

SECTION 270536 - CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the requirements for cable tray and runway, including but not limited to:

1. Ladder cable tray.
2. Wire-mesh cable tray.
3. Cable tray accessories.
4. Warning signs.

1.2 RELATED DOCUMENTS

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

B. These Specifications shall be construed in concert with the Owner's Standards. As such, relative to installation practices, should the published Specifications come in conflict with the Owner's published requirements, the more stringent requirement shall comply. With regards to materials, the Owner's requirements shall take precedence unless such requirements are not in compliance with current codes and/or industry standards. For those instances where no materials are specified within the Owner's document, the requirements of these Specifications shall remain in force. The requirements attached are recent revisions of the documents. However, the Contractor shall obtain and utilized the latest revisions available at the time of bidding and construction.

C. Related Requirements:

1. Section 270100 – Communications Common Work Results
2. Section 270524 – Communications Firestopping
3. Section 270526 – Grounding and Bonding for Communications Systems
4. Section 270528 – Pathways for Communications Systems
5. Section 270543 – Underground Pathways and Structures for Communications Systems
6. Section 271100 – Communications Equipment Rooms Fittings
7. Section 271323 – Communications Optical Fiber Backbone Cabling
8. Section 271513 – Communications Copper Horizontal Cabling

9. Section 281300 – Access Control
10. Section 282300 – Video Surveillance
11. Section 284810 – Emergency Responder Radio System Testing
12. Division 1 – General Requirements
13. Division 2 – Earthwork
14. Division 7 – Firestopping
15. Division 9 – Finish Painting
16. Division 11 – Equipment
17. Division 14 – Conveying Systems
18. Division 25 – Mechanical
19. Division 26 – Electrical

1.3 ACTION SUBMITTALS

A. Product Data: For each type of cable tray.

1. Include data indicating dimensions and finishes for each type of cable tray indicated.

B. Shop Drawings: For each type of cable tray.

1. Show fabrication and installation details of cable trays, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.
2. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:
 - a. Vertical and horizontal offsets and transitions.
 - b. Clearances for access above and to sides of cable trays.
 - c. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
 - d. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Scaled cable tray layout and relationships between components and adjacent structural, electrical, and mechanical elements.

2. Vertical and horizontal offsets and transitions.
 3. Clearances for access above and to side of cable trays.
 4. Vertical elevation of cable trays above the floor or below bottom of ceiling structure.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR CABLE TRAYS

- A. Cable Trays and Accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.
- B. Source Limitations: Obtain cable trays and components from single manufacturer.
- C. Sizes and Configurations: See the Drawings for specific requirements for types, materials, sizes, and configurations.
- D. Structural Performance: See articles for individual cable tray types for specific values for the following parameters:
1. Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.
 2. Concentrated Load: A load applied at midpoint of span and centerline of tray.
 3. Load and Safety Factors: Applicable to both side rails and rung capacities.

2.2 LADDER CABLE TRAY

- A. Utilized in any/all Telecommunications Room/Audio-Visual Server Room
- B. Description:
1. Configuration: Two longitudinal side rails with transverse rungs swaged or welded to side rails, complying with NEMA VE 1.
 2. Width: As indicated on Drawings, minimum 18".
 3. Straight Section Lengths: 10 feet, except where shorter lengths are required to facilitate tray assembly.
 4. Rung Spacing: 9 inches o.c.
 5. Radius-Fitting Rung Spacing: 9 inches at center of tray's width.

6. Minimum Cable-Bearing Surface for Rungs: 7/8-inch width with radius edges.
7. No portion of the rungs shall protrude below the bottom plane of side rails.
8. Structural Performance of Each Rung: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb concentrated load, when tested according to NEMA VE 1.
9. Splicing Assemblies: Bolted type using serrated flange locknuts.
10. Splice-Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

C. Materials and Finishes:

1. Steel:
 - a. Straight Section and Fitting Side Rails and Rungs: Steel complies with the minimum mechanical properties of ASTM A 1008/A 1008M, Grade 33, Type 2.
 - b. Steel Tray Splice Plates: ASTM A 1011/A 1011M, HSLAS, Grade 50, Class 1.
 - c. Fasteners: Steel complies with the minimum mechanical properties of ASTM A 510/A 510M, Grade 1008.
 - d. Finish: Powder-coat enamel paint.
 - 1) Powder-Coat Enamel: Cable tray manufacturer's recommended primer and corrosion-inhibiting treatment, with factory-applied powder-coat paint.
 - 2) Hardware: Chromium-zinc plated, ASTM F 1136.
 - e. Finish: Black oxide finish for support accessories and miscellaneous hardware according to ASTM D 769.

D. Manufacturer and Part: Hubbell HLS06**B

2.3 WIRE-MESH CABLE TRAY

A. Utilize for all tray on the Drawings, except that which occurs within the Telecommunications Room/Audio-Visual Server Room

B. Description:

1. Configuration: steel wire mesh, complying with NEMA VE 1.
2. Width: 18 inches unless otherwise indicated on Drawings.
3. Minimum Usable Load Depth: 4 inches unless otherwise noted on the Drawings.
4. Straight Section Lengths: 10 feet, except where shorter lengths are required to facilitate tray assembly.
5. Structural Performance: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb concentrated load, when tested according to NEMA VE 1.
6. Splicing Assemblies: Bolted type using serrated flange locknuts.

- 7. Splice-Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.
- C. Materials and Finishes:
 - 1. Steel:
 - a. Straight Sections and Fittings: Steel complies with the minimum mechanical properties of ASTM A 1008/A 1008M, Grade 33, Type 2.
 - b. Steel Tray Splice Plates: ASTM A 1011/A 1011M, HSLAS, Grade 50, Class 1.
 - c. Fasteners: Steel complies with the minimum mechanical properties of ASTM A 510/A 510M, Grade 1008.
- D. Manufacturer and Part: Cablofil CF-XXX series tray. Equal by Hubbell and Chatsworth.

2.4 CABLE TRAY ACCESSORIES

- A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.
- B. Barrier Strips: Same materials and finishes as for cable tray.
- C. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

2.5 WARNING SIGNS

- A. Lettering: 1-1/2-inch high, black letters on yellow background with legend "Warning! Not To Be Used as Walkway, Ladder, or Support for Ladders or Personnel."
- B. Comply with requirements for fasteners in Section 260553 "Identification for Electrical Systems."

2.6 SOURCE QUALITY CONTROL

- A. Testing: Test and inspect cable trays according to NEMA VE 1.

PART 3 - EXECUTION

3.1 CABLE TRAY INSTALLATION

- A. Install cable trays according to NEMA VE 2.
- B. Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.
- C. Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.
- D. Remove burrs and sharp edges from cable trays.

- E. Fasten cable tray supports to building structure.
- F. Design fasteners and supports to carry cable tray, the cables, and a concentrated load of 200 lb. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems."
- G. Place supports so that spans do not exceed maximum spans on schedules and provide clearances shown on Drawings. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.
- H. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.
- I. Support bus assembly to prevent twisting from eccentric loading.
- J. Install center-hung supports for single-rail trays designed for 60 versus 40 percent eccentric loading condition, with a safety factor of 3.
- K. Locate and install supports according to NEMA VE 2. Do not install more than one cable tray splice between supports.
- L. Support wire-basket cable trays with trapeze hangers.
- M. Support trapeze hangers for wire-basket trays with 3/8-inch diameter rods, unless otherwise noted.
- N. Make connections to equipment with flanged fittings fastened to cable trays and to equipment. Support cable trays independent of fittings. Do not carry weight of cable trays on equipment enclosure.
- O. Make changes in direction and elevation using manufacturer's recommended fittings.
- P. Make cable tray connections using manufacturer's recommended fittings.
- Q. Seal penetrations through fire and smoke barriers. Comply with requirements in Section 078413 "Penetration Firestopping."
- R. Install capped metal sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.
- S. Install cable trays with enough workspace to permit access for installing cables.
- T. Install barriers to separate cables of different systems, such as power, communications, audio/visual and data processing; or of different insulation levels, such as 600, 5000, and 15 000 V.
- U. Clamp covers on cable trays installed outdoors with heavy-duty clamps.
- V. Install warning signs in visible locations on or near cable trays after cable tray installation.

3.2 CABLE TRAY GROUNDING

- A. Ground cable trays according to NFPA 70 unless additional grounding is specified. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems."
- B. Cable trays shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.
- C. When using epoxy- or powder-coat painted cable trays as a grounding conductor, completely remove coating at all splice contact points or ground connector attachment. After completing splice-to-grounding bolt attachment, repair the coated surfaces with coating materials recommended by cable tray manufacturer.
- D. Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors."

3.3 CABLE INSTALLATION

- A. Install cables only when each cable tray run has been completed and inspected.
- B. Fasten cables on horizontal runs with hook, and loop fastening strips.
- C. Fasten cables on vertical runs to cable trays every 18 inches.
- D. Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 72 inches.
- E. In existing construction, remove inactive or dead cables from cable trays.

3.4 CONNECTIONS

- A. Remove paint from all connection points before making connections. Repair paint after the connections are completed.
- B. Connect pathways to cable trays according to requirements in NEMA VE 2 and NEMA FG 1.

3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. After installing cable trays and after equipment has been energized, survey for compliance with requirements.
 - 2. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.

3. Verify that the number, size, and systems of cables in cable trays do not exceed that permitted by NFPA 70. Verify that communications or data-processing circuits are separated from power circuits by barriers or are installed in separate cable trays.
 4. Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.
 5. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
 6. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
 7. Check for improperly sized or installed bonding jumpers.
 8. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
 9. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 1 ohm.
- B. Prepare test and inspection reports.
- 3.6 PROTECTION
- A. Protect installed cable trays and cables.
1. Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.
 2. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
 3. Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.

END OF SECTION 270536