

SECTION 27 05 36

CABLE TRAY FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to the work of this Section.

1.02 SUMMARY

- A. Provide all materials and labor for the installation of a cable tray system for communications infrastructure. This section includes requirements for providing a cable tray system for communications circuits.
- B. Related Sections
 1. Division 07 Section — "Firestopping"
 2. Division 01 Section — "Cutting and Patching"
 3. Division 26 Section — "Basic Electrical Materials and Methods"
 4. Division 27 Section — "Conduit and Boxes for Communications Systems"
 5. Division 27 Section — "Inside Plant Communications Systems"
 6. Division 27 Section — "Underground Ducts and Raceways for Communications Systems"

1.03 REFERENCES

- A. The applicable portions of the following specifications, standards, codes and regulations shall be incorporated by reference into these specifications.
 1. General:
 - a. National Electrical Code (NEC)
 - b. National Electrical Safety Code (NESC)
 - c. Occupational Safety and Health Act (OSHA)
 - d. ASTM A123 – Specification for Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.
 - e. ASTM A653 – Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process, Structural (Physical) Quality.
 - f. ASTM A1011 – Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low Alloy and High-Strength Low-Alloy with Improved Formability.
 - g. ASTM A1008 – Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low Alloy and High-Strength Low-Alloy with Improved Formability.
 - h. ASTM B633 – Specification for Electrodeposited Coatings of Zinc on Iron and Steel
 - i. NEMA VE 1 – Metallic Cable Tray Systems
 - j. NEMA VE 2 – Cable Tray Installation Guidelines

2. Communications:
 - a. TIA/EIA - 568: Commercial Building Telecommunications Cabling Standard
 - b. TIA/EIA - 569: Commercial Building Standard for Telecommunication Pathways and Spaces
 - c. TIA/EIA - 606: The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
 - d. TIA/EIA - 607: Commercial Building Grounding and Bonding Requirements for Telecommunications
 - e. ISO/IEC IS 11801: Generic Cabling for Customer Premises
 - f. BICSI: BICSI Telecommunications Cabling Installation Manual
 - g. BICSI: BICSI Telecommunications Distribution Methods Manual (TDMM)

1.04 DEFINITIONS

- A. "EMT shall mean Electrical Metallic Tubing.
- B. "RMC" shall mean Rigid Metal Conduit.
- C. "Raceway" shall mean any enclosed channel for routing wire, cable or busbars.
- D. "TMGB" shall mean Telecommunications Main Grounding Busbar. There is typically one TMGB per building, located in the main telecommunications room. This busbar is directly bonded to the electrical service ground.
- E. "TGB" shall mean Telecommunications Grounding Busbar. There is typically one TGB per telecommunications room. The TGB is connected both to the TMGB and to building structural steel or other permanent metallic systems.
- F. "TBB" shall mean Telecommunications Bonding Backbone. The TBB is a conductor used to connect TMGBs to the TGBs.
- G. "Pullbox" shall mean a metallic box with a removable cover, used to facilitate pulling cable through conduit runs longer than 100' or in which there are more than 180 degrees of bends. Pullboxes shall have no more than one conduit entering and one conduit exiting the box.
- H. "Junction box" shall mean a pullbox wherein a conduit run transitions from a feeder conduit to multiple distribution conduits.

1.05 SYSTEM DESCRIPTION

- A. Furnish, install, and place into satisfactory and successful operation all materials, devices, and necessary appurtenances to provide a complete, permanent Cable Tray infrastructure for communications circuits as hereinafter specified and as shown on the Contract Documents. The Cable Tray system shall support an ANSI/TIA/EIA and ISO/IEC compliant communications Structured Cabling System (SCS) as specified in 271500 - Inside Plant Communications Systems.

- B. The work shall include materials, equipment and apparatus not specifically mentioned herein or noted on the plans but which are necessary to make a complete working ANSI/TIA/EIA and ISO/IEC compliant Cable Tray system.

1.06 SUBMITTAL INFORMATION

- A. Product Data Submittals: Provide submittal information for review before materials are delivered to the job site. Provide product data submittals for all products at the same time.
 - 1. Submit a letter stating that the materials will be provided as specified, and specifically listing any items that will not be provided as specified. The letter shall also state that the Contractor has reviewed the specified items and agrees that they are applicable to this project in all respects.
 - 2. For those items noted as allowing “or equal,” and which are not being provided as specifically named, submit standard manufacturer's cut sheets or other descriptive information, along with a written description detailing the reason for the substitution.
 - 3. Provide standard manufacturer’s cut sheets and the operating and maintenance (O&M) instructions at the time of submittal review for each device in the system, regardless of whether it is submitted as specified or as an approved equal. These instructions shall detail how to install and service the equipment and shall include information necessary for rough-in and preparation of the building facilities to receive the materials.
- B. Closeout Submittals: Provide submittal information for review as follows:
 - 1. O&M Manual for Communications - At the completion of the project, submit O&M information from product data submittals (above), updated to reflect any changes during the course of construction, to the Designer in the telecommunications-specific O&M Manual for Communications binder labeled with the project name and description.
 - 2. Records - Maintain at the job site a minimum of one set of Record Drawings, Specification, and Addenda. Record Drawings shall consist of redline markups of drawings, specifications and spreadsheets.
 - a. Document changes to the system from that originally shown on the Contract Documents and clearly identify system component labels and identifiers on Record Drawings.
 - b. Keep Record Drawings at the job site and make available to the Owner and Designer at any time.
 - c. Keep Record Drawings current throughout the course of construction. (“Current” is defined as not more than one week behind actual construction).
 - d. Show identifiers for major infrastructure components on Record Drawings.

1.07 SEQUENCING

1.08 CONTRACTOR WARRANTY:

- A. Provide a Contractor-endorsed one-year service warranty against defects in materials and workmanship.
 - 1. Provide labor attributable to the fulfillment of this warranty at no cost to the Owner.

2. The Contractor Warranty period shall commence upon Owner acceptance of the work.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Materials shall consist of tray sections, tray fittings, connectors, supports, expansion joints, blind end plates, barrier strips, radius drops, bonding conductors and other incidentals and accessories as required for a complete, permanent Cable Tray infrastructure. Provide all incidental and/or miscellaneous hardware not explicitly specified or shown on the Contract Documents that is required for a fully operational and warranted system.
- B. Physically verify existing site conditions prior to purchase and delivery of the materials.
- C. Cable tray components shall be manufactured by a single manufacturer. Components shall not be intermixed between different manufacturers.
 1. The cable tray manufacturer shall be one of the following:
 - a. GS Metals
 - b. Cablofil
 - c. Or approved equivalent
 2. Substitution is not acceptable unless the cable tray manufacturer has been pre-approved prior to bidding. Contractors, in order to obtain approval for cable tray manufacturer substitution, shall submit their request for substitution to the Engineer at least two weeks prior to the bid date. Approval or denial of a substitution request will be based upon the sole judgment of the Engineer.
- D. For a given manufacturer, all components shall be part of a single cable tray product line – components shall not be intermixed between a manufacturer's cable tray product lines.
 1. The cable tray product one shall be one of the following:
 - a. For GS Metals: Flextray Series
 - b. For Cablofil, Inc.: EZ Tray CF54/xxx Series
 - c. Or approved equivalent

2.02 MATERIALS AND FINISH

- A. Welded wire: Cable tray shall be constructed of welded wire mesh (high strength steel wires) with a continuous safety edge wire lip. Cable tray shall be complete will all tray supports, materials, and incidental and miscellaneous hardware required for a complete cable tray system.
 1. Finish: Carbon steel with electro-plated zinc galvanized finish.
 2. Width: Widths shall be as shown on the Contract Documents. Where cable tray width is not shown on the Contract Documents, it shall be sized according to the amount of cable to be placed in the trays (as shown on the Contract Documents) plus an additional 20% for future expansion capability.
 3. Depth: minimum 2 inches.
 4. Mesh: 2 x 4 inches.
 5. Fittings: Fittings shall be field fabricated from straight sections using manufacturer-approved tools and in accordance with manufacturer's instructions.

- B. Grounding/bonding: In accordance with ANSI/NFPA 70 Section 318-7, cable tray shall be complete with bolted splicing hardware for grounding/bonding throughout the entire cable tray system.

2.03 FIRESTOPPING MATERIAL

- A. Firestopping material: Conform to both Flame (F) and Temperature (T) ratings as required by local building codes and as tested by nationally accepted test agencies per ASTM E814 or UL 1479 fire test in a configuration that is representative of the actual field conditions.
- B. Specified Technologies, Inc's EZ-Path Solution is the preferred fire stop product, where applicable.

2.04 LABELING AND ADMINISTRATION

- A. Labels: As recommended in ANSI/TIA/EIA 606. Permanent (i.e. not subject to fading or erasure), permanently affixed, and created by a hand-carried label maker or a computer/software-based label making system. Handwritten labels are not acceptable.
 - 1. Hand-carried label maker: Brady: ID Pro Plus (or approved equal).
 - 2. Labels: Brady: Bradymaker Wire Marking Labels WML-511-292 (or approved equal)
 - 3. Label Clips: Cablofil, Inc. (or approved equal, regardless of cable tray manufacturer)

PART 3 - EXECUTION

3.01 GENERAL

- A. The Contractor is solely responsible for the safety of the public and workers in accordance with all applicable rules, regulations, building codes and ordinances.
- B. All work shall comply with applicable safety rules and regulations including OSHA. All work shall comply with the requirements of the National Electrical Safety Code (NEC) and the NEC except where local codes and/or regulations are more stringent, in which case the local codes and/or regulations shall govern.
- C. All work shall comply with the standards, references and codes listed in PART 1 -- REFERENCES above. Where questions arise regarding which standards, references, or codes apply, the more stringent shall prevail.
- D. All work shall comply with the requirements and recommendations of the product manufacturers. Where questions arise regarding which requirements and recommendations apply, the more stringent shall prevail.
- E. Replace and/or repair to original (or better) condition any existing structures, materials, equipment, etc. inadvertently demolished or damaged by the Contractor during the course of construction at no additional cost to the Owner.

- F. Install the cable tray system in a manner ensuring that communications circuits, when installed, are able to fully comply with the ANSI/TIA/EIA and other references listed in Part 1 — References, above.
- G. Remove surplus material and debris from the job site and dispose of legally.

3.02 EXAMINATION

- A. Examine surfaces and spaces to receive cable tray for compliance with installation tolerances and other conditions affecting performance of cable tray installation. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Notify the Engineer/Owner of conditions that may adversely affect the installation, subsequent use, or cause the tray (or circuits to be subsequently installed in the tray) to not comply with ANSI/TIA/EIA standards.

3.03 INSTALLATION

- A. Provide cable tray, in the locations and widths shown on the Contract Documents and in accordance with manufacturer's requirements and industry practices (NEMA VE 2). Ensure that the cable tray equipment complies with the requirements of NEC, and applicable portions of NFPA 70B and NECA's "Standards of Installation" pertaining to general electrical installation practices.
 - 1. Cable tray shall be installed plumb, level and square with finished building surfaces.
 - 2. Provide factory-manufactured connection hardware between each cable tray segment. Cable tray segments shall be mutually aligned. Connection hardware shall be installed according to the manufacturer's requirements.
 - 3. Cable tray elevation changes shall be gradual.
- B. Slots/sleeves: Provide slots/sleeves where required and where shown on the Contract Documents. Provide roto-hammering, core drilling and saw cutting where required for installation. Seal and firestop (firestop only if fire rated barrier) between slot/sleeve and cable tray.
- C. Cable Tray Routing:
 - 1. Route cable tray as shown on the Contract Documents. Where not shown on the Contract Documents, route cable tray in the most direct route possible, parallel to building lines.
 - 2. Do not route cable tray through areas in which flammable material may be stored or through wet, hazardous or corrosive areas.
- D. Cable Tray Clearance Requirements:
 - 1. Clearance requirements for cable tray accessibility:
 - a. Maintain a clearance of 6" between top of cable tray and ceiling structure or other equipment or raceway.
 - b. Maintain a clearance of 8" between at least one side of cable tray and nearby objects.
 - c. Maintain a clearance of 6" between bottom of cable tray and ceiling grid or other equipment or raceway.
 - 2. Clearance requirements from sources of electromagnetic interference (EMI):
 - a. Maintain a clearance of 5" or more from fluorescent lighting.

- b. Maintain a clearance of 12" or more from conduit and cables used for electrical power distribution.
 - c. Maintain a clearance of 48" or more from motors or transformers.
 - d. Pathways shall cross perpendicularly to electrical power cables or conduits.
3. Maintain a clearance of at least 6 inches from parallel runs of flues and steam or hot-water pipes or other heat sources operating at temperatures above one-hundred degrees Fahrenheit.
- E. Cable Tray Fittings: Provide field-fabricated fittings from straight sections of cable tray using manufacturer-approved tools and in accordance with manufacturer's instructions. Bends shall be long radius. Short radius bends and T-sections shall not be used unless specifically called out on the Contract Documents.
- F. Cable tray supports shall be provided according to the manufacturer's recommendations.
1. Supports shall be attached to structural ceiling or walls with hardware or other installation and support aids specifically designed for the cable tray and designed to support the cable tray's weight and required cable weight and volume.
 2. Where cable trays abut walls, provide wall-mounted supports.
 3. Do not attach cable tray supports to ceiling support system or other mechanical support systems.
 4. Trays shall be supported at 6 foot intervals minimum, or more frequently if required by the manufacturer.
- G. Load span criteria: Install tray supports in accordance with the load criteria of L/240, and as shown on the Contract Documents.
- H. Cable tray shall be installed free of burrs, sharp edges, or projections which may damage cable insulation.
- I. Wire-type cable tray shall be cut with a manufacturer-approved cutter with "offset cutting blade" jaws and a minimum 24 inch handle.
1. The choice and position of the jaws at the point where the cut is to be made shall allow shearing as close as possible to the intersection of the steel wires.
 2. Cuts shall ensure the integrity of the galvanic protective layer.
- J. Expansion Joints: Provide cable tray sliding or offsetting expansion joints/fittings where cable tray crosses building expansion joints in addition to where shown on the Contract Documents. Provide bonding jumper except where expansion joints are specifically approved for bonding.
- K. Thermal contraction and expansion: Install cable tray sections with gap settings between cable tray sections that are appropriate for the range of thermal expansion and contraction expected for the space during construction and also during normal occupancy and operation.
- L. Blind End Plates: Close unused openings using factory-made blind end plates.
- M. Barrier Strips: Provide barrier strips as recommended by manufacturer.

- N. Radius Drops: Provide cable tray radius drops where cable trays cross other telecommunications cable trays or ladder rack in addition to where shown on the Contract Documents.

3.04 GROUNDING AND BONDING

- A. Grounding/Bonding: Grounding and bonding work shall comply with the Uniform Building Code, Uniform Fire Code, National Electrical Code, and UL 467, ANSI/TIA/EIA standards and the references listed in PART 1 – REFERENCES above, as well as local codes which may specify additional grounding and/or bonding requirements.
- B. Bond metallic raceway (including cable tray) together and to the nearest TGB (as provided under Division 27 Section — “Grounding and Bonding for Communications Systems”). Ensure that bonding breaks through paint to bare metallic surface of painted metallic hardware.
- C. Cable tray bonding splices: Provide cable tray splices according to manufacturer requirements to create a continuous bonding conductor throughout the entire cable tray.
- D. Bonding conductors:
 - 1. Bond distribution conduits to cable tray.
 - 2. Provide bonding jumpers at expansion joints, sleeves and any other locations where electrical continuity is interrupted.
 - 3. Provide bonding conductor between cable tray and the electrical power distribution system grounding infrastructure.

3.05 FIRESTOPPING

- A. Only employees trained/certified by the firestopping manufacturer shall apply firestopping materials.
- B. Maintain the fire rating of all penetrated fire barriers. Fire stop and seal all penetrations made during construction.
 - 1. Provide firestopping material for through and membrane penetrations of fire-rated barriers.
 - 2. Install firestops in strict accordance with manufacturer’s detailed installation procedures.
 - 3. Install firestops in accordance with fire test reports, fire resistance requirements, acceptable sample installations, manufacturer’s recommendations, local fire and building authorities, and applicable codes and standards referenced in PART 1 – REFERENCES. Apply sealing material in a manner acceptable to the local fire and building authorities.
 - 4. For demolition work, apply firestopping to open penetrations in fire rated barriers where cable is removed. Apply firestopping regardless of whether or not the penetrations are used for new cable or left empty after construction is complete.
 - 5. Firestopping material used to seal open penetrations through which cable passes shall be re-usable/re-enterable.

3.06 CLEANING AND PROTECTION

- A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and in accordance with accepted industry practice, that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.07 TESTING

- A. Test cable trays to ensure electrical continuity of bonding and grounding connections. Demonstrate compliance with maximum grounding resistance per NFPA 70B, Chapter 18.

3.08 LABELING AND ADMINISTRATION

- A. Provide the following two labels, alternating one label every 10 feet, along the entire length of the cable tray:
 - 1. Label #1: Label shall read "TELECOMMUNICATIONS / LOW VOLTAGE CABLING ONLY".
 - 2. Label #2: Label shall read "WARNING! CABLE TRAY SERVES AS A TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT DISCONNECT!"