Design Parameters and Constraints

We will first address the issues encountered while designing a horizontally run cable railing system.

A horizontally run series of cables used as in-fill in a railing is legal in most jurisdictions. A few places, however, do not allow the “ladder effect” of horizontal in-fill elements. Therefore, the first step to be taken is to determine if the jurisdiction of the site will allow a “ladder effect” type of railing. If you are unable to use a horizontal railing, we offer a vertical cable railing system, which is described later on in this section.

Cable is very strong in tensile strength and is a suitable in-fill material for a railing. There are many different types of constructions of cable (also referred to as wire rope). Most cable is designed to be flexible for going over pulleys or for lifting/moving heavy loads. Other constructions of cable are designed to hold something in tension, such as guy wire or a sailboat stay, and are less flexible. For any particular diameter of cable, the trade-off for flexibility is strength. The opposite is also true. You compromise strength when you require a construction of cable that is capable of a higher degree of flexibility.

Cable flexibility is an important consideration in designing a cable railing. The IRC and IBC require that a 4” sphere shall not pass through any portion of railing/stair rail. Having the rigidity to prevent deflection of a horizontally run cable that is subjected to a vertical load is partly mitigated by the cable’s lack of flexibility. Therefore, it is our initial preference to use the most rigid of cable constructions possible when designing a railing using cable. The other factors are the tension of the cable, the span between supporting intermediate members, the diameter of the cable, and the vertical spacing of the cables on center.

Let’s start with the spacing of your intermediate members, which are posts and/or braces, which will support the cable as it passes through the walls of the railing frame. (An intermediate post runs from the top rail to the mounting surface. A brace is a lighter weight material placed between posts, its primary purpose being to support the cable.) Cable can be run quite long distances between terminating ends (150 ft. or more, depending upon railing configuration), but it needs to be supported at intervals between end posts, to avoid cable deflection in excess of that permitted by building codes. When a rigid cable construction is used, such as 1x19, the spacing between posts and/or braces should not exceed 42”.

The next variable is the diameter of the cable. We feel 1/8” cable is too near the limits of the cable-breaking strength and holding strength of the cable fittings when the cable is properly tensioned and then subjected to abuse, such as a heavy-set person bouncing on one of the cables. We recommend 1/8” cable be used only in an area that is unlikely
must be constructed so that they will not deflect perceptively as the cables are tensioned to loads of 300-400 lbs. or more.

All of these variables work together to minimize the deflection of the cable so as to not allow a 4” sphere to pass between the cables when they are properly tensioned in a well-designed frame.

Now, we will discuss issues encountered in designing a railing using vertically run cables as in-fill.

Top and bottom rails are necessary in a vertical railing using cable, because mounting and tensioning hardware is attached to top and bottom rails instead of end posts. We recommend schedule 80 pipe or 2”x2”x1/4” square tubing for both the top and bottom rail, because of the forces applied when the cables are properly tensioned. However, the amount of force that can be applied to a vertical cable is generally less than can be applied to a horizontally run cable. The result is less force being applied to the mounting and tensioning fittings. Therefore, you may consider using 1/8” diameter cable with a vertical system, where you may not want to use it in a horizontal system.