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270741 - Telephone - Data Installation Requirements

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SECTION 27 0741 - TELEPHONE/DATA INSTALLATION REQUIREMENTS**1.1 GENERAL**

- A. UNH-Telecommunications systems shall be installed with strict adherence to all codes, standards, and manufacturers specifications. The following chapters are arranged as a working tool to help guide the installer/ designer of these systems.
- B. The word “shall” will be used in following statements where a topic is mandatory.
- C. The word “should” will be used in following statements of recommendation.

1.2 BUILDING SERVICES IDENTIFICATION LABELING

- A. The University has adopted a comprehensive label identification for the distribution systems for all plumbing, fire protection, air, mechanical piping, electrical, fire alarm, controls, telecommunications, audio/visual, and security. The specific label colors, text, and directional flows for each component part are described in a single comprehensive table that is Chapter 5, Appendix A, Building Services Identification labeling. This labeling system must be part of any construction project, even those that are limited to a portion of a building or a single utility system.

1.3 APPLICABLE CODES

- A. All applicable codes shall be observed for the design of telecommunications spaces. (ref. ANSI/TIA/EIA 7.1.3)
- B. All cabling systems installed at the University shall comply with the following Codes and Standards. The cabling system described in this specification is derived in part from the recommendations made in industry standard documents. The list of documents below are incorporated by reference:
 - 1. International Building Code (IBC) – most current adopted edition.
 - 2. National Fire Protection Agency (NFPA) - 70, National Electrical Code (NEC) – most current adopted edition.
 - 3. National Fire Protection Agency (NFPA) – 101, Life Safety Code most current adopted edition.
 - 4. ANSI/TIA/EIA SP-4195 Proposed Addendum No. 5 to TIA/EIA-568-A Additional Transmission Performance Specifications for 4-Pair 100 Ohm Enhanced Category 5 Cabling – most current edition.
 - 5. ANSI/TIA/EIA-568-A Commercial Building Telecommunications Cabling Standard – most current edition.
 - 6. ANSI/EIA/TIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces – most current edition.



7. ANSI/EIA/TIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings – most current edition.
 8. ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications – most current edition.
 9. Building Industries Consulting Services, International (BICSI) Telecommunications Distribution Methods Manual (TDMM) – most current edition.
 10. This standard and all associated project drawings and specifications .
- C. Any variation of codes, standards, or manufacturers specifications shall only be permitted with explicit approval of appropriate approving authority(ies).
- D. If a conflict exists between applicable documents, then the order in the list above shall dictate the order of precedence in resolving conflicts. This order of precedence shall be maintained unless a lesser order document has been adopted as code by a local, state or federal entity, and is therefore enforceable as law by a local, state, or federal inspection agency

1.4 NOTES TO DESIGNERS.

- A. Telecommunications equipment rooms shall be defined as any space utilized explicitly for the installation of Telecommunications infrastructure such as equipment racks, network hardware or the termination and distribution of copper/fiber optical backbone cable. Telecommunication spaces shall be used specifically for telecommunications purposes only. Controlled access to prevent accidental damage, vandalism, or theft of costly network devices is essential.

In the initial design, consideration may be given to permitting the installation of types of communication systems equipment in the room and the area up-sized accordingly. The minimum size will increase proportionally to the area if it is intended to serve CATV or other communications type systems.

- B. Backbone cable entering the Building Entrance Terminal (BET) from outside the building shall have surge protection mounted at the nearest practical location to the point of entry in the room. The surge protection should be mounted directly on 4' x 8' x .75" plywood unless otherwise noted in drawings. If the space where the unlisted communications cable enters the building does not meet the intent of the National Electrical Code "50 foot rule" as described in [Article 800.48](#) then space must be provided to transition the unlisted cable to the appropriate listed cable.
- C. A typical stand-alone telecommunications closet (without BET or other system) shall be 4 ft. x 8 ft. with a pair of outswinging doors (one leaf inactive) on one of the eight foot sides accessible to public space or hallway. The minimum space allocation of 32 SF must measure the minimum 4' x 8' of unobstructed area (not 32 SF of different dimensions) If the door must swing inward, the size of the room must be increased to accommodate the door swing. Telecommunication closets may be accessed from the lesser dimension side, but in such cases the minimum room dimensions must be increased to 5'-8" x 8' for a total of 45 SF accessible by a pair of 30" outswinging doors



(one leaf inactive). Where the BET is combined with telecommunications closet the room must be 50% larger than a standard closet with the entire additional 16 SF added on along the full length of one of the walls, and fully open to the main room.

- D. For most projects there should be a minimum of one telecommunications closet per floor. Smaller floor plate buildings may be able to be served by one every other floor or one only. Larger buildings when floor area exceeds 10,000 sq. ft. may require two or more stacks for each floor. Consult with UNH Telecommunications during Schematic Design to devise a distribution strategy. Telecommunications spaces and pathways shall be designed so that no horizontal distribution distance exceeds 90 m (295 ft.) actual length from the serving closet. Telecommunications spaces should be located (stacked) on each floor as close as possible to the center of the area served. (ref. ANSI/TIA/EIA 7.1.2)
- E. Telecommunication Closet Finishes
 1. Left, Right, and Back walls shall have 4 FT. X 8 FT. X $\frac{3}{4}$ inch AC grade plywood mounted vertically with the A side exposed. The plywood shall begin at floor level, be continuous to a height of 8 FT. AFF, and anchored a minimum of every 2 feet directly to drywall or masonry wall. Plywood shall be painted with two coats of a non-conductive fire-retardant overcoat (gray in color). All other wall surfaces shall be painted with a light colored paint.
 2. Suspended ceilings shall not be installed in telecommunications closets. (ref. ANSI/TIA/EIA 7.2.4.3) Where fireproofing is used in exposed structure situations use a cementitious fireproofing or treat with a sealer to prohibit fireproofing being dislodged and falling onto telecommunications equipment.
 3. Floor finish shall be static free using a resilient tile, or painted to eliminate dust.
 4. Light fixture height shall be a minimum of 8.5 ft. above the finished floor and provide adequate illumination to both sides of the rack. Light intensity shall be at least 500 lux (50 foot-candles) at 1 m (3.3 ft.) above the finished floor. The light switch shall be located on the right side wall when possible. Lighting fixtures should not be powered from the same electrical distribution panel as the telecommunications equipment in the telecommunications closet.
 5. Double-doors shall be fitted with a lock, (card access type if building is so equipped) have no threshold or center mullion, and open into the hallway or other common area. Both doors shall be 36 inches for a typical closet accessed on the 8' side Doors for a Building Entrance Terminal (BETs) shall be a single 36 inch door fitted with a lock, (card access type if building is so equipped) and have no threshold,
 6. Include a minimum of two dedicated 120volt, 20-ampere duplex outlets on separate branch circuits for equipment's power located as directed during plan review with UNH Telecommunications. There shall also be a minimum of one 120volt; 20-ampere convenience outlet located 16" to 18" AFF anywhere within the room.
 7. The room shall be designed so as or provided with environmental conditioning systems which will insure the room can always be maintained at a temperature between 41° and 113° and a relative humidity between 15% and 80%. In typical air conditioned and/or heated buildings the room needs ventilation to remove excess heat and capability to match the air temperature of the adjacent occupied

spaces and can be conditioned by the building's main environmental control systems and need not have a separate system unto itself. In buildings that are either not heated and/or not air conditioned, systems as appropriate must be provided to maintain the room within the range specified. For humidity control if unusual conditions require provide a floor level alcove of additional floor space in excess of the minimum required 4' x 8' 32 SF room that can accommodate a portable humidifier/dehumidifier purchased separately by the University. The alcove shall also be provided with a dedicated 120 v power outlet and an indirect connection to a drain pipe, gravity drain is preferable.

- F. Installation of equipment not related to the support of the telecommunications closet (e.g. piping, ductwork, pneumatic tubing, etc.) should be avoided in the dedicated space to the deck above. Particular attention should be given to any system that contains liquid or has the potential to create condensation with a means to handle the accumulation of liquid to prevent damage to the telecom systems. (ref. ANSI/TIA/EIA 7.2.1.3)
- G. Exceptions may be approved by UNH Telecommunications where conditions warrant.
- H. Multiple closets shall be interconnected with four 4-inch EMT conduits, terminating, reamed and bushed, 3-inches from any surface from which it emanates within the telecommunications closet. (ref. ANSI/TIA/EIA 7.2.2.2)
- I. Distribution Design
 1. Typically tel/data cables are distributed above accessible suspended ceilings in bundles supported on J hooks. Where bundles begin to approach 100 cables or more +/- distribution should be by cable tray. Where cable bundles cross over stretches of "hard" ceiling (drywall, wood, etc.) they should be conveyed from one suspended accessible ceiling area to another via a EMT conduit(s) sized to not more than a 40% fill ratio and with no more than 1 - 45° bend (without a pull box provided).
 2. Office spaces shall have two (duplex wall-plate) information outlets provided, each located on opposing walls of the room. Conduits shall be installed so they feed opposing offices in a staggered fashion with the second box feed by a short run of ¾" EMT. There shall be no more than 2 workboxes fed from any 1 inch EMT run. If modular furniture is specified for a space and its placement prohibits the accessibility of an information outlet, the telecommunications cables shall be extended continuously into the furniture and terminated in an accessible location. Coordination of furniture installation and cable installation is critical to prevent damage to furniture or cable and unnecessary labor costs.
 3. Public areas shall have information outlets provided as needed for vending, laundry, wireless access points, courtesy phones, entrance phones and area of refuge phones.
 4. Classrooms shall have a duplex wall plate located on the wall considered to be the front and back wall of the classroom.
 5. Telecommunications pathways in all new construction and in framed walls and framed/suspended ceilings in renovations/alterations shall be fully concealed in any room or space considered "finished" and intended for regular occupancy. Pathways may be exposed or surface mounted (and generally painted) in other



rooms or where required to be run along existing masonry surfaces in renovations/alterations.

All penetrations through a fire rated floor, walls or ceiling of a telecommunications space shall have an appropriately rated UL tested fire stop assembly installed restoring the surface to the original fire rating

PART 2 – PRODUCTS

2.1 OUTSIDE PLANT INFRASTRUCTURE: (DTR/CR)

A. Underground Entrance:

1. Conduit:
 - a. Shall be schedule 40 PVC conduit.
2. End Bells:
 - a. Conduit ends shall have end bells installed to provide a smooth, rounded pulling surface, to prevent damage to cable sheath or insulation.
3. Conduit Plugs:
 - a. All conduits shall be sealed with a blank plugs similar to those manufactured by JACKMOON USA INC., PART NO.: 40D402U.
4. Cable Rack Channel:
 - a. All 4 manhole walls shall be equipment with two rack channels that meet the following specification. 18 Support holes, 30 Inch Length, 28-1/2 Inch bolt hole spacing. Hot rolled steel channel, hot dip galvanized.
5. Manhole:
 - a. Shall meet the following specifications.
 - 1) Heavy duty precast reinforced concrete with internal dimensions of 12 ft. L x 6 ft. W x 8 ft. H in size and have a concrete minimum compressive strength of 5,000 lb. /psi. at 28 days in accordance with ASTM, reinforced in accordance with ASDM of H-20 loading. Precast units shall not have more than two (2) sections. Joints between sections shall have self-aligning V- grooves and asphaltic butyl compound joint sealant. The interior of each manhole shall have bonding inserts, hot dipped galvanized steel hardware that includes 1 inch dia. Eyebolt with 2 inch dia. pulling eyes and struts for heavy-duty adjustable notched channel cable wall racks. Each maintenance hole

shall have a sump hole of at least 6 inches deep located directly below, centered on the manhole cover opening and have a cover. (ref. ANSI/TIA/EIA C.6.1.1).

b. (Type A) Specifications.

- 1) Each vault shall have termaduct fittings precast into the manhole wall to accommodate (8 each) four inch (4") schedule 40 pvc ducts located on each end wall at the same elevation, opposing each other. Beginning 1 ft. off the sidewall to center of the first core and 3 ft. below top of vault to center of core. From the centerline of core #1, cores 2, 3, 4 shall be 10-inches on center and to the right of the previous. Core #5 begins a second tier at 1 ft. off the sidewall to center of the core #5 and 10-inches below the centerline of core #1. From the centerline of core #5, cores 6, 7, 8 shall be 10-inches on center and to the right of the previous.

c. (Type J) Specifications.

- 1) Each vault shall have termaduct fittings precast into the manhole wall to accommodate (8 each) four inch (4") schedule 40 pvc ducts located on each end wall at the same elevation, opposing each other. Each side wall shall have termaduct fittings precast into the manhole wall to accommodate (5 each) four inch (4") schedule 40 pvc ducts located at the following elevations, and directly across from each other. Beginning 1 ft. off the end wall to center of the first core and 1 ft. below top of maintenance hole to center of core. From centerline of core #1, core #2 shall be 10-inches on center and to the right of core #1. Cores 3, 4 shall be 10-inches on center directly below the previous. Core #5 shall be 10-inches directly below core #3.

6. Frames and Covers: (CR)

- a. Each manhole shall have a cover that is cast iron heavy-duty type, suitable for H-20 street loading when in the vehicular way and have machined bearing surfaces. Telephone manholes shall have a minimum clear opening of 32 inches round. The word "COMMUNICATIONS" shall be cast on the upper side of each cover.

2.2 INSIDE PLANT INFRASTRUCTURE: (DTR/CR)

A. Horizontal Pathways:

1. Conduit:

- a. New construction shall be EMT conduit. Only exception is in existing wall construction, GREENFIELD may be installed.



2. Surface Raceway:
 - a. Shall be of a metal design and have a factory painted finish.

3. Cable Support System:
 - a. Shall be cable tray, ladder, basket or J-hooks installed to meet all related codes, standards, and manufacturers specifications.

4. Paint:
 - a. Where exposed conduits shall be painted provide paint compatible with the conduit material.
 - b. All equipment back boards intended for Telecommunications shall be painted grey

5. Busbar Kit, Wall-Mount:
 - a. Shall be manufactured from high-quality 300 series stainless steel
 - b. Hole patterns on busbars shall accommodate two-hole lugs per the recommendation of BICSI and ANSI/EIA/TIA-607 standards
 - c. Shall have insulators electrically isolating the busbars from the wall or other mounting surfaces, thereby controlling the current path

6. Floor boxes and Poke-Thru work boxes:
 - a. Shall be compatible with COMMSCOPE/SYSTIMAX modules.

PART 3 – EXECUTION

3.1 OUTSIDE PLANT INFRASTRUCTURE: (OSP)

A. OSP Infrastructure (Underground Entrances Conduits)
Reference: ANSI/TIA/EIA-569-A ANNEX C (normative)

1. General (CR):
 - a. Shall be provided and installed in accordance with attached site plans or information herein.

2. Conduit (DTR/CR):

- a. A total of (8) 4-inch schedule 40 PVC Conduit encased in (3,500 psi), concrete will be provided for the **main** distribution between maintenance holes. Conduit couplings shall be staggered so that couplings on adjacent conduits do not lie on the same transverse plane. All conduits shall be terminated in termaduct fittings precast into the manhole walls. All concrete duct banks shall be doweled to the manholes walls, and foundation walls with rebar to prevent shearing. (ref. ANSI/TIA/EIA C.5.1.1.2).
 - b. A total of (5) 4 inch schedule 40 PVC Conduit encased in (3,500 psi), concrete will be provided for the **branch** distribution between a maintenance hole and building entrance terminal of a building. Conduit couplings shall be staggered so that couplings on adjacent conduits do not lie on the same transverse plane. All conduits shall be terminated in termaduct fittings precast into the manhole walls. All concrete duct banks shall be doweled to the manholes walls, and foundation walls with rebar to prevent shearing. (ref. ANSI/TIA/EIA C.5.1.1.2)
 - c. Each conduit shall have a non-corrosive pull-rope or pull-tape installed in each of them. (ref. ANSI/TIA/EIA C.5.1.4.6)
 - d. Each conduit shall be proved by the use of an appropriately sized mandrel to ensure inside diameter conformity from beginning to end.
3. Bends (DTR/CR):
- a. The total number of bends in a conduit section run shall not exceed two 90-degree bends or equivalent of sweeps and radius bends. Each bend shall have a minimum radius in accordance with existing standards. All offsets greater than 30 degrees shall be (RGC) rigid galvanized conduit elbows and offsets. All (RGC) rigid galvanized fittings buried below finish grade shall be field coated with asphaltum or shall have an additional outside factory coating of polyvinyl chloride or a phenolic resin epoxy material. (ref. ANSI/TIA/EIA C.5.1.3.1.1, .2,.3)
4. Separation (DTR/CR):
- a. Separation from other utilities, structures, and depth of coverage shall be provided per applicable codes. (ref. ANSI/TIA/EIA C.5.1.4.3)
5. Drain Slope (DTR/CR):
- a. Should be installed such that a slope exists at all points of the run to allow drainage and prevent the accumulation of water. A drain slope of not less than 100 mm per 30 meters (4 in. per 100 ft.) is desirable. (ref. ANSI/TIA/EIA C.5.1.4.4)
6. Termination (DTR/CR):



- a. When terminating in a vault, hand hole or building foundation wall, the conduit(s) shall be cut and terminate with an end bell installed as flush to the wall surface as possible. When terminating at a pole, clamp the conduit(s) rigidly to the field side of the pole at a 90-degree separation from power. In all scenarios the conduit(s) shall be reamed, bushed, plugged with mechanical-type seals to ensure foreign matters do not enter the space. (ref. ANSI/TIA/EIA C.5.1.4.5)

- 7. Encasement (DTR/CR):
 - a. All underground conduits shall be encased in concrete minimum 3" cover top, bottom and sides. Provide reinforcement rods where the concrete envelopes connect to manhole walls and building foundation. Reinforcing rod shall extend 5" into concrete on the manhole wall or foundation wall to minimize shearing.

 - b. **Refer to Section 337000 for Medium Voltage Duct Bank Details**

- B. OSP Infrastructure (underground Manholes)
Reference: ANSI/TIA/EIA-569-A ANNEX C (normative)
 - 1. General:
 - a. Shall be provided and installed in accordance with attached site plans or information herein. The installation of manholes shall begin with all exterior surfaces of the manhole and 10'-0" portion of ductbanks being waterproof coated with coal tar epoxy bitumastic. The excavated area shall be free of obstructions for a minimum 12 inches around outside perimeter, with a 6-inch compact gravel base of uniform thickness and level. The preparation of the base shall ensure no settlement. Backfill shall consist of good compactable material, such as pea gravel, sand or clean earth fill. Backfilling should be done progressively from bottom to top surface. Minimum earth cover from roof of manhole to finished grade shall be 8 inches. In paved areas, set top of frame and cover flush with finished surface. In unpaved areas, set top of frame and cover approximately 1/2 inch above finished grade. Precast concrete extension collar lined with mortar with full bearing under frame shall be installed as necessary. Set height in field per final grade elevations. Install per manufacturer's instructions.

 - 2. Location and Spacing (DTR):
 - a. When determining manhole locations, consideration should be given to ground topology, access, building location, splicing and soil conditions. Manholes should be placed when a conduit or duct section length exceeds 150 m (500 ft). (ref. ANSI/TIA/EIA C.6.1.5)



3. Cable Support System (CR/TR):
 - a. Each manhole shall have racking installed in all channels and adequate hooks and related hardware to support installed cable. Splices shall be properly supported on both sides of the splice. Cable rack arms or brackets shall be provided by cable installer as required to support installed cables.
 4. Cable Tags (TR):
 - a. Every cable passing through a maintenance hole or entering a building shall have a permanently affixed, non-corrosive identification tag with the cable number and identified cable count clearly legible.
 5. Grounding/Bonding System (DTR/CR):
 - a. Shall be designed so overall resistance to ground is less than 25 ohms. A single bare copper-grounding conductor shall wrap the vault at a height of above 6 ft. and have a bonding ribbon (#6 AWG min.) permanently bonded with an exothermic weld. The bonding ribbon shall be permanently bonded with an exothermic weld to the grounding electrode conductor. The grounding electrode conductor shall be centered on the vault sidewall. Provide a complete ground grid around the exterior of each manhole consisting of (4) 5/8-inch by 8'-0" long ground rods located at each corner of manhole. Interconnect the ground rods with a minimum of #4 AWG Bare Stranded copper conductor. Provide a #4 AWG Bare Stranded Copper Wire leads into manhole with a #4 AWG Bare Stranded Copper Wire loop attached around the perimeter of the interior wall of the manhole. The #4 AWG Bare Stranded Copper ground wire shall be connected to the ground rods by using exothermic weld type connectors.
- C. OSP Infrastructure (Aerial Entrances): (DTR/CR/TR)
Reference: ANSI/TIA/EIA-569-A ANNEX C (normative)
1. Shall be provided and installed in accordance with attached site plans or information herein.
 2. The pole to building span shall be no greater than 30 m (98 ft.), with the following minimum clearances:
 - a. 102 cm (40 inches) below power at the pole.
 - b. 31 cm (12 inches) below power at mid span (under cable sag conditions).
 - c. 11 cm (4 inches) horizontally at the building attachment.
 - d. 31 cm (12 inches) vertically at the building attachment.
 - e. 2.7 m (15.5 feet) vertically above street or driveway.
 - f. 3 m (10 feet) vertically above pedestrian traffic.
 - g. 2.5 m (8 feet) vertically above rooftops.
 - h. 7.4 m (23.5 feet) vertically above railroad tracks.



- i. 1.9 m (6 feet horizontally from roof conductors (antennas, etc.).
- 3. Riser poles shall have an appropriately sized pole guard installed over the cable, so there is no exposed cable from ground level to 10 ft. above ground level.
- 4. The cable(s) shall extend through the exterior wall using either a cable mast or sleeve through wall sloping downward toward the outside of the building 1/4 inch per foot.
- 5. Point of Demarcation: In this context, the point in which Outside Plant Infrastructure is terminated, grounded and effectively identified.

3.2 INSIDE PLANT INFRASTRUCTURE: (ISP)

A. ISP Infrastructure (Telecommunications Spaces): (DTR/CR)

- 1. Equipment Racks shall be properly anchored and grounded.

a. .

3. .

4.

. (ref. ANSI/TIA/EIA 7.2.4.4)

5. :

a. .

6. :



B. ISP Infrastructure (Horizontal Pathways): (DTR/CR/TR)
Reference: ANSI/TIA/EIA-569-A

Telecommunications pathways shall be designed and installed to minimize number of bends and length. No pathway shall exceed 90 m (295 ft.). Pathways traversing areas considered not re-enterable upon completion of construction shall have EMT or ENT installed to span the distance. All Telecommunication pathways shall be dedicated for Telecommunications use only. Considerations must be given to minimum clearances, sources of EMI, temperature, maximum fill ratio and overall functionality of these pathways.

1. Minimum requirements for the installed conduits, such as support, end protection, and continuity, are found in appropriate sections of the NEC.
(ref. ANSI/TIA/EIA 4.4.2.1)
2. No section of conduit shall be longer than 30 m (100 ft.) between pull points.
(ref. ANSI/TIA/EIA 4.4.2.2)
3. No section of conduit shall contain more than two 90-degree bends or the equivalent of 180 degrees cumulative between pull points. If there is a reverse (U-shaped) bend in the section, 180 degrees or 100 ft is exceeded, a pull box shall be installed. All pull boxes shall be accessible as required by the NEC.
(ref. ANSI/TIA/EIA 4.4.2.3.1)
4. The inside radius of a bend in the conduit shall be at least 6 times the internal diameter. Bends in the conduit shall not contain any kinks or other discontinuities that may have a detrimental effect on the cable sheath during cable pulling operations.
(ref. ANSI/TIA/EIA 4.4.2.3.2)
5. Cable support systems shall originate in the telecommunications closet and extend the entire length of all main hallways on that floor.
6. Cable tray/raceways shall not be filled greater than the NEC maximum fill for the particular raceway type, and shall be incrementally increased from the furthest outlet box to the Telecommunications closet.
(ref. ANSI/TIA/EIA 4.4.2.5.2)
7. A minimum of 1-inch EMT shall be used to serve a double-gang workbox with a single gang reducer ring.
8. From the first workbox to the second, the EMT may be reduced to ¾-inch.
- .
9. Conduits shall be appropriately sized so the cable's minimum bend radius and maximum pulling tension shall not be exceeded.



10. A minimum 3/4-inch conduit shall be provided from the telecommunications closet and terminate in a back box mounted 45" OC AFF to serve each wall mounted public phone (including area of refuge and building entrance phone locations), (ref. ANSI/TIA/EIA 4.4.2.7)
 11. A minimum 3/4-inch conduit shall be provided from the telecommunications closet and terminate in the Fire Alarm Control Panel.
 12. A minimum 3/4-inch conduit shall be provided from the telecommunications closet and terminate in the elevator control panel.
 13. Conduits shall be reamed and bushed at the point of termination. (ref. ANSI/TIA/EIA 4.4.3.1)
 14. Conduits shall have pull strings installed and be identified as tel. /data. (ref. ANSI/TIA/EIA 4.4.3.3)
 15. If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of four-foot intervals. At no point shall cable(s) rest on acoustic ceiling grids or panels.
 16. Cables shall not be attached to ceiling grid or lighting support wires. Where light support for drop cable legs is required, the contractor shall install clips to support the cabling.
 18. Cable pathways passing through a fire rated surface, shall have an appropriately rated UL listed fire stop assembly installed by the party responsible for providing the pathway, restoring the wall to the original fire rating.
 19. Flex conduit (Greenfield) shall not be used as a substitute for EMT in new construction. Flex conduit shall not be used for offsets.
- C. ISP Infrastructure (Horizontal Cable Installation): (TR)
Reference: ANSI/TIA/EIA-568-A
1. Cables shall be installed in continuous lengths from origin to destination (no splices).
 2. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.
- D. Telecommunications Grounding and Bonding Infrastructure (TR/CR)
Reference: ANSI/TIA/EIA-607
1. A Telecommunications bonding backbone (TBB) conductor shall be installed by the electrical contractor from the main electrical grounding bus bar to the Telecommunications main grounding bus bar (TMGBB). The bonding conductor

shall be a minimum of no. 6 AWG, insulated green in color and terminate at the (TMGBB) with a double bolt lug connector. The lug connector shall be through bolted to the copper grounding bus provided by the electrical contractor.

2. The Telecommunications main grounding busbar (TMGBB) shall be the same specified under Part 2 PRODUCT of this document and installed by the electrical contractor in the location specified on the construction documents.

E. ISP Infrastructure Cable System Labeling (TR)

1. LABELS:

- a. All label printing will be machine generated using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device. See 1.2-A of this section.

3. Terminal Block & Wall Plate:

- a. The cable labeling system shall be a numeric system. Each end shall be clearly labeled with a unique number, which is identical on both ends and corresponds to the self-laminated cable label. In ascending order from the lower most floor to top most floor, a block of 200 numbers per floor shall be reserved. If more or less numbers are required, the block of numbers shall be increased/ decreased by increments of 10

F. ISP Infrastructure Construction Documents (DTR)

1. A riser diagram reflecting the Telecommunications closet linkage shall be provided.

END OF SECTION 27 0741