Environmental Loads

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 impact pressure normal to the cable tray side rails (see detail 1).

Detail 1

The impact pressure corresponding to several wind velocities are given below in Table 1.

Table 1
Impact Pressures

V(mph)	P(lbs/ft^2)	V(mph)	P(lbs/ft^2)
15	0.58	85	18.5
20	1.02	90	20.7
25	1.60	95	23.1
30	2.30	100	25.6
35	3.13	105	28.2
40	4.09	110	30.9
45	5.18	115	33.8
50	6.39	120	36.8
55	7.73	125	40.0
60	9.21	130	43.3
65	10.80	135	46.6
70	12.50	140	50.1
75	14.40	145	53.8
80	16.40	150	57.6

V= Wind Velocity
P= Impact Pressure

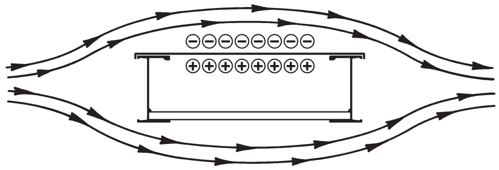
Note: These values are for an air density of 0.07651 lbs/ft^3 corresponding to a temperature of 60˚ F and barometric pressure of 14.7 lbs/in^2.

Example Calculation:
Side load for 6" side rail with 100 mph wind

$$\frac{25.6 \times 6}{12} = 12.8 \text{ lbs/ft}$$

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.

Detail 2



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

Special Notice:
Covers on wide cable tray and/or cable tray installed at elevations high off the ground may require additional heavy duty clamps or thicker cover material.

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 calculated as follows:

$$L_I = \left(\frac{W \times T_I}{144}\right) \times D_I \quad \text{where;}$$

L_I= Ice Load (lbs/linear foot)
W= Cable Tray Width (inches)
T_I= Maximum Ice Thickness (inches)
D_I= Ice Density = 57 lbs/ft^3
the maximum ice thickness will vary depending on location. A thickness of 1/2" can be used as a conservative standard.

Example Calculation:
Ice Loads for 24" wide tray with 1/2" thick ice;

$$\frac{24 \times .5}{144} \times 57 = 4.75 \text{ lbs/ft}$$

Environmental Loads

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 the building codes which apply for each installation.

Seismic Loads

A great deal of seismic testing and evaluation of cable tray systems, and their supports, has been performed. The conclusions reached from these evaluations is that cable tray is stronger laterally than vertically, since it acts as a truss in the lateral direction. Other factors that contribute to the stability of cable tray are the energy dissipating motion of the cables within the tray, and 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.

When seismic bracing is required for a cable tray system, it should be applied to the supports and not the cable tray itself. Cooper B-Line's "Seismic Restraints" brochure provides OSHPD approved methods of bracing cable tray supports using standard Cooper B-Line products. Contact Cooper B-Line to receive a copy of this brochure.

Concentrated Loads

A concentrated static load represents a static weight applied at a single point 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 (We) by using the following formula:

$$We = \frac{2 \times (\text{concentrated Static Load})}{\text{span length}}$$

Cooper B-Line's cable tray side rails, rungs and bottoms will withstand a 200 lb. static load without collapse (series 14 excluded)*. However, it should be noted that per NEMA Standard Publication VE1 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. Each section of Cooper B-Line Cable Tray has a label stating the following message:

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

Support Span

The strength of a cable tray is largely determined by the strength of its side rails. The strength of a cable tray side rail is proportionate to the distance between the supports on which it is installed, commonly referred to as the "support span". Therefore, the strength of a cable tray system can be altered by changing the support span. However, there is a limit to how much the strength of a cable tray system can be increased by reducing the support span, because the strength of the cable tray bottom members could become the determining factor of strength.

Once the load requirement of a cable tray system has been established, the following factors should be considered:

1. Sometimes the location of existing structural beams will dictate the cable tray support span. This is typical with outdoor installations where adding intermediate supports could be financially prohibitive. For this situation the appropriate cable tray must be selected to accommodate the existing span.
2. When cable tray supports are randomly located, the added cost of a higher strength cable tray system should be compared to the cost of additional supports. Typically, adding supports is more costly than installing a stronger series of cable tray. The stronger cable tray series (e.g. from 75 lbs./ft. on 20' span to 100 lbs./ft. on 20' span) will increase the price of the cable tray system minimally, possibly less than $1/ft., with little or no additional labor cost for installation. Alternately, one extra support may cost $100.00 (material and labor) for a simple trapeze. Future cable additions or the capability of supporting equipment, raceways for example, also favor stronger cable tray systems. *In summary, upgrading to a stronger cable tray series is typically more cost-effective than using the recommended additional supports for a lighter duty cable tray series.*
3. The support span lengths should be equal to or less than unspliced straight section lengths, to ensure that no more than one splice is placed between supports as stated in the NEMA VE 2 Cable Tray Installation Guideline.