 2.5 for details)**

**5. Main Communications Equipment Rooms must not contain dust-creating devices such as high volume printers or photocopy machines.**

**6. Main Communications Equipment Rooms must not be used as storage areas.**

**7. Provisions must be made for a telephone in the Main Communications Equipment Room.**

**8. Floors must be concrete, linoleum, or vinyl tile. Carpet should never be used.**

**TELECOMMUNICATION ROOM (TR)**

**Areas designated for use as a cross connect point between the backbone (riser) cable and the horizontal distribution cabling (wiring to the station outlets) shall be deemed a Telecommunication Room.**

**Room Design**

**The Telecommunication Room should be designed as follows:**

**1. There must be at least one Telecommunication Room or Main Communications Equipment Room (use as a horizontal distribution cross-connect) per floor. Multiple Telecommunication Rooms are required if:**

* **The floor area to be served exceeds 10,000 square feet**

• **The horizontal distance to any work area from the Telecommunications Room exceeds 295 feet (does not include patch cables).**

**2. The Telecommunication Rooms should be located as close as possible to the center of the area being served or within 295 feet, whichever is closer.**

1. **The size of the Telecommunication Room should be determined by the following chart:**

**SERVING AREA ROOM DIMENSIONS**

**5,000 square feet or less 10 feet x 7 feet**

**5,000 to 8,000 square feet 10 feet x 9 feet**

**8,000 to 10,000 square, feet 10 feet x 11 feet**

**4. If the area to be served is less than 5,000 square feet and the Telecommunications Room is not being used as a Main Communications Equipment Room, then a walk in room sized at 4.5 feet x 4.5 feet may be used.**

**5. Locate light fixtures a minimum of 8 feet, 6 inches above the finished floor.**

**6. Telecommunication Rooms should have fully outward opening, lockable doors which are at least 36-inches wide and 80-inches tall.**

**7. Depending on the scope of the job communication/equipment racks may be required in the Telecommunications Rooms.**

**8. Telecommunication Rooms must be equipped with adequate environmental control (HVAC). Environmental control needs to allow for a temperature range of 50 to 95 degrees Fahrenheit with a minimum of one air exchange per hour if just used for cross connects. If equipment is located in the Telephone Room then the temperature must range from 64 to 75 degrees Fahrenheit. These controls must be operational at all times (24x7). Swamp coolers are not acceptable.**

**9. Lighting must be equivalent to 50 foot-candles as measured 3 feet from the finished floor.**

**10. The room must have walls that extend to the roof or next floor. It must be sealed all the way around with conduits feeding into the room for security. Solid ceilings are acceptable.**

**11. Telecommunication Room floors are to have a minimum loading of 50 LB/per square feet.**

**12. Provisions should be made for a telephone in each Telecommunications Room.**

**TR ROOM CONTENTS**

**The Telecommunication Room must be equipped with the following:**

**1. Minimums of two dedicated 3-wire 120V AC duplex electrical outlets, which are on separate circuits and are 20 ampere rated. More may be required if equipment needs dictate.**

**2. Fire suppression equipment may be installed if required by the fire marshal or contractor.**

**3. Line one or two adjacent walls with ¾ inch A-C plywood 8 feet high. This must be painted with a fire resistant, low gloss, light colored paint. Note: fire rated plywood may be substituted.**

**4. Additionally, one utility/common use 120-volt AC outlet should be provided on each wall of the room, labeled as such.**

**CONDUITS AND PATHWAYS**

**General Pathway Requirements**

**1. All pathways must be installed to meet national and local building codes, such as NEC Article 392.**

**2. Cable trays/baskets are preferred for all main pathways and should be located adjacent to or over the common building hallways leading to the MCER and TR locations.**

**3. J-Hooks are permissible but are subject to the following conditions:**

**• They are to be spaced no further apart than 5’ apart.**

**• Must contain no more than 50 cables. Else cables trays or home run conduits must be used.**

**• J-hooks that cannot be attached to the building structural steel must be solidly secured using all threads.**

**Cable Tray Requirements**

**1. Cable trays should be used throughout the building for main pathways to the MCER and TR locations. All cable tray systems shall use manufacturer recommended components, supports, splices, grounding, etc.**

**2. The cable trays should be located adjacent to or over the common building hallways leading to the MCER and TR locations.**

**3. Access to the cable trays is necessary for future cable installations.**

**4. Conduits used in conjunction with cable trays should terminate within 1 foot of the cable tray run.**

**5. The inside of cable trays must be free of burrs, sharp edges or projections that can damage cable insulation.**

**Conduit Requirements**

**1. All conduit runs are to have no more than two 90-degree bends and no bend must ever exceed 90 degrees.**

**2. All conduits must be provided with an adequate pull string (rated at 200 lb.).**

**3. The minimum conduit size is 1-inch (3/4 inch and smaller conduit is not acceptable).**

**4. Multiple outlets off one conduit run are acceptable if ample sizing of the conduit is used. No more than 3 outlets per one conduit run for sizing purposes.**

**5. Box size and depth of outlet box should accommodate bend radius of all components installed in box. Coordinate with ITC.**

**6. Splicing of wire in a conduit run is not allowed. Splicing of communications wiring is not allowed at any time.**

**7. All exposed ends of conduits should be reamed and bushed.**

**8. Communications wiring shall never be placed in the same conduit with electrical power wiring**.

9. The will be one data conduit and box on each usable wall in each office.

10. Each data outlet conduit shall extend to the nearest cable tray.

**Entrance Conduits**

**Entrance conduits must be provided as follows:**

**1. A minimum of four 4-inch conduits must be home run from the Main Communications Equipment Room (or Telecommunication Room if designated as an entrance facility) to the NMT/ITC campus conduit system and terminate in a JBox (48’x48’x48 Quazite with no bottom). It is out intent to provide a diverse path to each building so each set of 2 conduits will exit the facility on different sides, both directions will have the same size and type of pull box. This is to provide ITC a pathway for a serving cable, so they must be contacted to determine where to place the conduit. The conduits should extend into the room a minimum of 2 inches.**  **If the conduits are to be used for pulling large cables the conduits should extend 4 inches or more to give pulling strength for the cable puller.**

**2. All conduits shall be provided with a non-corrosive pull- rope/pull-tape (a measured mule tape is preferred) rated at 200 pounds pulling strength All non-Telco conduits that leave the building are to be stubbed out and blocked-plugged just outside the building. If the contractor has a way of leaving a marker for the conduits provisions should be made at this time upon covering up the conduits.**

**3. The size and content of the building determines the amount of entrance facility conduits.**

1. **The four 4 inch conduits must be contiguous and must be coordinated with ITC.**

**5. The path of the four 4 inch conduits must be indicated on the architectural plans.**

**Riser Conduits**

**Conduits between Main Communications Equipment Room and Telecommunication Rooms must be provided as follows:**

**1. At least three 4-inch conduits are to be provided between floors (add) – with a minimum of 2 inches penetration into room, usually between Telecommunication Rooms.**

**2. At least one 4-inch conduit is to be provided between Telecommunication Rooms on the same floor at a minimum of 2 inches penetration into room.**

**3. Conduits should be brought up at the location where the backboard is installed in the room.**

**Horizontal Station Serving Conduits**

**Conduits used to serve the workstation must be provided as follows:**

**1. Conduits terminating in either the Telecommunications Room or Main Communications Equipment Room are to protrude 4 inches up from the finished floor or 4 inches down from the finished ceiling, depending upon the design.**

**2. Conduits feeding outlet boxes must be a minimum of 1-inch diameter. If multiple outlets have to be fed from one conduit, add one grade size for each box, e.g., two boxes =1 1/4 inch, three = 1 1/2 inch, etc. More than three outlet boxes on a single conduit are not permitted.**

**3. All telecommunications outlets installed in a dry wall, plaster, or concrete block wall must be at least 4 inch square by 2 1/8 inch deep (quad). The outlet boxes must be equipped with a single gang or double gang with mud ring, and metal cover plates. (Note: In order to meet A.D.A. specifications, the distance from the bottom of the outlet and the finished floor must be at least 15 inches. If this is a wall height phone location ADA requires 48 inches above finished floor.**

5. The will be one data conduit and box on each usable wall in each office.

6. Each data outlet conduit shall extend to the nearest cable tray.

**Communication/Equipment Racks**

**Depending on the scope and size of the job, racks will be either floor or wall mounted type.**

**Floor Mounted Racks**

* **Floor mounted racks must be 7 feet high and 19 inches wide for the purpose of mounting communications equipment and patch panels.**
* **A ladder rack must be attached from the rack to the backboard.**
* Dedicated power **must** be mounted on the racks away from the low voltage cabling.
* Power with surge protection **must** be provided for each equipment rack.
* Two shelves should be provided on each equipment rack for non-racked equipment.
* A number 6 AWG copper conductor (NEC article 100) **must** be used to connect separate pieces of ladder style cable raceway and racks to form a continuous ground that connects to the telecommunications grounding bus bar.
* There **must** be a minimum of 3 feet of clear working space in front and behind of any floor standing racks. Care **must** be taken when electrical panels are co-located in the same Telecommunication Room. Adequate working space requirements **must** be met by both the electrical and communication requirements.
* Floor mounted racks **must** be fully secured to the floor using bolts.
* Floor mounted racks of different heights can be used depending upon the application.

**Wall mounted racks**

* Wall mounted racks must be 2 to 4 feet high and 19 inches wide for the purpose of mounting communications equipment and patch panels.
* Wall mounted racks must be mounted to the ¾” plywood.
* There **must** be a minimum of 3 feet of clear working space in front and of any wall-mounted rack.
* Power with surge protection **must** be provided for all equipment.
* Wall mounted racks **must** also be properly grounded to the ground bus bar.

**Wire Management**

* Wire Management must be used for all communication/equipment racks.
* Horizontal wire management **must** be no less than 3” wide.
* Vertical wire management **must** be no less than 6” wide.
* There **must** be one U space between either side of all patch panels and the wire management and equipment. This is for practical access.

**SPECIFICATIONS FOR INTERNAL WIRING**

**General Wiring requirements**

**1. NMT/ITC standard for cabling and wiring applications is a Category 6 four pair jacketed cable (commonly called UTP – Unshielded Twisted Pair). STP or shielded twisted pair may be used in environments that require noise immunity but must be approved and tested by a certified communications wiring contractor.**

**2. NMT/ITC standard for horizontal optical fiber to the desktop is 50/125 or 62.5/125-micron multi-mode fiber. It is recommended to use the 50/125-micron multi-mode fiber since it provides longer distances.**

**3. All inside fiber must be tight buffered.**

**4. In plenum situations, where conduit is not available, the cable/wire shall be constructed with insulation and jacket material (i.e., Teflon), which satisfies the NEC. Under no circumstances must non-plenum wire be installed in a plenum air return. Some situations allow non-plenum cable because the air plenum is not a return and ducted. If the air space changes to an air plenum action must be taken to ensure public safety according to applicable code.**

**5. All installed cable shall be Underwriter’s Laboratories listed (or recognized) and shall display manufacturer’s markings showing the type of cable to ensure a code compliant installation.**

**6. All patch cords must be of the same category rating/fiber rating as the wire and jack. If the patch cord is made of copper wire it must be stranded copper wire and not solid. All patch cords and drop cables for data should be factory made and tested - no handmade jumpers should be made except for cross over cables.**

**7. PDS cabling and wiring shall be placed directly (laid openly or direct buried) or within conduit, depending upon the application and building design considerations.**

**8. Direct wiring from the Telecommunications Room to the premise equipment is NOT allowed**

**9. The appropriate jacks and cross-connections must be provided with labeling on patch panels and outlet plates.**

**Specifications for Internal Use Wire**

**Horizontal Wiring**

1. **Building inside horizontal wiring shall consist of two runs, one for voice and one for data, which will connect employee workstation terminals (outlets), with their serving Telecommunication Room or cable termination point.**
2. **Wiring runs shall be installed in such a way that electrical interference generating devices are avoided (florescent lighting fixtures, electric motors, X-ray machines, etc. To avoid electromagnetic interference, all horizontal cabling shall have clearances of at least:**

**• 4 feet from large motors or transformers.**

* **1 foot from conduit and cables used for electrical power distribution.**
* **1 foot from florescent lighting.**

**3. Wiring runs should be placed behind the backboards in both the Main Communications Equipment Room and Telecommunications Rooms. The cables will be brought through the backboard directly behind the connecting blocks. This will allow cross-connections to be made in an orderly manner by not having to cross over exposed cables running vertically on the backboard.**

**4. The two runs shall consist of 4 twisted pairs (8 conductors):**

**• One minimum Category 6 rated UTP for voice communications.**

* **One minimum Category 6 rated UTP or fiber cable for data communications.**

**5. If a higher grade of wire is installed the minimum test must be at that level.**

**6. The installation of fiber as a horizontal medium (fiber to the desktop) is a design consideration for future applications.**

**7. Transition from copper to fiber will require equipment that is compatible at the workstation as well as in the Main Communications Equipment Room.**

**8. The maximum lengths of horizontal distribution cables are:**

* **From the termination in the Telecommunications Room to the outlet - 295 feet (average runs are to be - 150 feet).**
* **Combinations of patch cords and cross-connect jumpers in the Telecommunications Room - 20 feet.**
* **Connections from the outlet to the user station - 10 feet.**
* **Total maximum length including patch cables and cable slack must not exceed 325 feet.**

**9. Horizontal wiring must be installed in a star topology, homeruns from each outlet to the Telecommunications Room. No splices may be made. If a transition box is installed only one transition may be installed.**

**10. Cable slack shall be as follows:**

**• Over all in the Telecommunications Room - 10 feet.**

* **12 inches at the outlet.**
* **The same slack will apply to fiber, coax, UTP or any other type of wiring installed.**

**11. Cables should cross perpendicular to florescent lighting and electrical power cables and conduits.**

**12. The minimum bend radius’ for horizontal cables are:**

* **No less than six times the cable diameter for:**

 **•UTP**

 **•STP**

 **•Coaxial cable**

* **No less than ten times the cable diameter for optical fiber.**

**13. All wiring that is not contained in a closed pathway (conduit, cable tray, etc.) must be supported by J-supports above the ceiling:**

* **Located on 48 inches to 60 inches centers.**
* **May hold up to fifty .25 inches diameter cables.**
* **Cable loads must be calculated when large horizontal pathways are used.**
* **Under no circumstances can horizontal pathways be cable tied, cinched to existing false ceilings or laid upon the ceiling tile.**
* **All cables must be bundled and or supported by Approved Reusable Hook and Loop Cable Ties. Nylon tie wraps are NOT acceptable.**
* **Directional changes must be made immediately after supporting points (i.e.: J-Hooks).**

**14. All cable runs must follow a logical and orderly path.**

**Backbone (Riser) Cables**

**1. Design backbone cables to provide for all anticipated low Voltage DC wiring needs.**

**This can include:**

* **Telephone and data wiring systems.**
* **Paging and public address systems.**
* **Environmental and intrusion alarms.**
* **Fire and security systems.**
* **Video systems- CATV/MATV.**
* **Other special purpose requirements.**
* **Foreseeable growth needs must be included.**

**2. Riser cables will be placed behind the backboards the backboard directly behind the connecting blocks or patch panels. This will allow cross-connections to be made in an orderly manner by not having to cross over exposed cables running vertically on the backboard.**

**3. All riser cables must be terminated and labeled at both ends.**

**4. Fiber will be installed and terminated - tested in both directions for dB loss and noted on NEMA termination box.**

**5. Risers may consist of either solid category 6 rated wire or optical fiber or both.**