SECTION 27 05 28

PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 – GENERAL

1.1 PURPOSE

A. This guideline is intended to provide useful information to the Professional Service Provider (PSP) to establish a basis of design. PSP is to apply the principles of this section such that the University of Texas at Arlington (UTA) may achieve a level of quality and consistency in the design and construction of their facilities. Deviations from these guidelines must be approved by UTA and may require justification through Life Cycle Cost (LCC) analysis and submitted to UTA for approval.

1.2 **LESSONS LEARNED AND DESIGN CONSIDERATIONS**

A. Telecommunications Contractor shall review and adhere to all of University of Texas at Arlington Standards of Installation for Network Cabling.

1.3 SUMMARY/OVERVIEW

A. This section includes:
   1. Hangers and Supports for communications systems:
      a. Open-top cable supports (cable hooks) for communications systems.
   2. Conduits and Pull Boxes for communications systems:
      a. Conduit, fittings and bodies, including multi-cell conduit
      b. Riser flexible raceway (innerduct) and fittings
      c. Junction boxes, pull boxes and gutters
      d. Measured pull tape
      e. Identification and labeling
   3. Cable Tray for communications systems:
      a. Cable tray (outside communications rooms) with associated accessories and fittings.

B. Related Sections
   1. Section 27 00 00 – Communications
   2. Section 27 05 26 – Grounding and Bonding for Communications Systems
   3. Section 27 05 43 – Underground Ducts and Raceways for Communications Systems
   4. Section 27 11 00 – Communications Equipment Room Fittings
   5. Section 27 13 00 – Communications Backbone Cabling
   6. Section 27 15 00 – Communications Horizontal Cabling

1.4 REFERENCES

A. The publications listed below form a part of this specification. The publications are referred to in the text by basic designation only

B. Specific reference in specifications to codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies shall mean the latest printed edition of each in effect at the date of contract unless the document is shown dated.

C. Conflicts
   1. Refer to Section 27 00 00.

D. Hangers and Supports:
   1. ASTM B633 Specification for Electro-deposited Coatings of Zinc on Iron and Steel.
   2. ASTM A653 Specification for Steel Sheet, Zinc-Coated by the Hot-Dip Process.
   3. Telecommunications Industry Association/Electronic Industries Alliance ANSI/TIA/EIA- 569-A Commercial Building Standard for Telecommunications Pathways and Spaces.
   4. Building Industry Consulting Services International (BICSI) Telecommunications Distribution Methods Manual (TDMM)
   5. National Electrical Code (NEC)
   6. Local, county, state and federal regulations and codes in effect as of date of installation.

7. Equipment of foreign manufacture must meet U.S. codes and standards. It shall be indicated in the proposal the components that may be of foreign manufacture, if any, and the country of origin.

E. Conduits and Pull Boxes:
   1. American National Standards Institute (ANSI):
      a. C80.1 Rigid Steel Conduit - Zinc Coated
      b. C80.4 Fittings for Rigid Metal Conduit
   2. Federal Specifications (FS):
      a. W-C-58C Conduit Outlet Boxes, Bodies Aluminum and Malleable Iron
      b. W-C-1094 Conduit and Conduit Fittings Plastic, Rigid
      c. WW-C-566C Flexible Metal Conduit
      d. WW-C-581D Coatings on Steel Conduit
   3. National Electrical Manufacturers Association (NEMA):
      a. RN1 Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Electrical metallic Tubing
      b. TC2 Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80)
      c. TC3 PVC Fittings for Use with Rigid PVC Conduit and Tubing
   4. Underwriters Laboratories (UL):
      a. 6 Rigid Metal Electrical Conduit
      b. 514 B Fittings for Conduit and Outlet Boxes
      c. 651 Schedule 40 and 80 Rigid PVC Conduit
      d. 651A Type EB and A Rigid PVC Conduit and HDPE Conduit
      e. 1666 Standard for Riser Application for Optical Fiber Raceway
   5. National Electrical Code (NEC)
   6. Telecommunications Industry Association/Electronic Industries Alliance ANSI/TIA/EIA- 569-A Commercial Building Standard for Telecommunications Pathways and Spaces
   7. Building Industry Consulting Services International (BICSI)
   8. BICSI Telecommunications Distribution Methods Manual (TDMM)
   9. Local, county, state and federal regulations and codes in effect as of date of purchase
   10. Equipment of foreign manufacture must meet U.S. codes and standards. It shall be indicated in the proposal the components that may be of foreign manufacture, if any, and the country of origin.

F. Cable Tray:
   1. National Fire Protection Association (NFPA) ANSI/NFPA 70 National Electrical Code (NEC)
   2. ANSI-J-STD-607-A Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications Section 270526 Grounding and Bonding for Communication Systems
   3. American Society for Testing and Materials (ASTM):
      a. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
      b. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process
      c. ASTM B633 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
      d. ASTM A510 – Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel
   4. National Electrical Manufacturers Association (NEMA):
      a. NEMA VE 1 – Metal Cable Tray Systems
      b. NEMA VE 2 – Metal Cable Tray Installation Guidelines
      c. NEMA VE 2-2000 – Cable Tray Installation Guidelines
   5. Telecommunications Industry Association/Electronic Industries Alliance: ANSI/TIA/EIA-ANSI/TIA/EIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces
   6. Building Industry Consulting Services International (BICSI) Telecommunications Distribution Methods Manual (TDMM)
   7. Local, county, state and federal regulations and codes in effect as of date of purchase shall be complied with
   8. Equipment of foreign manufacture must meet U.S. codes and standards. It shall be indicated in the proposal the components that may be of foreign manufacture, if any, and the country of origin.

1.5 SUBMITTALS

A. Refer to Section 27 00 00.

1.6 QUALITY ASSURANCE
A. Refer to Section 27 00 00.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Refer to Section 27 00 00.
B. Conduit Storage
1. Package conduits in bundles maximum 10-feet long, with conduit and coupling thread protectors for indoor/outdoor storage. Package fittings in manufacturer's standard quantities and packaging suitable for indoor storage. Protect coating on plastic-coated rigid conduit, fittings, and bodies from damage during shipment and storage.
2. Store conduit above ground on horizontal racks. Prevent corrosion and entrance of debris.
3. Equipment and components shall be protected from the weather, humidity, temperature variations, dirt, dust, or other contaminants. Protect plastic conduit and innerduct from sunlight. Equipment damaged prior to system acceptance shall be replaced at no cost to the owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
A. Subject to compliance with requirements, manufacturers that may be incorporated in the work, include, but are not limited to the following:
B. Hangers and Support:
1. Cooper B-Line, Inc.
2. Erico
3. Caddy
4. Acceptable alternate
C. Cable Tray (Metal):
1. Cooper B-Line, Inc.
2. Chatsworth (CPI)
3. Hoffman
4. Acceptable alternate
D. Wire Basket Cable Tray Cutting Tool
1. Flex Tray
2. Acceptable alternative
E. Polyethylene Cable Support System
1. Erico
2. Acceptable alternative
F. Innerduct:
1. Maxcell Mesh Duct (3-cell 4” size)
2. Carlon Innerduct (corrugated)
3. Acceptable alternate
G. Measured pull tape (pull tape printed with sequential footage markings):
1. Fibertek
2. Condux International
3. Acceptable alternate
H. Labeling
1. Refer to section 27 00 00.
I. Firestopping
1. Refer to section 27 00 00.

2.2 MATERIALS
A. Hangers and Support
1. Cable hooks shall have a flat bottom and provide a minimum of 1.625-inch cable-bearing surface.
2. Cable hooks shall have 90° radius edges to prevent damage while installing cables.
3. Cable hooks shall be designed so the mounting hardware is recessed to prevent cable damage.
4. Cable hooks shall have a stainless steel cable latch retainer to provide containment of cables within the hook. The retainer shall be removable and reusable.

5. Cable hooks shall be factory assembled for direct attachment to walls, hanger rods, beam flanges, purlins, strut, floor posts, etc. to meet job conditions.
6. Factory assembled multi-tiered cable hooks shall be used where required to provide separate cabling compartments, or where additional capacity is needed.

B. Conduits
1. All conduits, fittings, junction and pull boxes shall be UL rated and comply with the NEC.
2. Rigid Steel Galvanized Conduit and Fittings Before Coating:
   a. Follow FS WW-C-581d, ANSI C80.1, and UL 6
   b. Pass bending, ductility, and thickness of zinc coating in ANSI C80.1
3. Nonmetallic Conduit and Fittings: Pass NEMA TC2, UL 651 and 651A and FS W-C- 1094A. EMT fittings shall be formed steel compression ring type. Die cast fittings are not allowed.
4. Electrical Metallic Tubing (EMT)
5. Multi-Cell EMT Raceway
   a. 4-inch EMT conduit with four (4) 1.25 inch pre-installed, pre-lubricated PVC innerduct raceways
   b. EMT outside diameter (OD) is 4.5 inches; inside diameter (ID) is 4.33 inches
   c. Innerduct OD is 1.32 inches; ID is 1.19 inches
   d. EMT shall be UL listed and conform to NEC Article 300.22
   e. Shall be used inside buildings only
   f. Only manufacturer's fittings, transition adapters, terminators and fixed bends shall be used.
   g. All transition junction and pull boxes, fittings terminators and adapters shall be a metallic material.
6. Conduit Bodies: Follow UL 514B and FS W-C-58C. Furnish sufficient coating for touch up after installation.
7. Conduit Fittings
   a. All fittings shall be compression or threaded.
   b. Fittings shall provide a secure connection for pulling communications cables.
   c. Setscrew fittings are not permitted.
8. Conduit "condulets" are not permitted.
9. Non-metallic conduits are not permitted in above ground installations. Conversion fittings are required for non-metallic (below ground) to metallic (above ground) transitions.
10. Innerduct:
    a. All fiber shall be installed in innerduct.
    b. One part segmented
    c. UL Listed with Flame Propagation compliant with UL 2024
    d. Only manufacturer's fittings, transition adapters, terminators and fixed bends shall be used.
    e. Shall be constructed of non-metallic material
11. Measured Pull Tape:
    a. Pre-lubricated, woven polyester, low friction, and high abrasion resistant yarn with footage markers printed on tape
    b. Minimum average tensile strength shall be 1130 lbs. for 1.5 inch and smaller conduits and innerduct.
    c. Minimum average tensile strength shall be 1800 lbs. for conduits larger than 1.5 inch.

C. Pull Boxes, Junction Boxes and Gutters
1. All junction boxes, gutters and pull boxes shall comply with NEC Article 314.
2. All junction boxes, gutters and pull boxes shall meet the following minimum material requirements:
   a. 16-gauge steel or heavier
   b. Seams shall be continuously welded and grounded smooth
   c. External screws and clamps
   d. External mounting feet (where applicable)
   e. Oil-resistant gasket and adhesive
   f. ANSI 61 gray polyester powder coating inside and out over phosphatized surface
   g. UL 50 type 12
   h. All junction boxes, gutters and pull boxes shall be provided with bushings for conduits and/or cabling.
3. All junction boxes, gutters and pull boxes shall be securely installed.
4. All junction boxes, gutters and pull box sizes for single and multiple conduit runs shall comply with BICSI TDMM.

D. Labels and Labeling System:
1. Labeling system shall consist of a hand-held portable printer
2. Conduits: General-purpose label designed for powdered coated surfaces with an ultra- aggressive

adhesive. Label size shall be appropriate for the conduit size. Font size shall be easily visible from the finished floor.
3. Innerduct: Polyethylene general-purpose tagging material attached using tie wraps.
4. Junction boxes: General-purpose label designed for powdered coated surfaces with an ultra-aggressive adhesive, trade name. Font size shall be easily visible from the finished floor.
5. All labels shall be permanent, i.e. will not fade, peel, or deteriorate due to environment or time.

2.3 HANGERS AND SUPPORT

A. Load Capacity Rating:
1. Cable hooks shall be capable of supporting a minimum of 30 pounds with a safety factor of 3.
2. Spring steel cable hooks shall be capable of supporting a minimum of 100 pounds with a safety factor of 3 where extra strength is required.
3. Follow manufacturer's recommendations for allowable fill capacity for each size of cable hook.

B. Location:
1. Cable hooks for non-corrosive areas shall be pre-galvanized steel, ASTM A653. Where additional strength is required, cable hooks shall be spring steel with a zinc-plated finish, ASTM B633, SC3.
2. Cable hooks for corrosive areas shall be stainless steel, AISI Type 304.

2.4 CONDUIT AND PULL BOXES

A. Fill and Bend Radius:
1. Conduit fill shall comply with ANSI/TIA/EIA-569-A.
2. The minimum bend radius is six times the conduit inside diameter (ID) for a 2-inch conduit or less.
3. The minimum bend radius is 10 times the conduit ID for a conduit greater than two inches.
4. There shall be no more than two 90° bends (180° total) between conduit pull boxes.
5. Changes in direction shall be accomplished with sweeping bends observing minimum bend radius requirements above. Do not use pull boxes for direction changes unless specifically designated otherwise in the drawings.
6. Unless otherwise noted in the drawings, conduits entering pull boxes shall be aligned with exiting conduits.

B. Routing:
1. Conduits shall be routed in the most direct route, with the fewest number of bends possible.
2. There shall be no continuous conduit sections longer than 100 feet. For runs that total more than 100 feet, insert junction or pull boxes (or gutters if appropriate) so that no continuous run between pull boxes is greater than 100 feet.

C. Penetrations
1. All conduit penetrations shall comply with all applicable fire codes.
2. All conduit penetrations in fire-rated walls or floors shall be sealed and fire-proofed to meet or exceed the designed rating of the penetration area.

2.5 CABLE TRAY AND CABLE RUNWAY

A. Cable tray systems are defined to include, but are not limited to, straight sections of ladder type and wire mesh cable trays, bends, tees, elbows, reducers, crosses, wyes, vertical bends, up/down tees, cable support fittings, drop-outs, supports and accessories.

B. Cable runway systems are defined to include, but are not limited to, straight sections of ladder type and wire mesh cable runway, bends, tees, elbows, reducers, crosses, wyes, vertical bends, up/down tees, cable support fittings, drop-outs, supports and accessories.

C. Loading Capacities
1. Load cable tray and cable runway in accordance with NEMA VE-1 load span requirements and a 20% growth factor over initial installation.
2. Concentrated load in accordance with NEMA VE-1 load span requirements and a 20% growth factor over initial installation.
3. Load and safety factors specified are applicable to both side rails and rung capacities
4. Cable tray shall be made to manufacturing tolerances as specified by NEMA. Contractor and manufacturer shall provide test reports in accordance with the latest revision of NEMA VE-1 or CSA C22.2 No. 126.

D. Types of cable tray systems:
1. Aluminum:

a. Straight section and fitting side rails and rungs shall be extruded from Aluminum Association Alloy 6063. All fabricated parts shall be made from Aluminum Association Alloy 5052.

2. Pre-galvanized Steel:
   a. Straight sections, fitting side rails, rungs, and covers shall be made from steel meeting the minimum mechanical properties and mill galvanized in accordance with ASTM A653 SS, Grade 33, coating designation G90.
3. Hot-dip Galvanized Steel:
   a. Straight section and fitting side rails and rungs shall be made from steel meeting the minimum mechanical properties of ASTM A1011 SS, Grade 33 for 14 gauge and heavier, ASTM A1008, Grade 33, Type 2 for 16 gauge and lighter, and shall be hot- dip galvanized after fabrication in accordance with ASTM A123.
4. Stainless Steel:
   a. Straight section and fitting side rails and rungs shall be made of AISI Type 304 or Type 316 stainless steel. Transverse members (rungs) or corrugated bottoms shall be welded to the side rails with Type 316 stainless steel welding wire.
5. Wire basket (mesh) of types and sizes indicated; with connector assemblies, clamp assemblies, connector plates, splice plates and splice bars. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards; and with the following additional material and construction features.
   a. Yellow Zinc Dichromate: Straight sections shall be made from steel meeting the minimum mechanical properties of ASTM A510 and shall be electro-plated yellow zinc dichromate in accordance with ASTM B633 SC2.
   b. Stainless Steel: Straight sections and accessories shall be made from AISI Type 304 Stainless Steel.
   c. Pre-Galvanized Zinc: Wall brackets and other pre-galvanized accessories shall be coated with zinc in accordance with ASTM A653.
   d. Electro-Galvanized Zinc: Support accessories and miscellaneous hardware shall be coated in accordance with ASTM B633 SC3. All threaded components shall be coated in accordance with ASTM B633 SC1.
   e. All fittings shall be field formed as needed.
   f. All splicing assemblies shall be the bolted type using serrated flange locknuts. Hardware shall be either yellow zinc dichromate in accordance with ASTM B633 SC2 or AISI Type 304 Stainless Steel.
   g. Wire basket supports shall be center support hangers, trapeze hangers or wall brackets.
6. Continuous mesh polyethylene cable-support system: with connector assemblies and appropriate support components. Construct units in compliance with applicable standards and manufacturer's established procedures; and with the following additional material and construction features:
   a. Steel support brackets shall be galvanized steel and capable of supporting a minimum of 200 pounds with a safety factor of 3.
   b. Steel support brackets shall be galvanized steel and capable of supporting a minimum of 200 pounds with a safety factor of 3.
   c. Steel support brackets shall have a removable galvanized steel retaining strap.
   d. Steel support brackets shall accept 3/8" (or 10mm) threaded rod for attachment to building structure or sub structure.
   e. Cable support shall be of a flexible mesh design that is extruded from polyethylene. The sections shall be available in standard length of 25 feet with special orders of up to 500 feet. The flexible mesh shall be suitable for use in air handling spaces.
   f. Flexible mesh sections shall be connected together by non-metallic splice clips. The non-metallic splice clips shall be suitable for use in air handling spaces
   g. Cable support shall provide 32 square inches of cable containment area.
   h. Shall have steel transition pieces for radius bends and elevation changes with a steel retaining strap that is removable.
   i. All parts shall be UL-listed.
   j. Plastic (non-metallic) parts shall have a zero detectable halogen content as substantiated by an independent test laboratory.
7. Ladder type trays shall consist of two longitudinal members (side rails) with transverse members (rungs) welded to the side rails.
   a. Rungs shall be spaced nine inches on center.
   b. Spacing in radius fittings shall be 9 inches and measured at the center of the tray's width.

c. Rungs shall have a minimum cable-bearing surface of .875-inch with radius edges.
d. No portion of the rungs shall protrude below the bottom plane of the side rails.
e. Each rung must be capable of supporting the maximum cable load, with a safety factor of 1.5 and a 200-pound concentrated load when tested in accordance with NEMA VE-1, section 5.4.

8. Ventilated trough type trays shall consist of two longitudinal members (side rails) with a corrugated bottom welded to the side rails.
9. Solid bottom trough type trays shall consist of two longitudinal members welded to the side rails.

E. Cable trays shall have sufficient depth and width so as not to exceed 50% fill ratio, including anticipated growth. Tray sides shall have a 6-inch maximum usable load depth.
F. Straight tray sections shall have side rails fabricated as I-Beams. All straight sections shall be supplied in standard eight-foot lengths, except where shorter lengths are permitted to facilitate tray assembly lengths.
G. Cable Runway
1. Materials and finish for straight sections and fittings shall be ASTM A36 carbon structural steel stringers, side rails and rungs. All fabricated parts shall be made from welded structural steel.
2. Ladder cable runway shall consist of two longitudinal members (stringer/side rails) with transverse members (rungs) welded to the side rails.
a. Rungs shall be spaced nine inches on center.
b. Rung spacing in radius fittings shall be industry standard 9 inches and measured at the center of the trays width.
c. Rungs shall have a minimum cable-bearing surface.
d. No portion of the rungs shall protrude below the bottom plane of the side rails.
e. Each rung must be capable of supporting the cable load, with a safety factor of 1.5, and a 141-pound concentrated load when tested in accordance with NEMA VE 1, Section 5.4.

PART 3 – EXECUTION

3.1 EXAMINATION
A. Refer to section 27 00 00.
B. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of hangers, conduits, pull boxes, and cable trays. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION:
A. Refer to section 27 00 00.
B. Verify system is properly sized for cables before installation.
C. Verify general routing and coordinate locations with other trades before installation.
1. Layout cable runs in advance to determine quantities of cable to be installed along pathways, and to ensure non-interference from other trade installations.

3.3 INSTALLATION
A. Refer to section 27 00 00.
B. Hangers and Support:
1. Provide J-hook cable support system for horizontal and/or riser cabling in accessible ceiling space Assemblies shall be complete with mounting hardware.
2. Provide threaded rod for supporting hangers when hanging from floor deck and deck members. Alternate means of support for J-hooks may be submitted in writing for approval.
3. Follow manufacturers fill capacities.
4. Locate cable hooks on four- to five-foot centers to adequately support and distribute the cable's weight. These types of supports may typically hold up to 50 cables with an outside diameter of .25 inch or less.
5. Suspended cables shall be installed with at least 3 inches of clear vertical space above the ceiling tiles and support channels.
6. For larger quantities of cables, provide special supports that are specifically designed to support the required cable weight and volume.
7. Do not support cables from or lay on ceiling suspension system or use electrical, plumbing, or other pipes for support. Cable supports shall be permanently anchored to building structure or substrates. Provide attachment hardware and anchors designed for the structure to which attached, and that are suitably sized to carry the weight of the cables to be supported.

8. Secure and support exposed horizontal cable at intervals not exceeding 4-feet and not more than 16 inches from cabinets, pack pole, boxes, fittings, outlets, racks, frames, and terminals. The exception is in a vertical drop into a pack pole above a drop ceiling where the distance between supports shall not exceed 2 feet.
9. Cable sag between vertical supports for horizontal pathway shall not exceed 6 inches. Provide at least 3 inches cable sag between supports.
10. Painted J-hooks shall meet or exceed NEC requirements for the environment in which the product is installed.
11. Fiber Support:
    a. Support vertical fiber optic cable with basket weave wire/cable grips. Support fiber riser with single weave support grip with a single offset eye.
    b. Mount/attach pulling eye to a wall or ceiling deck secured hook to support/provide strain relief to riser cable. Provide a minimum 36 inch loop of fiber prior to entering fire stopped floor sleeve.
    c. Where required coil up slack fiber cable into pull box and secure with single weave support grip.

C. Conduit and Pull Boxes:
1. Route conduit in approximate locations unless dimensioned.
2. Cut conduit square with approved conduit cutter and thread with approved conduit threader. Ream ends of burrs, and remove metal shavings and cutting lubricants before conduit is connected to conduit system.
3. Coat threaded connections in conduits with colloidal rust and corrosion inhibitor and sealant. Conduit must be clean and dry and must pass standard sizing test after concrete is poured. Cap unused conduits with watertight caps
4. Make conduit connections with appropriate fittings and tighten securely.
5. Use appropriate tools to install PVC coated conduit; avoid damage to exterior coating. After installation, repair damaged area with Plasti-Bond touch up compound.
6. Install flexible metal conduit that is liquid tight where exposed to weather, water, or other liquids.
7. Use IMC, PVC conduit, or rigid galvanized steel conduit in underground installations.
8. Identification:
    a. All conduits, junction boxes, gutters, and pull boxes shall have machine-generated labels easily visible from the finished floor.
    b. Conduits shall be labeled with the word “communications” and the conduit’s origination room number and destination room number.
    c. The Contractor shall label conduit every 50 feet, at each wall and floor penetration and at each conduit termination, such as outlet boxes, pull boxes, and junction boxes, or as otherwise specified in other sections.
    d. Junction boxes, gutters and pull boxes shall be labeled with identification name or number as determined by contractor and submitted for approval.

D. Cable Tray and Cable Runway:
1. Contractor shall
    a. Ensure the wire-mesh cable tray equipment complies with requirements of NEC and applicable portions of NFPA 70B and National Electronic Contractors Association’s (NECA) National Electrical Installation Standards (NEIS).
    b. Cut wire basket cable tray members square with approved cable tray cutting tool as to not leave sharp edges at cut point. Smooth ends of burrs if needed before the cut is connected to wire-mesh tray system.
    c. Ensure that standard splices are designed to have less than 1 milliohm (0.0001 ohm) of resistance between connections and provide bonding between sections. Painted wire mesh tray requires the outer mask of the non-conductive surface be removed at each end of the tray prior to installing the splice to provide continuity between painted tray sections.
2. Communications cable shall not be installed in elevator shafts.
3. A minimum of 12 inches access headroom shall be provided above a cable tray. Ensure that other building components do not restrict access to the cable trays from the sides.
4. Power outlets shall not be installed in or mounted to cable tray or cable runway.
5. Threaded rod (minimum .5-inch diameter) or equivalent and slotted channel shall be used for hanging cable runway between floor deck and deck members
6. Cable tray clearances
    a. Motors or transformers: 4 feet
    b. Power cables and conduit: 1 foot

c. Fluorescent lighting: 5 inches
d. Halide lights: 1 foot
e. Above the ceiling tiles: 3 inches
f. Access above the cable tray: 1 foot

3.4 FIELD QUALITY CONTROL

A. Testing
1. Test system to ensure electrical continuity of bonding and grounding connections.
a. Ensure compliance with specified maximum ground resistance.
2. Refer to NFPA 70B Chapter 18 for testing and test methods.

3.5 CLEANING

A. Remove all unnecessary tools and equipment, unused materials, packing materials, and debris from each area where Work has been completed unless designated for storage.
B. Wipe clean all cable trays and apply appropriate manufacturer's paint to areas that have been scratched.

END OF SECTION