

SECTION 161xx NON-METALLIC CABLE TRAY POLYESTER, VINYL ESTER

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, tests and services to install complete cable tray systems as shown on the drawings.
- B. Cable tray systems are defined to include, but are not limited to straight sections of [ladder type] [vented bottom type] [solid bottom type] cable trays, bends, tees, elbows, drop-outs, supports and accessories.

1.02 REFERENCES

- A. ANSI/NFPA 70 – National Electrical Code
- B. NEMA FG 1-2002 – Non-Metallic Cable Tray Systems
- C. NEMA VE 2-2002 – Cable Tray Installation Guidelines

1.03 DRAWINGS

- A. The drawings, which constitute a part of these specifications, indicate the general route of the cable tray systems. Data presented on these drawings are as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification, of all dimensions, routing, etc., is directed.
- B. Specifications and drawings are for assistance and guidance, but exact routing, locations, distances and levels will be governed by actual field conditions. Contractor is directed to make field surveys as part of his work prior to submitting system layout drawings.

1.04 SUBMITTALS

- A. Submittal Drawings: Submit drawings of cable tray and accessories including clamps, brackets, hanger rods, splice plate connectors, expansion joint assemblies, and fittings, showing accurately scaled components.
- B. Product Data: Submit manufacturer's data on cable tray including, but not limited to, types, materials, finishes, rung spacings, inside depths and fitting radii. For side rails and rungs, submit cross sectional properties including Section Modulus (S_x) and Moment of Inertia (I_x).

1.05 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of cable trays and fittings of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. NEMA Compliance: Comply with NEMA Standards Publication Number FG-1, "Non-Metallic Cable Tray Systems".
- C. NEC Compliance: Comply with NEC, as applicable to construction and installation of cable tray and cable channel systems (Article 318, NEC).

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver cable tray systems and components carefully to avoid breakage, denting and scoring finishes. Do not install damaged equipment.
- B. Store cable trays and accessories in original cartons and in clean dry space; protect from weather and construction traffic. Wet materials should be unpacked and dried before storage.

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PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with these specifications, cable tray systems shall be as manufactured by Cooper B-Line, Inc. [or engineer approved equal].

2.02 CABLE TRAY SECTIONS AND COMPONENTS

- A. General: Except as otherwise indicated, provide non-metallic cable trays, of types, classes, and sizes indicated; with splice plates, bolts, nuts and washers for connecting units. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards; and with the following additional construction features. Cable tray shall be installed according to the latest revision of NEMA VE 2.
- B. Material and Finish: Straight section structural elements; side rails, rungs and splice plates shall be pultruded from glass fiber reinforced polyester resin, vinyl ester resin or dis-stat.
- C. Pultruded shapes shall be constructed with a surface veil to insure a resin-rich surface and ultraviolet resistance.
- D. Pultruded shapes shall meet ASTM E-84, Class 1 flame rating and self-extinguishing requirements of ASTM D-635.

2.03 TYPE OF TRAY SYSTEM

- A. Ladder Cable Trays shall consist of two longitudinal members (side rails) with transverse members (rungs) mechanically fastened and adhesively bonded to the side rails. Rungs shall be spaced [6] [9] [12] inches on center. Rung spacing in radiused fittings shall be industry standard 9" and measured at the center of the tray's width. Each rung must be capable of supporting a 200 lb. concentrated load at the center of the cable tray with a safety factor of 1.5 (See following rung loading table).
- B. Ventilated Bottom Cable Trays shall consist of two longitudinal members (side rails) with rungs spaced 4" on center.
- C. Solid Bottom Cable Trays shall consist of two longitudinal members (side rails) with a solid sheet over rungs spaced on 12" centers.
- D. Cable tray loading depth shall be [2] [3] [5] inches per NEMA FG 1.
- E. Straight sections shall be supplied in standard [10 foot (3m)] [20 foot (6m)] lengths.
- F. Cable tray inside widths shall be [6] [9] [12] [18] [24] [30] [36] inches or as shown on drawings. Outside width shall not exceed inside by more than a total of 2".
- G. Straight and expansion splice plates will be of "L" shaped lay-in design with an eight-bolt pattern in 5" fill systems and four-bolt pattern in 3" and 2" fill systems. Splice plates shall be furnished with straight sections and fittings.
- H. All fittings must have a minimum radius of [12] [24] [36].
 - I. Molded fittings shall be formed with a minimum 3" tangent following the radius.
- J. Systems with 3 inch loading depth shall have 90-degree and 45-degree molded fittings in 12 inch or 24 inch radius. (Polyester and vinylester only.)
- K. Systems with 5 inch loading depth shall have 90-degree and 45-degree molded fittings in 24 inch or 36 inch radius. (Polyester and vinylester only.)
- L. All other fittings shall be of mitered construction.
- M. Dimension tolerances will be per NEMA FG 1.

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Fiberglass - Recommended Tray Specifications

2.04 LOADING CAPACITIES

A. Cable trays shall meet NEMA class designation: [8C] [12C] [20B] [20C].

Or

A. Cable tray shall be capable of carrying a uniformly distributed load of _____ lbs./ft on a _____ foot support span with a safety factor of 1.5 when supported as a simple span and tested per NEMA VE 1 Section 5.2.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install cable trays as indicated: Installation shall be in accordance with equipment manufacturer's instructions, and with recognized industry practices to ensure that cable tray equipment comply with requirements of NEC and applicable portions of NFPA 70B. Reference NEMA VE 2 for general cable tray installation guidelines.
- B. Coordinate cable tray with other electrical work as necessary to properly integrate installation of cable tray work with other work.
- C. Provide sufficient space encompassing cable trays to permit access for installing and maintaining cables.
- D. Cable tray fitting supports shall be located such that they meet the strength requirements of straight sections. Install fitting supports per NEMA VE 2 guidelines, or in accordance with manufacturer's instructions.

3.02 TESTING

- A. Upon request manufacturer shall provide test reports witnessed by an independent testing laboratory of the "worst case" loading conditions outlined in this specification and performed in accordance with the latest revision of NEMA FG 1.

SECTION 161xx

LOW SMOKE, ZERO HALOGEN, NON-METALLIC CABLE TRAY

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, tests and services to install complete cable tray systems as shown on the drawings.
- B. Cable tray systems are defined to include, but are not limited to straight sections of ladder type cable trays, bends, tees, elbows, drop-outs, supports and accessories.

1.02 REFERENCES

- A. ANSI/NFPA 70 – National Electrical Code
- B. NEMA FG 1-2002 – Non-Metallic Cable Tray Systems
- C. NEMA VE 2-2002 – Cable Tray Installation Guidelines

1.03 DRAWINGS

- A. The drawings, which constitute a part of these specifications, indicate the general route of the cable tray systems. Data presented on these drawings are as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification, of all dimensions, routing, etc., is directed.
- B. Specifications and drawings are for assistance and guidance, but exact routing, locations, distances and levels will be governed by actual field conditions. Contractor is directed to make field surveys as part of his work prior to submitting system layout drawings.

1.04 SUBMITTALS

- A. Submittal Drawings: Submit drawings of cable tray and accessories including clamps, brackets, hanger rods, splice plate connectors, expansion joint assemblies, and fittings, showing accurately scaled components.
- B. Product Data: Submit manufacturer's data on cable tray including, but not limited to, types, materials, finishes, rung spacings, inside depths and fitting radii. For side rails and rungs, submit cross sectional properties including Section Modulus (Sx) and Moment of Inertia (Ix).

1.05 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of cable trays and fittings of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. NEMA Compliance: Comply with NEMA Standards Publication Number FG-1, "Non-Metallic Cable Tray Systems".
- C. NEC Compliance: Comply with NEC, as applicable to construction and installation of cable tray and cable channel systems (Article 392, NEC).

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Fiberglass - Recommended Tray Specifications

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver cable tray systems and components carefully to avoid breakage, denting and scoring finishes. Do not install damaged equipment.
- B. Store cable trays and accessories in original cartons and in clean dry space; protect from weather and construction traffic. Wet materials should be unpacked and dried before storage.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with these specifications, cable tray systems shall be part number **24FT09-12-240** as manufactured by Cooper B-Line, Inc. [or engineer approved equal].

2.02 CABLE TRAY SECTIONS AND COMPONENTS

- A. General: Except as otherwise indicated, provide non-metallic cable trays, of types, classes, and sizes indicated; with splice plates, bolts, nuts and washers for connecting units. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards; and with the following additional construction features. Cable tray shall be installed according to the latest revision of NEMA VE 2.
- B. Material and Finish: Straight section structural elements; side rails, rungs and splice plates shall be pultruded from glass fiber reinforced zero halogen resin.
- C. Pultruded shapes shall be constructed with a surface veil to insure a resin-rich surface and ultraviolet resistance.
- D. Pultruded shapes shall meet the following criteria shown in Table 1:

Table 1

<u>Test Performed</u>	<u>Specified Requirement</u>
Flexural Strength	25,000 psi, Min.
Flexural Modulus	1,000,000 psi, Min.
Tensile Strength	17,000 psi, Min.
Tensile Modulus	900,000 psi, Min.
Impact Strength	25 ft-lb./in., Min.
Dielectric Strength	170 volts/mil, Min.
Arc Resistance	180 seconds, Min.
Water Absorption	0.2%, Max.
Thermal Expansion	0.000007 in./in./°F., Max.
Flame Spread Index	60, Max.
Flame Resistance	UL 94 V-0, Min.
Tracking Resistance	600 minutes, Min. at 2500V
Specific Optical	200 Max. within 4 minutes
Smoke Density	after start of test.

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SMOKE TOXICITY

<u>Gases</u>	<u>Maximum Quantities</u>
Hydrogen Chloride	10 ppm
Hydrogen Bromide	10 ppm
Hydrogen Cyanide	10 ppm
Hydrogen Sulfide	10 ppm
Vinyl Chloride	10 ppm
Ammonia	500 ppm
Aldehydes	30 ppm
Oxides of Nitrogen	100 ppm
Carbon Dioxide	15,000 ppm
Carbon Monoxide	1,000 ppm

Fiberglass pultruded shapes are manufactured per Creative Pultrusions Inc. Fiberglass Transportation Products-130 specifications.

2.03 TYPE OF TRAY SYSTEM

- A.** Ladder Cable Trays shall consist of two longitudinal members (side rails) with transverse members (rungs) mechanically fastened and adhesively bonded to the side rails. Ladder Cable Tray shall be Cooper B-Line part number 24FT09-12-240 [or engineered approved equal]. Rung spacing in radiused fittings shall be industry standard 9" and measured at the center of the tray's width.
- B.** Straight and expansion splice plates will be of "L" shaped lay-in design with a four-bolt pattern. Splice plates shall be furnished with straight sections and fittings.
- C.** All fittings must have a minimum radius of [12] [24] [36].
- D.** All fittings shall be of mitered construction.
- E.** Dimension tolerances will be per NEMA FG 1.

2.04 LOADING CAPACITIES

- A.** Cable tray shall be capable of carrying a uniformly distributed load of _____ lbs./ft on a _____-foot support span with a safety factor of 1.5 when supported as a simple span and tested per NEMA VE 1 Section 5.2.

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PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install cable trays as indicated: Installation shall be in accordance with equipment manufacturer's instructions, and with recognized industry practices to ensure that cable tray equipment comply with requirements of NEC and applicable portions of NFPA 70B. Reference NEMA VE 2 for general cable tray installation guidelines.
- B. Coordinate cable tray with other electrical work as necessary to properly integrate installation of cable tray work with other work.
- C. Provide sufficient space encompassing cable trays to permit access for installing and maintaining cables.
- D. Cable tray fitting supports shall be located such that they meet the strength requirements of straight sections. Install fitting supports per NEMA VE 2 guidelines, or in accordance with manufacturer's instructions.

3.02 TESTING

- A. Upon request manufacturer shall provide test reports witnessed by an independent testing laboratory of the "worst case" loading conditions outlined in this specification and performed in accordance with the latest revision of NEMA FG 1.