

SECTION 260536 - CPI: CABLE TRAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

Section Includes:

Wire mesh cable tray.

Related Requirements:

Section 270536 "Cable Trays for Communications Systems" for cable trays and accessories serving communications systems.

1.3 DEFINITIONS

BICSI: Building Industry Consulting Service International.

- A. EIA: Electronic Industries Alliance.
- B. TIA: Telecommunications Industry Association
- C. ANSI: American National Standards Institute

1.4 REFERENCES

ANSI/TIA-569-D Telecommunications Pathways and Spaces, 2015

- A. ANSI/TIA-568-D.0 Generic Telecommunications cabling for Customer Premises, 2015
- B. ANSI/TIA – 568-D.1 Commercial Building Telecommunications Cabling Standard, 2015
- C. ANSI/NECA/BICSI 568-2006 – Standard for Installing Commercial Building Telecommunications Cabling
- D. ANSI/TIA-942-A Telecommunications Infrastructure Standard for Data Centers, 2014
- E. ANSI/NFPA 70 – National Electric Code, 2008, 2014
- F. NEMA – VE 1 – Metal Cable Tray Systems, 2009

G. NEMA – VE 2 – Metal Cable Tray Installation Guidelines, 2013

1.5 ACTION SUBMITTALS

Product Data: For each type of product.

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

Shop Drawings: For each type of cable tray.

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, supports, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.

1. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:

Vertical and horizontal offsets and transitions.

- a. Clearances for access above and to sides of cable trays.
- b. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
- c. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.

Delegated-Design Submittal: For seismic restraints.

Seismic-Restraint Details: Signed and sealed by a qualified professional engineer who is licensed in the state where Project is located and who is responsible for their preparation.

2. Design Calculations: Calculate requirements for selecting seismic restraints.
3. Detail fabrication, including anchorages and attachments to structure and to supported cable trays.

1.6 INFORMATIONAL SUBMITTALS

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:

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

1. Vertical and horizontal offsets and transitions.
2. Clearances for access above and to side of cable trays.
3. Vertical elevation of cable trays above the floor or below bottom of ceiling structure.

Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cable tray supports and seismic bracing.

- A. Seismic Performance: Cable trays and supports shall withstand the effects of earthquake motions determined according to [ASCE/SEI 7] <Insert requirement>.

The term "withstand" means "cable trays will remain in place without separation of any parts when subjected to the seismic forces specified."

1. Component Importance Factor: [1.5] [1.0].
2. <Insert requirements for Component Amplification Factor and Component Response Modification Factor>.

2.2 GENERAL REQUIREMENTS FOR CABLE TRAY

Cable Trays and Accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.

Source Limitations: Obtain cable trays and components from single manufacturer.

Sizes and Configurations: See the Cable Tray Schedule on Drawings for specific requirements for types, materials, sizes, and configurations.

- A. Structural Performance: See articles on individual cable tray types for specific values for the following parameters:

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.

1. Concentrated Load: A load applied at midpoint of span and centerline of tray.
2. Load and Safety Factors: Applicable to both side rails and rung capacities.

2.3 WIRE-MESH CABLE TRAY

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Pemsas Rejiband Wire Mesh Cable Tray.

Description: Nominal mesh size of 2 inches by 4 inches (60 mm by 100 mm).

Configuration: [Steel wire mesh, complying with IEC 61537]

1. Width: [4 inches (100 mm)] [6 inches (150 mm)] [8 inches (200 mm)] [12 inches (300 mm)] [18 inches (450 mm)] [24 inches (600 mm)] unless otherwise indicated on Drawings.
1. Sidewall Height: [2 inches (60 mm)] [4 inches (100 mm)]
Straight Section Lengths: 10 feet (3 m), except where shorter lengths are required to facilitate tray assembly.
2. Splicing Assemblies: Bolted type using serrated flange locknuts.

3. Splice-Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

Materials and Finishes:

Surface Protection and Resistance to Corrosion

1. Depending on the installation's conditions the tray will have one of the following protections against corrosion:

Zinc electroplated, EZ – silver colour, in compliance with ASTM B 633. Resistance to corrosion Class 3, recommended for dry interior environment.

BLACK C8, in compliance with ASTM B 633. Resistance to corrosion Class 8, recommended for humid and aggressive environment.

2.4 CABLE TRAY SUPPORTS

General:

Supports will be sized at minimum to match the width of the wire mesh cable tray that is supported. The support may be wider than wire mesh cable tray.

1. Each support will be punched with a hole-pattern that accepts tray attachment hardware and/or will have tabs that can be bent over the tray wires to secure the tray to the support.
2. Supports will be manufactured from steel.

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Central Hanging Plate.

Finish: [**Zinc Electroplate**][**BLACK C8**].

2. Accessories: Compatible with ¼" (M6), 5/16" (M8) and 3/8" (M10) threaded rods.

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; SPLUS Omega Ceiling Bracket.

Finish: [**Zinc Electroplate**][**BLACK C8**].

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Light-Duty Ceiling Support.

Finish: [**Zinc Electroplate**][**BLACK C8**].

3. Note: Supports trays of 2" (50 mm) and 4" (100 mm) width and loads up to 22 lbs (10 kg)

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Click Central Hanging Plate.

Finish: [**Zinc Electroplate**][**BLACK C8**].

4. Note: Compatible with 5/16" (M8) and 3/8" (M10) threaded rods.

Basis-of-Design Product: Subject to compliance with requirements, provide

Chatsworth Products, Inc.; Omega SPLUS Channel.

Finish: [**Pre-galvanized**][**BLACK C8**].

5. Note: Compatible with 3/8" (M10) threaded rods

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Omega SPLUS Bracket.

Finish: [**Pre-galvanized**][**BLACK C8**].

Accessories: Includes plastic insert guides and protectors

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Omega SPLUS Pendant.

Finish: [**Pre-galvanized**][**BLACK C8**].

Accessories: Includes plastic insert guides and protectors

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; RPLUS Medium-Duty Cantilever Bracket.

Finish: [**Pre-galvanized**][**BLACK C8**].

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Wall Angle Support Kit.

Finish: [**Zinc Color Paint**][**Black Paint**]

6. Note: Order the Wall Angle Support Kit to match Tray width

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Support Foot.

Finish: [**Black Plastic – UL 94 V-0**].

Note: Support foot can be stacked in two levels, providing total of 3" (7.5 cm) height

2.5 CABLE TRAY SPLICES AND FASTENERS

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Reinforced Joint Clamp

Finish: [**Electrogalvanized**][**Black Paint**].

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Part Clamp.

Finish: [**Electrogalvanized**][**Black Paint**].

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Click Connector.

Finish: **[Electrogalvanized][Black Zinc Electroplate]**.

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Splice Plate.

Finish: **[Electrogalvanized][Black Zinc Electroplate]**.

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Elevation Kit.

Finish: **[Black Paint][White Paint]**.

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Grounding Connector.

Material: Copper and Bronze Alloy.

1.2 CABLE TRAY ACCESSORIES

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Divider Kit.

Finish: **[Zinc-Colored Paint] [Black Paint]**.

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Radius Drop.

Finish: **[Zinc-Colored Paint] [Black Paint]**.

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Universal Bracket.

Finish: **[Electrogalvanized][Black Zinc Electroplate]**.

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Mini Universal Bracket.

Finish: **[Electrogalvanized][Black Zinc Electroplate]**.

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Conduit Gland Bracket.

Finish: **[Electrogalvanized][Black Zinc Electroplate]**.

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Cable Tie Clip.

Finish: **[Black Plastic – UL 94 V-0 rated]**.

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Identification Plate

Material: **[White PVC Plastic - UL 94 V-0 rated]**.

Wire Mesh Cable Tray Installation Tool:

Basis-of-Design Product: Subject to compliance with requirements, provide Chatsworth Products, Inc.; Cutting Tool.

Installation Hardware: Subject to compliance with requirements, provide Chatsworth Products, Inc. listed below:

Threaded Rod.

1. Threaded Rod Coupling Kit.
2. Threaded Rod I-Beam Clamp.
3. Hex Nut.
4. Split Lock Washer.
5. Washer.
6. Hex Lag Screw.
7. Split Lock Washer.
8. Other hardware as required to complete installation.

2.6 SOURCE QUALITY CONTROL

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

PART 3 - EXECUTION

3.1 CABLE TRAY INSTALLATION

Install cable tray and support systems according to NEMA VE 2.

- A. Install cable tray 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.
- B. Install cable tray, so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.
- C. Remove burrs and sharp edges from cable trays.
- D. Fasten cable tray supports to building structure[**and install seismic restraints**] using manufacturer's recommended supports and appropriate hardware as defined by local code or the authority having jurisdiction.
- E. Design fasteners and supports to carry cable tray, cables, and a concentrated load of **200 lb (90 kg)**. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems." [**Comply with seismic-restraint details according to Section 260548.16 "Seismic Controls for Electrical Systems."**]
- F. 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.

- G. Support assembly to prevent twisting from eccentric loading.
- H. Do not install more than one cable tray splice between supports.
- I. Make changes in direction and elevation using manufacturer's recommended fittings.
- J. Make cable tray connections using manufacturer's recommended fittings.
- K. Install cable trays with enough workspace to permit access for installing cables.
- L. Installation Tolerances:

Overhead pathway: 12 inches (300 mm) minimum, above the tray.

- 1. Ceiling or Building Truss: 12 inches (300 mm).
- 2. Multiple tiers: Minimum clearance of 12 inches (300 mm) in between the trays.
- 3. Acoustical ceilings: 3 inches (75 mm) minimum above the ceiling panels or tiles.
- 4. Raised Flooring: 3/4-inch (19 mm) minimum clearance between the top of the tray and the bottom of the floor tiles or floor system stringers, whichever are lower in elevation.
- 5. Between trays and tray cross overs: 3 inch (75 mm) clearance.

Provide support for the following instances:

Length of span: 6 feet (1.8 m) or less.

- 6. Splices and Intersections.
- 7. Change of direction or change of elevation.
- 8. 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 tray rungs.

3.2 CABLE TRAY GROUNDING

Ground cable trays according to NFPA 70 unless additional grounding is specified. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

- A. Cable trays with electrical power conductors shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.
- B. Cable trays with single-conductor power conductors shall be bonded together with a grounding conductor run in the tray along with the power conductors and bonded to the tray at 72-inch (1800-mm) intervals. The grounding conductor shall be sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors," and Article 392, "Cable Trays."
- C. When using 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

The combined weight of cables within the tray will not exceed stated load capacity in manufacturer's specifications.

- A. Separate different media type within the tray. Treat each type of media separately when determining cable fill limits.
- B. When pathways for other utilities or building services are within **2 feet (0.6 m)** of the wire mesh cable tray, cover the tray after cables are installed only when each cable tray run has been completed and inspected.
- C. The quantity of cables within the tray will not exceed a whole number value equal to 50 percent of the interior area of the tray divided by the cross-sectional area of the cable. Cable fill will not exceed the depth of the cable tray's side rail.
- D. Fasten cables on vertical runs to cable trays every **18 inches (450 mm)**.
- E. Install Radius Drops at each point where cables enter or exit the tray pathway to guide and support cables at the point of entry or exit.
- F. 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 (1800 mm)**.
- G. Tie mineral-insulated cables down every **36 inches (900 mm)** where required to provide a two-hour fire rating and every **72 inches (1800 mm)** elsewhere.
- H. In existing construction, remove inactive or dead cables from cable trays.

3.4 CONNECTIONS

Remove paint from all connection points before making connections. Repair paint after the connections are completed.

- A. Connect raceways to cable trays according to requirements in NEMA VE 2.

3.5 FIELD QUALITY CONTROL

Perform the following tests and inspections:

After installing cable trays and before electrical circuitry has been energized, survey for compliance with requirements.

1. 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.
2. Verify that the number, size, and voltage 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.
 3. Verify that there are no intruding items, such as pipes, hangers, or other equipment, in the cable tray.
 4. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
 5. 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.
 6. Check for improperly sized or installed bonding jumpers.
 7. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
 8. 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.

Prepare test and inspection reports.

3.6 PROTECTION

Protect installed cable trays and cables.

- 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.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
 2. Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.

END OF SECTION 260536