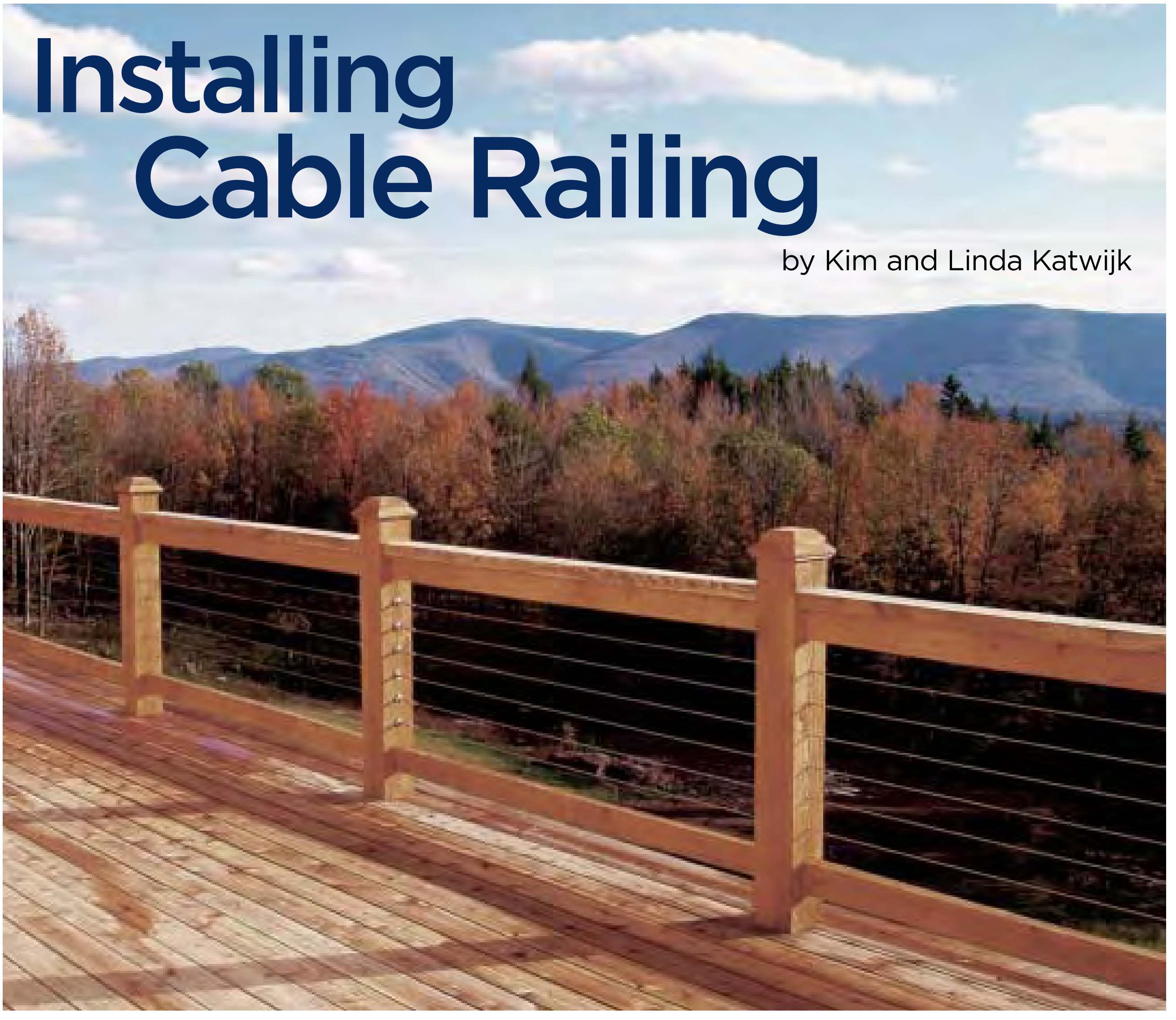


Installing Cable Railing

by Kim and Linda Katwijk

With a couple of specialty tools, you can offer this sleek look to your high-end customers

Stainless steel cable railing is low maintenance and long-lasting. It's also fairly easy to install: Horizontal cables are strung through holes drilled in railing posts and tightened with cable studs — fittings that grip the end of a cable run and allow it to be tensioned — until they "sing." With its open, airy design, cable railing virtually disappears, providing an unobstructed view and a clean, contemporary look.

My company specializes in building decks. Though cable railings don't make up a large percentage of our work, we have seen an increase in demand for them since they were approved in recent versions of the building codes. Many customers ask about cable railings but lose interest after learning that they cost almost twice as much per foot as wood ones.

I buy cable in bulk and have the fittings I need made in a local millwork shop. This substantially reduces my material costs compared with using an off-the-shelf cable-rail system. For convenience, however, you may want to consider one of the available packages if you're doing only one deck (see "Buying Components," page 89).

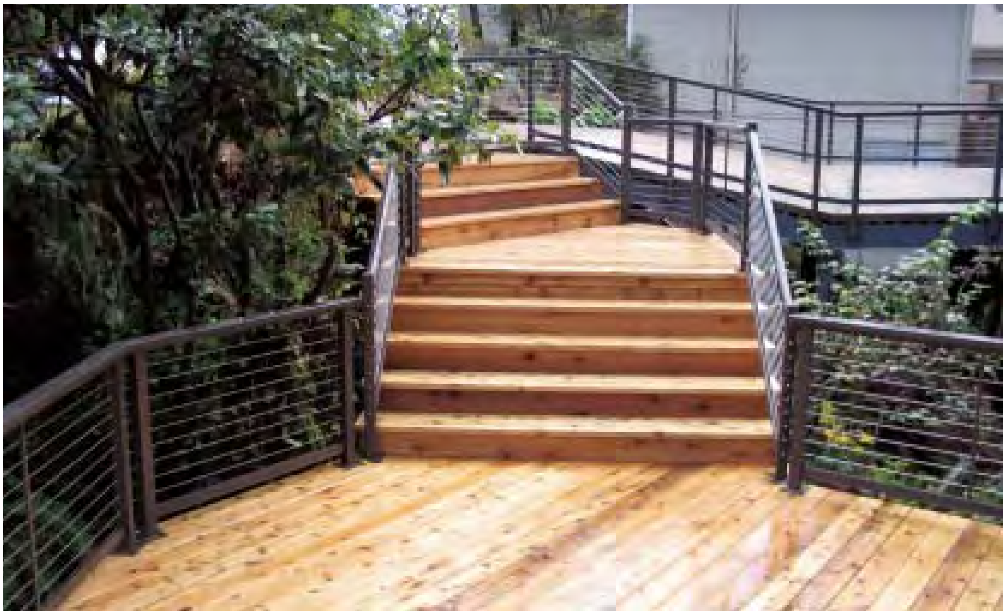
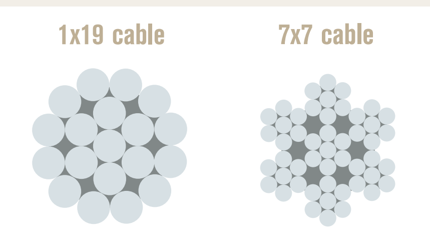


Figure 1. Although wood is the most common material for posts, powder-coated steel and aluminum are clean-looking alternatives and can be engineered to withstand the forces involved with cable railing.

Stainless Steel Cable Configuration

Different configurations of stainless steel cable vary in flexibility. For example, semiflexible 7x7 cable has seven cords, each with seven individual wires; 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. Since it's semirigid, it's 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 is what gives stainless its superior corrosion resistance. Still, the alloy can discolor or rust if it comes in contact with chloride salts or sulfides.

There are several grades of stainless steel. Type 303 contains sulphur to enhance machinability; typical applications include bolts, bushings, nuts, and shafts. The most widely used stainless for aesthetic purposes is type 304, a low-carbon, general-purpose alloy. Type 316 is the most corrosion-resistant form commonly available; it contains extra nickel and molybdenum and is used in marine environments. It's also the type most often used for cable railings.

Cable and Posts

Cable comes in diameters of 1⁄8 inch to 1⁄2 inch, in 1⁄16-inch increments. The sizes most often used for residential applications are 1⁄8 inch, 3⁄16 inch, and 1⁄4 inch. With very large posts — say, 10-inch-diameter logs — the larger 1⁄4-inch to 1⁄2-inch cable should be used, to balance the look of the railing. For commercial applications, 3⁄16 inch is the smallest size allowed, but 1⁄4 inch is recommended. In my area, 3⁄16-inch cable runs around 80 cents per foot when bought in 100-foot rolls.

Posts can be made of a variety of materials, such as wood, powder-coated steel, and powder-coated aluminum (**Figure 1**). Cables should be spaced no more than 3 1⁄2 inches apart, so that a 4-inch sphere can't pass between them (code requirement). This means there are at least nine cables on a 36-inch-high residential railing, and since each cable exerts roughly 300 pounds of tension, the posts need to withstand a minimum of 2,700 pounds

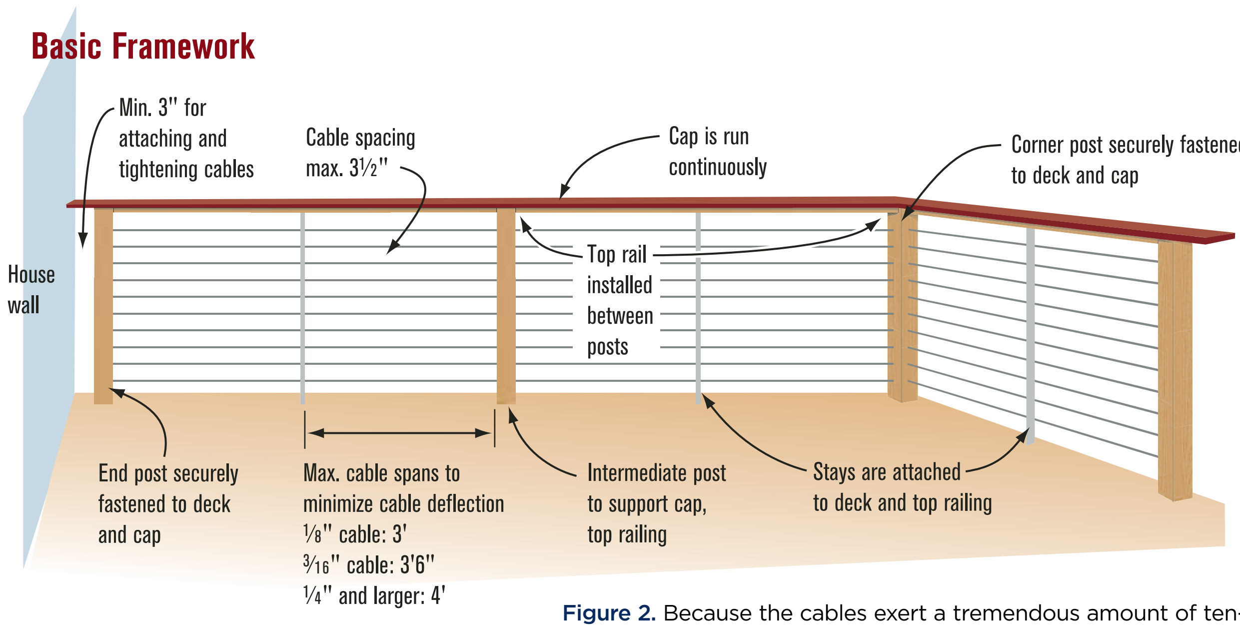


Figure 2. Because the cables exert a tremendous amount of tension on the end posts, it's critical to mount the posts firmly to the framing, and brace between them with a subrail that's capable of withstanding the pressure.

of pull. Posts require stout 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, though, 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 and prevent wear. Aluminum posts of the same dimensions can be used, but 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 are fine.

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. Since each supplier has better prices on some components than on others, you can make a better profit if you work with several companies. In addition to the sources listed here, local marine supply houses often sell cable and other components.

Atlantis Rail Systems
800/541-6829
www.atlantisrail.com

Cable Railing by Feeney
800/888-2418
www.cablerail.com

Ultra-tec
800/851-2961
www.ultra-tec.com

Carl Stahl DécorCable
800/444-6271
www.decorcable.com

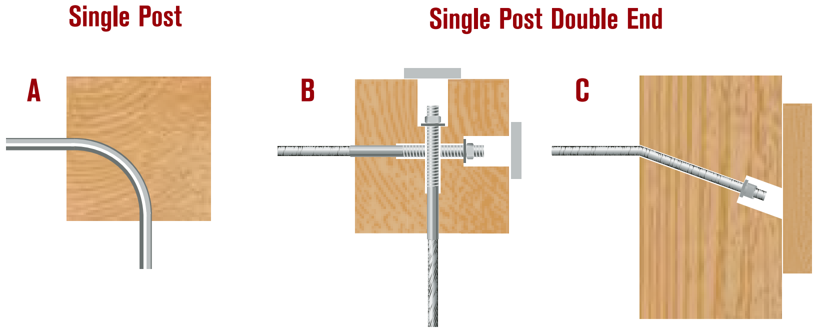


Figure 3. There are two ways to handle a single-post corner (left). One is to drill a curved hole through the post (A). Because there's a lot of tension on the inside corner of wood posts, a hardwood like ipe is recommended over soft cedar or pine for curved-hole corners. The second method is to terminate two cables at the post (B). For the cables to exit at about the same height, one of the stud holes must be drilled at an angle so it doesn't intersect the other hole (C).

Figure 4. For double-post corners, you can either set the posts within 4 inches of each other and terminate the cable at each post (left) or run the cable through both posts (right).

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 — according to code — needs to withstand 200 pounds of pressure in any direction (plus 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 together the posts need to be — 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 midspan by substituting "stays" — thinner pieces of steel, aluminum, fiberglass, or wood. The cables run through holes drilled in the stays.

Because long runs are harder to tension, I try to avoid straight runs of cable longer than 80 feet. For runs that have one or two 90-degree corners or up to four 45-degree corners, 40 feet or less is

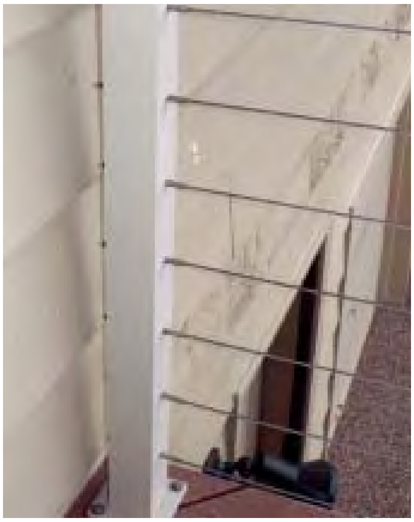


Figure 5. Space end posts away from the house to leave room for tightening the cables with a wrench.

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 caps that can be removed for subsequent tightening (**Figure 6**).

When using wood posts and rails, 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 it 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.

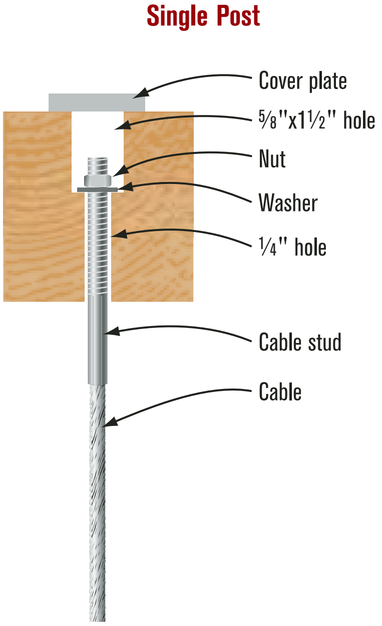


Figure 6. A removable cap protects people from the ends of the cable hardware while allowing for maintenance tightening.

Cable Connections

The machine shop I use makes the cable studs from 4-inch lengths of 1⁄4-inch 303 stainless rod. The shop drills a 1⁄8-inch hole down the center of one end to a depth of 1 1⁄4 inches, and 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 strong, permanent connection (**Figure 7**).

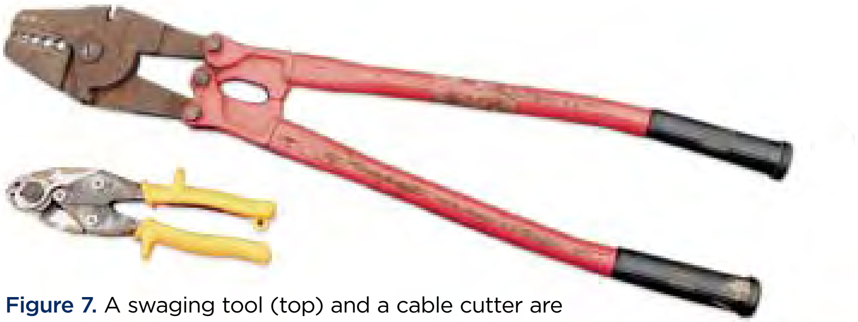


Figure 7. A swaging tool (top) and a cable cutter are the only special tools required. A cable cutter cleanly snips multiple steel strands, and a swaging tool crimps connectors onto cables for a permanent connection.

Figure 8. The author's favorite commercial cable stud is made by Atlantis Rail Systems. A cap nut and bushing eliminate the need for a swaging tool, and the flange mount allows the 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 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.

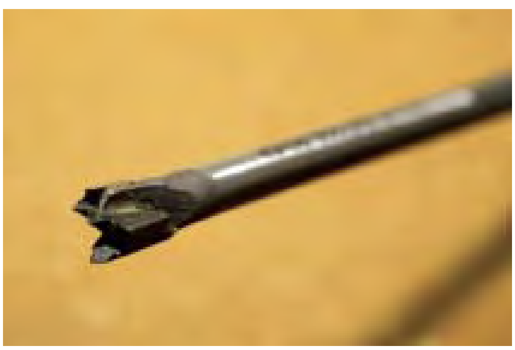


Figure 10. Curving holes are made possible with Rover bits by Bad Dog Tools.

Alternatively, the Atlantis Rail System uses a mechanical swaging that is an integral part of its universal turnbuckle (**Figure 8**). 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 time that would otherwise be spent drilling the end posts. Though it costs about $14, this is the only commercial stud I would use.

For short runs — straight runs up to 40 feet or runs of less than 20 feet that have one corner — studs aren't needed at both ends. Instead, one end (usually on the far side of the last post) is anchored with a swaged cable stop and washer (**Figure 9**). Cable stops, which are available from any professional fastener supply shop, are simple 1/2-inch-by-1/2-inch aluminum tubes with a hole sized to fit the cable. For the stops, I drill a 3/4-inch-diameter hole 3/4 inch deep, then continue through with a small hole sized for the cable. If the posts are ACQ-treated lumber, I make sure to use stainless steel stops.

Preparing Posts for Cable

The first step in installing a cable railing is locating the posts and 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 need angled holes.

I drill straight through most posts, using a bit that's 1/16 inch larger than the cable size. To drill accurately, I use a simple jig made from a piece of 1x4 the height of the posts, with guide holes where the cables are located. 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, facing page**). Single posts on 45-degree corners are mounted at 22.5 degrees and drilled straight through.

End posts need two-step holes to fit the cable stud, washer, and nut. I use a 5/8-inch Forstner bit to drill a hole about 2 inches deep for the washer and nut (**Figure 11**). I 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.) It's important for the larger and smaller holes to line up, because there's little room for a 9/16-inch washer and the cable stud to align.

To find the right angle for drilling the stair posts, I use a 6-foot level, a Speed Square, and a torpedo level (**Figure 12**). After cutting a small angle block for guiding the drill, I make a hole halfway through the post with a 6-inch-long drill bit; then I remove the guide and continue to drill through.

If the stair post is going to be used as an end post, it will also need a two-step hole to accommodate a cable stud or stop. This can be tricky to drill. I use the angle block and a Forstner bit with a drill stop mounted 2 inches back from the cutting head. I start drilling with the bit vertical, then carefully tip it back to meet the guide block and continue to drill until the hole is 1 1/2 inches deep.

Capping and Cabling

Once all the posts have been installed, the top rail is fitted between them to resist the tension when the cables are tightened.

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.

Figure 12. A long level on the tread noses establishes the stair pitch, and a Speed Square, held level, measures the stair angle (above). Use the angle to make a simple guide block for drilling cable holes in stair posts and newels (left).

Figure 13. To pretension the cable before final tightening, the author uses locking pliers to grip the cable, and wedges to stretch it. He does this at several spots along a run, particularly at corners.

Tightening Sequence

Figure 14. Because the top and bottom of the posts are braced, tightening starts in the middle. Tighten the center cable enough to remove sags, then alternate between the cables that are directly above and below. When properly tensioned, all of the cables should sound the same note.

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 an end post that's 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) 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 13**). If you skip this step and rely only on the threaded studs for tightening, you may run out of thread before the cable is tight enough. Then you'll have to cut off that stud — now expensive scrap — and swage on another.

Pretensioning is done with locking pliers, scraps of wood or composite decking slit to fit over the cable, and wedges. Working back from the first end post, I pull the cable hand-taut and slip a piece of wood over it on the pull side of the post. With the locking pliers, I gently grip the cable right behind the block. Then I drive the wedges between the block and the post to tighten the cable. Next, leaving the pliers and wedges in place, I jump ahead three or four posts and repeat the process. I pretension at every corner and typically use four or five pairs of locking pliers in a run.

With the cable taut at the last post, I cut it to fit in the stud so that there's just enough thread left to engage the nut. I swage the cable stud, slip it into the end post, and tighten the washer and nut. I install the rest of the cables the same way.

Once all the cables have been pretensioned, it's time to fully tension each one. There is a correct sequence to this: Start with the center cable, then tighten the remaining cables by alternating above and below the center cable (**Figure 14**). All cables should be of uniform tension, with no sag. Each should sound the same note when plucked.

The final step is to cover the holes in the end posts. I rip a $^1/_4$-inch-thick by $1^1/_2$-inch strip of the same material as the post, cutting it long enough to hide all the holes. This I attach with three stainless steel screws, for easy removal in case the cables need tightening.

__Kim Katwijk__ builds decks in Olympia, Wash. __Linda Katwijk__ assisted with this article, which was adapted with permission from Professional Deck Builder *magazine.*