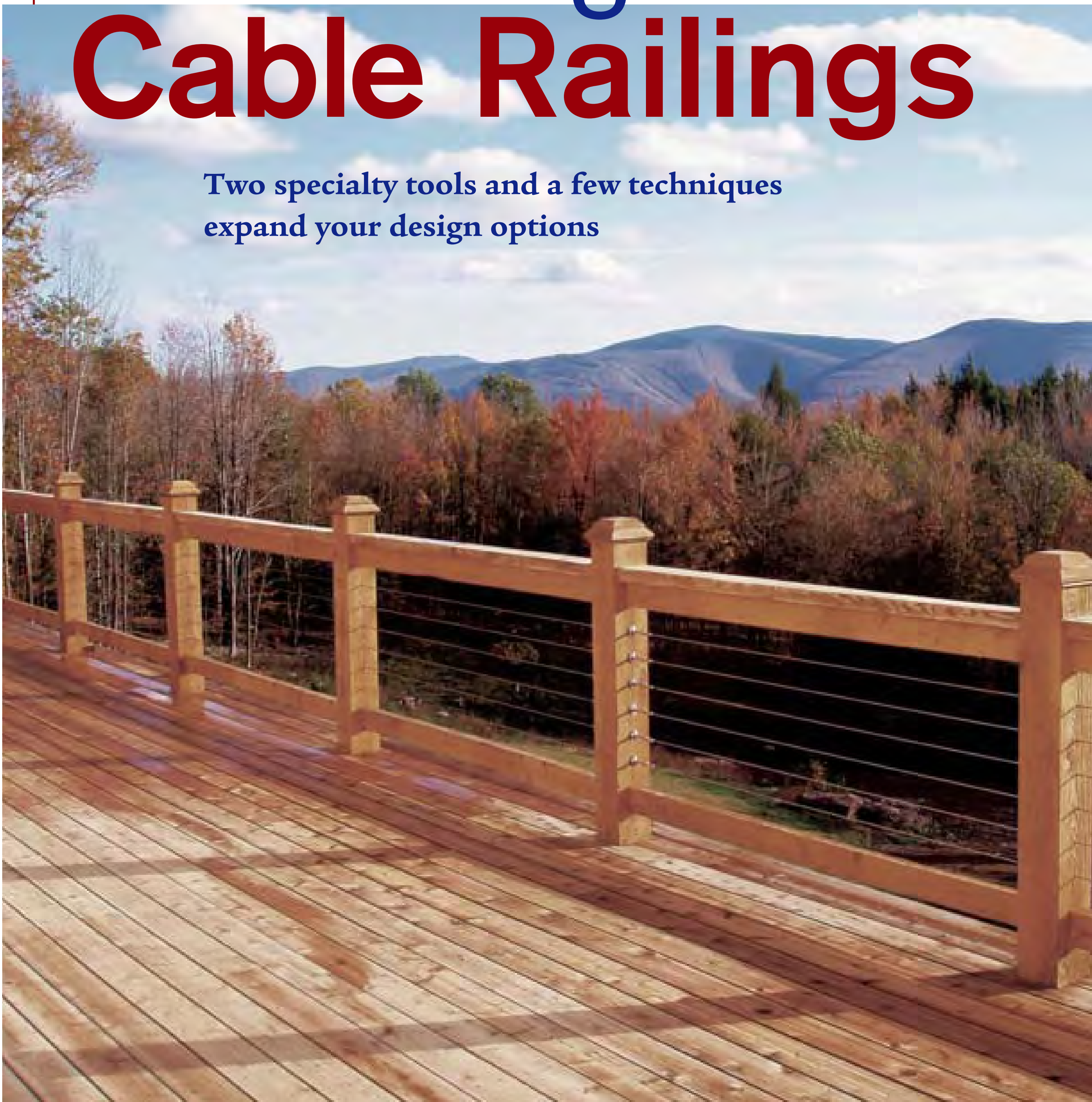
Installing Cable Railings



Two specialty tools and a few techniques expand your design options

RANDY VARGA

Figure 1. Posts and rails can be a variety of materials. Although wood is most common, powder-coated steel or aluminum is a clean-looking alternative. Components can be had from specialty vendors, or locally sourced from a metal shop.

by Kim and Linda Katwijk

Cable railing is much easier to install than many deck builders think. Horizontal cables are run through holes drilled in railing posts and tightened with turnbuckles or studs (connectors that grab the cable and tighten by way of a nut) until they "sing."

Open and airy, cable railing virtually disappears, offering the client an unobstructed view and a clean, contemporary look. Stainless steel cable railing is low maintenance, long lasting, and fairly easy to install. With a little know-how, you can turn a nice profit.

Cable and Posts

Cable comes in 1/8-inch to 1/2-inch diameters, in 1/16-inch increments. The sizes most often used for residential applications are 1/8 inch, 3/16 inch, and 1/4 inch. When using very large posts, such as 10-inch-diameter logs, you need to balance the look of the railing by using the larger 1/4-inch to 1/2-inch cable. For commercial applications, 3/16 inch is the smallest size allowed, but 1/4 inch is recommended.

To give you an idea of price, 3/16-inch cable runs around $.80 per foot when purchased in 100-foot rolls (it costs more when purchased by the foot).

Posts can be made of a variety of materials, such as wood, powder-coated steel, or powder-coated aluminum (**Figure 1**). Cables should be spaced 3 1/2 inches or less apart, so a 4-inch sphere can't pass between them (code requirement). This means there are at least 9 cables on a 36-inch-high railing, and since each cable exerts roughly 300 lb. of tension, the posts need to withstand a minimum of 2,700 lb. of pull. Posts require stout

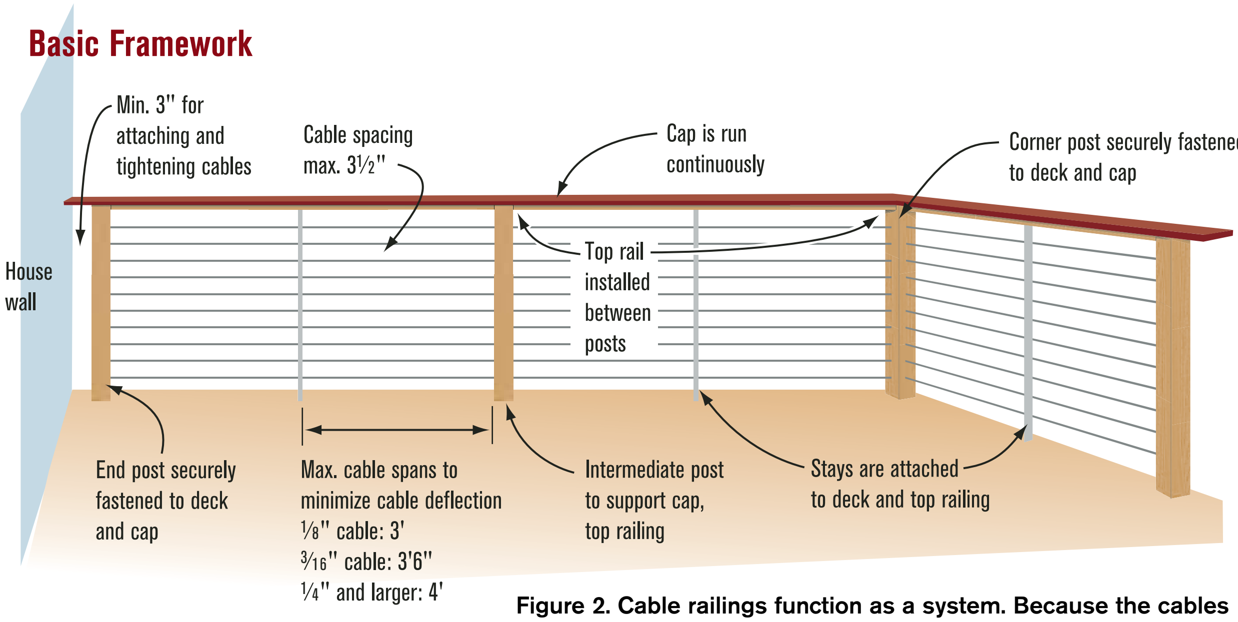


Figure 2. Cable railings function as a system. Because the cables exert a tremendous tension on the end posts, it's critical to mount the posts firmly to the framing, and brace between them with a subrail that's capable of withstanding the pressure.

mounting, plus a cap rail that spreads the load out from the anchor posts to the intermediate posts (**Figure 2**).

Most wood 4x4 posts can withstand these pressures. Because cedar is so soft, however, you must use wider washers at cable terminations to prevent the cable from pulling through — and you should consider using larger posts, such as 4x6s or 6x6s.

Steel posts can be 1-inch-by-3-inch flat bar, 2-inch-by-2-inch-by-3/8-inch angle, schedule-80 pipe, or 1/4-inch walled tubing. With all steel posts, you need to use sleeves of rubber, nylon, or stainless steel to separate the cable from the steel to prevent wear. Aluminum posts of the same dimensions can be used, except that 2-inch-by-2-inch angle must be beefed up to 1/2-inch thickness.

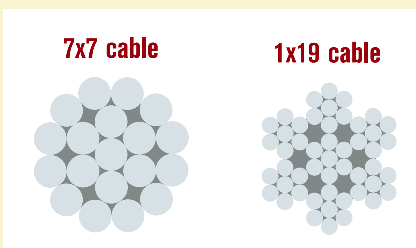
Do not attempt cable railing with solid composite posts, as they will warp when the cables are tightened. Composite or plastic sleeves that fit over a wood post, though, are fine.

STAINLESS STEEL CABLE CONFIGURATION

Different configurations of stainless steel cable vary in flexibility. For example, semi-flexible 7x7 cable has seven cords, each with seven individual wires, and it's used for straight runs and corners where cable runs between multiple posts. The smooth cable preferred by most customers is 1x19 rope, made by twisting 18 wires around one center wire. It's semi-rigid, so 1x19 is used for straight runs and gentle turns.

Stainless steel is an alloy of iron and carbon that contains between 12 percent and 30 percent chromium. The chromium forms an oxide film on the surface, which provides stainless steel its superior corrosion resistance. Good as it is, stainless steel in contact with chloride salts or sulfides can discolor or rust.

Stainless steel comes in several grades. Type 303 contains sulphur to enhance its machinability. Typical applications include bolts, bushings, nuts, and shafts. The stainless most widely used for aesthetic purposes is type 304, a low-carbon, general-purpose alloy. The most corrosion-resistant stainless steel commonly available, type 316, contains more nickel and molybdenum, and is used in marine environments. This is the type most often used for cable railing.



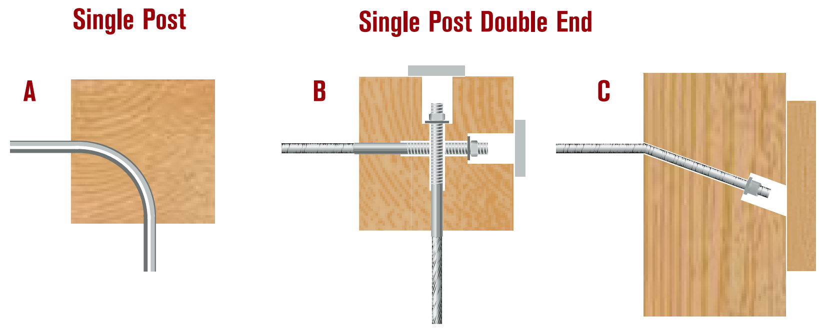


Figure 3. When a cable has to turn a corner at a single post (left), one method is to drill a curved hole through the post (A). Because there's a lot of tension on the inside corner of these posts, hardwood such as ipe is recommended over soft cedar or pine. The second way around a single-post corner is for two cables to terminate at that post (B). For the cables to run at the same level, the hole for one cable stud must be angled to miss the other stud (C).

Post Configuration

You can use single-posted (**Figure 3**) or double-posted (**Figure 4**) corners. Post spacing should be determined according to the strength of the top rail, which needs to withstand 200 lb. of pressure in any direction to meet code (that's in addition to being able to help spread out the tension from the cables to the other posts). Most railing materials are limited to 6 feet or less, though with engineering, steel railings can exceed 6 feet.

In most cases, the rail can span a greater distance than the cables. The smaller the cable, the closer the posts — no more than 36 inches between posts for 1/8-inch cable, 42 inches for 3/16-inch cable, and 48 inches for 1/4-inch-diameter and larger cables. If you want a more open look, you can avoid placing full-sized posts mid-span by substituting "stays" — thinner pieces of steel, aluminum, fiberglass, or wood. The cables run through holes drilled in the stays, which keeps the cables from spreading.

Because longer runs are harder to tension, I try to avoid straight runs of cable more than 80 feet long. For runs

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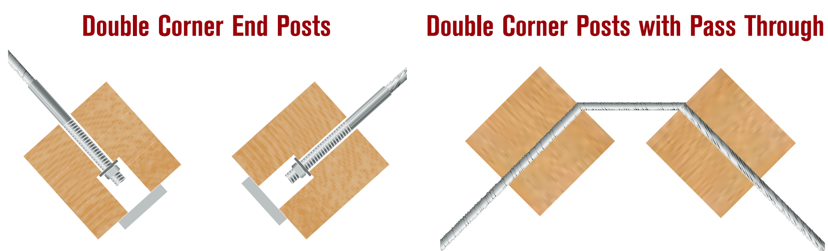

Figure 4. Double-post corners offer options. Set the posts within 4 inches of each other, and the cable can terminate here, leaving an open space between the posts (left). Alternatively, the cable can run through the posts to create a decorative corner (right).

that have one or two 90-degree corners or up to four 45-degree corners, 40 feet or less is the rule of thumb. End posts need to be spaced away from the building (**Figure 5**) to allow for tightening the cable. When the face of an end post is exposed, the ends of the studs are covered with a cap that can be removed for subsequent tightening (**Figure 6**).

When using post and rail materials that can be field cut, such as wood, I order all the railing components before building the deck. If I'm using a welded steel or aluminum frame whose dimensions can't be easily changed, I order the frame after the deck is built. I like having the flexibility to make changes in the deck framing without worrying about the railing being exactly right.

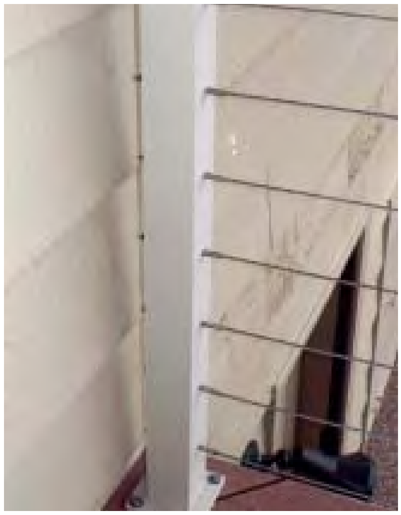

Figure 5. Space end posts from the house to leave room for a wrench to tighten the cables.

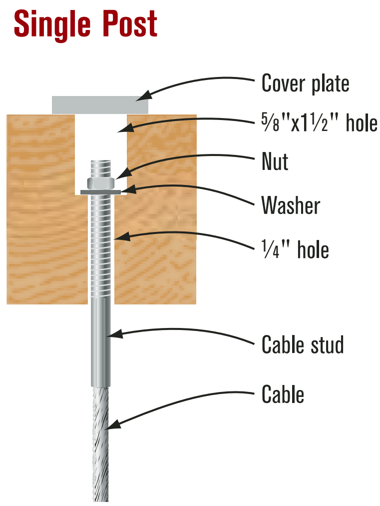

Figure 6. A removable cap protects people from the ends of the cable hardware while allowing for maintenance tightening.

Cable Connections

To lower costs, I have a local machine shop make my cable studs, and get my cable from a local supplier. The studs I use are 4-inch-long pieces of 1/4-inch 303 stainless rod. The machine shop drills a 1/8-inch hole down the center of one end to a depth of 1 1/4 inch. The shop threads the other end for 2 1/2 inches to take a 1/4x20 nut. The stud slides over the cable and is swaged, or crimped, with an H.K. Porter swaging tool ($110; 919/362-1709, www.cooperhandtools.com). Swaging makes a permanent connection (**Figure 7**).

Figure 7. A swaging tool and a cable cutter are the only special tools required. A cable cutter cleanly snips multiple steel strands, and a swaging tool crimps connectors onto cables for a connection that won't pull free.

Alternatively, the Atlantis Rail System uses a mechanical swaging that is an integral part of its universal turnbuckle (**Figure 8, page 6**). Its ball joint and flange mount allows it to be used for straight runs, turns, or stairs. Tightening a cap nut secures the cable — no swaging tool needed, just a wrench. The turnbuckle screws to the inside of the post, so it can be installed tight to the building. The screw attachment also saves the time spent on drilling the end posts. At about $14 each, it is the only commercial stud I've ever considered.

The cable end that doesn't receive a stud is anchored with a swaged cable stop and a washer that go on the far side of the last post (**Figure 9**). Cable stops are 1/2-inch-by-1/2-inch aluminum tubes with a hole sized to fit the cable. If the posts are ACQ-treated lumber, use a stainless steel cable stop.

Preparing Posts for Cable

The first step in installing a cable railing is locating the posts, making sure they're spaced to support both the upper railing and the cable. The post locations dictate how to drill the posts. For example, single-post corners get holes that curve, while double-posted corners are drilled straight through. Posts at stairs will need angled holes.

Most posts I'll drill straight through, using a bit that's 1/16 inch larger than the cable size and guided by a jig. Now, a jig sounds complicated, but this one is nothing more than a piece of 1x4 the height of the posts, with holes drilled where I want the cables to be. I use a Milwaukee Pathfinder bit to drill the curved holes in single-post corners; I start these holes from each side, and join them in the middle. Milwaukee no longer makes Pathfinder bits, but Bad Dog Tools (800/252-1330, www.baddogtools.com) has similar ones (**Figure 10**). Single posts on 45-degree corners are mounted at 22 degrees and drilled straight through.

End posts need to be drilled to fit a cable stud, washer, and nut. Use a 5/8-inch Forstner bit to drill a hole about 2 inches deep for the washer and nut (**Figure 11**). Center a 1/4-inch bit in the 5/8-inch hole, and drill the rest of the way through for the cable stud. The Forstner bit makes an indentation in the center so you can line up the 1/4-inch bit more easily. It's important for the larger and smaller holes to line

Figure 8. The author's favorite commercial cable stud is made by Atlantis Rail Systems. A cap nut and bushing eliminates the need for a swaging tool, and the flange mount allows this stud to work at a variety of angles.

Figure 9. Studs and stops end the cable runs. Stops are simple aluminum rings that are swaged onto one end of the cable. Used in conjunction with a washer, they resist the tension applied by the stud. The author has studs made locally from stainless steel rod. They're swaged to the cable, and tightened with a nut.

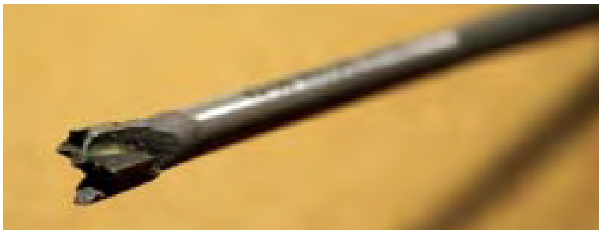

Figure 10. Curving holes are made possible with Rover bits by Bad Dog Tools.

Figure 11. A two-step hole makes room for a socket wrench. The cable and stud enter the opposite side of the post through a smaller hole, and the nut used to tension the cable is buried inside a 5/8-inch-diameter hole that also accommodates the socket.

up, because there is little room for a 9/16-inch washer and the cable stud to align. On short runs of 20 feet or less, only one end needs a stud to tension the cable. That end doesn't need a hole as deep as 5/8 inch; this smaller hole should be the same as all the other cable holes.

Stairs require the posts to be drilled at an angle. I find the angle with a 6-foot level, a Speed Square, and a torpedo level (**Figure 12**). I cut a small block of wood at that angle for guiding the drill bit. I use a 6-inch-long drill bit, which helps to get the hole halfway through the post. Then I remove the guide and continue to drill a hole following the path that has already been drilled out.

If the stair post is going to be used as an end post, it will need to have a 5/8-inch two-step hole drilled into it to accommodate a cable stud or stop. This is done using the same block of wood and a Forstner bit with a drill stop mounted 2 inches back from the cutting head (**Figure 13**). This can be a tricky hole to drill. Start drilling with the bit vertical and then gently tip it to meet the guide block. Continue to drill until the hole is 1 1/2 inch deep.

Capping and Cabling

After all the posts are installed, the top rail is fitted between the posts to resist the tension when the cables are tightened. The decorative cap is then installed continuously over the top rail and the posts.

Cable comes on a large spool, which I mount on a spindle so that it feeds easily from post to post. It's usually best to set up the spool so that it feeds straight into the end post — generally the end post that is not against the house. Before threading the cable, I wrap the end with tape to keep it from fraying on its journey through the holes. A $24 HIT Tools 22WRC75 cable cutter (909/974-0369, www.hittools.com)

Figure 12. Tools you probably already own determine the angle for drilling the stair posts. A long level on the tread noses establishes the stair pitch, and a Speed Square, held level, measures the angle.

Figure 13. Use the angle obtained with the speed square to make an angled block to guide the drill on stair newels. The block is cut on a miter saw. Here, the carpenter is preparing to drill the large diameter side of a two-step hole for a cable stud.

BUYING COMPONENTS

A number of good companies supply complete cable railing systems. It's easier to order everything from one source, but you pay more for that convenience. Each supplier has better prices on some components than others, so if you are willing to work with several suppliers, you can make a better profit. In addition to the listed suppliers, local marine supply houses often sell cable and other components.

Sources:

Atlantis Rail Systems (800/541-6829, www.atlantisrail.com)
Ultra-tec (800/851-2961, www.ultra-tec.com)
Cable Railing by Feeney (800/888-2418, www.cablerail.com)
Carl Stahl DécorCable (800/444-6271, www.decorcable.com)

Figure 14. Snug up the cable before final tightening. Locking pliers gently closed on the cable provide the grip. Wedges provide the force to stretch the cable. Stretch from several spots along the run, particularly at corners.

Tightening Sequence

Figure 15. Because the top and bottom of the posts are braced, tightening starts in the flexible middle. Tighten the center cable enough to remove sags, then tighten the cables that are directly above and below, and so on. All should sound the same note when properly tensioned.

cuts the cable cleanly. Once the cable is fed through all the posts, I swage a cable stud or a stop to its end.

The next step is pretensioning, or stretching the cable tight before putting on the end stud (**Figure 14**). If you skip this step and rely on only the studs for tightening, it's possible to run out of thread on the stud before the cable is tight enough. Then, you've got to cut off that stud, which is now expensive scrap, and swage on another.

Pretensioning is done with locking pliers, pieces of wood or composite decking slit to fit over the cable, and wedges. Working back from the first end post, pull the cable hand taut and slip a piece of wood over the cable on the pull side of the post. With the locking pliers, gently grip the cable right behind the block. Then, drive the wedges between the block and the post to tighten the cable.

Leaving the pliers and wedges in place, jump ahead three or four posts and do it again. Pretension at every corner. Using four or five pairs of locking pliers eases the job.

With the cable taut at the last post, cut it to fit in the stud so that just enough threads to engage a nut protrude past the bearing surface in the post. Swage the cable stud, slip it into the end post, and put a washer and nut on it. Install the rest of the cables in the same way.

Once pretensioning all the cables is complete, it is time to fully tension each cable. There is a correct sequence to this, starting with the center cable, followed by tightening the remaining cables, alternating above and below the center cable (**Figure 15**). You need to take out any sag, and get the cables to a uniform tension. Each cable should sound the same note when strummed.

The final step is to cover the holes in the end posts. I use a 1/4-inch-thick strip of the same material as the post. Screw it on so that it can be removed easily in case the cables need tightening. ❖

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