

EPIP Aug 2016

Critical Applications
Wire Management & Connectivity

Power and productivity
for a better world™

Electrification Products – Installation Products (EPIP)
Product Families

Wire Management & Connectivity (WMC)

Ty-Rap



Color-Keyed



furse

ABB



Cable Protection, Explosion Proof and Lighting (CEL)

Adaptaflex



Harnessflex



EMERGI-LITE



Van Lien



KAUFEL



DTS



KOPEX-Ex



Hazlux



Cable Accessories & Apparatus (CAA)



JOSLYN



elastimold



ABB

Installation Products (EPIP)
Wire Management & Connectivity - WMC

Cable Ties, Wiring Duct, Terminals - TDT



Essential products
Premium cable ties
Metallic cable ties
General cable ties
Wiring duct
Trunking
Ergonomic tools

Preferred brands
Ty-Rap
Ty-Met
Ty-Fast
Catamount
Spec-Kon

Compression Connectivity, Tools



Essential products
Mechanical compression connectors
Tooling

Preferred brands
Blackburn
Color-Keyed
Spec-Kon

Metal framing & cable tray systems - MFC



Essential products
Industrial ladder
Commercial ladder
Basked tray
Tooling (CE marking)
Spring steel fasteners

Preferred brands
T&B Cable Tray
Kindorf
Superstrut

Earthing & lightning protection - ELP



Essential products
Earthing & lightning protection
Furseweld
Training & services

Preferred brands
furse
ABB Hélita
ABB OPR

Boxes & Enclosures B&E



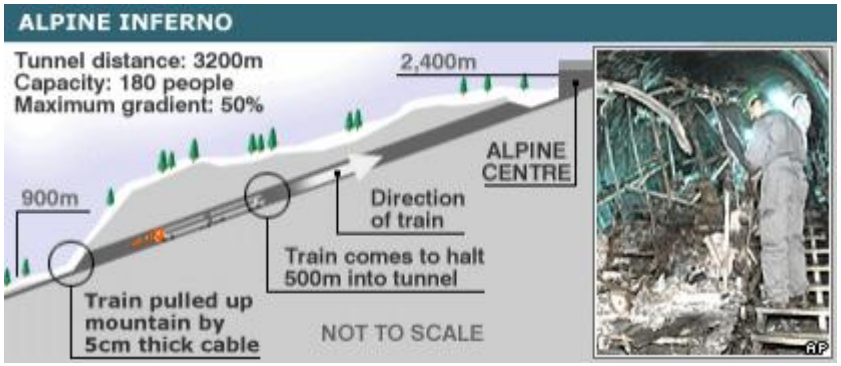
Essential products
Metallic boxes
Non metallic boxes
Floor boxes
Weatherproof

Preferred brands
IBERVILLE
Carlon
Steel City
red•dot

Power and productivity for a better world™

Major Tragedies that occurred to the Railway Industry
Kaprun Disaster - Austria





Kaprun Disaster – 11 Nov 2000

- Fire that occurred in an ascending train in the Tunnel of Gletscherbahn Kaprun, Austria
- Railway has a 3,300 metres of track inside a tunnel where the train will lead to the Alpine Centre
- Electric fan heater broke down at the lower end of the train and caught fire
- The fire melted the plastic pipes carrying hydraulic fluid from the braking system, and the lost of fluid pressure caused the train to halt in the tunnel
- The fire spread and the still-trapped occupants had now lost consciousness due to toxic fumes, and they died of smoke inhalation
- The Alpine centre was also filled with smoke due to the smoke kept ascending the tunnel
- 155 people were killed, many due to smoke inhalation

Major Tragedies that occurred to the Railway Industry
Al Ayyat Disaster - Egypt



Al Ayyat Disaster – 20 Feb 2002

- A cooking gas cylinder exploded and created a fire which spread as the train ran
- 7 carriages were burnt to the ground
- Survivors described their ordeal of having to push and throw each other out of the windows as they were suffocating from the smoke
- Another survivor said that he was so overwhelmed by the smoke that he jump out of the window of the moving train.
- More than 373 people were killed, many were killed when they jumped off the moving train and tried to escape.

Major Tragedies that occurred to the Railway Industry
L'Enfant Plaza Metro Station- USA



L'Enfant Plaza Metro Station– 12 Jan 2015

- A Virginia bound train was in the tunnel when it stopped for unknown reasons
- The train's cars begin to be filled with thick, black smoke with many people trapped inside
- Visibility was poor and passengers could barely breathe
- 1 person died and 84 were hospitalized due to the smoke.

Major Tragedies that occurred to the Railway Industry
Daegu Subway – South Korea



Daegu Subway Tragedy – 18 Feb 2003

- Arsonist set fire to a train stopped at the Jungangno Station of the Deagu Metropolitan Subway in Daegu, South Korea
- Within 2 minutes of the Arsonist lighting up, the fire quickly spread to all the 6 cars. The vinyl and plastic materials in the seat cushions and strap handles, heavy plastic matting on the floors produced thick smoke as it burned.
- Many victims became disoriented in the dark, smoke-filled underground station and died of asphyxiation looking for exits
- Toxicity of the smoke slow down fire rescue effort from entering the station for 3 ½ hours.
- A total of 192 people were killed and 151 people injured

Why Are European Train Fire Requirements Changing EN 45545

EN 45545

- Previously each country have their own fire requirements and standards
- European law is changing to improve interoperability
- All of Europe will work to the same fire safety requirements (reaction to fire, fire resistance, fire detection, etc)
- To achieve the highest possible level of safety in trains, the materials and components must meet strict fire protection requirements
- Defines tighter requirements for the fire behavior of materials and components
- In March 2016, EN 45545-2 is mandated by European law following the expiry of the national standards
- Replaces national fire tests for railway vehicles



How Does EN 45545 relates to You and I
Standards of Railway in Asia

Country	Standards Applicable
Singapore	Standard for Fire Safety in Rapid Transit Systems 2012 Editions (Following Closely to the British Standards)
Japan	Technical Regulatory Standards on Japanese Railways (Ministry of Land, Infrastructure, Transport and Tourism) – JRS & JIS
India	Manual of Specifications and Standards for the Ministry of Railways (Railway Board Government of India) – reference standards from EN 45545
Korea	Korea Land, Transport and Maritime Affairs : Guidelines on Safety Standards for rail vehicles – reference from EN 45545 and also ISO 9705, ISO 5658-2 and ISO 4589-2 for fire tests
China	TB/T 3138-2006: Railway Industry Standard of The People's Republic of China, reference standards from UIC 564-2-2000 and NF F16-101-1988

EN 45545
Part Requirements

Part 1 General

***Part 2* Requirements for fire behaviour of materials and components**

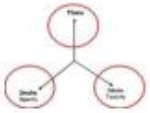


Minimise the possibility of ignition of materials installed on railway vehicles due to accidents or vandalism

Part 3 Fire resistance requirements for fire barriers

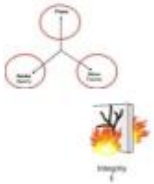


Part 4 Fire safety requirements for rolling stock design



Part 5 Fire safety requirements for electrical equipment

Part 6 Fire control and management systems



Part 7 Fire safety requirements for flammable liquid and flammable gas installations

EN 45545-1
Principal Terms and Definitions

EN 45545-1

- Contains the principal terms and definitions
- General regulations governing the classification of rail vehicles in operational and design categories
- Fire safety objectives

Hazard Levels (HL) Matrix Requirement				
Operation Categories	Class N: Standard Vehicles	Class A: Vehicles forming part of an automatic train and having no emergency trained staff on board	Class D: Double Decked Vehicles	Class S: Sleeping / Couchette Vehicles
OC 1	HL1	HL1	HL1	HL2
OC 2	HL2	HL2	HL2	HL2
OC 3	HL2	HL2	HL2	HL3
OC 4	HL3	HL3	HL3	HL3

* Operation Categories:
1- No underground lines
2- Regular use of tunnels, fast evacuation possible
3- Regular use of tunnels, slow evacuation possible
4- Regular use of tunnels, no evacuation possible

* Hazard level:
3 Hazard level (HL1 to HL3), HL3 is the highest level and thus makes the highest demands of the materials used

EN 45545-1
Operation Categories

Operation Categories

OC 1 : Vehicles for operation **on infrastructure** (tunnel or elevated structures < 1km in length) where railway vehicles may be stopped with minimum delay, and where a safe area can always be reached immediately.

OC 2 : Vehicles for operation **on underground sections**, tunnels and/or elevated structures (< 5 km in length), with side evacuation available and where there are stations or rescue stations that offer a place of safety to passengers, reachable within a short running time 4min (min speed 80 km/h).

OC 3: Vehicles for operation **on underground sections**, tunnels and/or elevated structures (> 5 km in length), with side evacuation available and where there are stations or rescue stations that offer a place of safety to passengers, reachable within a long running time 15min (min speed 80 km/h).

OC 4: Vehicles for operation **on underground sections**, tunnels and/or elevated structures (< 5 km in length), without side evacuation available and where there are stations or rescue stations that offer a place of safety to passengers, reachable within a short running time 4min (min speed 80 km/h).





EN 45545-2
Product Requirements Classification

EN 45545-2

- Describes the requirements for the fire behavior of materials and components
- Classifies all material on board in different groups which have to fulfill specific “Requirement Sets” including several test methods
- ABB cable tie, wiring accessories, wiring duct would fall under the R22 and R23 product requirement sets, depending on their installation location
  - R22 requirement – Supply line system and high power devices - Interior
  - R23 requirement – Supply line system devices – Exterior, – Supply line system and high power devices - Exterior
- 3 Tests used to establish product performance versus these product requirements
  - Oxygen Index to EN ISO 4589-2
  - Flue Gas Density (Smoke Opacity Density) to EN ISO 5659-2
  - Smoke Toxicity to NF X70-100

Specification for R22		HL1	HL2	HL3
Oxygen Index	(Min)	28%	28%	32%
Smoke Density	(Max)	600	300	150
Smoke Gas Toxicity	(Max)	1.2	0.9	0.75

Specification for R23		HL1	HL2	HL3
Oxygen Index	(Min)	28%	28%	32%
Smoke Density	(Max)	-	600	300
Smoke Gas Toxicity	(Max)	-	1.8	1.5

Wire duct
Brand ABB

Stock in Singapore



Halogen free for enclosed areas (Low smoke opacity & toxicity)

- Major competition: Phoenix contact, Iboco
- Applications: Where people are in proximity: Rail, Construction (Cinemas, Airports, et.)
- Height : 17 - 30 - 40 - 60 - 80 - 100 mm
- Width : 15 - 25 - 40 - 60 - 80 - 100 - 120 mm
- Length : 2 meters
- Slots : Narrow (4 mm), Wide (8 mm)
- Color : Grey RAL 7035
- Raw material: Halogen-Free material, RoHS compliant



narrow slots



wide slots

Wire duct
Brand ABB

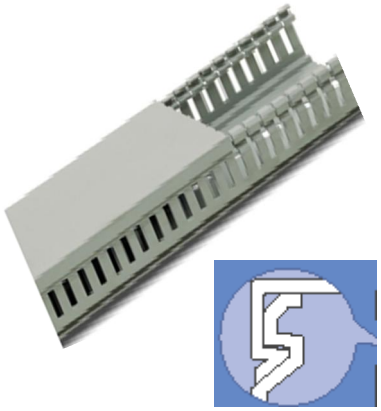
Stock in Singapore



Different Types of Wire Duct Available:

- § **Thermoplastic (PVC) for general purpose applications**
- § **Halogen free for enclosed areas (low smoke opacity & toxicity)**
- § **Flexible wire duct**
- § **Wire duct with circular knockout**











Wire duct - EN 45545-2
Comparison Chart

Brand	Halogen Free Wire Duct	EN 45545-2 Compliance	Hazard Level
ABB	✓	✓	HL3
Competitor PH	✓	✗	✗
Competitor C	✓	✓	Not Stated
Competitor P	✓	✓	HL2
Competitor I	✓	✗	✗

Cable Ties

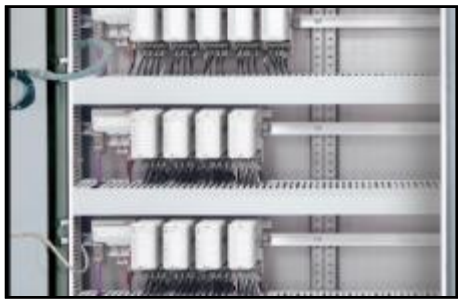
Brand: Ty-rap or Spec kon

Ty-Rap®
Ty-Met™

Spec-Kon®



- § **Ty Rap** | OEM applications, inside and outside
- § **Detectable cable ties** | food & beverage industry
- § **Special material ties** | chemical industry, high temperature & low smoke requirements, automotives
- § **Ty-Met stainless steel ties** | extreme robust for harsh environments
- § **Spec kon |** low end market



OEM Panel Makers



Petrochem



Automotive / Transportation

Cable Ties
Quick guide

Brand	Product Series	Product Specs & Information	Certifications / Standards
Ty Rap		• **Extensive choice of materials** • Poly 6.6 (standard, UV-resistant, heat stabilised, flame retardant) • Poly 4.6 (extra high heat) • Poly 12 (chemical, high durability)	
Deltec		• Acetal (high uv resistance and durability – 20yrs) • Solar industry	
Spec kon		• Poly 6.6 standard • General applications • Panel building industry • Inventory stock in sg	
Ty Rap	TY**RW Series	• Poly 6.6 (standard, UV-resistant, heat stabilised, flame retardant)	EN 45545-2

Cable Ties - EN 45545-2
Comparison Chart

Ty-Rap

Brand	Cable Ties Type	R22 Requirement	R23 Requirement
ABB	UV- Resistant	HL2	HL2
	Flame Retardant	HL3	HL3
Competitor P	UV- Resistant	HL1	HL2
	Flame Retardant	HL2	HL3
Competitor K	UV- Resistant	Nil	Nil
	Flame Retardant	Nil	Nil
Competitor H	UV- Resistant	HL2	HL2
	Flame Retardant	HL2	HL3

ABB

Detectable Ty-Rap – Unilever Food Solutions

With significant costs and penalties for non-compliance, food processors rely more than ever before, on the latest quality control methodologies and equipment to keep the food supply safe. Detectable cable ties provide a cost-effective solution for food processors to improve consumer safety with ease





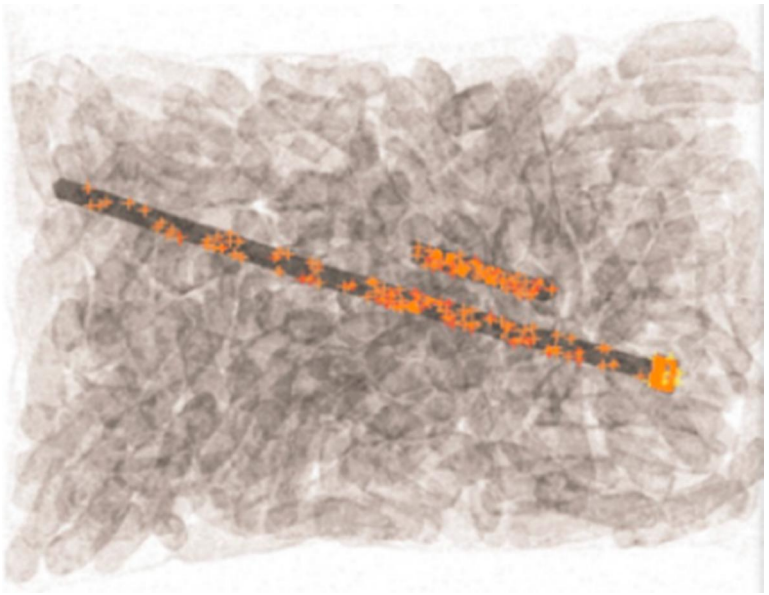
Customer concern

Contamination @ food production floor

1. **Sampling test on chemical contaminants**
2. **Visual inspection**
3. **Metal detectors**

T&B Solutions

1. **Made of polymeric material which can be detected by metal detectors.**
2. **Bright blue colored for easy visual detection.**
3. **In liquid processing environment, buoyant polypropylene version is used.**



Wire Management & Connectivity - WMC
Metal Framing & Cable Tray Systems - MFC

Cable Tray Systems

T&B Cable Tray



Helix



ABB
Wire Basket Tray



QuickTurn



Metal Framing System

Superstrut



Kindorf



Cable Tray Systems
Cable Tray – Introduction

Cable Tray

- A unit or assembly of units or sections and associated fittings that form a rigid structural system used to support cables and raceways
- As a Support system for cables
  - Power
  - Distribution
  - Instrumentation
  - Communication
- Used in both indoor and outdoor applications



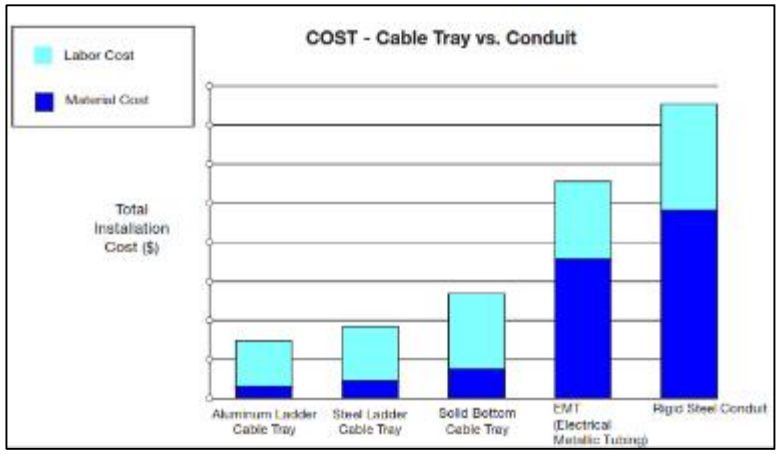
Cable Tray Systems
Why use Cable Tray?

Advantage of Cable Tray

1. Material cost savings
   - § Cost savings up to 60%
2. Installation cost savings
   - § Much easier to install than conduit
3. Engineering cost savings
   - § Design changes can be made quickly
4. Future capacity
   - § Room for growth in cable load
5. Flexibility
   - § Additional cables can be added with ease







Cable Tray Systems
Cable Tray – Selection Process

Selection Process

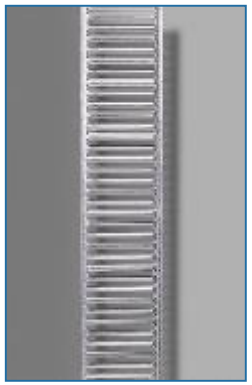
1. Select Material and Finishing
2. Select Tray Load Class
3. Deflection Consideration
4. Select Tray Type
5. Select Tray Size
6. Select the Fittings



T&B Cable Tray Systems
Product Offering

Available Materials & Finishing





Materials

- Aluminum
- Steel
- Stainless steel
- Non-Metallic – Polyester or Vinylester Resin Systems

Finishing

- Electrogalvanized Coatings
- Pre-galvanized
- Hot-dip-galvanized
- Epoxy coated
- PVC coated



Cable Tray Systems
Cable Tray – NEMA Classifications

NEMA Classifications

- Key Cable Tray Standards in the Market
- Specifies requirements designed for use in accordance with NEC
- Established to simplify and standardize the specification of Cable Tray
- Classifications is based:
  - On working load (the total weight of the cables)
  - Support Span (Distance between the Supports)
- Cable Load/Working Load – Total Weight of the cables to be placed in the tray.
- Support Span is the distance between the supports.

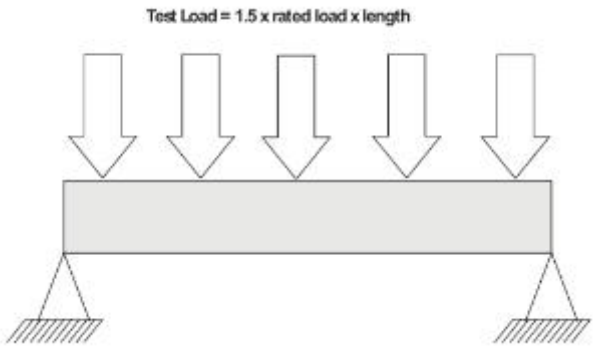
NEMA CLASS	SUPPORT SPAN (feet/meters)	LOAD (lbs./ft.)/(kg/m)
5AA	5/1.5	25/37
5A	5/1.5	50/74
8AA	8/2.4	25/37
8A	8/2.4	50/74
8B	8/2.4	75/112
8C	8/2.4	100/149
10AA	10/3.0	25/37
10A	10/3.0	50/74
12AA	12/3.7	25/37
12A	12/3.7	50/74
12B	12/3.7	75/112
12C	12/3.7	100/149
16A	16/4.9	50/74
16B	16/4.9	75/112
20AA	20/6.0	25/37
20A	20/6.0	50/74
20B	20/6.0	75/112
20C	20/6.0	100/149

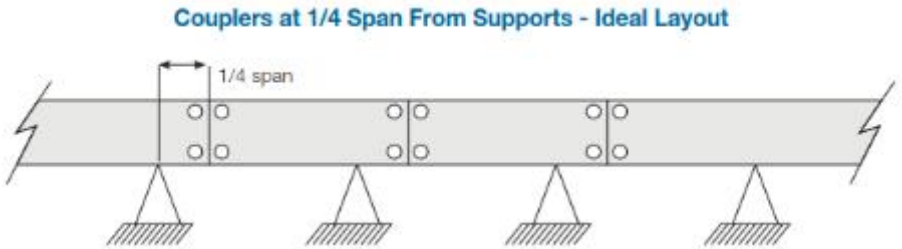


T&B Cable Tray Systems
NEMA Load Test - Deflection Consideration

Deflection Consideration – Based on NEMA Load Test

- NEMA load test is a simple beam, uniformly distributed load test
- Selected because it was easiest to test
- Test Acceptance Criteria = Ability to support 150% of the rated load





Cable Tray Systems
Tray Type Selection

Tray Selections

- Ladder Type
- Ventilated Type
- Solid Bottom Type
- Perforated Type
- Channel Tray
- Ladder Tray most often used because of its cost-effectiveness



Cable Tray Systems
Application

Application

- T&B Cable Ladder
  - Industrial Applications
  - Heavy Duty
- T&B Perforated Cable Tray
  - Commercial Applications
  - Mostly used for instrumentation & Telecommunication in industrial applications
- T&B Channel Tray
  - Used for Control / Instrumentations/ Telecom and Data Cables









T&B Cable Tray Systems
Applications

Indoor Applications





Outdoor Applications





Cable Tray Systems
Tray Size Selection

Tray Size Selections

- Width or Height of a cable tray is a function of the number, size, spacing and weight of the cables in the tray
- Important to remember that the load rating does not change as the width increases as ratings is based on working load / support span (lbs/ft)
- To support more load, choose cable tray with a deeper side rail height
- Available Nominal Widths
  - 6,9,12,18,24,30,26,42 inches
- Available Nominal Heights
  - 3-5/8,4,5,6 and 7 inches

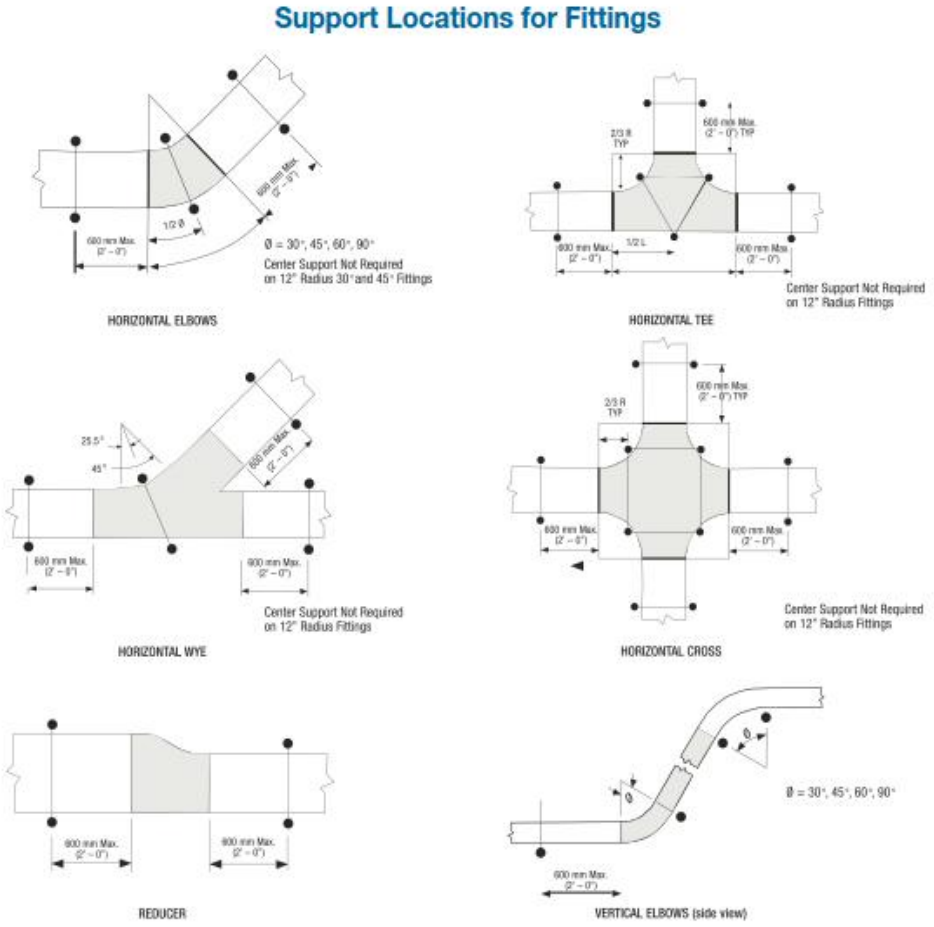


T&B Cable Tray Systems
Different Fittings Available

Different Fittings

Fittings are not subjected to NEMA load ratings

- HB - Horizontal Bend
- HT - Horizontal Tee
- HX - Horizontal Cross
- VI - Vertical Inside Bend
- VO - Vertical Outside Bend
- VTD - Vertical Tee Down
- VTU - Vertical Tee Up
- HYR - Horizontal Wye Right
- HYL - Horizontal Wye Left
- RT - Reducing Tee
- ET - Horizontal Expanding Tee
- EX - Horizontal Expand Cross
- HLR - Horizontal Left Reducer
- HRR - Horizontal Right Reducer
- HSR - Horizontal Straight Reducer



T&B Cable Tray Systems
Electrical Grounding Capacity

Electrical Grounding Capacity

- Based on NEC Standard, cable tray can be used as an equipment grounding conductor
- Must meet metal area requirements for cable trays used as equipment grounding conductors table
- All T&B standard cable trays are UL classified as per NEC Table 392-7 based on their cross sectional area

NEC TABLE 392.7 (B)

Metal Area Requirements for Cable Trays

Used as Equipment Grounding Conductors

Maximum Fuse Ampere Rating, Circuit Breaker Ampere Trip Setting, or Circuit Breaker Protective Relay Ampere Trip Setting for Ground Fault Protection of any Cable Circuit in the Cable Tray System	Minimum Cross-Sectional Area of Metal* In Square Inches	
	Steel Cable Trays	Aluminum Cable Trays
60	0.20	0.20
100	0.40	0.20
200	0.70	0.20
400	1.00	0.40
600	1.50**	0.40
1000	–	0.60
1200	–	1.00
1600	–	1.50
2000	–	2.00**

For SI units: 1 in^2 = 645 mm^2.

T&B Cable Tray Systems
Agency Listings & Ratings









CSA INTERNATIONAL

Certificate of Compliance

Certificate: 1001279 (LR 14201-44) **Master Contract:** 163305

Project: 2146700 **Date Issued:** 2009/03/16

Issued to: **Thomas & Betts Corporation**
8155 T&B Blvd
Memphis, TN 38125
USA
Attention: Pierre Aubin

The products listed below are eligible to bear the CSA Mark shown

Issued by: Ioan Goga, Eng.

Authorized by: Helene Vaillancourt, Operations Manager

PRODUCTS
CLASS 4681 01 - WIREWAYS AND BUSWAYS - Cabletroughs

ONLINE CERTIFICATIONS DIRECTORY

CYNW.E167525
Cable Trays

Page Bottom

Cable Trays

See General Information for Cable Trays

THOMAS & BETTS CORP E167525
8155 T & B BLVD
MEMPHIS, TN 38125 USA
Last Updated on 2009-05-05

Cable Tray Systems
Brand: T&B Cable Tray

T&B Cable Tray

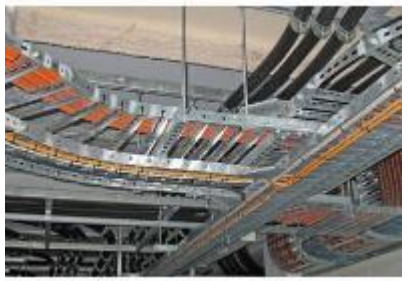
- **Ladder tray | perforated cable tray management systems**
- **Corrosive & harsh environments protection | aluminum & steel range**
- **Easy & quick installation | through extensive range of accessories**
- **Easy to expand & rewire modular system**









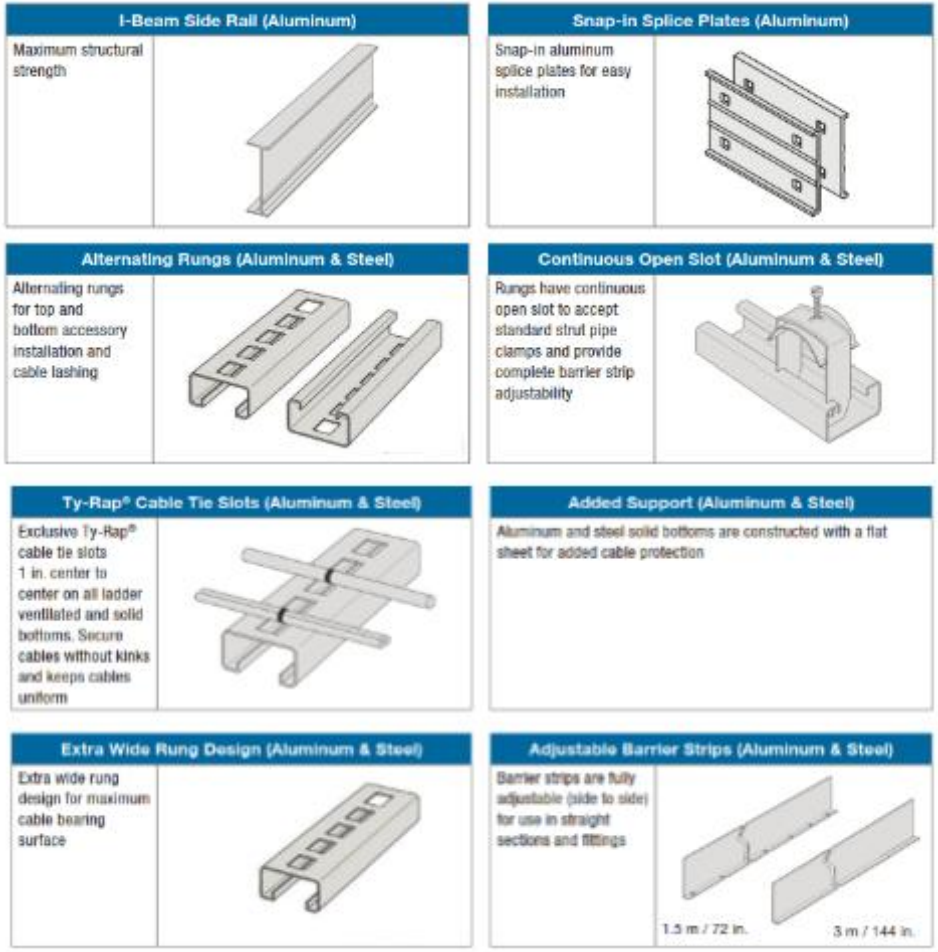


Cable Tray Systems
Brand: T&B Cable Tray



Unique Design Features

- Maximum Structural Strength
- Snap – in Aluminum splice plates
- Alternating rungs
- Rungs have continuous open slot
- Exclusive Ty-Rap Cable ties slots
- Solid bottoms constructed with flat sheet
- Extra wide rung design
- Barrier strips are fully adjustable

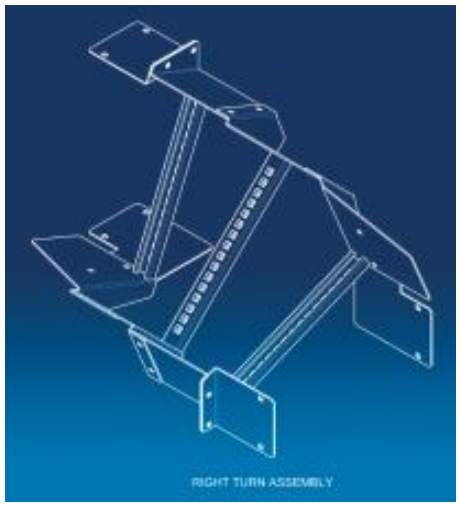


Cable Tray Systems
Helix Cable Tray Fitting

Helix™ Cable Tray Fitting

- **Making transitions from horizontal to vertical cable tray runs easy**
- **Developed specifically for use in confined areas**
- **Eliminates the need to distance cable runs from wall to make transition**
- **Delivered pre-assembled, reduces time spent configuring fittings on site**







Cable Tray Systems
Helix Cable Tray Fitting

Helix™ Cable Tray Fitting

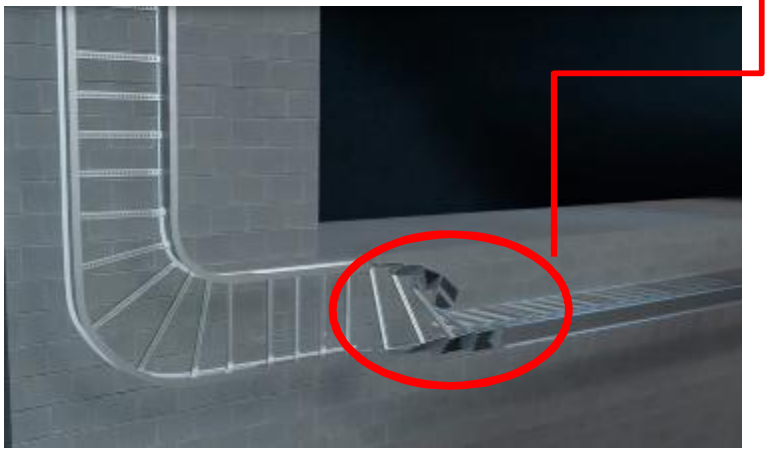


- **Cable need to distance from wall to make transition, taking into consideration the minimum bending radius of the cables**
- **To make this transition**
  - **Cable need to be distanced from wall**
  - **3 Horizontal Bend required**
  - **1 Vertical Bend**

Cable Tray Transition without Helix



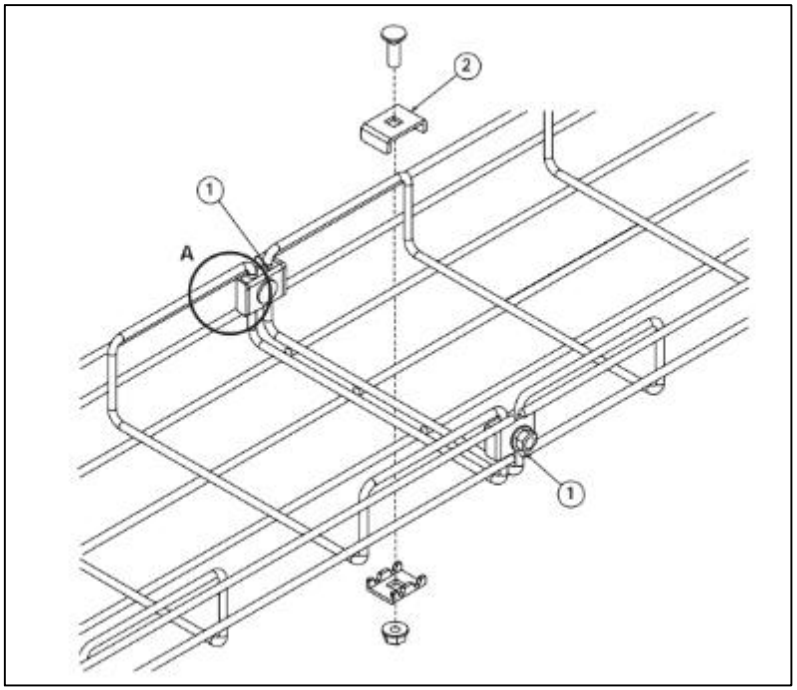
Cable Tray Transition with Helix



Cable Tray Systems
Wire Basket Tray

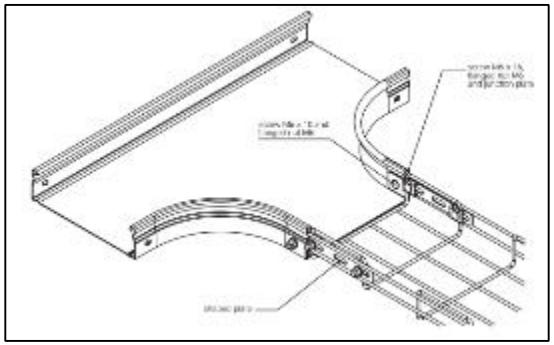
- **Universal joint guarantees electrical continuity**
- **Joint of straight elements with staples ensures that after tightening of the screws, there is earth continuity**
- **Adaptable Tray for an easier installation**

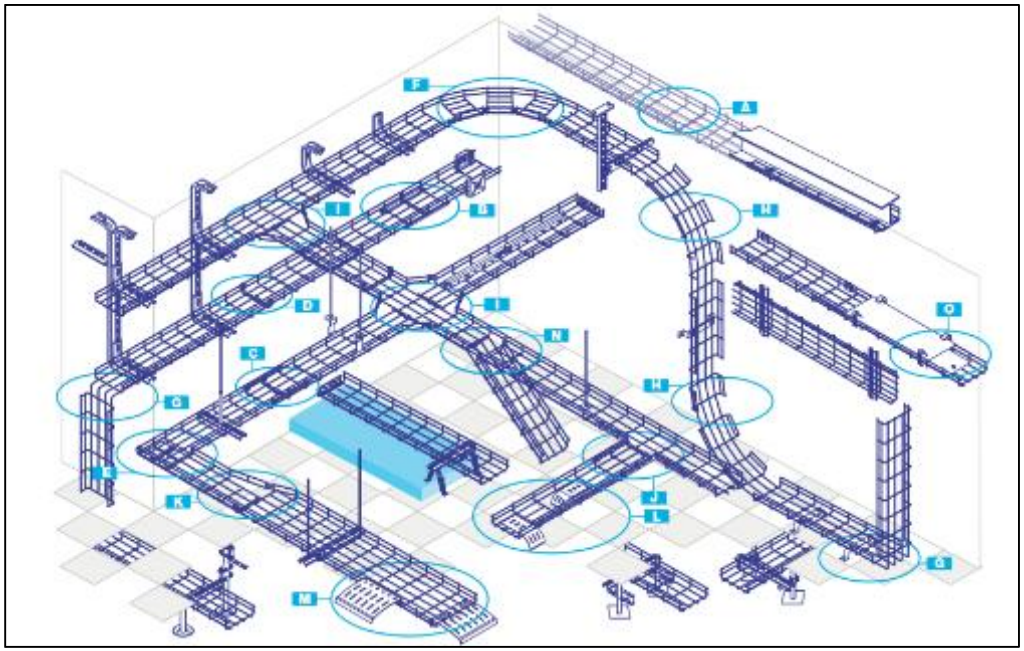




Wire Basket Tray
Possibilities are Unlimited

- **Complicated cable routing layouts become simpler**
- **Possibilities are unlimited**
- **A variety of connections are available**
- **A wide collection of support methods are also available for installation**





Wire Basket Tray
Finishing & Accessories

- **Finishing / Material**
  - **Sendzimir painted Galvanization**
  - **Sendzimir Galvanization**
  - **Hot-Dipped Galvanized**
- **Different Sizes Available**
  - **Depths – 35mm to 75mm**
  - **Widths – 75mm to 400mm**
- **Wide variety of Accessories Available**



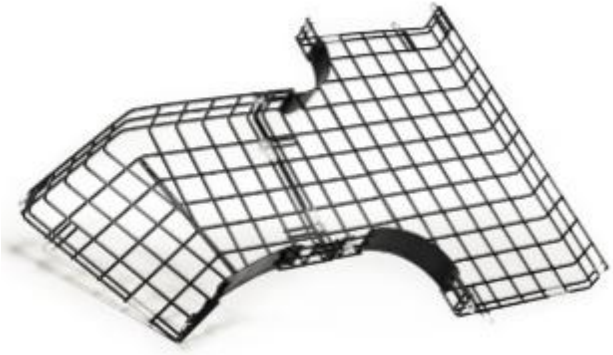


Cable Tray Systems
QuickTurn

QuickTurn™

- **Basket Tray System with Prefab Fittings**
- **Save time and money**
- **Reduce installation time by eliminating the need for cutting or bending**
- **Require only one tool for installation**
- **UL Classified**
- **NEC compliant with no bonding jumpers required**
- **Rugged steel construction with powder coat or hot-dip galvanized finish**





QuickTurn
Fittings, Mounting Supports and Hardware Accessories

QuickTurn™

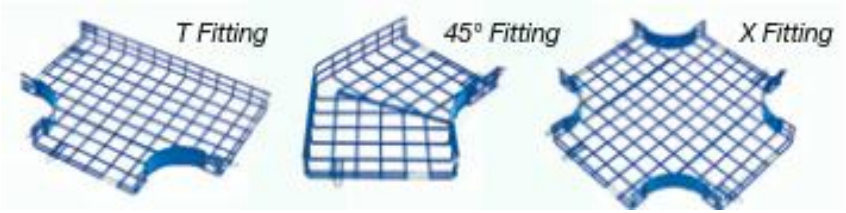
- **One Tool Installation**
- **A fitting for every need**
- **No cutting needed**
- **Wide Range of Accessories for use**


Center Support


Trapeze Support

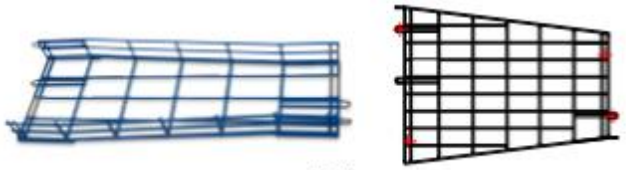
Under-Floor Mount Support


Wall-Mount Support


T Fitting

45° Fitting

X Fitting


Reducers


Top Covers


Solid Bottom Plate

Power and productivity
for a better world™

