Building a Stationary Dock

by Matt Gard

Use big PVC pipe to keep water out of the footer holes, opt for cordless tools, and remember to empty your pockets

Building a dock is a lot like building a deck — with wet feet. Like decks, docks have footers, posts, beams, joists, decking, and railing; docks also have the same load requirements as decks. A few techniques, however, are different for docks, mostly involving the footers.

Where I live in Indiana, docks are common. Most new subdivisions have lakes — often even stocked with fish — built by developers seeking the premium pricing that's typical for lakefront lots. This works out well for me, as it means there are a lot of potential clients who want a dock, whether for fishing, swimming, entertaining, or some combination thereof.

Getting Started

Before I design a dock, I spend time with the customers to find out how they plan to use it. I encourage them to stick to lighter colors of composite

decking, such as gray or cedar, which stay cooler and are less likely to burn bare feet. I also ask them a number of questions: Do they want accessories, such as a ladder or a fish cleaning station? Will they keep a table or storage bins on the dock? Do they have a boat? Their answers will affect the size of the dock.

You can build a basic 8-foot-square dock, but it would be impractical for anything more than a place to put a couple of chairs. A fairly typical dock is a rectangle 16 feet wide by 12 feet deep (**Figure 1**). Generally, I crop the two outer corners of the rectangle at 45 degrees, back 2 feet to 3 feet depending on the dock's width. This gets rid of the sharp 90-degree corners while leaving plenty of room to pull up a paddle boat, install a ladder, or go fishing.

The cropped shape works well with the cantilevered design I like to use. Cantilevering the cropped section allows me to install the outer support beam and outer posts closer to the shoreline — where the water is usually shallower and where digging the outer footers and setting the posts is much easier than it is even a couple of feet farther out.

I don't usually need to clear a design with the building department, as building permits are rarely required for docks in the counties where I work. You should, of course, check with your local building authorities to see if permits are needed in your area. Sometimes when I'm building in a subdivision, I do need to adhere to the standards of a homeowner's association; these usually address how far a dock may extend into the water or how much of the shoreline it may consume.

Even though where I work codes rarely require railings on a dock, I

Cantilever Framing for Safety

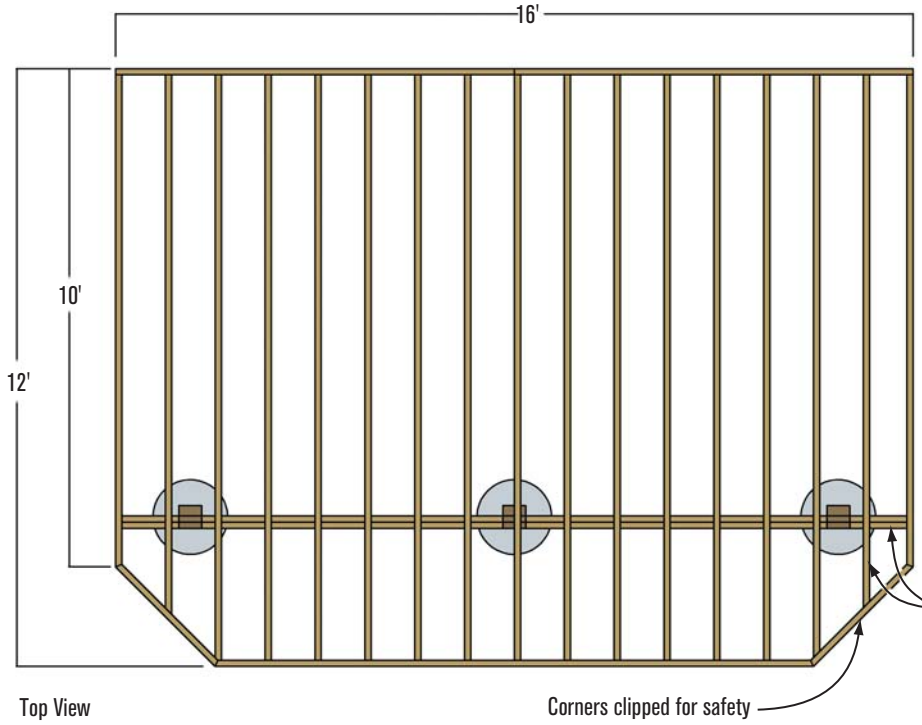

Figure 1. Cantilevering the beam beyond the posts, and the joists beyond the beam, keeps the posts and footer forms under the dock. Otherwise, anyone jumping or falling from the dock could be injured by the edge of the footers.

Figure 2. Although not required by many codes, railings along the side of a dock are still a good idea to protect people from falls to the shore or into shallow water.

still think they're a good idea for the sides (**Figure 2**). If someone fell off the side into shallow water, he or she could get badly hurt.

Above the High-Water Mark

A dock's elevation is key to its durability and usability. The beam and the joists need to be out of the water as much as possible; but at the same time, the dock needs to be low enough for the client to easily enter a boat or climb out of the water. Locating the bottom of the beam just a couple of inches above the lake's maximum water level strikes a good balance.

I say "maximum" because the level of a lake's surface can fluctuate. One way to determine how high the water level can get is by finding the runoff drain, which many lakes have. It's typically a pipe or similar structure located in the water near a dam. If the lake's surface rises past the level of this drain, the excess water will flow out over the top of it. Barring extreme circumstances, the drain generally corresponds to the high-water mark.

After measuring how far the drain is above the current water surface, I measure up the same distance from the water's surface at the dock location (preferably on the same day). By leveling over to land, I can then mark the high-water level on the shore, using paint. From this elevation, I can establish the height of the framing using a laser level (a builder's level or water level would also work) — no matter what height the lake happens to be any particular day.

I mark a few other reference points on the shore, in addition to the high-water level: the elevation of the bottom of the joists/top of the beam, and two points several feet back from — and parallel to — where the dock will hit the shore. At the latter two points, I drive in steel concrete stakes; I run a string between them to create an offset line from which I measure to locate the support posts. This offset line usually also represents the shoreline rim board of the framework.

PVC-Pipe Footer Forms

I start with the offshore support posts — I won't place the onshore posts until I've assembled the outer frame of the dock. As with a deck, the number and spacing of the posts depends on the size of the structure and the depth of the beam and joists. The posts themselves, usually 6x6s, will be encased in concrete in a permanent form made from 12- to 18-inch-diameter PVC pipe that extends above the surface of the water (**Figure 3**).

Figure 3. Large-diameter PVC pipe serves as a concrete form for the footers. The author extends it several inches above the average waterline.

My local plumbing-supply store carries large-diameter PVC pipe. The 12-inch pipe costs less, and I use that when the length will be 18 inches or less. When 12-inch pipe is longer than 18 inches, the handles of the post-hole diggers can't open all the way, so I switch to 18-inch pipe.

Although frost heave is not a problem with most dock footers, I still like to sink the post and concrete about 3 feet into the lake bed. This is usually deep enough to get past the soft muck into soils that can support a load. Additionally, this depth helps to give the post some lateral stability.

Next comes the fun part — empty your pockets because it's time to get wet. I tend to take off my shoes and socks and just jump in and get the task done. I have worn waders but only if the water is very cold. Waders rapidly heat you up and feel big and bulky — without necessarily keeping you dry.

I wade out and pull some rough measurements from the reference line to determine where to place the pipes and posts. I make sure the pipes are inset at least 6 inches from the edge of the dock. This way, someone jumping or falling into the water isn't likely to get hurt by the edge of the pipe. At the approximate locations of the pipes, I measure from the muck to the high-water mark. I add an extra foot or two to that measurement — depending on how soft the bottom of the lake is — to find the length of the pipes.

Once I've cut the pipes to length, I place them at the desired locations. I push the pipes into the muck as far as they'll go (usually 6 inches or so), but not so far as to drive them below the waterline (**Figure 4**). The muck seals around the bottoms of the pipes, keeping out additional water.

I double-check the measurements from the reference points. If all is well, it's time to get the water out of the pipes. I bail it out with a small bucket. I suppose a pump could be used, but even if it were plugged into a GFCI circuit, mixing electricity and water would make me nervous.

When the water has been removed

Offshore Footing

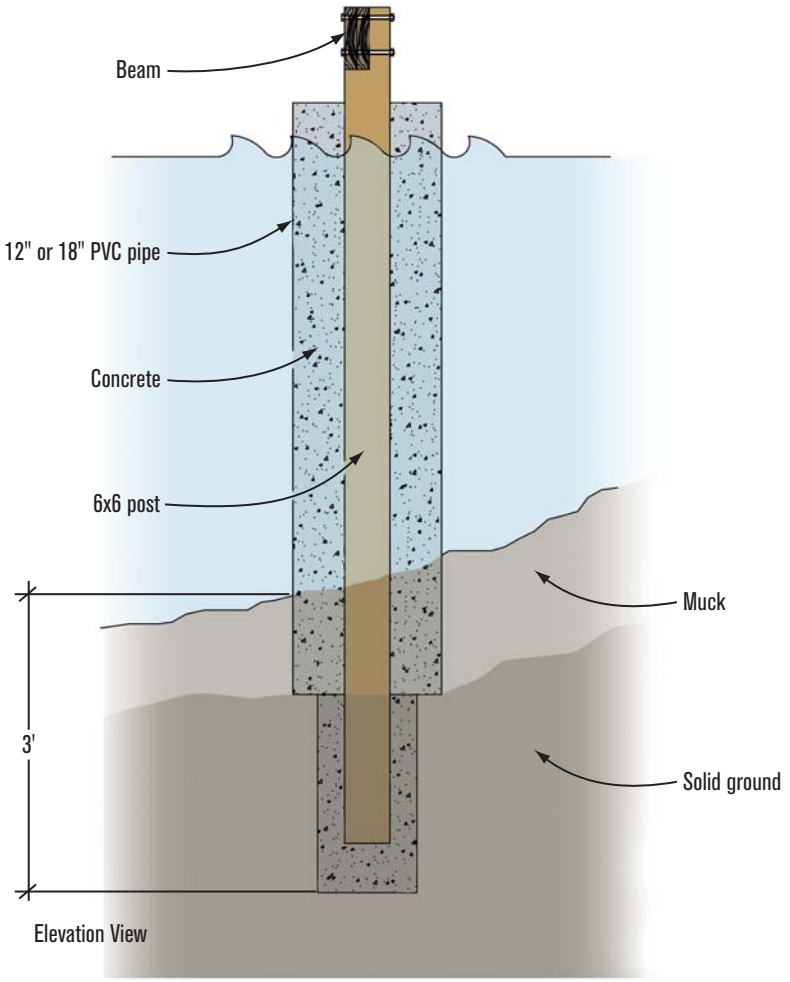

Figure 4. Twelve-inch or 18-inch PVC pipe driven into the mud of the lake both keeps out the water while the footer is being dug and serves as a concrete form. Treated 6x6 posts are cast in the concrete.

Figure 5. Once the PVC pipe is driven into the mud, it's emptied of water with a bucket. The footer is dug down into solid ground using a post-hole digger.

from the pipe, I dig the footer hole (**Figure 5**). Again, these footers provide much of the lateral support for the dock, so don't skimp on their depth. In my area, it's common for the first foot or so to be soft and muddy and the rest to be clay. Clay is very hard to dig through, and I've found that sharpening the cutting edges of the post-hole digger with a grinder makes the job a little easier.

Deeper footers are harder to dig and I have occasionally rented a mini-excavator with an auger. The excavator's boom can be used to seat the PVC in the mud, and the auger is run inside the pipe. You can also buy post-hole diggers that are up to 8 feet long (one source is Swartz Tools; 866/399-3056, superdigger.com, $53 plus shipping), but you might need a boat to use them. This is the point where I begin to think a floating dock would be easier — but that's another article.

Setting the Support Posts

The distance from the top of the muck to the beam can be anywhere from 3 feet to 6 feet. Add the 3 feet of post going into the lake bed and most of the time the posts end up being 8-foot to 10-foot 6x6s. I cut the posts long to begin with, as I'll cut them to height after the concrete has set.

Before I lower the posts through the PVC pipes, I pour about 10 inches of concrete through the pipes into the footer holes. About the only way to get the concrete out to the pipes is in buckets. It's important to allow extra time in your estimate for this process.

Figure 6. The 6x6 posts are set in the PVC forms and concrete is carried out from the shore in buckets and placed around the posts. The PVC will be trimmed to the level of the concrete with a cordless reciprocating saw after the concrete sets.

Then I drop the posts in the pipes so they rest on the 10 inches of concrete in the footer holes, a foot or more down past the bottoms of the pipes. After bracing the posts to keep them in line — with 2x4s attached to stakes driven in onshore — I fill around them with concrete.

The concrete fills the pipes to a couple of inches above the normal waterline (**Figure 6**). Some pipe may extend above the concrete. I let the concrete cure for three to four days, after which I cut off the excess pipe with a cordless reciprocating saw.

Sources of Supply

Docks often use accessories that are quite different from those used on decks. For specialty items from ladders to float foam, here are a few suppliers that I use.

Tiger Waterfront Products
636/272-4300
tigerboatdocks.com

Merco Marine
800/396-3726
mercomarine.com

Dock Accents
888/219-0112
dockaccents.com

Dock Hardware
800/826-3433
dockhardware.com

Figure 7. The outer posts are trimmed to the correct height after the concrete sets. White paint on the grass represents the maximum water level of the lake; the height of the framing should be several inches above that. The author uses a laser level to transfer this elevation from the shore to the posts.

A word on power tools: I don't like 120-volt power near the water so I use cordless tools for all cutting. I won't tell you that the DeWalt cordless tools I use are waterproof or even water-resistant, but I can tell you that I have dropped several into the water and after drying out, they still work. When I drop a tool, I get it out of the water quickly, remove the battery, and allow it to dry overnight.

The next step is cutting the posts for the beam (**Figure 7**). I set my laser level on the shoreline reference mark that indicates the bottom of the joists and the top of the beam, then wade out to mark all the posts at this height. With a cordless saw, I cut the tops of the posts at my marks and notch them the full depth and width of a beam.

I attach the beam to the notched posts using 1/2-inch stainless steel through bolts. I've been using all stainless steel hardware and fasteners on my projects since before ACQ-treated lumber was introduced. Not only is this added insurance, but it helps me to stand out from the competition.

After the beam is bolted to the notched support posts, I assemble the outer frame of the dock — but I don't secure it to the beam yet. I square the frame to the beam and make sure all the posts and concrete are covered by the framework.

Figure 8. Once the outer footers and posts are complete, framing proceeds as it would with any freestanding deck.

With the outer frame set temporarily in place, I can mark exactly where to dig the footers for the shoreline support posts. I slide the frame out of the way to dig the holes. Once these footers have been placed and the beam that they support is set, the rest of the job proceeds about like building a deck (**Figure 8**). Except that on hot days, it's really easy to cool off. ❖

Matt Gard owns Artisan Decks & Docks, in Evansville, Ind.