

SPECIFICATION STANDARD

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PART 1: GENERAL

The Contractor is responsible to be knowledgeable with provisions contained herein and with other Sections of this Specification as applicable to the work related to this section.

1.01 SCOPE OF WORK

- A. The scope of work under this section consists of providing conduits, boxes, raceways, pathways, and cable supports for telecommunications wiring included in this project.
- B. Work covered by this Section shall consist of furnishing labor, equipment, supplies, and material, unless otherwise specified, and performing the following operations are necessary for the installation and testing of all infrastructure required by this specification's standard.
- C. The horizontal infrastructure begins in the telecommunications room (TR) and is terminated at the telecommunications outlet that is located in the end user work area.
- D. Only the UNM IT-approved manufacturers for structured cabling systems shall be installed in the pathways. The exact Category performance requirements are project specific. Verify and comply with manufacturer installation and warranty requirements when designing and installing structured cabling systems.
- E. The typical Telecommunications Outlet is a Category 6 faceplate that shall be provisioned to accept four (4) ports. The standard installation is two (2) Category 6 cables and two (2) 8P8C jacks. There will be applications where other cabling requirements are needed. When these cables are added to the Telecommunications Outlet such as (Category 6, 6A, F/UTP Fiber, or Coax) use approved jacks. The sizing of the pathway will need to be adjusted to meet additional cabling requirements. Initial installation shall have a 40% fill rate.
- F. Provide conduits and boxes for Code Blue Emergency Phones, Elevator Phones, mechanical and electrical metering equipment, and wall phones.
- G. Furnish and install an inter-building cabling infrastructure and pathways. Originate the system from the building's main equipment room and distribute it to the telecommunications room.

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- H. Furnish and install raceways and cable tray systems in hallways and other accessible areas, above ceilings where applicable or as specified in the project documents and drawings.
- I. Transition cable tray to conduit systems in inaccessible areas. Must meet the same volume as the tray.
- J. Install cable tray and raceway systems according to the manufacturers' product installation instructions using the manufacturers' approved methods and components.
- K. Furnish, install and document re-enterable UL-listed firestop assemblies at all firewall penetrations. (UNM IT-approved firestop systems are Hilti and or STI) (UNMH only approves Hilti) Document means the manufactures label is permanently attached to the wall located adjacent to the penetration along with a photo taken and submitted to (UNM IT).

1.02 RELATED SECTIONS

- A. Division 26 Electrical Division
- B. Division 27 Communicants Systems.
- C. Division 28 Electronic Safety and Security

1.03 RELATED REFERENCES

- A. All work performed under this section must comply with the manufacturer's approved methods and comply with the most recent versions of the following Industry Standards and Practices applicable to work being performed under this section. The contractor shall have working knowledge and possess the following documents of the Standards and Methods listed and must adhere to the most recent published edition.
 - 1. National Fire Protection Association
 - 2. National Electrical Code
 - 3. National Electrical Safety Code
 - 4. Telecommunications Industry Association (including but not limited to)
 - a. TIA/EIA 569 Commercial Building Standard for Telecommunications Pathways and Spaces.
 - b. TIA/EIA 758 3Customer-Owned Outside Plant Telecommunications Cabling Standard.
 - c. TIA/EIA 568 Commercial Building Telecommunications Cabling Standard
 - d. TIA/EIA 607 Grounding
 - 5. Building Industry Consulting International (BICSI)

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- a. Telecommunications Distribution Design Manual

PART 2: PRODUCTS

2.00 TELECOMMUNICATIONS OUTLETS BOXES, FLOOR BOXES and SURFACE RACEWAYS

- A. Telecommunication Outlets shall have the ability to accommodate a complete line of connectivity modules including those for UTP cables Category 6, Category 6 Augmented F/UTP, fiber optic, coaxial, and other cabling types with matching faceplates and bezels to facilitate mounting.
1. It is the responsibility of the project RCDD, Electrical Engineer and Contractor to verify that the design requirements which are specified below have been met.
 2. It is the responsibility of the contractor to submit an RFI for any noted incorrect designs or conditions found that do not meet the requirements of this Specification Standard.
- B. Furnish and install telecommunications outlets in studded drywall or masonry wall providing a 4 11/16" inch square 2 1/8" inch deep boxes with 1" inch mud ring provisioned with a 1" inch conduit knockouts.
- The box depth will be 3 1/8" inches. It is the responsibility of the designer, electrical contractor, and structured cabling contractor to identify and verify the conduit and box size to match the cabling requirements at each location.
1. Fiber Optic, Category 6, and Category 6 Augmented F/UTP radius: The depth of the box shall accommodate a 1 1/4" inch cable bend radius, which meets or exceeds the specifications for fiber optic and UTP cabling per TIA/EIA-56 requirements for communications pathway. A 1 1/4" inch-controlled radius storage loop shall be installed.
- C. The minimum requirement for all telecommunications outlets is a 1" inch conduit(s) provisioned with a bushing on each and a measured pulled line secured at each termination point for horizontal cabling installation. The conduit sizing and fill ratio shall be verified in design and provided to meet the requirements of the TIA/EIA 568, 569 with an initial installation fill ratio of 40% percent.
- D. For all horizontal cabling pathways provide a minimum of a 1" inch conduit from the outlet box to the nearest cable tray or conduit system. Terminate conduits above cable trays at approximately 12 inches to the nearest side rail.

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- E. In inaccessible as well as areas that are non-adjacent to spaces conduit shall be provided from the outlet box to the nearest cable tray or conduit system with no exceptions. Terminate conduits above cable trays at approximately 12" inches to the nearest side rail.

2.02 FLOOR BOXES

- A. Floor boxes provide the interface between power, communication, and AV cabling in an on-grade or above-grade concrete floor where power and communications services are required. Boxes shall provide flush or recessed device outlets that will not obstruct the floor area.
- B. Floor boxes and covers must be heavy-duty in construction, watertight, and easily accessible by users. Meeting and Exceeding Water Exclusion Standards in Poke-Thru Devices and Floor Boxes UL514A standards require that all concrete floor box covers and poke-thru devices meet a carpet water exclusion test. Water exclusion tests are designed to simulate typical maintenance procedures such as mopping tile floors and shampooing carpets.
- C. All floor boxes shall be submitted and approved by UNM IT.
 - 1. An acceptable pre-approved box is Wiremold RFB6.
- D. Communications Devices and Accessories: The floor box shall accommodate a complete line of connectivity outlets and snap-in modular inserts for UTP including Category 6, 6 Augmented F/UTP, fiber optic, coaxial, and other structured cabling types with matching faceplates and bezels to facilitate mounting. Where indicated, provide connectivity outlets and modular inserts. **Bezels shall be supplied by the contractor furnishing the floor boxes.**
- E. Furnish and install 1 ½" EMT conduit to each floor box. In new construction, conduits should be run continuously from the outlet box to the cable tray installing pull boxes where necessary to meet bend radius requirements. **DO NOT DAISY CHAIN FLOOR BOXES.**
- E. Covers and Bezels: Floor box options shall accept both brass and nonmetallic cover plates and flanges. Flanges for both brass and nonmetallic shall be available in one, two, and three gang applications and installed on boxes. Each flange shall provide ½" inch of adjustment to accommodate various floor covering and concrete depths.
- F. Floor Boxes on "Slab on Grade" must have OSP category cable installed. Must be suitable for "wet locations". A suitable substitute cable must be approved by UNM IT.

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2.03 POKE THRU DEVICES

- A. Poke-thru devices provide a path for power and communications cabling in an above-grade concrete or steel deck floor and where the workstation is located where the power and data communication devices outlets are required.
- B. Poke Thru Devices and covers must be heavy-duty in construction, watertight, and easily accessible by users. Meeting and Exceeding Water Exclusion Standards in Poke-Thru Devices and Floor Boxes UL514A standards require that all concrete floor box covers and poke-thru devices meet a carpet water exclusion test. Water exclusion tests are designed to simulate typical maintenance procedures such as mopping tile floors and shampooing carpets.
- C. All Poke-thru devices shall be submitted and approved by UNM IT.
- D. Poke-thru devices shall be suitable for use in air handling spaces in accordance with Section 300-22 of the National Electrical Code.
- E. Furnish with necessary channels to provide complete separation of power and communication service. There shall be one minimum of 1 ¼” inch channels for communication cabling to the nearest cable pathway. The channels shall be arranged such that communication cables can be conduit protected and connected to the insert body.
- F. Activation covers shall provide spring-loaded slides that snap back into place when not in use to protect the flush-mounted power receptacle.
- G. Communications Devices and Accessories: Poke Thru Devices shall accommodate a complete line of connectivity outlets and snap-in modular inserts for UTP including Category 6, 6 Augmented F/UTP, fiber optic, coaxial, and other cabling types with matching faceplates and bezels to facilitate mounting. Where indicated, provide connectivity outlets and modular inserts. **Bezels shall be supplied by the contractor furnishing the Poke Thru.**
- H. The poke-thru shall have an incorporated approved UL firestop system that meets the rating of the floor.
- I. Unit shall be installed per Manufacture Specifications.

2.04 SURFACE MOUNTING RACEWAYS (SMR)

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- A. A submittal is required on all SMR, outlet, and accessories to UNM IT for approval before construction.
- B. Furnish and install surface raceways connecting EMT conduit system to the nearest Horizontal Distribution Infrastructure connection point. Size conduits to meet the cabling requirements of surface-mounted raceway system with 60% growth.
- C. Provide surface raceway systems for branch circuits and data networks voice and another low-voltage wiring. The surface raceway system shall consist of raceway covers; appropriate fittings and device mounting plates necessary for complete installation.
- D. Provide full capacity corners elbows and tees fittings to maintain the proper bend radius, meeting the specification for Fiber Optic and UTP cabling exceeding the TIA/EIA-569 requirements for communications pathways.
- E. Raceway Covers and Devices Plates: Raceway covers with the cable exiting the SMR shall have a hole cut with a grommet. Wiring connections of these devices shall be completed during installation.
- F. Ensure the depth of the surface raceway will provide sufficient space for jacks, and bend radius for terminations.
- J. Surface Mounted Raceway shall accommodate a complete line of connectivity outlets and snap-in modular inserts for UTP including Category 6, 6 Augmented F/UTP, fiber optic, coaxial, and other cabling types with matching faceplates and bezels to facilitate mounting. Where indicated, provide connectivity outlets and modular inserts. **Bezels shall be supplied by the contractor furnishing the SMR.**

2.04 SERVICES POLES

- A. All service poles shall be submitted to and approved by UNM IT.
- B. Provide indoor service pole systems for the video, and other universal communications cabling to points of use shown on the Drawings. The system shall consist of multi-outlet assemblies, and appropriate fittings and accessories as required for complete assembly.
- C. Provide a removable cover at the compartment bottom to assemble and mount communications connections. Sections shall be removable without dismantling or removing the pole after installation. The cover section shall have six knockouts for modular universal jacks and a rectangular knockout for modular furniture outlets.

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- Include a knockout with a grommet for straight-through communications cabling access.
- D. Provide entrance fittings for the top of the communications channel, ceiling trim plate, pole-mounting bracket, carpet gripper pad, and adhesive pad. For air handling spaces, furnish an entrance end fitting.
 - E. Pole shall be UL listed for field modifications, changes, and additions of receptacles, devices, and circuits. Field-installed power device covers shall be available to add duplex, single 1.40" inch and 1.59" inch, and rectangular type receptacles. Covers shall match and finish of pole. Add-on communications covers shall be available to mount workstation devices faceplates, inserts, and specialty mounting bezels. Where indicated, provide connectivity outlets and modular inserts.
 - F. Fiber Optic / UTP (including Category 6, 6Augmented) Cabling Radius: Provide each pole with a proper bend radius entrance fitting, which meets or exceeds the specifications for fiber optic and UTP cabling and TIA/EIA 569 requirements for communications pathways.

2.05 ARCHITECTURAL COLUMNS

- A. Architectural columns can consist of a vertical chase and multi-outlet systems to provide a wire pathway such as a conduit and access point for communications and power. The system shall consist of modular vertical channels and appropriate fittings as required for a complete assembly.
- B. Provide connectivity outlets and modular inserts for UTP (Category 6, 6Augmented F/UTP). Fiber Optic, Coaxial, and other cabling types with faceplates and bezels to facilitate mounting.

2.06 WIRE MESH CABLE TRAYS-Light to Medium Use

- A. Acceptable Manufacturers are Cablofil, Chatsworth, Cooper B-line.
- B. Wire mesh cable trays shall not be used within ERs or TRs.
- C. All wire mesh cable trays and accessories shall be submitted for approval by UNM IT.
- D. Furnish and install wire mesh cable tray system from the telecommunications room, in hallways and corridors inaccessible areas to complete a distribution infrastructure.

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- E. DESIGN EXCEPTION: When a large number of cables are entering ER/TR cable tray shall be used to accommodate the additional weight, the requirements for this design shall include a minimum of 10 feet of cable tray in each area approaching the ER/TR as specified by UNM IT. Ensure proper bonding, transition, and supports between types of systems are maintained according to the manufacturer's instructions.
- F. Wire Mesh Cable tray will consist of a continuous, rigid, welded steel wire mesh cable management system, to allow continuous ventilation of cables and maximum dissipation of heat, with UL Classified splices where the cable tray acts as Equipment Grounding Conductor (EGC).
- G. Provide manufacturer splices, supports, and other fittings necessary for a complete, continuously grounded system installed per the manufacturer's recommendations. **No single center support systems.**
- H. Cable Tray Size
 - 1. Depth: Cable tray minimum depth shall be a minimum of 2" inches.
 - 2. Width: Cable tray width will be designed per project.
- I. Cable tray fill
 - 1. The ratio may be filled to 40% of the total fill capacity on initial installation. Size cable tray to accommodate future cabling changes or additions.
 - 2. Load Span Criteria: Install and support the cable management system following the manufacturer's specifications.
- J. Supports
 - 1. Ceiling-mounted supports shall be mounted directly to the ceiling structure with a minimum of 3/8" inch or 1/2" inch threaded rod, and shall have a maximum of three threads beyond the nut.
 - 2. Wall-mounted supports where specified are acceptable and shall be installed per the manufacturer's specifications.
 - 3. Cable tray support systems shall be installed within raised floor systems. Install per manufacturer specifications or a minimum of 5/8" inches off the floor.
 - 4. Splices, including those approved for electrical continuity (bonding), as specified by the wire mesh cable tray manufacturer.
 - 5. Accessories: Install as specified by the manufacturer to protect and support, the wire mesh cable tray system. Waterfalls shall be used where ever cable enters or exits the tray or cable changes elevations without supports.
 - 6. Ground and bond according to the manufacturer's specifications or instructions and NEC Article 250.

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2.08 CABLE TRAYS - Ladder Type

- A. Acceptable Manufacturers are Chatsworth, Cooper B-Line
 - B. All ladder-type cable trays, devices, and accessories shall be submitted to and approved by UNM IT.
 - C. Provide metal cable trays with splice plates, bolts, nuts, and washers for connecting units. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards and the manufacturer's instructions; and with the following additional construction features.
 - 1. Material and finish specifications for each tray type are as follows; Aluminum or Steel.
 - 2. Ladder-type trays shall consist of two longitudinal members (side rails minimum four inches) with transverse members (rungs) attached to the side rails. Rungs shall be spaced 6", 9", or 12" inches on center. Spacing in radiused fittings shall be 9" inches and measured at the center of the tray width. Rungs shall have a minimum cable-bearing surface of 7/8" inch with radiused edges. No portion of the rungs shall protrude below the bottom.
- **Each rung must be capable of supporting the maximum cable load, with a safety factor of 1.5 and 200 pounds concentrated load when tested under NEMA VE-1, section 5.4.**
- D. Tray widths shall be minimum of 12" inches or as shown on drawings.
 - E. All fittings must have a minimum radius of 18" inches.
 - F. Straight tray sections shall have side rails fabricated as I-Beams. All straight sections shall be supplied in standard lengths, except where shorter lengths are permitted to facilitate tray assembly lengths as shown on drawings.
 - G. Splice plates shall be the bolted type as specified by the manufacturer. Splice plate construction shall be such that a splice may be located anywhere within the support span without diminishing the rated loading capacity of the cable tray.
 - H. Cable Tray Supports shall be placed so that the support spans do not exceed the maximum span per manufacturer and NEC load rating. Supports shall be constructed from 12 gauge steel formed shape channel members 1 5/8" inch by 1 5/8" inch with necessary hardware, Unistrut or equal. The trapeze hanger's supports shall be supported by 1/2" inch (minimum) diameter rods. Cable trays

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installed adjacent to walls shall be supported on wall-mounted brackets. Support shall be loading condition with a safety factor of 3.

- I. Barrier Strips shall be placed as required.
- J. Accessories shall be furnished as required to protect, support, and install a cable tray system. Accessories shall consist of but are not limited to; section splice plates, expansion plates, blind-end plates, specially designed ladder dropouts, barriers, waterfalls, etc.

2.09 NON-CONTINUOUS CABLE SUPPORTS – J-HOOKS

- A. Acceptable Manufacturers are Erico, Cable Cat, or a UNM IT-approved equivalent.
- B. Non-continuous cable supports shall provide a bearing surface of sufficient width to comply with the required bend radii of high-performance cables (CAT 6 and Cat 6 Augmented); UL Listed.
- C. Non-continuous cable supports shall have flared edges to prevent damage while installing cables.
- D. Non-continuous cable supports shall have an electro-galvanized finish and shall be rated for indoor use in non-corrosive environments.
- E. Saddles can be installed as approved by UNM IT.

2.10 HORIZONTAL CONDUIT DISTRIBUTION:

- A. Furnish and install 4” inch EMT conduits in inaccessible areas to complete distribution infrastructure. Provide sufficient conduit capacity to meet the cabling capacity of the cable tray system. Furnish and install pull strings and bushing for conduit sections.
- B. Hinged pull boxes with the opening completely assessable from below without obstructions. Install as required per TIA/EIA where conduit runs exceed 100 feet and/or bends exceed a total of 180 degrees in a section of conduit. Pull boxes sized per BICSI TDMM.

2.11 FIRESTOP

- A. Acceptable Manufacturers: Hilti, STI, and Wiremold

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- B. Furnish and install re-enterable UL-listed fire-rated assemblies through fire-rated partitions, walls, and floors. Installed per UL system assembly requirements.
- C. Fire Rated Cable Pathways: Hilti Speed Sleeve, STI EZ-PATH™, and Wiremold modules comprised of steel raceway with intumescent foam pads allowing 0 to 100 percent cable fill, the following products are acceptable:
 - 1. Hilti Speed sleeve CP 653.
 - 2. Specified Technologies Inc. (STI) EZ-PATH™ Fire Rated Pathway.
 - 3. Wiremold FS4R for conduit.
- D. Where it is not practical to use a mechanical device, openings within floors and walls designed to accommodate structured cabling provide re-enterable products that do not cure or dry. Submittals shall be submitted to UNM IT for approval.
- E. Cable trays shall not penetrate fire-rated walls or partitions and floors. Use UNM IT-approved fire-rated assembly to penetrate walls and floors.

Part 3: INTRA BUILDING INFRASTRUCTURE

3.01 GENERAL REQUIREMENTS

- A. The intra-building pathways intend to provide the building with a route from the building's ER/TRs and spaces to the TOs at the end user's work area or equipment termination point.
- B. The installation of new pathways shall not interfere with existing utilities or pathways. The contractor shall coordinate the installation of the new pathways with other trades and project requirements. Minimum clearances shall be 6" inches on sides 3 inches below and 12" inches above.
- C. All pathways must remain accessible and useable after completion.
- D. All pathways must comply with the list of related references listed in Part 1 of this section and comply with installation instructions and methods specified by the product manufacturer.
- E. The contractor shall reference the related sections listed in Part 1 to determine any additional requirements necessary to complete the project.

3.02 TELECOMMUNICATIONS OUTLETS

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- A. New construction telecommunications outlets shall be installed at a minimum of 18” inches AFF unless specified.
- B. The telecommunications outlet box will be a 4-11/16” inch square box with a 1” extension ring fitted with a single gang mud plate.
- C. The telecommunications outlet shall be provisioned minimum with a 1” inch EMT conduit that has bushings installed and a measured pull line installed and secured at the conduits terminations points
- D. Telecommunications outlets are not to be installed back to back.
- E. Firestop the outlet box using a listed UL application in firewalls.
- F. Renovated Areas of Existing Buildings Alternate – When approved by UNM IT.
 - 1. In accessible ceiling areas, extend the conduit through the wall plate and bend the conduit 90° to face the nearest cable tray, or access conduit or sleeve.
- G. Provide a minimum of one (1) 2” inch EMT sleeve on non-rated walls from the cable tray into each room. On fire-rated walls use UNM IT-approved firestop sleeve as per 2.11 Firestop. In inaccessible or semi-accessible ceiling areas, install a complete 1” inch minimum EMT conduit system from the telecommunications outlet box to the nearest or most available cable tray.
- E. Install system Category-compliant cable supports every 36” to 60” inches.
- F. Conduit needs to run in the most direct route possible, parallel with building lines and in a workman-like manner.
- G. The use of flexible metallic conduit is not permitted.
- H. Specify UL-listed fire-stopping application for conduit and sleeve penetrations using a code-compliant and re-enterable application as per 2.11 Firestop. Document and provide to the owner a photo of the application, the name of the listed application, the date of installation, and the name of the installer.

3.03 GENERAL CONDUIT REQUIREMENTS

- A. Horizontal conduit routes are to be designed to enable the cabling system to meet the link length requirements of 295 feet.
- B. Intra-building conduit runs shall contain no continuous sections longer than 100 feet. If runs total more than 100 feet, pull points or pull boxes shall be inserted.

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- C. Conduit shall have no more than 180 degrees of cumulative bends between pull points or more than 90 degrees of bends at any one point.
- D. The use of a third conduit bend is only acceptable if:
 - 1. The total conduit run does not exceed 33' feet.
 - 2. The conduit is increased to the next trade size.
 - 3. One of the bends is located within 12" inches of the cable feed end.
- E. Pull boxes are not to be used as a means to change the direction of conduit runs. Pull boxes are to be sized as per the latest version of the BICSI TDMM.
- F. The use of EB's is not permitted. Only approver LB type bodies that are manufacturers for the use with communications cabling.
- G. Specify UL listed fire-stopping application for conduit and sleeve penetrations using a code-compliant application in the fire-stopping section. Install a Hilti or STI ULcompliant and re-enterable application as per 2.11 Firestop. Document and provide to the owner a photo of the application, the name of the listed application, the date of installation, and the name of the installer.
- H. The following table provides general guidelines for cable capacity for conduits that have no more than two 90° bends and are not longer than 100 feet. It is based on a maximum 40% fill and includes a de-rating factor of 15 % for each of the two 90° bends. The final conduit design shall be compliant with the Related References in Part 1. The radius of conduit bends shall be at least 10 times the conduit diameter. Under certain conditions where 10 times bend radius is not achievable due to structural conditions 6 times bend radius may be permitted by UNM IT.

Table 1 – Maximum Conduit Fill for Horizontal Cables Number of Cables or Wires

Wire O.D. mm	3.3	4.6	5.6	6.1	7.4	7.9	9.4	13.5
(in)	(.13)	(.18)	(.22)	(.24)	(.29)	(.31)	(.37)	(.53)
Conduit size								
1	8	8	7	6	3	3	2	1
1 ¼	16	14	12	10	6	4	3	1
1 ½	20	18	16	15	7	6	4	2

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2	30	26	22	20	14	12	7	4
2 ½	45	40	6	30	17	14	12	6
3	70	60	50	40	20	20	17	7
3 ½	-	-	-	-	-	-	22	12
4	-	-	-	-	-	-	30	14

Note: Ensure that conduit/sleeve cable fill does not exceed specified fire-stopping methods.

3.04 Interbuilding Backbone Conduit Requirements

- A. All conduits for backbone cabling shall be 4”.
- B. Conduits entering telecommunications or equipment rooms from below the floor shall be terminated not more than 4" above the finished floor.
- C. Conduits for riser cables shall be continuous and separate from all conduit or enclosed raceway systems. Do not include more than two 90° bends between pulling points when installing riser conduits. Where junction boxes are required they must be hinged-type boxes and located in accessible areas, such as above suspended ceilings in hallways.
- D. Factory bends are required for backbone conduit installations.
- E. A 40” inch bend radius is to be maintained at all turns in.
- F. A change in direction of the conduit run is not to be accomplished by adding a pull box.
- G. UNM IT's preferred method for Optical Fiber Cable is to utilize Interlocking Armored Cable, which is appropriately color coded, without the use of innerduct or max-cell.
- H. Where specified by UNM IT install one (1) 1 1/4” inch plenum-rated inner duct for each optical fiber cable specified in all cable tray installations.
- I. Label optical fiber inner ducts at each end within six feet of the rack and within one foot of entering or exiting a conduit, label shall be preprinted caution labels that indicate optical fiber cables and describe the size and the termination points of the installed cable. Labels must be yellow with black text and waterproof.
- J. Install a single conductor locating wire of minimum 14 gauge solid insulated orange

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wire for all non-metallic optical fiber cables and terminate on cable's FDU.

- K. All multi-cell conduits and inner ducts and multi-cell inner duct shall be rated per NFPA 70 requirements.
- L. Conduits entering the entrance, equipment, or telecommunications rooms from below grade shall extend 4" inches above the finished floor. Location of entrance conduits shall be within 12" inches of room corners.
- M. Conduits shall be sloped downward from the building towards the manhole or handhole to prevent flooding in the building. Install a waterproof plug on each end of the conduit section.
- N. Terminate conduits entering the entrance, equipment or telecommunications rooms from above the ceiling extend the conduit 4" inches below the finished ceiling or 12" inches above the cable tray.
- O. Entrance conduits shall be continued into the building and to the entrance, equipment, or telecommunications rooms. Securely fasten all entrance conduits to the building to withstand any cable placing operation.
- P. If the entrance conduits exceed the 180° of total bends limitation, a UNM IT-approved sized junction box, manhole, or handhole.
- Q. All conduits shall have a measured 1320 pull-strength mule tape installed and tied off at each end.
- R. Install bushings at the endpoint of all conduit sections.

3.05 SURFACE-MOUNTED RACEWAYS

- A. Install sufficient conduit capacity from the cable tray to Surface Mounted Raceways (SMR) to provision the cabling capacity of all outlets in the raceway system.
- B. Fit out each outlet in the SMR with the parts and accessories necessary to install the specified cabling system.

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- C. Furnish and install raceway and boxes for renovations and daily work orders. The minimum cabling capacity of the SMR shall be one inch. Provide a complete system using approved manufacturer parts and approved methods. Secure the raceway system using screws and attachments. Install a minimum of three support screws per raceway section. Do not use adhesive strips as a final means of support.

3.06 CORRIDOR CABLE TRAY SYSTEM

- A. Complete wall-mounted or suspended aluminum or stainless cable tray system and necessary accessories shall be provided as shown on the plans. Install the entire cable tray system following the manufacturer's installation instructions and all local governing codes.
- B. Coordinate installation of cable tray with other trades to allow a minimum of 12" inches above, 6" inches in front, and 3" inches below of clearance from piping, conduits, ductwork, etc.
- C. Submittal drawings, in the form of 8 1/2" inch by 11" inch catalog cut sheets, shall be provided for the following items: cable tray, fittings, accessories, and load data.
- D. The cable tray shall not be loaded beyond 60% of the manufacturer's recommended load capacity.
- E. Coordinate cable tray installations with other trades.
- F. Where a new cable tray distribution system encounters an inaccessible area, install sufficient 4" inch EMT sleeves through the area so that cabling does not exceed a 40% fill ratio.
- G. Where the cable tray is exposed below the ceiling and is accessible to the public, install the appropriate solid bottom and cover inserts to conceal cables.
- H. Install the appropriate cable tray waterfalls and/or cable exits where large quantities of cables exit the distribution system.
- I. Install one 1 1/4" inch plenum-rated inner duct for each optical fiber cable specified in all cable tray installations, except where Interlocking Armored Optical Fiber is installed.

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J. Label optical fiber inner ducts at every start and end point and on each wall with preprinted caution labels that indicate optical fiber cables and describe the size and termination points of the installed cable. Labels must be yellow with black text and waterproof.

3.06 COMMUNICATIONS ROOM CABLE TRAY SYSTEM

- A. TR cable tray shall completely wrap all walls within the room.
- B. The cable tray shall extend over all equipment racks.
- C. The cable tray shall be a minimum width of 18" inches or such width to support cables with a 60% growth allowance.
- D. Typical cable tray installations will be at nine feet AFF or one foot above equipment racks.
- E. Bond and ground cable tray system to equipment racks using manufacturer approved methods and products.
- F. See section 2.08 Cable Trays-Ladder Type

3.07 JUNCTION BOX REQUIREMENTS FOR STATION CONDUITS

- A. If the station conduit route exceeds the 180 ° of total bends limitation, an appropriately sized junction box is required within a straight section of the conduit run.
- B. A junction box shall not be used in place of a bend. All junction boxes in station conduit paths shall be installed within a straight section of the conduit run.
- C. Junction Box Requirements for Station Cables.

JUNCTION BOX REQUIREMENTS FOR STATION CONDUITS

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Conduit size	Size of Box		
	width	length	depth
¾"	4"	4"	3.5"
1"	4-11/16"	4-11/16"	3.5"
1-¼"	6"	6"	4"
1-½"	6"	6"	4"
2"	8"	8"	4"
2-¼"	12"	12"	6"
2-½"	12"	12"	6"

3.08 FIRESTOP

- A. Telecommunications pathways requiring fire-stopping shall utilize UL-listed re-enterable fire-stopping assemblies. See Section 2.11 Firestop (Hilti, STI, or Wiremold).
- B. In all buildings, floor/ceiling assemblies, stairs, and elevator penetrations shall be sealed with a 2-hour fire stop assembly at a minimum, unless otherwise noted.
- C. Provide restorable fire stops inside and around conduits as recommended by UL1479 or ASTM E814 for all conduits penetrating fire-rated construction. Fire-rated construction is to be verified with UNM/IT. All fire-stopping penetrations must be photographed and labeled with the UL1479 or ASTM E814 reference number, dated, and signed by the technician who installed the fire-stopping material. Submit firestop documentation to UNM IT before the final electrical inspection

End of Section