



# TOUGHTray

- Specification -

(CTI-TT-PS-001-A10)



### SECTION CTI-TT-PS-001

## CABLE LADDER TRAYS FOR ELECTRICAL INFRASTRUCTURE SYSTEMS

This section specifies aluminum cable ladder tray in accordance with NEMA VE 1

### 1.0 GENERAL

#### 1.1 SUMMARY

- A. TOUGHTray cable ladder tray forms a cable management mechanical support system, that is to safely secure, protect and support the cables as specified within the electrical infrastructure system.
- B. To warranty the performance of the TOUGHTray cable ladder tray mechanical support system and the safety of the electrical infrastructure cables within the tray; this specification must be followed. Deviation to this specification is not permitted without owner or owner representative prior approval.

#### 1.2 DEFINITIONS

- A. TOUGHTray cable ladder tray systems are to include but are not limited to; straight sections, fittings, horizontal and vertical bends, tees, crosses, covers, dropouts, dividers, links, connectors, clamps, brackets, supports, fixings, hardware and accessories to form an electrically continuous cable management system.
- B. TOUGHTray cable ladder tray systems must be manufactured from materials as listed in Section 2.2-A of this specification.
- C. TOUGHTray cable ladder tray systems shall be furnished in the material finishes listed in Section 2.2-B of this specification.

#### 1.3 CONSIDERATIONS

- A. TOUGHTray straight sections shall be constructed of TOUGHRail and TOUGHRung being I-Strut profile with the TOUGHConnect System and manufacturer pre-installed TOUGHLink connectors manufactured from the materials and finishes as listed within this specification.
- B. TOUGHRail side rail sections shall be I-Strut profile incorporating upper and lower longitudinal strut channel with TOUGHConnect System punched holes along the longitudinal length.
- C. TOUGHRung shall be I-Strut profile and provide two flat 1" width faces for cable support and two open 1" width faces for installation of channel nuts along the entire longitudinal length of the rung.
- D. TOUGHFittings shall be modular type, constructed of side-rail incorporating the TOUGHConnect System and TOUGHRung supplied with INTEGRAL-Link connectors.
- E. TOUGHConnect System shall be incorporated into TOUGHTray straight sections and fittings to provide modularity in the attachment of TOUGHLinks, TOUGHRungs and tray system accessories.



## 2.0 PRODUCTS

### 2.1 TOUGHTRAY CABLE LADDER TRAY SYSTEM

#### A. TOUGHTray Construction

Cable ladder tray of the types and sizes indicated, shall be constructed of two (2) longitudinal members (side-rails) with transversal members (rungs). Link connectors shall be supplied manufacturer pre-installed at each end of straight sections and integral to fittings. Rungs shall be equally spaced measured at the center of the tray width. An individual rung must be capable of supporting a 300lbs concentrated load.

#### B. TOUGHTray Straight Sections

Shall be modular type constructed from aluminum alloy TOUGHRail longitudinal side-rails being engineered I-Strut profile with incorporated strut channel profiles at the top and bottom running the entire longitudinal length with TOUGHConnect System holes along the entire longitudinal length for the attachment of TOUGHRung and TOUGHLink connectors. TOUGH-Link connectors shall be supplied manufacturer pre-installed to each straight section.

#### C. TOUGHTray Fittings

Shall be modular type constructed from aluminum alloy side-rail incorporating the TOUGHConnect System and TOUGHRung supplied with INTEGRAL-Link connectors incorporated into the fitting side-rail.

1. Fitting minimum bending radius shall be as listed in Section 2.1, H-5 of this specification.
2. INTEGRAL-Link connectors at each end of the fitting side rails.
3. Be modular type, interchangeable, allowing angle fittings to be linked together.

#### D. TOUGHTray Rungs

Rungs shall be constructed from aluminum alloy modular TOUGHRung engineered I-Strut profile. The rung shall provide a 1.0" width flat surface on two (2) faces and two (2) open faces for the installation of channel nuts along the entire longitudinal length.

#### E. TOUGHTray Links

The connection of straight sections and fittings shall use link connectors. TOUGHLinks shall be supplied pre-installed to straight sections and INTEGRAL-Links shall be supplied incorporated into the fittings side-rail. Links shall incorporate square holes for the captivation of connecting hardware.

1. Electrical resistance measured across the link is not to exceed 0.00033ohms.
2. TOUGHLink connector shall be tested to NEMA VE 1 design load classifications.
3. Links shall be supplied manufacturer pre-installed to straight sections, integral to each fitting.
4. Links shall be connected using manufacturer supplied LINKBolt with serrated flanged lock nuts.



### F. TOUGHTray Expansion Joints

Expansion Cartridge shall be used to provide mechanical connection at every expansion joint within the cable ladder tray system. Cartridge shall install within the pre-installed TOUGHLink connectors expansion cartridge keyholes. Expansion joints shall be designed in accordance with:

1. [CTI-S65001] technical data sheet for expansion gap setting.
2. [CTI-S52004 and CTI-S52005] installation instruction for expansion-link connector.
3. [CTI-TSS-TT-S0001] recommended expansion-link locations.
4. [NEMA VE 2, 3.4.2] expansion joints.

### G. TOUGHTray Hold Down Clamps and Expansion Guides

The cable ladder tray system shall be anchored to supports by hold-down clamps and secured to supports by expansion guides as recommended by manufacturer. Hold-down clamps shall anchor cable ladder tray to supports. Expansion guides shall secure cable ladder tray to supports while allowing longitudinal movement of the tray.

### H. TOUGHTray cable ladder tray shall be manufactured to the following nominal dimensions:

1. Straight Lengths: [10] [12] [20] feet / [3.048] [3.658] [6.096] meters
2. External Heights: [4.50] [6.50] inches / [114.0] [165.0] mm
3. Internal Depths: [3.22] [5.22] inches / [82.0] [132.5] mm
4. Internal Widths: [6] [9] [12] [18] [24] [30] [36] inches / [150] [225] [300] [450] [600] [750] [900] mm
5. Fitting Radius: [12] [18] [24] [30] [36] inches / [300] [450] [600] [750] [900] mm
6. Fitting Angles: [30] [45] [60] [75] [90] [105] [120] [135] [150] [165] [180] degree
7. Fitting Tangent: [0.00] inches maximum / [0.00] mm maximum

### I. TOUGHTray Supports

Cable ladder tray system structural supports shall be designed in compliance with and shall follow manufacturer recommendations TOUGH Support Savings, Document # CTI-TSS-TT-S0001.

### J. Fit, Function and Compatibility

TOUGHTray accessories and miscellaneous items necessary to constitute a complete and continuously grounded cable management system; must be supplied by the same manufacturer. All cable ladder tray accessories must be compatible with the material or finish of the cable ladder tray. Manufacturer recommendations shall be followed.

### K. UL Classified

TOUGHTray shall be UL Classified for use as a EGC (Equipment Grounding Conductor) in compliance to NEC Article 392.7 Grounding. The cable ladder tray manufacturers recommendations must be followed.



## 2.2 MATERIALS AND MATERIAL FINISHES

### A. MATERIALS

Mesh cable tray shall be manufactured from the following listed materials:

1. [AA6063-T6] Aluminum Extrusions
2. [AA6005-T6] Aluminum Extrusions
3. [AA5052-H32] Aluminum Sheet and Strip
4. [ASTM A240] Stainless Steel Plate
5. [ASTM F593] Stainless Steel Hardware
6. [ASTM A36] Plain Steel Plate

### B. MATERIAL FINISHES

Cable ladder tray shall be manufactured to the following listed material finishes:

1. [AL] = Aluminum [AA6063-T6] / [AA5052-H32]
2. [AN] = Anodized [ASTM B580]
3. [ZN] = Zinc Geomet [ASTM F1136 / F1136M]
4. [S4] = Stainless Steel 304 [ASTM F593 Type 304]
5. [S6] = Stainless Steel 316 [ASTM F593 Type 316]
6. [HD] = Hot Dip Galvanized [ASTM A123]

## 2.3 NEMA VE 1 CLASS DESIGNATIONS

NEMA VE 1 Class Designation, is support span in feet (meters) plus the working load designation in pounds per foot (kilograms per meter).

### A. Design Span Designation:

[10] = [ 10 feet (3.048 meters) ]

[12] = [ 12 feet (3.658 meters) ]

[20] = [ 20 feet (6.096 meters) ]

[24] = [ 24 feet (7.316 meters) ]

[30] = [ 30 feet (9.144 meters) ]

### B. Working Load Designation:

[A] = [ 50 pounds per foot (75 kilograms per meter) ]

[B] = [ 75 pounds per foot (112 kilograms per meter) ]

[C] = [ 100 pounds per foot (149 kilograms per meter) ]

### C. Class Designation Example:

Class 12C applies to a cable ladder tray required to span [12 feet] while supporting a uniformly distributed load of [100 pounds per foot].

### D. Testing and Factor of Safety:

The cable ladder tray must be tested to the NEMA VE 1 class designation in compliance with the prescribed test method. Test loads and published design loads must include a 1.5 factor of safety.