SECTION 16133

CABLE TRAYS

Display hidden notes to specifier. (Don't know how? [Click Here](http://www.arcat.com/sd/display_hidden_notes.shtml))

*Copyright 2010 - 2013 ARCAT, Inc. - All rights reserved*

\*\* NOTE TO SPECIFIER \*\* Cablofil®; cable trays.  
.  
This section is based on the products of Cablofil®, which is located at:  
8319 State Rte. 4   
Mascoutah, IL 62258  
Toll Free Tel: 800-658-4641  
Tel: 618-566-3230  
Fax: 618-566-3250  
Email: [request info (info@cablofil.com)](http://admin.arcat.com/users.pl?action=UserEmail&company=Cablofil%26reg;&coid=39569&rep=&fax=618-566-3250&message=RE:%20Spec%20Question%20(16133cab):%20%20&mf=)  
Web: [www.legrand.us/Cablofil.aspx](http://www.legrand.us/Cablofil.aspx)   
 [ Click Here ] for additional information.  
Through the design of effective, efficient and innovative wire cable trays, Legrand/Cablofil, the leader in wire mesh cable tray, provides the highest quality ladder or wire mesh cable management solutions for any situation.

1. GENERAL
   1. SECTION INCLUDES
      1. Continuous, rigid, welded wire mesh cable management system.
      2. Ladder rung type cable tray system.
   2. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 16120 - Conductors and Cables.
    2. Section 16130 - Raceway and Boxes.
    3. Section 16140 - Wiring Devices.
    4. Section 16150 - Wiring Connections.
    5. Section 16200 - Electrical Power.
    6. Section 16700 - Communications.
  1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. ANSI/NFPA 70 - National Electrical Code (NEC).
    2. ASTM International (ASTM):
       1. ASTM A 123 - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
       2. ASTM A 380 - Specification for Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
       3. ASTM A 510 - Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel.
       4. ASTM A 653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
       5. ASTM B 633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
       6. ASTM C 3451 - Specification for Powder Coated Painted Tray.
       7. ASTM F 1136 - Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners.
    3. IEC 61537 - Cable Tray Systems and Cable Ladder Systems for Cable Management.
    4. NEMA VE 1/CSA C22.2 No. 126.1-02 - Metal Cable Tray Systems.
    5. NEMA VE 2 - Metal Cable Tray Installation Guidelines.
    6. TIA 569-A (1998) - Commercial Building Standard for Telecommunications Pathways and Spaces.
  1. SUBMITTALS
     1. Submit under provisions of Section 01300.
     2. Product Data: Manufacturer's data sheets on each product to be used, including:
        1. Include dimensions, materials, and finishes, including UL Classification and NEMA/CSA Certification.
        2. Preparation instructions and recommendations.
        3. Storage and handling requirements and recommendations.
        4. Installation methods.
     3. Shop Drawings:
        1. Submit shop drawings indicating materials, finish, dimensions, accessories, layout, supports, splices, and installation details.
        2. Verify loading capacities for supports.
     4. Coordination Drawings: Include floor plans and sections drawn to scale. Include scaled cable tray layout and relationships between components and adjacent structural and mechanical elements. Field verification of all dimensions, routing, etc., is required.
     5. Certification:
        1. Submit manufacturer's certification indicating ISO 9001 quality certified.
        2. Submit training procedure for certifying cable tray installers.
  2. QUALITY ASSURANCE
     1. Installer Qualifications: Certified by manufacturer.
        1. Certified Installers: Cable tray installers shall have successfully completed Cablofil's Certified Installer program.
     2. Product Requirements:
        1. Source Limitations: Obtain cable tray components through one source from a single manufacturer.
        2. Approval and Labeling: Provide cable trays and accessories specified in this Section that are approved and labeled.
           1. The Terms "Classified" pertaining to cable trays (rather than "Listed") and "Labeled": As defined in NFPA 70, Article 100.
           2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.
        3. Comply with NFPA 70, National Electrical Code, Article 392: Cable Trays; provide UL Classification and labels.
        4. Comply with IEC 61537, Cable Tray Systems and Cable Ladder Systems for Cable Management.
        5. Comply with NEMA VE 1/CSA C22.2 No. 126.1, Metal Cable Tray Systems, for materials, sizes, and configurations; provide cCSAus Certificate and labels.
        6. Provide documentation of the following certifications:
           1. ISO 9001 quality certification.
           2. American Bureau of Shipping (ABS) Product Design Assessment certification.
           3. Det Norske Veritas (DNV) certification.
           4. E 90 Fire Testing certification.
        7. Provide UL (or ETL) test documentation showing cable compression/deformation testing.
        8. Provide military test documentation showing compliance with the following standards:
           1. MIL-S-901D (Navy) - Military Specification, Requirements for Shock Tests, High Impact; Shipboard Machinery, Equipment and Systems
           2. MIL-STD-167-1 (Ships) - Military Standards Mechanical Vibrations of Shipboard Equipment
        9. Structural Performance: Cable trays shall be tested and rated for load carrying capacity and safety factors.
           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.

\*\* NOTE TO SPECIFIER \*\* Include a mock-up if the project size and/or quality warrant taking such a precaution. The following is one example of how a mock-up on a large project might be specified. When deciding on the extent of the mock-up, consider all the major different types of work on the project.

* + 1. Mock-Up: Provide a mock-up for evaluation of installation techniques and application workmanship.
       1. Finish areas designated by Architect.
       2. Do not proceed with remaining work until workmanship is approved by Architect.
       3. Rework mock-up area as required to produce acceptable work.
  1. DELIVERY, STORAGE, AND HANDLING
     1. Avoid breakage, denting and scoring finishes. Damaged products shall not be installed. Store cable trays and accessories in original cartons and in clean dry space; protect from weather and construction traffic. Wet materials will be unpacked and dried before storage.
     2. Store products in manufacturer's unopened packaging until ready for installation.
     3. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
  2. PROJECT CONDITIONS
     1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
  3. COORDINATION
     1. Coordinate layout and installation of cable tray with other installations.
        1. Revise locations and elevations from those indicated as required to suit field conditions and as approved by the Architect.

1. PRODUCTS
   1. MANUFACTURERS
      1. Acceptable Manufacturer: Cablofil®, which is located at: 8319 State Rte. 4 ; Mascoutah, IL 62258; Toll Free Tel: 800-658-4641; Tel: 618-566-3230; Fax: 618-566-3250; Email: [request info (info@cablofil.com)](http://admin.arcat.com/users.pl?action=UserEmail&company=Cablofil%26reg;&coid=39569&rep=&fax=618-566-3250&message=RE:%20Spec%20Question%20(16133cab):%20%20&mf=); Web: [www.legrand.us/Cablofil.aspx](http://www.legrand.us/Cablofil.aspx)

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
    2. Requests for substitutions will be considered in accordance with provisions of Section 01600.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* 1. WIRE MESH CABLE TRAY

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + 1. Cable tray shall consist of continuous, rigid, welded steel wire mesh cable management system, to allow continuous ventilation of cables and maximum dissipation of heat, with UL Classified splices where tray acts as Equipment Grounding Conductor (EGC). Wire mesh cable tray will have continuous Safe-T-Edge T-welded top side wire to protect cable insulation and installers.
       1. Cable tray systems shall include, but are not limited to, straight sections, supports and accessories.
       2. Product: Cablofil CF (or ZF) Series Cable Tray as manufactured by Legrand.
       3. Provide splices, supports, and other fittings necessary for a complete, continuously grounded system.
          1. Mesh: 2 by 4 inches (50 by 100 mm).
          2. Straight Section Lengths: 118 inches (3,000 mm).
          3. Wire Diameter: Patented design includes varying wire sizes to meet application load requirements; to optimize tray strength; and to allow tray to remain lightweight.
          4. Safe-T-Edge: Patented Safe-T-Edge technology on side wire to protect cable insulation and installers' hands.
          5. Fittings: Wire mesh cable tray fittings shall be field-fabricated from straight tray sections, in accordance with manufacturer's instructions.
          6. Tape: Painted wire mesh cable tray to include metallic conductive UL tape.

\*\* NOTE TO SPECIFIER \*\* Delete basket size not required.

* + - 1. Wire-Basket Depth: 2-inch (50-mm) usable loading depth.

\*\* NOTE TO SPECIFIER \*\* Delete basket width not required.

* + - * 1. 2 inches (50 mm) wide.
        2. 4 inches (100 mm) wide.
        3. 6 inches (150 mm) wide.
        4. 8 inches (200 mm) wide.
        5. 12 inches (300 mm) wide.
        6. 18 inches (450 mm) wide.
        7. 20 inches (500 mm) wide.
        8. 24 inches (600 mm) wide.
      1. Wire-Basket Depth: 4-inch (100-mm) usable loading depth.

\*\* NOTE TO SPECIFIER \*\* Delete basket width not required.

* + - * 1. 4 inches (100 mm) wide.
        2. 6 inches (150 mm) wide.
        3. 8 inches (200 mm) wide.
        4. 12 inches (300 mm) wide.
        5. 18 inches (450 mm) wide.
        6. 20 inches (500 mm) wide.
        7. 24 inches (600 mm) wide.
      1. Wire-Basket Depth: 6-inch (150-mm) usable loading depth.

\*\* NOTE TO SPECIFIER \*\* Delete basket width not required.

* + - * 1. 6 inches (150 mm) wide.
        2. 8 inches (200 mm) wide.
        3. 12 inches (300 mm) wide.
        4. 18 inches (450 mm) wide.
        5. 20 inches (500 mm) wide.
        6. 24 inches (600 mm) wide.
      1. Length: Cable tray section length shall be 118.1 inches (3000 mm) unless otherwise shown on drawings.

\*\* NOTE TO SPECIFIER \*\* Delete cable tray material not required.

* + - 1. Cable Tray Material: Carbon steel wire, ASTM A 510, Grade 1008. Wire welded, bent, and surface treated after manufacture.

\*\* NOTE TO SPECIFIER \*\* Delete finish for material selected not required.

* + - * 1. Electrodeposited Zinc Plating: ASTM B 633, Type III, SC-1.
        2. Hot-Dip Galvanizing After Fabrication: ASTM A 123.
        3. Powder-Coated:

\*\* NOTE TO SPECIFIER \*\* Delete powder coat finish color not required. Contact Cablofil for color information.

Black powder-coated surface treatment over Electrodeposited Zinc Plating using ASA 61 black polyester coating.

Custom Color Powder-Coated surface treatment. Color as scheduled.

* + - 1. Cable Tray Material: Stainless steel wire, AISI 304L or AISI 316L, 2B, finished cold drawn wire.
         1. Finish for Stainless Steel Wire: Passivated according to ASTM B 380.
      2. Load Span Criteria:

\*\* NOTE TO SPECIFIER \*\* Delete performance reference standard not required.

* + - * 1. Install and support cable management system in accordance with NEMA VE-1, with Safety Factor of 1.5.

\*\* NOTE TO SPECIFIER \*\* Alter load criteria if required. Consult with manufacturer for availability.

* + - * 1. Cable tray will be capable of carrying a uniformly distributed load of 25 pounds per foot on an 8 foot (2.4 m) support span, according to load tests of standard specified.
      1. Fittings/Supports: Wire mesh cable tray fittings are field-fabricated from straight tray sections, in accordance with manufacturer's instructions. Supports shall include the FAS (Fast Assembly System) where possible so that screws, bolts, and additional tools are not required for cable tray mounting to reduce installation time; and tray path can adapt to installation obstacles without the need for additional parts. Place supports so that support span does not exceed that shown on the drawings and is capable of supporting total fill capacity loading.
         1. Ceiling-mounted supports mount to ceiling structure directly or with threaded rod sized for total fill capacity.
         2. Wall-mounted supports.
         3. Underfloor supports mount directly to floor or to floor posts.
         4. Splices, including those approved for electrical continuity (bonding), as recommended by cable tray manufacturer.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + 1. Cable tray shall consist of continuous, rigid, welded steel wire mesh cable management system, to allow continuous ventilation of cables and maximum dissipation of heat, with UL Classified splices where tray acts as Equipment Grounding Conductor (EGC).
       1. Cable tray systems shall include, but are not limited to, straight sections, supports and accessories.
       2. Product: Wire Mesh Cable Trays as manufactured by Legrand/Cablofil.
       3. Configuration: Wires are formed into a standard 2 inches by 4 inches (50 by 100 mm) wire mesh pattern with intersecting wires welded together. Mesh sections shall have at least one bottom longitudinal wire along entire length of section.
       4. Materials: High-strength-steel longitudinal wires with "T" weld.
       5. Safety Provisions: Wire ends along wire-basket sides (flanges) rounded during manufacturing to maintain integrity of cables and installer safety.
       6. Straight sections shall be furnished in standard 118.1 inches (3000 mm) lengths.

\*\* NOTE TO SPECIFIER \*\* Delete basket size not required.

* + - 1. Wire-Basket Depth: 2-inch (50-mm) usable loading depth.

\*\* NOTE TO SPECIFIER \*\* Delete basket width not required.

* + - * 1. 2 inches (50 mm) wide.
        2. 4 inches (100 mm) wide.
        3. 6 inches (150 mm) wide.
        4. 8 inches (200 mm) wide.
        5. 12 inches (300 mm) wide.
        6. 18 inches (450 mm) wide.
        7. 24 inches (600 mm) wide.
      1. Wire-Basket Depth: 4-inch (100-mm) usable loading depth.

\*\* NOTE TO SPECIFIER \*\* Delete basket width not required.

* + - * 1. 4 inches (100 mm) wide.
        2. 6 inches (150 mm) wide.
        3. 8 inches (200 mm) wide.
        4. 12 inches (300 mm) wide.
        5. 18 inches (450 mm) wide.
        6. 24 inches (600 mm) wide.
      1. Wire-Basket Depth: 6-inch (150-mm) usable loading depth.

\*\* NOTE TO SPECIFIER \*\* Delete basket width not required.

* + - * 1. 6 inches (150 mm) wide.
        2. 8 inches (200 mm) wide.
        3. 12 inches (300 mm) wide.
        4. 18 inches (450 mm) wide.
        5. 24 inches (600 mm) wide.
      1. Connector Assemblies: Listed Snap in couplers or factory assembled bolted couplers that mechanically join adjacent tray wires to splice sections together or to create horizontal fittings.
      2. Hardware and Fasteners:
         1. ASTM F 593 and ASTM F 594 stainless steel, Type 316.
         2. Steel, zinc plated according to ASTM B 633.

\*\* NOTE TO SPECIFIER \*\* ASTM A 1011/A 1011M is for 14 gage and thicker; ASTM A 1008/A 1008M is for 16 gage and thinner. Both have structural-steel (SS) and high-strength, low-alloy-steel (HSLAS) designations. Delete if steel not required.

* + - 1. Steel Material: Straight section and fitting side rails and rungs shall comply with the minimum mechanical properties of ASTM A 1008/A 1008M.
      2. Steel Tray Splice Plates: ASTM A 1008/A 1008M.
      3. Fasteners: Steel complies with the minimum mechanical properties of ASTM A 510/A 510M, Grade 1008.

\*\* NOTE TO SPECIFIER \*\* Delete finish not required.

* + - 1. Finish: Hot-dip galvanized after fabrication.
         1. Standard: Comply with ASTM A123/A123 M, Class B2.

\*\* NOTE TO SPECIFIER \*\* Delete hardware finish not required.

* + - * 1. Hardware: Aluminum-zinc (Geomet) plated, ASTM F 1136.
        2. Hardware: Stainless steel, Type 316.
      1. Finish: Epoxy-resin paint.

\*\* NOTE TO SPECIFIER \*\* Delete hardware finish not required.

* + - * 1. Hardware: Aluminum-zinc (Geomet) plated, ASTM F 1136.
        2. Hardware: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.
      1. Finish: Powder-coat paint.

\*\* NOTE TO SPECIFIER \*\* Delete hardware finish not required.

* + - * 1. Powder-Coat: Cable tray manufacturer's recommended primer and corrosion-inhibiting treatment, with factory-applied powder-coat paint.
        2. Hardware: Aluminum-zinc (Geomet) plated. ASTM F 1136.
        3. Hardware: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.
      1. Finish: Factory-standard primer, ready for field painting, with zinc-plated hardware according to ASTM B 633.

\*\* NOTE TO SPECIFIER \*\* Delete hardware finish not required.

* + - * 1. Hardware: Aluminum-zinc (Geomet) plated, ASTM F 1136.
        2. Hardware: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.
        3. Hardware for Aluminum Cable Tray Used Outdoors: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.

\*\* NOTE TO SPECIFIER \*\* Delete if stainless steel not required.

* + - 1. Stainless Steel Material:

\*\* NOTE TO SPECIFIER \*\* Delete stainless steel alloy not required.

* + - * 1. Low-carbon, passivated per ASTM A 380, stainless steel, Type 304L, ASTM F 593 and ASTM F 594.
        2. Low-carbon, passivated per ASTM A 380, stainless steel, Type 316L, ASTM F 593 and ASTM F 594.
        3. Hardware for Stainless-Steel Cable Tray Used Outdoors: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.
        4. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + - 1. Covers: Same materials and with same finishes as cable tray.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + - 1. Barrier Strips: Same materials and finishes as for cable tray. Refer to required locations for barrier strips on Drawings.
      2. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* 1. LADDER TYPE TRAY

\*\* NOTE TO SPECIFIER \*\* Channel rail design. Delete if not required.

* + 1. Cable Tray Design: Prefabricated metal structure consisting of two longitudinal side members connected by individual transverse members or individual rungs. Standard manufacturer ladder tray selections shall include both flange in and flange out configurations.
       1. Product: PW Series (Ladder Type) Cable Tray as manufactured by Legrand.
       2. Length of Straight Sections: Standard manufacturer lengths (not including connectors if attached) shall be 12 feet (3.7 m) and 20 feet (6.1 m) except where shorter lengths are required to facilitate tray assembly. Straight section lengths shall be greater than or equal to the support span length. Straight section lengths shall be used such that a maximum of one splice joint is between any two tray supports.
       3. Working Allowable Load Capacity: Working load capacity and span shall be in accordance with NEMA Standard VE1 Sections 4.8, 5.2, and Table 1.

\*\* NOTE TO SPECIFIER \*\* Delete class not required.

* + - * 1. NEMA Load/Class 12C.
        2. NEMA Load/Class 20A.
        3. NEMA Load/Class 20B.
        4. NEMA Load/Class 20C.
      1. Tray deflection shall not exceed manufacturers published engineering data for project cable tray working load capacity and minimum support span requirements.
      2. Safety Factor: Minimum load capacity safety factor shall be 1.5 in accordance with NEMA Standard VE1 Section 5.2.8.
      3. Standard manufacturer widths shall be in accordance with NEMA Standard VE1 Section 4.3.3.1.

\*\* NOTE TO SPECIFIER \*\* Delete width not required.

* + - * 1. Width: 6 inches (150 mm).
        2. Width: 9 inches (229 mm).
        3. Width: 12 inches (300 mm).
        4. Width: 18 inches (450 mm).
        5. Width: 24 inches (600 mm).
        6. Width: 30 inches (762 mm).
        7. Width: 36 inches (914 mm).
      1. Standard manufacturer heights shall be in accordance with NEMA Standard VE1 Section 4.3.4.3.

\*\* NOTE TO SPECIFIER \*\* Delete height not required.

* + - * 1. Side Rail Height: 4 inches (102 mm).
        2. Side Rail Height: 5 inches (127 mm).
        3. Side Rail Height: 6 inches (152 mm).
        4. Side Rail Height: 7 inches178 mm).
      1. Side Rails: Side rail members to be of 'C' channel configuration for steel and I-beam configuration for aluminum. Steel top flange shall be minimum 1 inch (25 mm) or 1-3/4 inches (44.5 mm) per standard model design.
      2. Rungs: Rungs shall be minimum 1 inch (25 mm) wide. Rungs shall be attached to side rails by welding. Attachment of rungs to side rails shall not be by mechanical means. Rungs shall be constructed from same material as side rails.
      3. Distance between rungs on fittings shall not exceed rung spacing and tolerances for straight tray and shall be measured at the center of the fitting. Standard manufacturer rung spacing on straight sections.
         1. Rung Spacing: 9 inches (229 mm).
      4. Tray Fittings: Tray fittings shall be constructed of same material as straight tray sections.
         1. Tangent sections of tray fittings shall be at least 5 inches (127 mm) for NEMA class 20A, 20B, and 20C.
         2. Horizontal elbow fittings in 30, 45, 60, and 90 degree angles.
         3. Vertical elbow fittings in 30, 45, 60 and 90 degree angles with inside and outside radius options.
         4. Fitting Radius: The nominal bend radius measured on the smallest side shall be appropriate for the allowable bending radius of the cables to be installed in the fitting.

\*\* NOTE TO SPECIFIER \*\* Delete radius not required.

Standard manufacturers fitting radius in accordance with NEMA Standard VE1 shall be 12 inches (305 mm).

Standard manufacturers fitting radius in accordance with NEMA Standard VE1 shall be 24 inches (610 mm).

* + - 1. Materials: Cable tray sections, fittings and accessories shall be made from corrosion resistant metal or metal with a factory applied corrosion resistant finish. All materials shall be as indicated on drawings and in accordance with NEMA Standard VE1 Sections 4.1 and 4.2.

\*\* NOTE TO SPECIFIER \*\* Delete material not required.

* + - * 1. Mill Galvanized Steel (PGSTL): Mill galvanized coatings shall be applied at the steel mill in accordance with ASTM specification A924 and in accordance with ASTM Publication No. 653.
        2. Hot Dipped Galvanized After Fabrication (HDGAF): Hot dipped galvanized after fabrication shall be applied in accordance with ASTM Publication No. A123.
        3. Stainless Steel (S.S.) Wire: AISI 304L, 2B, finished.
        4. Stainless Steel (S.S.) Wire: AISI 316L, 2B, finished.
      1. Connectors: Connector splice shall be UL Classified and have less than 0.00033 ohms electrical resistance. Expansion connectors shall provide for minimum 2 inch (51 mm) tray expansion and shall be placed as shown on drawings or as required to prevent damage to the tray system from thermal expansion and contraction. Grounding bonding jumpers shall be installed at all adjustable connectors and expansion connectors.
      2. Connector Hardware: 3/8 inch (9.5 mm) diameter, truss head, ribbed neck steel screw with Phillips recess and a free spinning, lock type steel nut which does not need a washer. Connector hardware finish shall be protected against corrosion.

\*\* NOTE TO SPECIFIER \*\* Delete hardware material not required.

* + - * 1. Connector hardware shall be aluminum-zinc (Geomet) plated steel finish per ASTM F 1136.
        2. Connector hardware shall be Type 316 Stainless Steel.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + - 1. Bonding: Ensure continuous bond between sections and from cable tray to building ground in accordance with NEC 392.7(A) and NEC 250.96. The cable tray system shall be UL classified as an equipment grounding conductor.

\*\* NOTE TO SPECIFIER \*\* I-beam rail design. Delete if not required.

* + 1. Cable Tray Design: Prefabricated metal structure consisting of two I beam side rails with I beam transverse rungs welded to side rails. Standard manufacturer lengths (not including connectors if attached) shall be 12 feet (3.7 m) or 20 feet (6.1 m) except where shorter lengths are required to facilitate tray assembly. Straight section lengths shall be greater than or equal to the support span length. Straight section lengths shall be used such that a maximum of one splice joint is between any two tray supports.
       1. Product: PW/Legrand; Ladder Cable Tray as manufactured by Legrand.
       2. Rung Spacing: 9 inches (225 mm).
       3. Radius-Fitting Rung Spacing: 9 inches (225 mm) nominal at center of tray's width.
       4. Minimum Cable-Bearing Surface for Rungs: 7/8-inch (22-mm) width with radius edges.
       5. No portion of the rungs shall protrude below the bottom plane of side rails.
       6. Structural Performance of Each Rung: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb (90-kg) concentrated load, when tested according to NEMA VE 1.

\*\* NOTE TO SPECIFIER \*\* The maximum uniform load and the support span are indicated by the cable tray class. Delete class not required.

* + - 1. Class: Comply with NEMA VE 1, Class 12B.
      2. Class: Comply with NEMA VE 1, Class 12C.
      3. Class: Comply with NEMA VE 1, Class 20B.
      4. Class: Comply with NEMA VE 1, Class 20C.

\*\* NOTE TO SPECIFIER \*\* Delete width not required.

* + - 1. Width: 6 inches (150 mm).
      2. Width: 9 inches (229 mm).
      3. Width: 12 inches (300 mm).
      4. Width: 18 inches (450 mm).
      5. Width: 24 inches (600 mm).
      6. Width: 30 inches (762 mm).
      7. Width: 36 inches (914 mm).

\*\* NOTE TO SPECIFIER \*\* Delete depth not required.

* + - 1. Minimum Usable Load Depth: 3 inches (75 mm)
      2. Minimum Usable Load Depth: 4 inches (100 mm)
      3. Minimum Usable Load Depth: 5 inches (125 mm).
      4. Minimum Usable Load Depth: 6 inches (150 mm).

\*\* NOTE TO SPECIFIER \*\* Delete radius not required.

* + - 1. Fitting Minimum Radius: 12 inches (300 mm).
      2. Fitting Minimum Radius: 24 inches (600 mm).
      3. Splicing Assemblies: Mid-span capable and bolted using serrated flange locknuts.

\*\* NOTE TO SPECIFIER \*\* Delete material not required.

* + - 1. Hardware and Fasteners: ASTM F 593 and ASTM F 594 stainless steel, Type 316.
      2. Hardware and Fasteners: Steel, Geomet coated.
      3. Finish: Powder-coat paint.
         1. Powder-Coat: Cable tray manufacturer's recommended primer and corrosion-inhibiting treatment, with factory-applied powder-coat paint.

\*\* NOTE TO SPECIFIER \*\* Delete if aluminum not required.

* + - 1. Aluminum Material: Alloy 6063-T6 according to ANSI H35.1/H 35.1M for extruded components, and Alloy 5052-H32, 3003-H14, or Alloy 6061-T6 according to ANSI H35.1/H 35.1M for fabricated parts.

\*\* NOTE TO SPECIFIER \*\* Delete hardware finish not required.

* + - * 1. Hardware: Aluminum-zinc (Geomet) plated. ASTM F 1136.
        2. Hardware: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.
        3. Hardware for Aluminum Cable Tray Used Outdoors: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + - 1. Covers: Louvered type made of same materials and with same finishes as cable tray.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + - 1. Barrier Strips: Same materials and finishes as for cable tray. Refer to required locations for barrier strips on Drawings.
      2. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* 1. WARNING SIGNS
     1. Lettering: 1-1/2-inches (40 mm) high, black letters on yellow background with legend "Warning! Not To Be Used as Walkway, Ladder, or Support for Ladders or Personnel.”
  2. LABELS
     1. Labels: Letter shall be black in color on white background.

1. EXECUTION
   1. EXAMINATION
      1. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of cable trays. Do not proceed with installation until unsatisfactory conditions have been corrected.
      2. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
   2. PREPARATION
      1. Clean surfaces thoroughly prior to installation.
      2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
   3. CABLE TRAY INSTALLATION
      1. Comply with recommendations in NEMA VE 2. Install as a complete system, including all necessary fasteners, hold-down clips, splice-plate support systems, barrier strips, hinged horizontal and vertical splice plates, elbows, reducers, tees, and crosses.
      2. On jobs over 300 feet (90 m) in total length, installers must be certified and trained by manufacturer.
      3. Remove burrs and sharp edges from cable trays. All wire mesh tray must be manufactured with top wire safety edge design.
      4. Fasten cable tray supports to building structure and install seismic restraints. Underfloor cable tray shall be installed with adjustable floor supports that do not attach rigidly to floor posts. Supports shall be free standing and shall be usable with 24 inch (610 mm) sections or 120 inch (3048 mm) sections of cable tray.
         1. Design each fastener and support to carry load indicated by seismic requirements.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + - 1. Design each fastener and support to comply with seismic-restraint details according to Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
      2. Place supports so that spans do not exceed maximum spans on schedules.
      3. 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.
      4. Support bus assembly to prevent twisting from eccentric loading.
      5. Manufacture center-hung support, designed for 60 percent versus 40 percent eccentric loading condition, with a safety factor of 3.
      6. Locate and install supports according to NEMA VE 2.

\*\* NOTE TO SPECIFIER \*\* Retain paragraph below if cable tray connects to equipment. Delete if not required.

* + 1. Make connections to equipment with flanged fittings fastened to cable tray and to equipment. Support cable tray independent of fittings. Do not carry weight of cable tray on equipment enclosure.

\*\* NOTE TO SPECIFIER \*\* Retain first paragraph below if expansion fittings are required. Delete if not required.

* + 1. Install expansion connectors where cable tray crosses building expansion joint and in cable tray runs that exceed dimensions recommended in NEMA VE 2. Space connectors and set gaps according to applicable standard.
    2. Make changes in direction, connections and elevation using manufacturer recommended fittings.
    3. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping" with Wiremold Flamestopper. Install E90 certified cable tray (90 minute fire rated) for critical circuits, hallways or in areas of egress as shown on drawings.

\*\* NOTE TO SPECIFIER \*\* If cable trays are sized for future cables, specify provisions for penetrations with sleeves through fire-rated partitions or use "repairable" firestop-sealing material. Include specific firestopping requirements of this Section in a schedule developed in the Division 07 Section referenced in paragraph above.

* + 1. Workspace: Install cable trays with enough space to permit access for installing cables.

\*\* NOTE TO SPECIFIER \*\* Retain first two paragraphs below if applicable; these requirements are optional in NEMA VE 2. Retain first paragraph below if systems are mixed. Delete if not required.

* 1. CABLE INSTALLATION
     1. Install cables only when cable tray installation has been completed and inspected.
     2. Tighten cable clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.
     3. On vertical runs, fasten cables to tray every 18 inches (457 mm).
     4. In existing construction, remove inactive or dead cables from cable tray.
     5. Install covers, if required, after installation of cable is completed.
     6. Ground cable trays according to manufacturer's written instructions.

\*\* NOTE TO SPECIFIER \*\* Retain paragraph below for metallic cable trays if grounding, in addition to tray metallic path, is desired. Delete if not required.

* 1. FIELD QUALITY CONTROL
     1. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements. Perform the following field quality-control survey:
        1. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable tray, vibration, 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 tray do not exceed that permitted by NFPA 70. Verify that communication or data-processing circuits are separated from power circuits by barriers.
        3. Verify that there is no intrusion of such items as pipe, hangers, or other equipment that could damage cables.
        4. Remove deposits of dust, 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 re-torque in suspect areas.
        6. Check for missing or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
        7. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable tray. Test cable tray in accordance with NFPA 70B Chapter 18 and verify cable tray is bonded with a total resistance less than 5 ohms.
     2. Report results in writing to engineer of record.
  2. PROTECTION
     1. Protect installed products until completion of project.
        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.
        3. Install temporary protection for cables in open trays to protect exposed cables from falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials until the risk of damage is over.
     2. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION