

## SECTION 270528- COMMUNICATION PATHWAYS

### SECTION 270528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS PART 1 - GENERAL

#### 1.1 COMMUNICATION PATHWAYS DESCRIPTION

- A. Communications pathways consist of structures that conceal, protect, support, and provide access between telecommunication spaces (Work area outlets, ETR, and TR).

#### 1.2 RELATED DOCUMENTS

- A. BICSI Telecommunications Distribution Methods Manual (TDMM), Thirteenth Edition.
- B. EIA/TIA-568-C: Communications Industry Testing standards.
- C. Section 260526: "Grounding and Bonding for Communication Systems."
- D. Section 271300: "Communications Backbone Cabling"
- E. Section 271100: "Communication Equipment Rooms."
- F. Section 271500: "Communications Horizontal Cabling."
- G. Appendix A

#### 1.3 DEFINITIONS AND ACRONYMS

- A. BICSI: A professional association supporting the information technology systems (ITS) industry. [www.BICSI.org](http://www.BICSI.org)
- B. Entrance Telecommunications Room (ETR): A space in which the joining of inter and/or Intra building telecommunications backbone facilities takes place. It is the TR where exterior cabling enters the building.
- C. IDC: Insulation displacement connector.
- D. RCDD: Registered Communications Distribution Designer.
- E. Telecommunications Room (TR): A space for housing telecommunications equipment, cable terminations, and cross-connect cabling. A space that joins the backbone and horizontal cabling for a building.
- F. EMT: Electrical Metallic Tubing.
- G. GRC: Galvanized rigid steel conduit.
- H. IMC: Intermediate metal conduit.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For surface pathways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Pathway routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
  - 1. Structural members in paths of pathway groups with common supports.
  - 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

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### PART 2 - PRODUCTS

#### 2.1 METAL CONDUITS AND FITTINGS

- A. Subject to compliance with requirements.
- B. General Requirements for Metal Conduits and Fittings:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 2. Comply with TIA-569-B.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. IMC: Comply with ANSI C80.6 and UL 1242.
- E. EMT: Comply with ANSI C80.3 and UL 797.
- F. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
  - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
  - 2. Fittings for EMT:
    - a. Material: Steel or Die Cast.
    - b. Type: Setscrew or Compression.
  - 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions were installed, and including flexible external bonding jumper.
- G. Joint Compound for IMC or GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

#### 2.2 NONMETALLIC CONDUITS AND FITTINGS

- A. Subject to compliance with requirements.
- B. General Requirements for Nonmetallic Conduits and Fittings:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 2. Comply with TIA-569-B.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. Rigid HDPE: Comply with UL 651A.
- E. Continuous HDPE: Comply with UL 651B.
- F. RTRC: Comply with UL 1684A and NEMA TC 14.
- G. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- H. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- I. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

#### 2.3 LADDER TRAY:

- A. Tray is to be constructed of aluminum, at least 12" wide and at least 2" high.
- B. Tray must be installed with the proper mounting hardware to securely fasten the tray to the walls and the top of the Floor-Mounted Racks.
- C. Must be equipped with the proper grounding lugs to assure proper grounding and bonding of the tray.

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- D. The ladder tray should be selected to support the amount of cable at a 50 percent fill ratio per ANSI/TIA/EIA 569-A.

### 2.4 SURFACE PATHWAYS

- A. Surface Nonmetallic Pathways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard or custom colors. Product shall comply with UL-94 V-0 requirements for self-extinguishing characteristics.
  - 1. Panduit T45
  - 2. Panduit T70
  - 3. Panduit TG70
- B. Tele-Power Poles:
  - 1. Material: Galvanized steel with ivory baked-enamel finish, or Aluminum with clear anodized finish.
  - 2. Fittings and Accessories: Dividers, end caps, covers, cutouts, wiring harnesses, devices, mounting materials, and other fittings shall match and mate with tele-power pole as required for complete system.

### 2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Outlet Boxes:
  - 1. Outlet Box Dimensions: **4 inches square by 2-1/8 inches deep (Double gang deep).**
  - 2. Exterior Cast-Metal Outlet Boxes: Comply with NEMA FB 1, ferrous alloy or aluminum, Type FD, cover with gasket.
    - a. Size to accommodate application.
    - b. Box extensions may be used to accommodate new building finishes shall be of same material as recessed box (ie. Sheetrock ring).
- B. Floor Boxes:
  - 1. Material: Cast metal or sheet metal.
  - 2. Type: Fully adjustable or Semi-adjustable.
  - 3. Shape: Rectangular.
  - 4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Small Sheet Metal Pull Boxes: NEMA OS 1.
- D. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum, galvanized, or cast iron with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, 3R, 4, and 12 with continuous-hinge cover with flush latch unless otherwise indicated.
  - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
  - 2. Nonmetallic Enclosures:
    - a. Material: Plastic or Fiberglass.

### 2.6 HANDHOLES AND MANHOLES FOR EXTERIOR UNDERGROUND CABLING

- A. General Requirements for Handholes and Manholes:
  - 1. Handholes and Manholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.

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2. Comply with TIA-569-B.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
  1. Standard: Comply with SCTE 77.
  2. Configuration: Designed for flush burial with open, closed, and integral closed bottom unless otherwise indicated.
  3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with handhole location.
  4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  5. Cover Legend: Molded lettering, "**COMMUNICATIONS**".
  6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
  7. Handholes 24 Inches Wide by 36 Inches Long and Larger: Size must be job appropriate. Have inserts for cable racks and pulling-in irons installed before concrete is poured.
- C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of polymer concrete, reinforced concrete cast iron, hot-dip galvanized-steel diamond plate, and fiberglass.
  1. Standard: Comply with SCTE 77.
  2. Color of Frame and Cover: Gray
  3. Configuration: Designed for flush burial with open, closed, and integral closed bottom unless otherwise indicated.
  4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
  5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  6. Cover Legend: Molded lettering, "**COMMUNICATIONS**".
  7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
  8. Handholes 24 Inches Wide by 36 Inches Long and Larger: Size must be job appropriate. Have inserts for cable racks and pulling-in irons installed before concrete is poured.
- D. Concrete Manholes shall be vaults made of steel reinforced, pre-cast concrete with non-skid, steel lids labeled for application as required. Manholes shall be equipped with all necessary plugged holes for duct entry(s), pulling eyes for pulling in cables, racks for supporting cables and splices, ground wire for bonding cable shields and splice closures, sump and ladder. Manholes shall be capable of withstanding heavy vehicular loading, as a minimum, manholes shall meet REA/RUS standards.

### 2.7 Specialty pathway

- A. Hubbell NAV Wall Box – This is the box that is mounted behind TVs.
- B. Floor poke – Hubbell E-series

## PART 3 - EXECUTION

### 3.1 PATHWAY APPLICATION

- A. Outdoors: Apply pathway products as specified below unless otherwise indicated:

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1. Exposed Conduit: GRC or Type EPC-80-PVC.
  2. Concealed Conduit, Aboveground: GRC, IMC, EMT, RNC, Type EPC-40-PVC.
  3. Underground Conduit: RNC, Type EPC-40-PVC, Type EPC-80-PVC, direct buried and concrete encased.
    - a. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.
  4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3 and Type 4.
    - a. Type 3 for general outdoor use
    - b. Type 4 for areas that will be subjected to high pressure water situations (ie. Tiger Stadium)
- B. Indoors: Apply pathway products as specified below unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT identified for such use.
    2. Exposed and Subject to Severe Physical Damage: GRC or IMC. Pathway locations include, but not limited to the following:
      - a. Loading dock.
      - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
      - c. Mechanical rooms.
      - d. Gymnasiums
    3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
    4. Damp or Wet Locations: GRC or IMC.
    5. Pathways for Cable in Spaces Used for Environmental Air: Plenum-type communications-cable pathway or EMT.
    6. Pathways for Risers in Vertical Shafts: Riser-type communications-cable pathway or EMT.
    7. Pathways for Concealed General-Purpose Distribution of Cable: EMT.
    8. Boxes and Enclosures: NEMA 250 Type 1 and Type 4
      - a. Type 1 for general indoor use.
      - b. Type 4 for institutional and commercial kitchens and damp or wet locations.
  - C. Pathway Fittings: Compatible with pathways and suitable for use and location.
    1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
    2. EMT: Use setscrew or compression, steel or cast-metal fittings. Comply with NEMA FB 2.10.
  - D. Surface pathways are discouraged, but if necessary, only install where indicated on Drawings.
  - E. Complete pathway installation before starting cable installation.

### 3.2 INSTALLATION OF INSIDE PATHWAY

- A. Minimum Pathway Size: one (1) inch conduit from outlet box to above accessible ceiling space. If no accessible ceiling space is available then conduit shall be home run to nearest TR.
- B. Minimum Pathway Size and Quantity between Entrance TR and each TR: Minimum of two (2) – four (4) inch conduits.
  1. Pathway Conduits must not exceed 40% fill ratio. If it is determined that additional conduit space is needed, then additional four (4) inch conduits should be added.
- C. Comply with requirements "Hangers and Supports for Electrical Systems" for hangers and supports. (i.e., No cable is to be supported from recess ceiling or any of its grid members.)
- D. Install no more than the equivalent of two 90° (90-degree) bends in any pathway run. If more than 180° bends are necessary in a pathway, then a pull point will be necessary.
  1. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.
- E. Support pathway within 12 inches of all pull points and any changes in direction.

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- F. Utilize long radius bends for all pathways.
  - G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
  - H. Stub-ups to Above Recessed Ceilings:
    - 1. Use EMT for pathways.
    - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
  - I. Pathway above Ceiling:
    - 1. Accessible Ceiling: Above ceiling where conduit is not available, cabling should be supported in open top hangers (j-hooks) at random intervals between 4' and 5'.
    - 2. Inaccessible Ceiling: Passing communication cables through inaccessible ceiling space is discouraged. Every attempt should be made to create access to all space that communication cables are passed through. In hard ceiling areas, hatches that are large enough so that a technician can work in that area above the ceiling is recommended.
  - J. Install pathways square to the enclosure and terminate at enclosures with locknuts.
  - K. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
  - L. Install pull string in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 24 inches of slack at each end of pull string.
  - M. Surface Pathways:
    - 1. Surface pathways are discouraged, but if necessary, only install where indicated on Drawings.
    - 2. Install surface pathway with a minimum 2-inch radius control at bend points.
    - 3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 24 inches and with no less than three (3) supports per straight pathway section.
    - 4. Support surface pathway according to manufacturer's written instructions or above instructions, whichever is more stringent. Tape and glue are not acceptable support methods.
  - N. Mount outlet boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements.
  - O. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
  - P. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
  - Q. Floor boxes are to be level and flush with finished floor surface.
- 3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS
- A. Install sleeves and sleeve seals for all telecommunication penetrations of all floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."
- 3.4 FIRESTOPPING
- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

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### 3.5 INSTALLATION OF OUTSIDE / UNDERGROUND PATHWAYS

#### A. UNDERGROUND CONDUIT:

1. Minimum Pathway Size and Quantity from servicing manhole to Entrance TR: Minimum of four (4) – four (4) inch conduits.
  - a. Pathway Conduits must not exceed 40% fill ratio. If it is determined that additional conduit space is needed, then additional four (4) inch conduits should be added.
2. Install no more than the equivalent of two 90° (90-degree) bends in any pathway run. If more than 180° bends are necessary in a pathway, then a pull point will be necessary.
  - a. Separate lengths with access points using underground vaults or terminations at distribution frames or cabinets where necessary to comply with these requirements.
3. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
4. Install backfill as specified in Section 312000 "Earth Moving."
5. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
6. Install manufactured duct elbows for stub-ups at equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
  - a. Install manufactured rigid steel conduit elbows for stub-ups at building entrance TR through floor. Couple steel conduits to PVC ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
  - b. Arrange stub-ups in Entrance TR so curved portions of bends are not visible above finished slab.
7. Cap underground pathways designated as spare above grade alongside pathways in use. No underground pathway designed as spare will be left capped under grade.

#### B. INSTALLATION OF UNDERGROUND HANDHOLES AND MANHOLES

1. Install Manholes and handholes level and plumb. Orientation and depth must be coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
2. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch to No. 4 and compacted to same density as adjacent undisturbed earth.
3. Elevation: In paved areas, set so cover surface will be flush with finished grade. In grassy areas, set cover flush with grade or slightly higher than grade. No cover is to be buried below grade.
4. Install removable hardware, including pulling eyes, cable stanchions, and insulators, as required for installation and support of cables and conductors.
5. If not factory built with conduit windows, field cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

END OF SECTION 270528