

Using a Cargo Rack

Organizing the load and knowing the right knots are the keys to transporting building materials safely



Lashing panels to a cargo rack. When transporting panel products, such as gypsum board or plywood, to the job site, the materials should be supported in the middle and restrained at the corners.

by Roe A. Osborn

There is an old saying that "getting there is half the fun." The home builder's variation on that expression might be, "getting it there is half the challenge." Indeed, transportation of tools and materials to the job site can be a nail-biting experience, especially if you've got a winding road to travel or if you have to stop suddenly.

In this article I'll tell you about the methods I use to tie down a load of lumber to make sure it stays put. The most important details are the knots, but first let's look at a typical rack and how it should be loaded.

Racks, ropes and tie-downs—Most contractors outfit their vehicles with a rack that consists of a pair of big, H-shaped frames made of steel or wood. The frames' crossbars run parallel with the vehicle's axles and are joined with horizontal bars that add rigidity (top right drawing, facing page).

If the rack members are wood, all joints should be carriage-bolted together and inspected regularly for tightness. Metal racks should be checked for signs of fatigue—especially at the welds. No matter what the material, racks should be mechanically fastened to the vehicle. If the rack is attached to sheet metal, use backing plates and through-bolts. Don't depend on gravity to keep racks in the integral pockets found in the corners of some pickup beds. They should be bolted through the body of the bed.

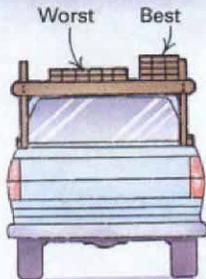
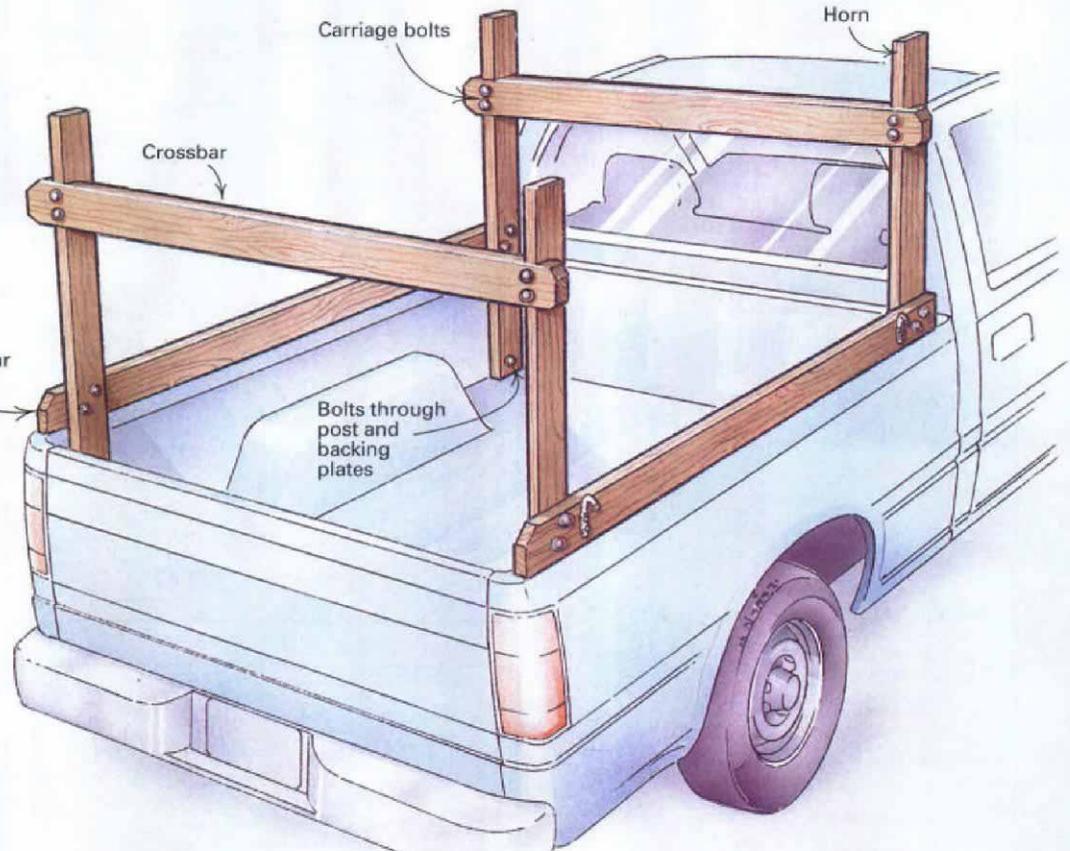
There are three basic types of tie-downs [drawing facing page]: horned cleats, hooks and rings or fixed loops. I think the horned cleat is probably the strongest and most versatile of this group. Hooks also are easy to work with and allow for quick rigging. Rings and fixed loops are the most inconvenient tie-downs because the entire rope has to be fed through one of them to function properly. While not the most convenient places to tie off a rope, the horns of the racks can also serve as tie-downs. The horns are the short, vertical sections of the rack that extend above the crossbars.

Every hardware store has a shelf of proprietary tie-downs that use straps, ratchets, elastic shock cords or clamps to secure cargo to a vehicle. But I don't think any of them are as versatile as a good length of rope.

A good cargo rope is about $\frac{3}{8}$ -in. dia. It should have minimum stretch yet be flexible and easy to handle. A 50-ft. rope should be sufficient to handle even the most complicated rigging jobs on a standard pickup.

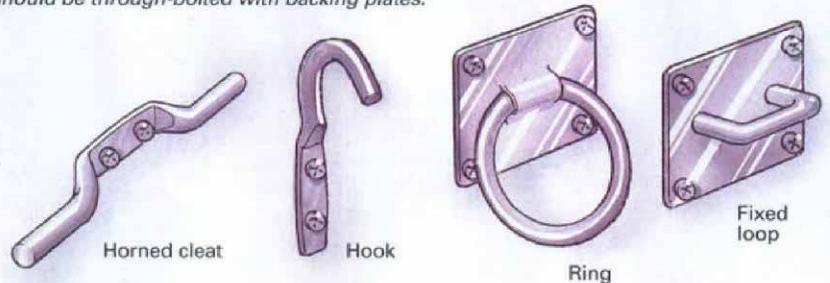
Polypropylene rope resists stretching, but it's stiff and difficult to coil. It also degrades when exposed to ultraviolet light and weather. Nylon rope is more flexible and comfortable to handle but stretches easily, making it tough to keep a load tightly secured. Nylon rope also has a tendency to unravel and lose its shape with extended use. Both nylon and polypropylene ropes usually come as "twisted" rope, where three strands of the material are

Typical cargo racks. Whether metal or wood, a cargo rack should be bolted to the truck. And you should inspect bolted or welded connections frequently for signs of fatigue.



Stacking lumber. Stacks of lumber should be as square as possible without extending above the horns of the rack.

Tie-downs. Cleats and hooks are the most convenient tie-downs because rope doesn't need to be passed through them. But no matter what the configuration, tie-downs should be through-bolted with backing plates.



twisted together to form the rope. Twisted rope is not recommended for rigging loads. It tends to "martyr" itself, taking on the shape of the knots tied in it, which makes them difficult to untie. Clothesline is OK for drying blue jeans but should not be considered seriously for lashing cargo to a vehicle. I limit my use of elastic shock cords to lashing together the ends of long pieces of stock.

The finest rope for load rigging is low-stretch, yacht-braid Dacron yacht line. There are dozens of types and grades of this rope, and a medium grade at a medium price is fine for lashing cargo. Most manufacturers offer braided line with either a smooth or a fuzzy surface. Fuzzy is easier on the hands, but the smooth surface will enable the rope to slide easier over itself as well as over the racks. These ropes can be obtained at marine-supply stores or through marine-supply mail-order companies, such as E & B Marine (201 Meadow Road, P. O. Box 3138, Edison, N. J. 08818; 800-533-5007).

Load organization—When you pull into the lumberyard, there are several things to remember about lashing a load of materials to a cargo rack (drawings p. 50). First, most yards deliver, usually for no extra charge. So if you can work around the delay that accompanies a delivery, do so. If you've got to load materials for immediate transport, start by sorting the lumber by di-

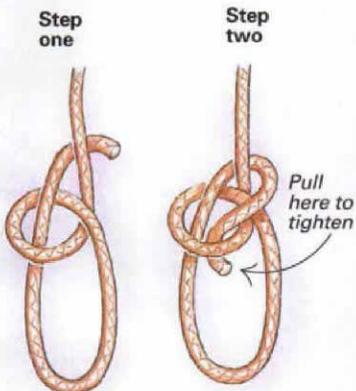
mension and length (drawings above left). Stacks that are much wider than they are tall should be avoided because the tension is applied to the edges of the load. Wide loads can get loose in the middle and bounce free. For example, it is better to stack a dozen 2x4s in three stacks of four (roughly 6 in. by 10½ in.) than six stacks of two (roughly 3 in. by 21 in.).

Whatever the dimension of the stack, it shouldn't extend above the horns of the rack because the top layer has to be held against something. If the horns aren't tall enough to support the side of the load, try turning a wide board—say a 2x8—on edge. Place the 2x8 against the horns and butt your load against it. But go easy with this modification. Loads have a way of getting top-heavy in a hurry.

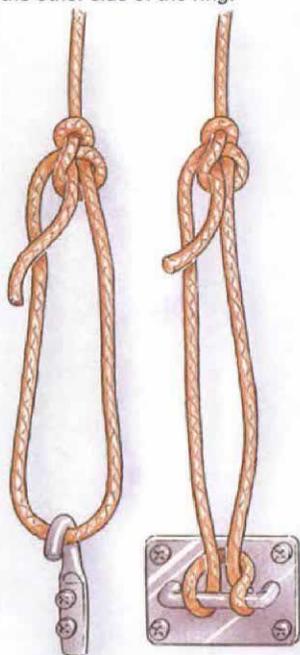
A load of lumber of like thickness but different width can be intermixed as long as the width of the stack remains fairly uniform. If there are large variations in thickness, width and length in the load, it may be sensible to split the load into two parts, securing each part separately to opposite sides of the cargo rack. A good example of this would be a load of framing lumber mixed with finish stock.

Contrary to what you might think, you should put the shortest pieces of lumber in a load on the bottom. The shorter boards will help support the longer ones, and this arrangement will minimize the flapping that occurs

The bowline. This knot is used to put a loop in the end of the rope. Almost every rigging job begins with the loop of the bowline passed around or through a tie-down.

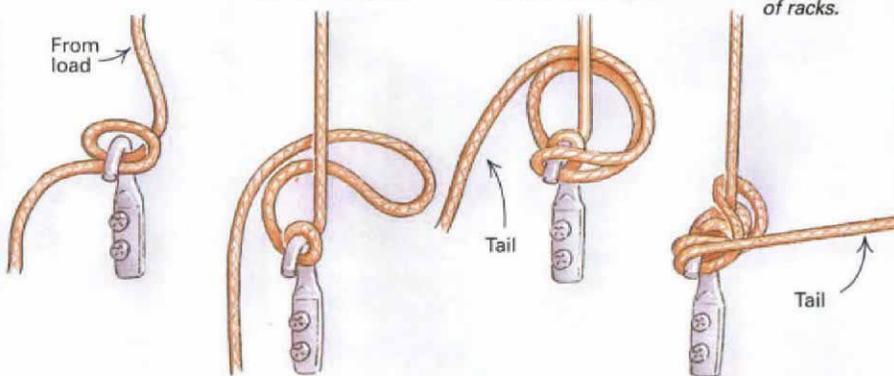


Bowline to a hook or loop. For a fixed loop or ring, feed the loop through the ring. Then pull the rope through the loop from the other side of the ring.

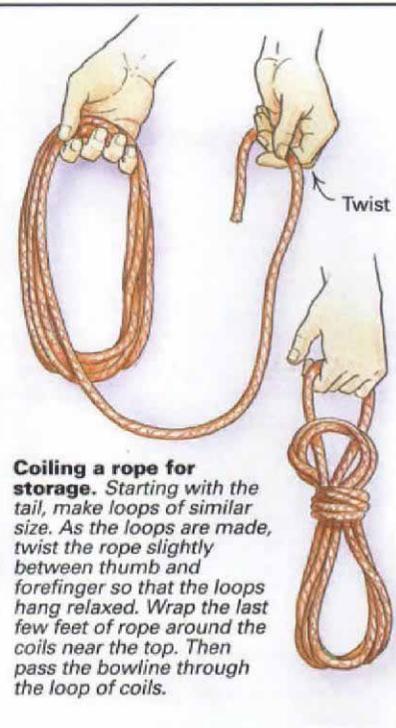
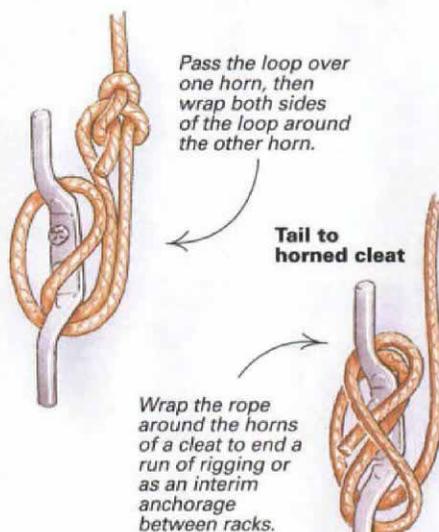


Tow-boat hitch. Use this knot to make off a rope in the middle of its run when you're using a hook for a tie-down, and you need to maximize the length of rope.

1. Take extra turn around hook horn.
2. Pass tail loop behind tensioned line and around horn.
3. Bring tail around tensioned line and around horn again.
4. Tail can now be led to next set of racks.



Bowline to horned cleat



Coiling a rope for storage. Starting with the tail, make loops of similar size. As the loops are made, twist the rope slightly between thumb and forefinger so that the loops hang relaxed. Wrap the last few feet of rope around the coils near the top. Then pass the bowline through the loop of coils.

when hauling long stock over rough or bumpy roads. The thinner the stock, the greater the flap. So lash the ends of thin boards or moldings together to keep them from slapping into one another during transport. A good way to brace them is to use a sturdier board in the load as a splint. And, of course, loads that project beyond the tailgate should be marked with a red flag.

If possible, panel materials, such as plywood or gypsum board, should be carried inside the bed of the truck and secured there. Unsecured panels can be sucked out by the negative pressure that builds up behind the cab. I've seen some builders who stack the panels vertically and lash them to the rack's uprights. This is OK if the trucks are big enough to tie the panels off hard against the uprights.

If you have to carry panel stock atop the racks, load it on top of three 2x4s that are longer than the panels. One 2x4 is placed under each side of the panels, and one under the middle. The panels should be centered lengthwise on the racks and pushed against the horns on one side. After lashing the sides of the panels to the horizontals, I lead the rope over the corner of a

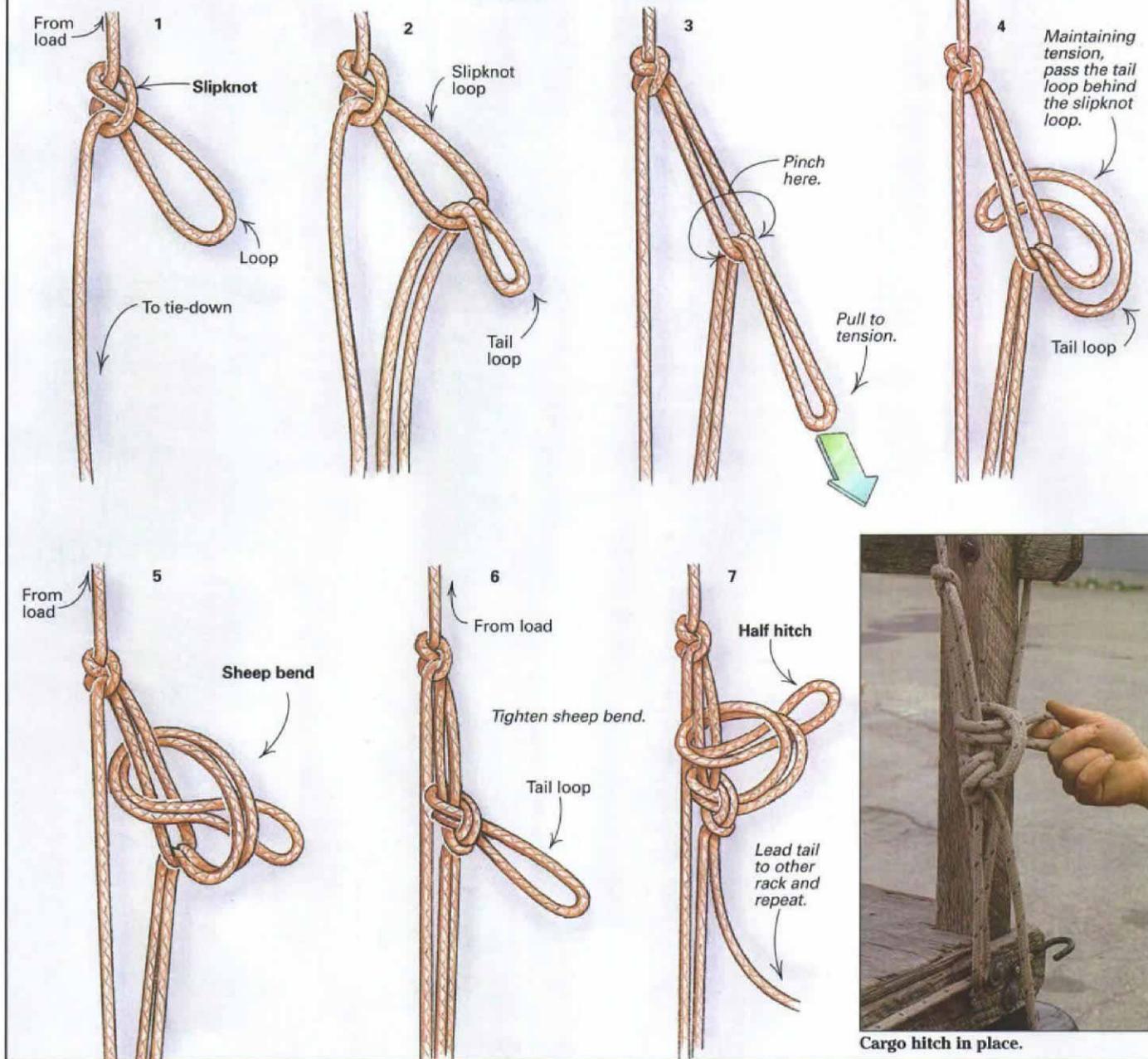
panel, loop it around the center 2x4 and then across the adjacent corner (photo p. 46). This pattern lashes the stock to the center 2x4, stiffening the load and preventing it from sliding forward or backward.

Builders have to carry more than materials—tools, for example. Some racks include ladder dogs, which are short, vertical pieces (like the horns) affixed to the crossbars. During transport, the dogs project through the rungs of the ladder to keep the ladder from sliding backward or forward. Dogs help, but don't depend exclusively on them to keep the ladder in place. Set the ladder against one side so that it can be secured to the horns, and pass your rope through the rungs. If it's an extension ladder, both halves should be secured together before the ladder is placed on the racks.

Now the knots—Once you know what to look for, you can tell in an instant if a load has been rigged properly. If you see a necklace of half hitches, square knots, granny knots and what knots, the guy who rigged the job doesn't know what he's doing. Half hitches are especially common in bad

The cargo hitch, which combines the slipknot and the sheep bend, is the indispensable rigging knot. Begin with a loop through a slipknot on the load side of the tie-down (1). Pass the rope around the tie-down, make a loop in its tail and pass this loop through the

slipknot (2). Pull on the rope, and pinch the tail loop and the slipknot loop where they engage (3). Lead the tail around the slipknot loop (4) to tie a sheep bend (5). Tighten the sheep bend by pulling on the tail loop (6). Finish with a half hitch above the sheep bend (7).



rigging. They tend to tighten up to the point where they can't be untied while perversely allowing the tension on the rope to loosen. Don't use half hitches except to tuck away rope tails that have been rigged with real knots.

A good knot is easy to tie, maintains tension under load and can be untied easily. The knots illustrated here satisfy all of these criteria.

Except in the rarest of cases, the bowline (left and bottom middle drawings, facing page) will serve as the starting point for all your lashing. A bowline makes a loop, and I keep one permanently tied in one end of my rope (the other end is the tail). Two other knots that are used repeatedly in lashing cargo are the slipknot and the sheep bend (drawings above).

To start a run of rigging, the loop of the bowline can be hooked over a cleat or a hook, or pushed through a ring or a fixed loop. To begin rigging a load on a truck with cleats, pass the loop of the bowline over one of the cleat's horns and then both sides of the loop under the other horn (bottom middle drawing, facing page). Now pass the rope over the load, around the crossbar and then back over the load (bottom right drawing, p. 50). Each

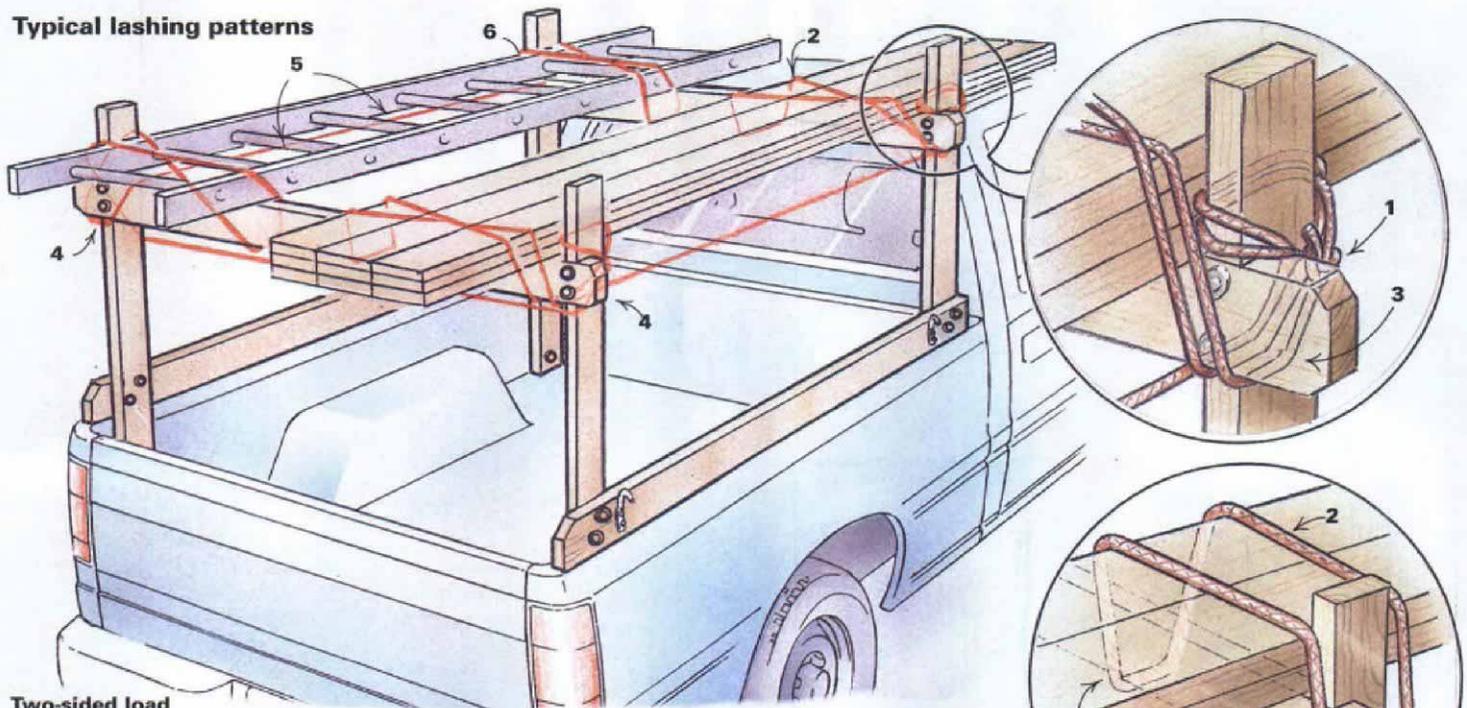
time the rope changes direction, pull hard to put as much tension as possible on the rope. Use one hand to pull and keep the tension, and the other hand to feed the rope. After completing the path around the load, lead the rope back to the cleat. Now tie off the rope (also called making off the rope) on a cleat. The tail of the rope can then be led to the next rack, and the procedure repeated.

If you want to maximize the tension on the load, use a cargo hitch for making off the rope. This wonderful knot (drawings above) has the added usefulness of doubling your mechanical advantage when you tension the knot. You can make off a cargo hitch in the middle of the rope and then lead the tail of the rope to the other rack to secure the load there.

Lacking a tie-down, you can start rigging the load by passing the loop of the bowline under the crossbar and over the horn of the cargo rack (top right drawing, p. 50).

Another way to make off a rope on a hook is with a tow-boat hitch (top drawing, facing page). I use this knot to end my rigging when I don't have

Typical lashing patterns

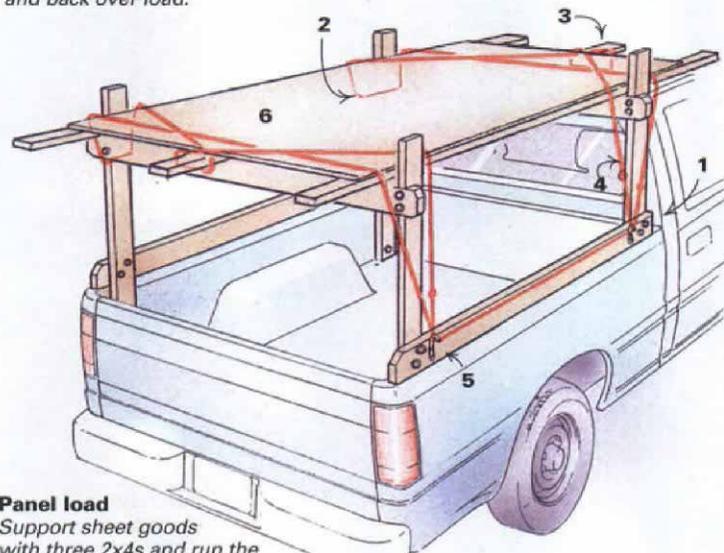


Two-sided load

To conserve rope on a two-sided load, begin the run at a rack horn. Keep the rope taut, and wrap it around each crossbar and post to maintain tension.

1. Start with bowline looped over rack horn.
2. Lead rope over load, under crossbar and back over load.

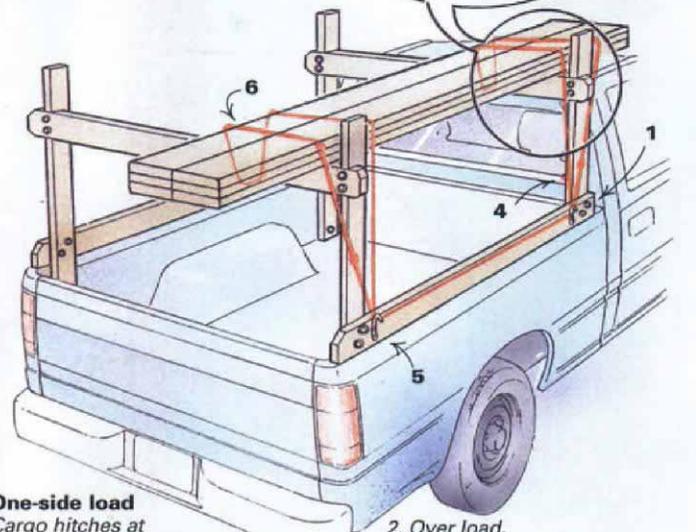
3. Pull rope taut, and lead it under the crossbar and around the horn.
4. Repeat at each corner.
5. Pass rope through ladder rungs.
6. To cargo hitch or a tow-boat hitch if the rope runs short.



Panel load

Support sheet goods with three 2x4s and run the rope over each corner.

1. Begin with bowline around forward tie-down.
2. Over the load and under the crossbar.
3. Over panel corner and around middle 2x4.
4. Over corner to cargo hitch.
5. Tail to rear tie-down.
6. Repeat procedure.



One-side load

Cargo hitches at each rack help ensure a tightly secured load.

1. Begin with bowline around forward tie-down.
2. Over load.
3. Under crossbar.
4. Back over load to cargo hitch.
5. Tail to rear tie-down.
6. Repeat procedure.

enough rope or space to tie a cargo hitch. Once familiar with the tow-boat hitch, you can also use it to make off ropes on the horns of a cargo rack.

Logic and care—Always take the time to plan the rigging logically. For example, if I'm using both sides of the rack, I want to make sure that I have enough rope to lash down both stacks. A thoughtful rigging job is usually fast and efficient—at both pickup and drop off. Dismantling the rigging at the job site should occur in the exact reverse that it was done. The rope should come off the load knot-free except for the bowline.

Get into the habit of coiling the rope correctly after each use, starting with the tail end. The rope should be coiled while it hangs from one hand (bottom right drawing, p. 48), not twisted around the hand and elbow. Twisting it

around the wrist and elbow doesn't allow the rope to relax, and it will soon develop kinks. When you've got the rope coiled, wrap the bowline end around the coil a few times. Then pass the bowline through the top of the coil to form a hanging loop.

Once the cargo is in place, and you've driven a few miles, pull over to inspect the load. Heavy cargo subjected to the rigors of transport has a way of bringing out the flaws in even the most experienced rigger's work. And remember that the weight carried on racks will tend to make a vehicle top-heavy and behave accordingly on the road. □

Roe A. Osborn is a carpenter and sailor living in Wakefield, R. I. Photos by Charles Miller.