PHOTOS BY ROBIN LOPEZ

Building a Freshwater Dock

Except for a few details—like the water—it's not that different from building a deck

by Robin Lopez

In some respects, a dock is nothing more than a deck over water. At least, that's what I tell my clients. That's an oversimplification, of course, but many of the same construction principles apply to both scenarios. Once you understand the basics, building a dock is no harder than building a deck.

A bit smaller than our typical build, this project is located on Florida's historic Winter Park chain of lakes, which has strict construction requirements to ensure conformity throughout the lakeshore. The dock has only 20 feet of walkway, a 12-foot-by-16-foot platform, and a 10-foot-by-28-foot slip, while the majority of our projects have a minimum of 80- to 100-foot walkways and 800- to 1,000-square-foot platforms.

Equipment

Dock building requires a few tools that might not be in your standard deck-building arsenal. A floating work surface (preferably motorized and with a crane) is immensely helpful. A necessity is a 2-inch trash pump with accessories (intake line, outflow line, quick-connect fittings, wand, wand extension) that transform it into a jet pump, which we use for setting piles. Waders and sun protection are also essential.

We typically don't build in saltwater, but when we do, everything metal—connectors, nails, screws, bolts—is stainless steel. Saltwater construction generally requires driving the pilings, which is much more time intensive than using a jet pump.

Our framing materials are always pressure-treated southern yellow pine #2 grade or better (we frame with #1 grade for all visible portions, like the roof framing). We buy all of our materials from a marine lumberyard, which ensures that they are AWPA UC4B compliant.

Waterfront Rules and Regulations

Most of our work is in central Florida, where securing building permits means dealing with more than 20 city and county municipal entities. Each municipality has its own code and regulations, so if a lake is located in two (or more) towns, something that is acceptable on one side of the lake might not be acceptable on the other side.

Figure 1. A water jet is used to set 6x6 PT pilings into the lake bottom (A). Then 2x8 stringers are nailed to pilings a minimum distance above the water level, per state and local codes (B). A second set of pilings are set parallel to the first (C). The crew sets a maximum of seven or eight pilings per side, then starts to frame the structure to stabilize them (D).

In addition, we have to acquire environmental permits for any waterfront work prior to applying for a building permit. Again, there are different procedures for different locations, though there is one consistent requirement: a floating turbidity curtain to keep all of the soil disturbance and construction materials contained.

Keeping all the specific rules and regulations straight sometimes makes my head spin. But I've learned that it's worth digging in and making sure we're on solid legal ground, rather than provide a client with a dock design that has to be changed midway through the permit review process for being nonconforming.

Layout

Once we've leaped the permit hurdle, it's on to the easy and quick part: construction. With all these rules and regs, nothing is more important than making sure that we install the dock in the right location—no matter how much we dig, we've never managed to unearth a physical property line.

To ensure that we build our docks where we intended to, all of our site plans are CAD-based, which allows us easy access to all critical dimensions as we lay out the project on the jobsite. We typically use a known reference point—such as a survey marker (if available), a house, or a fence line—to provide the basis for the starting point. Because we have a laptop on site, we also double-check the location with a secondary reference point.

When we're confident that our starting location is accurate, we set a string line from the shore out into the water. Some of our walkways are up to 600 feet long (where the shoreline is marshy), so being off "slightly" would result in large location variations over these distances. With a string line set and denoting the line that the pilings will follow, it is time to start setting pilings.

Our locations are all based on the dimensions in our CAD layouts. When we set the string line, we confirm that the end point is at the proper location using simple right-triangle geometry, which is easily verifiable in the field.

Setting Pilings

On dry land, of course, concrete is the go-to solution for creating a solid foundation for a deck. But for residential dock construction, where digging a hole underwater and pouring concrete into it is not an option, we use 6x6 square pilings made of pressure-treated southern yellow pine. For walkways, the pilings range from 10 feet to 16 feet in length, while for roof support, we typically spec 20-foot to 24-foot pilings.

Figure 2. Hurricane clips tie the intermediate stringers to the 2x8 cross beams (far left), while 10-inch-long-by-5/8-inch-diameter HDG through-bolts fasten the cross beams to the pilings (left).

Figure 3. The crew dry-lays the decking to check the layout, spacing the deck boards with 16d nails to make sure water will drain off the dock quickly (far left). To provide support for a picture-frame border, the crew installs extra stringers between the pilings and adds blocking (left).

Because the majority of the soil in our area is soft, we usually are able to use our jet pump—which is just a trash pump operated in reverse—to set the pilings. We feed the outflow from the trash pump through a reduced-diameter pipe to blast a stream of water into the lake bottom at the point where a piling is to be located (**Figure 1**).

While one worker holds the piling upright and in position, a second worker uses the wand on the jet pump to open a hole underneath it. As the water jet scours out the hole, the weight of the piling sinks it down into the excavation. Once the piling has sunk a few feet, we remove the wand and check the piling for plumb and location along the string line.

It seems like pilings never end up exactly in the correct location, though. To correct this, we bring back the wand, situating it to provide directional jetting at an angle toward where we want to move the base of the piling. We also angle the piling as needed to provide the desired lateral shifting as it continues to drop in the lake bottom. It's much easier than moving a hole in dry ground.

Typically, we set pilings 5 to 6 feet into the lake bottom. When pilings will be supporting a boathouse structure, we are careful not to set them too deep; otherwise, we could end up not having sufficient height to support the roof.

Once a piling is in the desired location, we use the wand to refill the blown-out area around the piling and provide support to the piling. For added stabilization or in harder soil, we sometimes use a vibratory hammer to finish setting the pilings and fill in any voids.

After setting several pilings in a row (working out from shore), we set up a second string line parallel to the first and, working back toward shore, set the mate for each of the pilings in the first row. Setting seven or eight pilings per side before stopping to frame up the structure allows for a convenient way to move materials out to the proper location, and it ensures that the

Figure 4. When plans include a boathouse or other roofed structure, the crew installs longer pilings to support the framing (above left). To create the box beams that support the roof, the crew fastens 2x10s to the inner and outer faces of the pilings, then fills the gap between the 2x10s with a 2x6 filler, making a convenient wiring chase (above right).

pilings don't shift due to settling or wave action. We try to keep all spans to less than 10 feet in all directions, though we can stretch that, if needed, to work around a tree root system or a submerged obstruction.

Framing the Dock

Unlike a deck, docks come with built-in level references (at least on calm-water days). Measuring up from the waterline at opposite ends of the dock is an accurate and convenient way to transfer level across the pilings.

Usually, the dock is required to be at least 12 inches above the Normal High Water Elevation, which is a reference contour elevation that may or may not have any actual bearing on the true normal water line. While we do have seasonal fluctuations (summer is rainy season), the changes in water level are usually no more than 2 feet from high to low.

With the specified height marked, we snap a chalk line to mark the intended locations for the top of the stringers at each piling. Then we nail the outside 2x8 stringers in place.

Once we've secured the outside stringers to the pilings, we again check the pilings for plumb and adjust as necessary. Then we measure and cut the double 2x8 beams that will connect each pair of pilings and support the stringers. We through-bolt the beams to the pilings with 10-inch-long-by-5/8-inch-diameter HDG carriage bolts (**Figure 2**).

With the beams installed flush under the stringers, there's now a framework ready for installing the intermediate stringers. We space them depending on the width of the dock and the span rating of the decking being used, and tie them to the cross beams with Simpson Strong-Tie H2.5A hurricane clips to prevent uplift due to wind or wave action. Once the framing is structurally secure, it's time to begin laying the decking.

Installing the Decking

When it comes to decking, we are pretty much brand agnostic—everyone makes a great board these days—though we prefer wood-plastic composites to a true PVC or plastic. Our recommendation is to choose the product that has the strongest rep support in the event there ever should be an issue.

Though some of our clients ask about hidden fasteners, we try to steer them away, especially given the length of some of our walkways. Most clients don't mind visible screw lines, as the eye has a lot more to take in on a long walkway versus a standard 12x20 backyard deck. Regardless of what our clients

Figure 5. When the crew is working over water, care must be taken to collect offcuts. The orange turbidity curtain is a requirement for containing construction debris.

Figure 6. To provide visual interest to the boathouse ceiling, the crew installs grooved T1-11 ⅝-inch sheathing, with the grooved side facing down.

choose—PT, composite, or PVC decking—we install it using either a Simpson Strong-Tie QuikDrive or a Muro stand-up screw gun (**Figure 3**).

We start by rough-cutting the decking to size and dry-laying the deck boards, using 16d nails as spacers. Once the boards are spaced and in place, we snap lines to mark the locations of the outside stringers, screw the decking down, and then cut to the lines. Later, we snap lines (always with erasable blue chalk) for the intermediate stringers before installing the rest of the fasteners.

This dock happens to have a picture-frame border. To provide support, we installed extra stringers between the pilings and additional blocking as needed.

Unlike with deck construction, we station a person with a net to collect the offcuts when we cut decking in place. Otherwise, the scraps will float down along the shoreline or sink to the bottom.

Once the decking is complete, we install "pretty boards" around each of the pilings. These boards—basically 2x6s with a 45-degree bevel at the top—aren't really that pretty, but they do add some visual definition to the pilings and are a great place to hide wiring for lighting as well as splices needed for any pilings that were too short (**Figure 4**).

Boathouse

The boathouses in our area have many restrictions on parameters such as square footage, overall height, and even whether they can be enclosed or not. The majority of our work is on inland waters, so most of the boats we see are between 3,000 and 7,000 pounds and less than 8½ feet wide. With those specifications in mind, we move forward with setting the pilings for the boathouse platform. This phase of the job requires a bit more strategy, as we want to avoid boxing our workboat into the structure or being unable to set a piling because the space is no longer accessible.

Our reference for squaring the boathouse platform is the line created by the final two walkway pilings. With the pilings set, we frame the platform structure in much the same way as the walkway, again working outward into the water and installing the necessary components prior to relocating our workboat, ensuring ease of access later.

Once we've installed the platform

Figure 7. Before the roofing subcontractor arrives to finish off the project, the crew installs a second layer of 1/2-inch plywood sheathing, which strengthens the roof deck and prevents nails from popping through the grooved T1-11 ceiling.

decking, we shift our focus to the roof structure. For our headers, we like the look of a "boxed" beam, so we sandwich our roof support pilings with pairs of 2x10s fastened to the inside and outside the piling faces. This leaves us with a gap between the headers the width of the 6x6 piling, which we fill with 2x6s that are flush with the bottom of the headers. Creating a box beam around the perimeter of the structure adds quite a bit of strength and rigidity to the roof system and gives us a convenient trough to set down tools during installation, as well as a place to conceal wiring after installation is complete (**Figure 5**).

We use typical roof construction practices for placing the ridge beams, corner ridges, rafters, and collar ties. The trimming of the rafters and the installation of the fascia can get a bit tricky at times without solid ground to work from; otherwise, the process is identical to conventionally framing a roof over a gazebo.

With the roof structure completed, we install the beams needed to support the boat-lift system. Those are sized based on the specs of the lift (**Figure 6**).

For the roof decking, we like to use 5/8-inch T1-11 plywood with 4-inch-on-center groove spacing, with the grooved side facing down. To prevent nail pops, we then add a second layer of standard 1/2-inch plywood. Combined with the exposed rafters, this gives the boathouse ceiling a poor man's "tongue-and-groove" look. The exposed rafters also add visual height and provide usable space for storing boat accessories (skis, wakeboards, inner tubes, paddleboards, and so on). And without a flat ceiling, there's extra room for a boat's wakeboard tower or Bimini top when the boat is in a lifted position.

Finishing Up

Finally, we call in the subs to complete the roof installation (shingle, tile, or metal) and the electrical installation (115 VAC and 12 VDC), and we schedule a surveyor to come out to survey the dock to verify its location and elevation for permit compliance. By this time, we have relocated our workboat and turbidity barrier and moved on to our next project (**Figure 7**).

It took our four-man crew five days to build this dock, which had a project budget of just over $30,000. Other than the need for longer pilings and the increased insurance requirement for working over water, costs don't vary much from those of a standard deck. ❖

Robin Lopez owns Summertime Deck and Dock (summertimedocks.com), located in Orlando, Fla.