

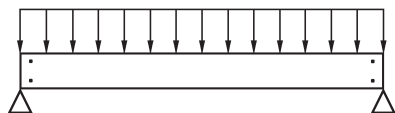
Structural Characteristics of Cable Tray and Supports

When viewed in its installed condition, any cable tray system performs functionally as a beam under a uniformly distributed load. There are four basic beam configurations typically found in a cable tray installation. All four types of beams support cable tray but each differ in the way that the beam is attached to the support.

The first two beam configurations, simple and continuous, apply to the cable tray itself. The second two beam configurations, cantilever and fixed, apply more to the cable tray supports than to the cable tray itself.

Simple Beam

A good example of simple beam is a single straight section of cable tray supported but not fastened at either end. When the tray is loaded the cable tray is allowed to deflect.



Simply beam analysis is used almost universally for beam comparisons even though it is seldom practical in field installations. The three most prominent reasons for using a simple beam analysis are: calculations are simplified; it represents the worst case loading; and testing is simple and reliable. The published load data in the B-Line cable tray catalog is based on the simple beam analysis per NEMA Standard FG-1.

Standard B-Line Label

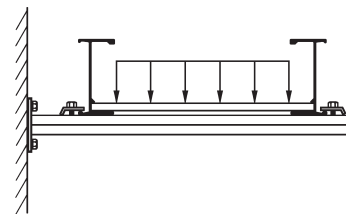
WARNING!		Do Not Use As A Walkway, Ladder, Or Support For Personnel.		
Use Only As A Mechanical Support For Cables, Tubing and Raceways.				
Catalog Number: 24A09-12-144 STR SECTION <small>(and description)</small>	Shipping Ticket: 260203 00 001	Mark Number: 78101115400	Purchase Order: D798981	Minimum Area: 1.000 SQ. IN.
Load Class: D1 179 KG/M 3 METER SPAN	REFERENCE FILE # LR360266	1 of 1		VENTILATED 09/05/2002
This product is classified by Underwriters Laboratories, Inc. as to its suitability as an equipment grounding conductor only. 556E		 		
		816 LIONS DRIVE TROY, IL 62294 (618) 667-6779		 30781011154005

Warning! Walkways

It should be noted that cable tray is designed as a support for power or control cables, or both and is not intended or designed to be a walkway for personnel, the user is urged to display appropriate warnings cautioning against the use of this support as a walkway. The following language is suggested:

WARNING! Not to be used as a walkway, ladder or support for personnel. To be used only as a mechanical support for cables and tubing.

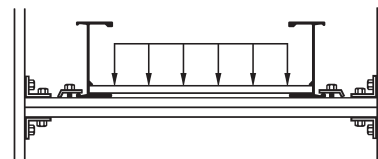
the cantilever beam will hold considerably less load than a comparable simple beam.



Fixed Beam

A fixed beam configuration has both ends of the beam rigidly attached to the supports. A good example of a fixed beam is the rung of a cable tray. By attaching the ends of the rung to the side rails, the ends are not free to move, bend or twist. This restriction in end movement effectively increases the load

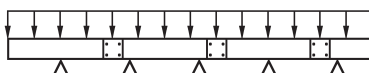
carrying capacity of the member. Fixed beam configurations are also typically found in strut rack type support systems. These types of racks are found extensively in tunnel applications for support of pipe and cable tray.



Continuous Beam

Continuous beam is the beam configuration most commonly used in cable tray installations. An example of this configuration is where cable trays are installed across several supports to form a number of spans. The continuous beam possesses traits of both the simple and fixed beams.

When equal loads are applied to all spans simultaneously, the counterbalancing effect of the loads on both sides of a support restricts the movement of the cable tray at the support. The effect is similar to that of a fixed beam. The end spans behave substantially like simple beams. When cable trays of identical design are compared, continuous beam installations will typically have approximately half the deflection of a simple beam of the same span. Therefore, simple beam data should be used for a general comparison only.



Cantilever Beam

A cantilever beam configuration occurs when one end of the beam is rigidly attached to the support and the other end is unsupported. This type of configuration is typically used when wall mounting a bracket to support cable tray. Since one end is unsupported,

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Cable Loads

The cable load is simply the total weight of all the cables to be placed in the tray. This load should be expressed in lbs./ft.

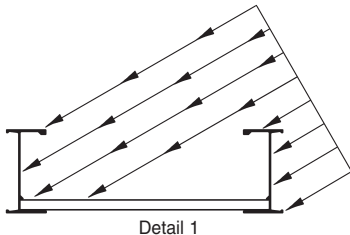
Concentrated Loads

A concentrated static load represents a static weight applied between the side rails. Tap boxes, conduit attachments and long cable drops are just some of the many types of concentrated loads. When so specified, these concentrated static loads may be converted to an equivalent, uniform load (W_e) in pounds per linear foot by using the following formula:

$$W_e = \frac{2x \text{ (concentrated static load)}}{\text{span length (ft.)}}$$

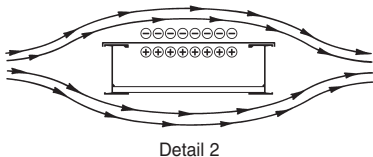
Wind Loads

Wind loads need to be determined for all outdoor cable tray installations. Most outdoor cable trays are ladder type trays,



therefore the most severe loading to be considered is pressure on the tray side rails (see Detail 1).

When covers are installed on outdoor cable trays, another factor to be considered is the aerodynamic effect which can produce a lift strong enough to separate a cover from a tray. Wind moving across a covered tray (see Detail 2) creates a positive pressure inside the tray and a negative pressure



above the cover. This pressure difference can lift the cover off the tray.

B-Line recommends the use of heavy duty wrap-around cover clamps when covered trays are installed in an area where strong winds occur.

Ice Loads

Glaze ice is the most commonly seen form of ice build-up. It is the result of rain or drizzle freezing on impact with an exposed object. Generally, only the top surface (or the cover) and the windward side of a cable tray system is significantly coated with ice. The maximum design load to be added due

to ice should be determined from local and federal weather bureau information.

Snow Loads

Snow is measured by density and thickness. The density of snow varies almost as much as its thickness. The additional design load from snowfall should be determined using local snowfall records which can be obtained from local and federal weather bureaus.

Seismic Loads

In recent years a great deal of testing and evaluation of cable tray systems, and their supports, has been performed. The conclusions reached from these evaluations have shown the cable tray/strut support system exhibited more seismic capacity than originally expected. One of the factors contributing to this is the energy dissipating motion of the cables within the tray. Another factor is the high degree of ductility of the cable tray and the support material. These factors, working in conjunction with a properly designed cable tray system, should afford reasonable assurance to withstand even strong motion earthquakes. Please consult the factory with your specific seismic specifications and request a seismic brochure.

Splices

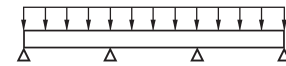
A lot of attention has been given to the strength of the side rails. These load bearing side rails must be spliced to form a continuous system, therefore the design of the splice plate is very important. The splice plate needs to be both strong and simple to install. These characteristics have been designed into B-Line's splice plates. B-Line's new high strength "L" shaped LAY-IN splice plate offers several advantages:

- 1) stronger than flat plate splices.
- 2) time saving - holds tray in position before fasteners are inserted.
- 3) provides base for an expansion splice to function - no vertical binding.
- 4) discourages splice on support-positioning, over the support is the worst place to splice - Fig 3.

The location of splices in a continuous span cable tray system is also very important. The splices should be located at points of minimum stress whenever practical. NEMA standards FG-1 limits the use of splice plates as follows:

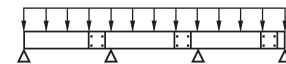
Unspliced straight section should be used on a simple span and on end spans of continuous runs. Straight section lengths should be equal to or greater than the span length to ensure not more than one splice between supports. See Figures 1 through 3 for examples on splicing configurations.

Typical Continuous Span Configuration
Figure 1



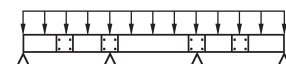
- + Maximum positive moment
- Maximum negative moment

Preferred Splice Plate Locations
Figure 2



- Preferred splice location:
- $\frac{1}{4}$ span

Undesirable Splice Plate Locations
Figure 3



- Undesired location:
- over supports
 - mid spans