THE DOCK PRIMER

A COTTAGER'S GUIDE TO WATERFRONT-FRIENDLY DOCKS

Fisheries and Oceans Canada
Pêches et Océans Canada

Cottage Life

THE DOCK PRIMER

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GETTING STARTED

In the beginning...there was a shoreline. Perhaps it already had a dock, one that no longer suited anybody's requirements. Perhaps the dock was falling apart, or maybe the shoreline was devoid of a dock, an empty beach with no place to moor a boat. For whatever reason, the decision was made, and that shoreline is getting a new dock.

Building a residential dock is not a difficult process. In fact, constructing a dock can be as easy as falling off a log, often with the same results. Fortunately, building a safe and stable dock is only a little more difficult than building a bad one, with the majority of not-as-good-as-they-could-be docks existing simply because the builder was unaware how little separates good from bad. This primer points both the confirmed do-it-yourselfer and the equally confirmed purchase-it-yourselfer in the direction of good docks and good dock-building practices. It also explains how to avoid some potentially damaging and costly errors. For the full scoop on docks – including plans and full construction techniques – you will need to buy *The Dock Manual* (Storey Books), the only resource that can explain all facets of residential dock construction. (See "Further Reading," p. 22.) Coincidentally, *The Dock Manual* was also written by the author of this primer, which explains how I got away with borrowing some research from it.

The most important thing to know about dock construction is that no dock is a stand-alone structure. A dock has to work in harmony with that sometimes uneasy marriage of land and water known as your shoreline, and with the various uses you and your family envision for that shoreline. No two sites are alike. And no two families are alike. Celebrate this uniqueness by making note of your shoreline's prominent features and hidden secrets. Then make a detailed map of it all. Graph paper is the preferred media for cartographic novices, as a scale can easily be assigned to the squares, such as one $\frac{1}{4}$" square equals 4' or whatever is needed to fit your cottage shoreline onto paper.

A detailed map of your shoreline is your most valuable tool in building a dock. For one thing, while I'm sure you are a very nice person, you probably don't want to build your neighbours a dock, which can happen when your carefully constructed masterpiece ends up on the wrong side of a property line (it happens).

Also, no matter where your waterfront is located, chances are you will need to get approval from at least one government agency, probably several.

Having a map of your site, with the proposed project all neatly drawn out, cuts down on the red tape (see "The Approval Process," p. 20). Yet the best reason to map your shoreline is that it greatly eases the task of choosing the location, type, and size of dock best suited to your needs and budget, whether you're building it yourself or hiring a professional.

Begin the mapping process by locating lot lines and measuring any structures, such as the cottage or pumphouse. Mark your findings on the map. Same goes for the shape of the shoreline, the direction of prevailing winds and currents, the best views of the lake and shoreline, the topography and vegetation on the land rising from the water and the land under the water, noting its makeup (rock, sand, mud) at 12', 24', and 36' intervals. Also mark the location of submerged navigational hazards such as rocks and sand bars. Note frequently used areas such as horseshoe pits or swimming areas, along with water-intake lines, power lines, and telephone lines – basically everything.

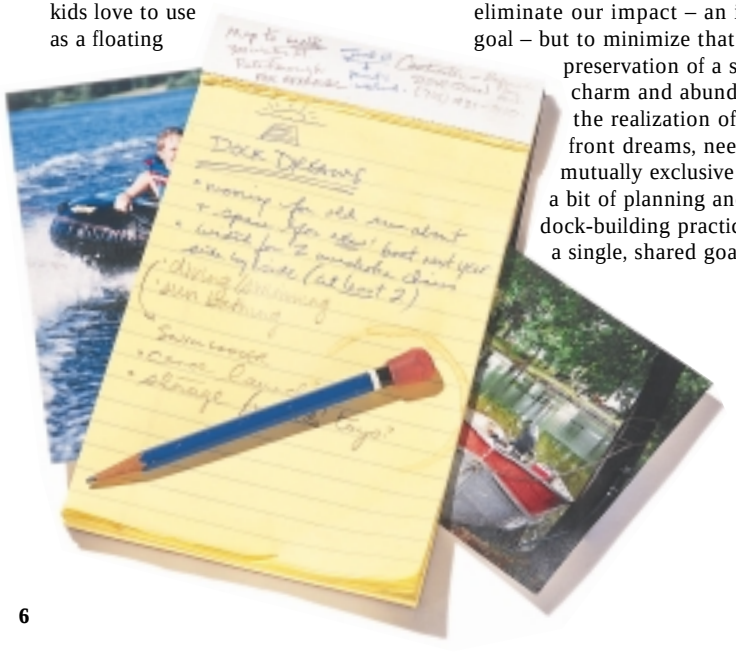
If you are aware of shoreline nesting sites for waterfowl (remember the ducklings that swam by in the spring?), fish spawning areas or wetlands, mark these on the map too. But don't include any as-yet-to-be-constructed docks – yet. Do, however, take pictures. In the summer, definitely, but also in winter and during spring break-up if possible. While your cottage may be only a summertime retreat, the shoreline is there all year, and spring ice can tear apart anything that you might decide to add – even reinforced concrete bunkers. If you are new to the area, ask the neighbours about the ice; longtime residents delight in frightening newcomers.

Before you pick up a hammer, pick up a pencil and make a detailed site plan of your waterfront.

A SHORELINE NAMED DESIRE

At this stage, what you have is the "before" plan, the shoreline as it exists prior to any dock additions. Now, look into the future – not at structures, but at uses. Remember that the dock only facilitates your needs. Make a wish list of shoreline desires. Perhaps you need a place to moor the boat. (How big is it?) Or perhaps a place to swim, fish, launch a canoe, and sunbathe. Or maybe just a spot to sit and watch the world drift by. Or any combination of the above and more. Your needs and what you have in the way of waterfront property should dictate the shape, size, and type of dock, not what the local lumberyard happens to have in stock. Obviously, finances also play a role, but as we will see, docks are usually modular devices, allowing you to add and rearrange dock sections over time. So rather than compromise your dreams with some substandard fright the kids love to use as a floating roller coaster and older members of the family refuse to board, complete your dream in stages as your finances permit.

Any successful shoreline structure also pays homage to its surroundings. The body of water fronting your property exists because of a delicate balance in nature that has evolved over many millenniums. That narrow band of earth known as the shoreline – an interdependent conglomerate that includes the water and both exposed and submerged lands – is the most ecologically sensitive piece of the planet most of us are likely to encounter. It's also the reason we have chosen to inhabit this small piece of planet earth. Unfortunately, anything we do at or near the shoreline will inevitably disrupt the balance, sometimes destroying not only the shoreline, but also water quality and many of the countless plants and animals that depend on that shore area for existence. The goal in successful dock building is not to eliminate our impact – an impossible goal – but to minimize that impact. The preservation of a shoreline's charm and abundant life, and the realization of our waterfront dreams, need not be mutually exclusive goals. With a bit of planning and use of good dock-building practices, it can be a single, shared goal.



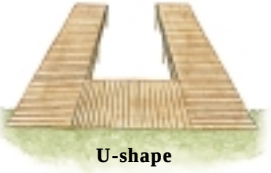
THE SHAPE OF THINGS TO COME

The most common dock shape is the rectangle. It is, after all, the simplest and most economical shape to build. But often there are better choices, both from the shoreline's perspective and that of our cottage wish list. The neat thing is that most variations are based on the rectangle, often with one or more rectangular sections joined together to make a more stable, useful, and attractive dock.

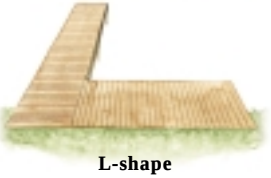
In most cases, dock stability increases with size. It's simply a matter of percentages – the bigger the dock, the smaller the impact your visit, or nature's tantrums for that matter, will have on it. But it's also true that as dock size increases, so too does the risk of harming nature. All docks possess the potential to disrupt currents enough to erode submerged lands and shorelines (including those belonging to your neighbours), increase the shading of submerged lands, and disturb submerged lands via a dock's seemingly benign footprint, all of which can destroy aquatic flora and destroy fish habitat and spawning areas. Then there's the connection of dock to shoreline and dock to cottage, both of which are no slouches when it comes to disrupting that delicate ecological balance. The bigger the dock, the greater the potential for mayhem. "Bigger" also costs more to construct and maintain. So big docks are bad, right? Maybe. The problem is, build a dock too small and not only is stability compromised, it might also fail to serve your needs. That's why that map of your shoreline is so important – it makes it easier for both you and the various approval authorities to choose the dock best suited to both your shoreline and your needs.

DOCK SHAPES

T-shape



U-shape



L-shape

The needs part of the equation is your wish list. The list tells you what activities are envisioned for the dock, and these often dictate minimum size requirements. For instance, while considered small craft, both sailboards and canoes can become serious dock hogs when out of water, demanding plenty of deck-acreage to swing around and launch. And things only get worse should Aunt Mabel demand

unobstructed sitting room for her and her favourite deck chair while all this is taking place. That said, if your shoreline includes a usable beach (check your map if you forgot), some things – such as swimming zones and sailboard storage, may be best assigned to the beach, reducing demands on dock size. However (dock planning has no shortage of "however"), if big boats are in the picture, there's little point in opting for a small dock. Should nature make waves, and the dock isn't up to snuff, it's goodbye to both dock and boat. If the shoreline has no usable beach – where water and land meet at a steep cliff, for example – the dock then takes on the role of a beach.

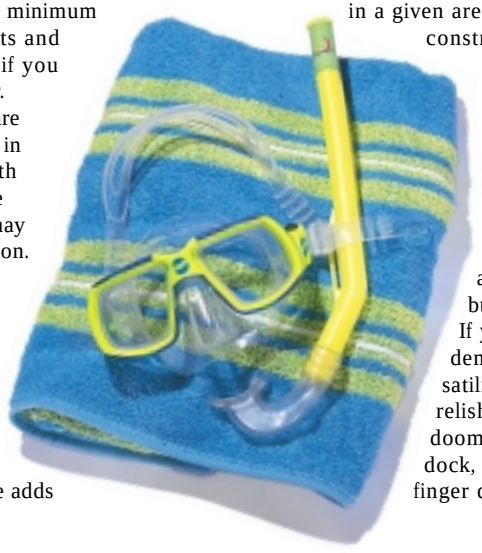
THE LIMITS TO THIN

With the exception of finger docks (we'll get to them later), 3' is the practical minimum width for any dock. You need that much room for two people to pass without risking one, or both, being bumped into the drink. Also, as you will see in our discussion of the various dock types, most docks have minimum size requirements and stability suffers if you try to go smaller.

If your needs are modest (perhaps in rare harmony with your budget), the basic rectangle may be your best option. However, by adding a second rectangular section perpendicular to the first dock (at the deep end), the resulting T-shape or L-shape adds to dock stability – like training wheels on a bicycle – and the shapes created help to define designated activity areas. For example, one end of a T-shape could be set aside for sunbathing, while splashing and diving are moved to the other end. The shapes can also "capture" protected areas of water for the mooring boats or to create a children's wading area.

Breaking away from the basic rectangle allows us to direct foot and boat traffic, and activity patterns, reducing dock congestion. Therefore, less deck-acreage is required to accomplish the same goals. This means less cost, less impact on the environment, and usually makes for a more attractive shoreline. And, as a bonus, those additional rectangles can be added or subtracted over time as needs – and finances – change.

What shouldn't be considered for budgetary reasons are finger docks. Finger docks are long and skinny rectangles that run out from a much larger main dock or breakwall. They are designed to provide the maximum number of slips (stalls to moor a boat) in a given area, not to save on construction costs.



Because of the reduced width (sometimes down to a foot), finger docks wiggle around just like fingers and provide wobbly access to boats, but not much else. If your activity list demands greater versatility, or you don't relish that impending doom feeling of a tippy dock, stay away from finger docks.

BETWEEN A DOCK AND A HARD PLACE

The main problem docks experience is one shared with everything else in the universe: entropy. Or the idea that nothing lasts forever. Wood, metal, plastic, concrete – all the basic ingredients of dock building – and even nature's own bedrock, are all under continual assault from two very destructive forces – stress and decay. The deleterious effects of stress (the result, say, of visiting boaters bashing into the dock, or nature hurling up huge waves, or spring ice pounding at your shoreline) can be reduced by distributing the loads. For a dock to survive to its maximum life expectancy, all loads must be shared by as much of the structure as possible. That's construction rule number one.

Decay is often a keen partner to stress when it comes to destruction. Wood rots, plastic degrades, concrete spalls and cracks, metal corrodes, rock erodes – it's all part of nature's regenerative process.

Generally, decay thrives in an environment of warmth, a little moisture, and a little oxygen, all readily available at your local shoreline. Too much or not enough of any of these ingredients and decay moderates its attack. The secret to longevity, therefore, is to take advantage of this weakness, using good design and appropriate materials to discourage the onset and growth of decay. That's construction rule number two.

DOCK MATERIALISM

WOOD Wood is the most common element in residential dock construction. It's relatively easy to work with, reasonably priced, and has some "give," allowing it to bend slightly under duress. It's also at its strongest under short-term loads (such as when your neighbour Phil clobbers the dock with his new ski boat), a decided advantage to waterfront structures. And things made of wood are usually easy to rebuild should nature prove the better of humanity once again.

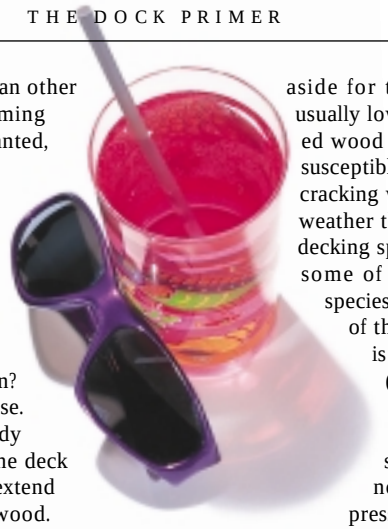
While real wood should be used for your dock's framing, plastic lumber can be an excellent choice for decking. When installed properly, it can offer a long working life.

On the other hand, wood is at its worst down at the waterfront – wet and fat one moment, dry and skinny the next. Therefore, joining pieces of wood in dock building requires different techniques than the accepted practices of house carpentry.

The preferred deck woods for dock building are western red cedar, redwood, cypress, and eastern white cedar (in that order), all of which offer reasonable longevity and beauty. For most docks, that's also the preferred structural list, but for dock cribs and permanent piles, stronger woods, such as Douglas fir, hemlock, and tamarack (in that order) are a better choice. Unfortunately, this group is not as resistant to rot as the first. For permanent piles, western larch, pine, and even spruce can be used if fir is not available.

The downside of opting for the preferred species, such as western red cedar,

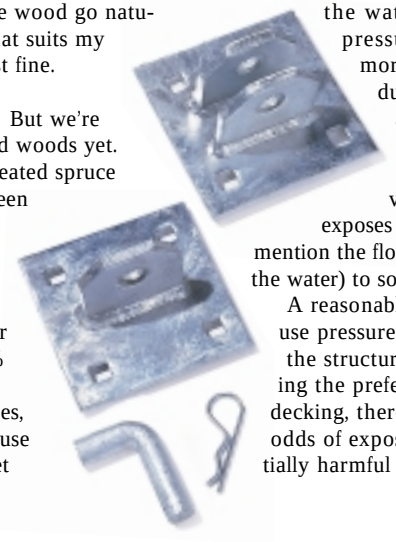
is cost. It may last longer than other species, but it's also becoming increasingly expensive. Granted, that could be said for all types of wood. Certainly, the better decking species, being naturally resistant to rot, will outlast species such as spruce, but what if the bank account won't accept that logic and demands a cheaper solution? That's when we compromise. One way to do this – already mentioned – is to reduce the deck acreage. Or we can try to extend the life of lesser grades of wood.



Unfortunately, the standard route to wood preservation – paint and stain – is not the answer for docks. Any coating you put on a dock will fade, blister, and peel. Not only will this look terrible, but damaged coatings also trap water, creating an ideal spot for a wood-destroying fungi family to take up housekeeping. So you can either scrape and re-coat the dock every few years or use preferred wood species and do as many dock builders advise – let the wood go naturally grey, an option that suits my minimal-work ethic just fine.

PRESSURE TREATING But we're not out of the protected woods yet. There's still pressure-treated spruce or pine, that Kermit-green alternative seen on countless decks, jungle gyms, and suburban retaining walls. Pressure-treated pine or spruce is about 20–30% less expensive than the preferred decking species, such as cedar, but because the grades of lumber set aside for treatment are usually low, pressure-treated wood is typically more susceptible to warping and cracking when exposed to weather than the untreated decking species, and even some of the structural species, such as fir. Most of the problem wood is labelled S-GRN (the chemicals applied when the wood is wet with sap, and therefore not as absorbent); pressure-treated wood labelled S-DRY is typically of much better quality and longer lasting, but also more expensive.

Because it can leach chemicals into the environment, pressure-treated wood is banned for waterfront use in some areas and, in all cases, construction should take place well back from the shoreline, with the finished dock being left to thoroughly dry and "age" before being launched into the water. Working with pressure-treated wood is more difficult, the sawdust considered toxic, and each cut end must be sealed with an approved preservative, all of which exposes the builder (not to mention the flora and fauna living in the water) to some nasty chemicals.



A reasonable compromise is to use pressure-treated wood for the structure of the dock, keeping the preferred species for the decking, thereby lessening the odds of exposing skin to potentially harmful chemicals.

PLASTIC Plastic has become a common building material for docks. Compared to most woods, metals, or concrete, the types of plastic used in dock construction are relatively low in strength and lack hardness, which rules them out for structural duties. Plastic is, however, the primary material for dock floats and when supported by an appropriate structure – typically made from wood, metal, or concrete – plastic materials can be used for decking. Plastic is also waterproof and decay-resistant, a decided advantage when it comes to dock construction.

The cost of plastic decking usually fits somewhere between cedar and pressure-treated wood, although some variations are more expensive than even the preferred species of wood decking. Typically, plastic decking comes in traditional "planks" of solid polyethylene (PE), extrusions made from polyvinylchloride (PVC), and composites of recycled PE and wood byproducts. Unfortunately, all plastic decking has a propensity to sag, which means that decking cannot extend across the spans of traditional dock designs (check with the decking's manufacturer).

Plastic decking is more fragile than wood and more prone to splitting during installation (so follow the instructions), but when installed properly, it can certainly offer long life.

HARDWARE

I cannot stress enough the importance of good hardware in building docks. Dock hardware is that bewildering array of metal brackets (usually steel) used to brace corners and joints, connect dock and ramp sections, hold the legs of pipe docks in place, and basically add strength to any dock connection under load. Technically, it doesn't fasten stuff together; it leaves that task to the nails, screws, nuts, and bolts. Instead, once secured in place with nuts and bolts and the like, dock hardware shares and transfers loads, diminishing stress at crucial junctures. Joints that are nailed or screwed together without the benefit of dock hardware will inevitably pull apart.

High-quality hardware, like galvanized corner brackets, heavy-duty hinges, and corrosion resistant nuts, bolts, and screws is crucial if you want a long-lasting dock.

It doesn't make sense to waste your time and money on second-rate hardware – whether it's your own creation (sorry), a piece of metal conscripted for a duty it wasn't designed for (such as barn-door hinges used to join sections of dock), or even most hardware sold from mass-merchandising outlets. Whether you're buying individual pieces or acquiring the hardware as part of a completed dock or in a kit, buy your hardware from an established dock builder. It's an expense you'll never regret.

As for fasteners, screws and bolts hold a dock together much better than nails. The extra cost is minimal, but the increase in strength is not.

DOCK TYPES

Although nature considers all docks to be removable, floating docks and pipe docks are the only ones cottagers usually consider removing, either for repairs or to protect the dock from the ravages of winter ice and spring breakup. Given Canada's climate, that means removable docks are extremely popular.

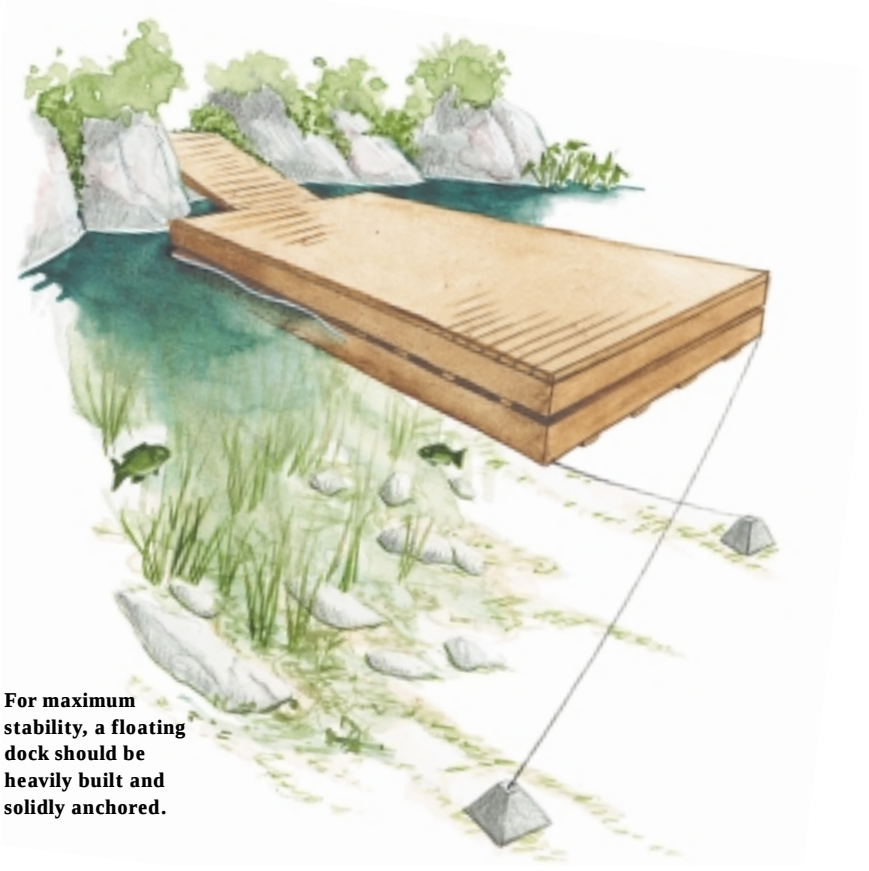
REMOVABLE DOCKS

Floating docks The people's choice award goes to floating docks. Floating docks are relatively easy and economical to build, adaptable to most shorelines and, because they are held up by the water, the distance between the top of the dock's deck and the surface of the water – known as freeboard – remains darn near constant, varying only with dock load and high seas (both variances being minimal on a well-designed and well-built floater). And because a floating dock is not dependent on submerged lands to hold it up, there is no maximum water depth that prevents its use.

From an environmental perspective, floating docks cause minimal direct disruption to submerged lands; typically from the small areas disturbed by anchors, spuds, or pilings (the most popular ways to moor a floating dock in place). In fact, if secured to the shore only, there may be no contact with submerged lands at all. However, floating docks can block sunlight to aquatic plants – destroying fish habitat – and they may also cause the erosion of shorelines.

So, floating docks won't work everywhere. For instance, a floater must have sufficient draft to keep its floats resting on water, rather than bumping into submerged lands (which can harm both the dock and aquatic habitat). A depth of 3' (measured at the low-water mark) is the normal accepted minimum, however, less may be possible if the water level never varies and the area is not subjected to harsh wave action.

Floating docks often lack stability. Not that it isn't possible to make a stable floater – hundreds of good designs exist, some so stable a user could mistake the dock underfoot for a waterfront boardwalk. Unfortunately, the stable of stability disasters is even greater. But it ain't the dock's fault, folks, it's bad construction practices. When it comes to stability, a floating dock works best when it's made long,



For maximum stability, a floating dock should be heavily built and solidly anchored.

wide, low, and heavy. The consensus among dock builders is that 6' x 20' is the minimum size for a stable floater, this single section weighing in at about 1,000 lbs, minimum. And bigger is even better.

As usual, the drawbacks to bigger are increased initial cost, increased labour to install (and remove) and, of course, greater impact on the shoreline's ecosystem. A pipe dock – which can be made smaller and still remain stable – may be a preferable choice in shallow water.

In areas where ice conditions prohibit a four-season solution, the floating dock offers the advantage that it can be removed from the water in the fall and replaced in the spring (albeit with no small effort in some cases). That said, many floaters are left in all year where wave action and ice conditions permit.

In addition to size and shape, float type and float location also contribute to stability. A discussion of float types is beyond the scope of this booklet (see "Further Reading," p. 22) but as a general rule, installing floats towards the perimeter of the dock, rather than set back towards the dock's centre line, greatly enhances stability.

Because they have little contact with submerged lands, pipe docks are easy on the aquatic environment.

Pipe docks If you can imagine a 4' wide wooden ramp, sitting about a foot above the water, supported by long skinny legs running from the ramp down to submerged land, you've just mentally built a pipe dock. Building one in reality is only a little more difficult, and not a lot more expensive (pipe docks are typically the least costly dock option). And because most of the dock sits out of water, with contact with land and shading of aquatic plants held to a minimum, a simple pipe dock is typically the least disruptive to the environment of all the dock types.

Unlike the floating dock, the pipe dock's freeboard varies as the water rises and falls. Should the lake or river at your shoreline do a gentle retreat through the season, the pipe dock's deck can usually be lowered on its legs to accommodate moderate fluctuations in water levels, and even more extreme fluctuations can sometimes be handled by relocating the dock further out on the shoreline. (The dock's light weight is a real advantage here.) Some pipe dock legs can also be fitted with wheels to make moving the dock an even easier task. Be aware that the slightest amount of ice movement can fold up a pipe dock like an accordion, so plan on moving the dock at least twice a year. Or buying a new one each spring.

Because a pipe dock's deck and framing remain elevated above the water, there's very little surface area exposed at the waterline for nature to take a whack at. This makes the pipe dock a good candidate for situations where plenty of surface activity is experienced, such as on busy river channels where the wakes from passing boats may be a problem. However, with waves passing under the dock unobstructed, any boat moored to the opposite side will be exposed to the full brunt of wave action. This makes a pipe dock a poor choice for creating protected areas.

Severe wave action can put some of the lighter aluminum pipe docks at risk. However, lighter construction also means less labour to install and remove the dock, and less initial cost to purchase. And in the right situation – a protected bay for instance – a lightweight pipe dock is certainly up to the task of mooring smaller boats. For larger vessels and harsher wave action, boat lifts or marine railways are a better choice. (For more information about these options, see *The Dock Manual.*)

Because a pipe dock is propped up on legs, it can be built smaller than a floating dock yet still remain stable. The basic rule for pipe docks is that the

Where ice and currents permit, rock-filled cribs can make a solid dock foundation.

Concrete piers are expensive and environmentally destructive.

width of the dock should be at least 3' and never less than the depth of the water. Because stability suffers as legs get longer, about 6'-7' is considered the maximum water depth for pipe dock installations. Choose one of the other dock types – such as a floating dock – for deeper water.

PERMANENT DOCKS

Residential permanent docks (as opposed to commercial wharves) can be divvied up into three categories: crib docks, concrete piers, and permanent pile docks. The term "permanent dock" is more a reflection of objective than reality, because permanence is not a concept recognized by nature. Shifting ice can topple cribs, lift piles right out of submerged land, and push concrete piers up onto shore. However, blessed with sound construction techniques and the appropriate conditions, a permanent dock can be made nature resistant, perhaps serving faithfully for several generations.

Because freeboard will vary with fluctuations in water level, permanent docks are often used in conjunction with floating docks, the floaters attached to the more permanent structure in a manner that permits the floater to move up and down in concert with changing water levels.

Crib docks A "crib" is a container. It could hold farm produce, or a child that hopefully will soon go to sleep or, in the context of waterfront construction, a few tons of rock and stone. Cribs should not be confused with gabions. Gabions are inexpensive wire or plastic mesh baskets designed to hold stones, rock, or concrete, the baskets wired together to serve as unattractive retaining walls. At first glance, they may seem like a good idea for dock building, but time has proven gabions to be better at tearing skin than retaining rock under siege by strong currents, waves, and ice, all of which will distort the basket's shape, causing the gabion to sag and flatten (along with your bank account when you replace them).

A proper crib is made from new, square-cut timber, not wire or driftwood or round logs tacked together with small nails and hope. (Occasionally, steel or concrete castings are used in lieu of wood.) The timbers are assembled in opposing pairs, one pair laid out on top of the next, creating a slatted, box-like affair boasting an integral floor. Threaded rods run the full height in each corner to secure the timbers in place. The box is then filled with rock, providing the bulk necessary to face off against nature. (Of course nobody – not even Gretzky – wins every faceoff.)

Maximum water depth for a crib is about 8'. For optimum stability (required to fend off attacks from nature more than humanity), a crib's total height should at least equal its total width. Obviously, this can make for a very large container, which in turn needs a ton or more of rock to fill. And all of this rock must be taken from onshore sources, not from close-at-hand submerged lands (which would disrupt fish habitat). For this reason, and from an environmental standpoint, cribs work best when placed

above the high-water mark, using the strength of the crib as an anchor or attachment point for other structures such as floating docks, cantilever docks or pipe docks.

From an environmental perspective, cribs aren't the most destructive kind of dock (see "Concrete pier," below). But because a crib covers a large area of submerged ground, essentially smothering anything beneath it, crib-based docks often claim a close second on the list of bad-guy installations.

Sunk deep in the ground, piles made of wood, steel, or plastic make a great base for a stable dock.

Concrete piers The concrete pier is basically a big, monolithic block of cement and aggregate, bound together in apparent perpetuity, often with an integral boat ramp. Most often, they are found in commercial or municipal settings. As with crib-based docks, practical water depths are limited to about 8', and the piers can be merged into shorelines to provide a shoreline interface for other types of docks.

However, concrete piers are expensive to construct, and no dock does a better job of disrupting the environment. Erosion of submerged lands at the base of the pier can often be a problem too. And unlike the slatted sides of the crib, the concrete pier provides no substitute home for refugee aquatic life. In most cases, there are better solutions for residential docks.

Cantilever docks don't disturb the water or submerged lands.

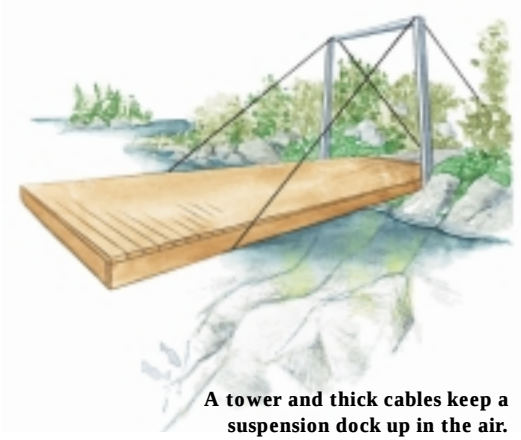
Permanent pile docks
The permanent pile dock is a heavyweight, long-term version of the pipe dock – still a ramp on long legs, but definitely not portable. Instead of resting on the surface of submerged lands (as the legs of pipe docks do), long poles of wood or tubes of steel or plastic – all referred to as piles – are sunk into planet earth, either by force or by being set in pre-drilled holes.

Either way, because of the heavy-duty equipment required, a pile dock is not the stuff of home workshop projects.

Piles should always be braced to prevent sway, and although there are no theoretical limits to depth, if the exposed portion of the pile extends 25' or more above supportive soil, construction costs will skyrocket.

The permanent pile dock shares many of the environmental advantages of the pipe dock – minimal contact with submerged lands, free flow of water underneath, and the ability to build a relatively narrow dock that is still quite stable.

Specialty docks Specialty docks include cantilever docks, suspension docks, and lift docks. These docks can be dramatic to behold, and expensive to purchase. Some design and construction similarities exist between specialty docks and the docks discussed above, but specialty docks are more complex, typically making their construction and installation beyond the skills of even many professional dock builders. So these are not docks that lend themselves well to the average tinkerer.

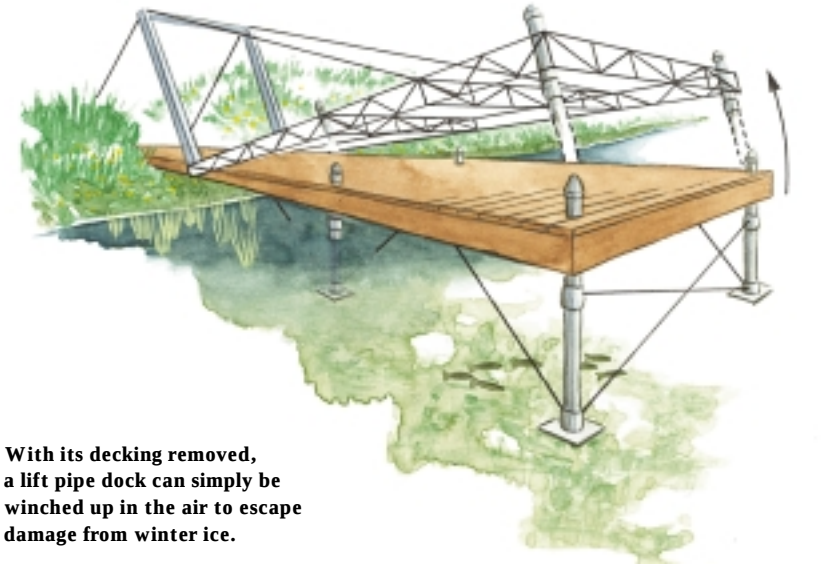


A tower and thick cables keep a suspension dock up in the air.

Cantilever and suspension docks The cantilever dock works in the same manner as an overhanging apartment building balcony: the dock's frame stretches from shore over the fulcrum point and then out over the water. The maximum length of the dock, and what proportion of that length is land-based, is determined by how well the land-based end – the end that supports the load – is tagged to the shore. Customarily, a cantilevered dock requires 2' of onshore dock for every 1' hanging beyond the fulcrum, although I have seen cantilever docks incorporated into wood bulkheads (walls built parallel to, and usually at, the shoreline) using a leverage ratio as little as 1' on shore for every 1' of overhang, and even less when the land-based end is embedded into a concrete bulkhead or solid bedrock.

The suspension dock, on the other hand, has more in common with a massive suspension bridge than an apartment balcony. Picture half a Golden Gate Bridge. But instead of connecting two bits of land together, it connects one bit of land to water and your boat. What you get is the Golden Gate Dock.

Unlike the cantilever dock, a suspension dock's deck does not rely on large chunks of shoreline for support. Instead, a rectangular tower holds up a pair of cables anchored well back on shore to keep the deck suspended over the water (just like the entrance to the aforementioned bridge). Both cantilever and suspension docks sit completely out of the water, so neither dock demands a minimum depth of water for installation. And because freeboard will vary with water level fluctuations,



With its decking removed, a lift pipe dock can simply be winched up in the air to escape damage from winter ice.

cantilever and suspension docks are not the answer for locations that experience extreme water level fluctuations.

Both dock types have practical limits to the length of overhang: About 8' for cantilever docks (which normally equates to a minimum of 16' of onshore decking), and about 50' for the suspension dock. Greater distances are not considered cost effective.

A short cantilevered overhang of about 1'–2' can work very well along bulkheads, cribs, and the like. And when a large, shore-based deck is desirable (such as over a boulder-strewn shoreline), the cantilever dock again becomes a reasonable option.

Cantilever and suspension docks cause the least disruption to the water or submerged lands – it's difficult to disrupt what you don't touch. However, as with floating docks, the resulting shading of the aquatic environment could be deleterious to aquatic life. Also, both dock types will disturb the shoreline, particularly the cantilever dock, which in turn has the potential to disrupt both aquatic and land-based life.

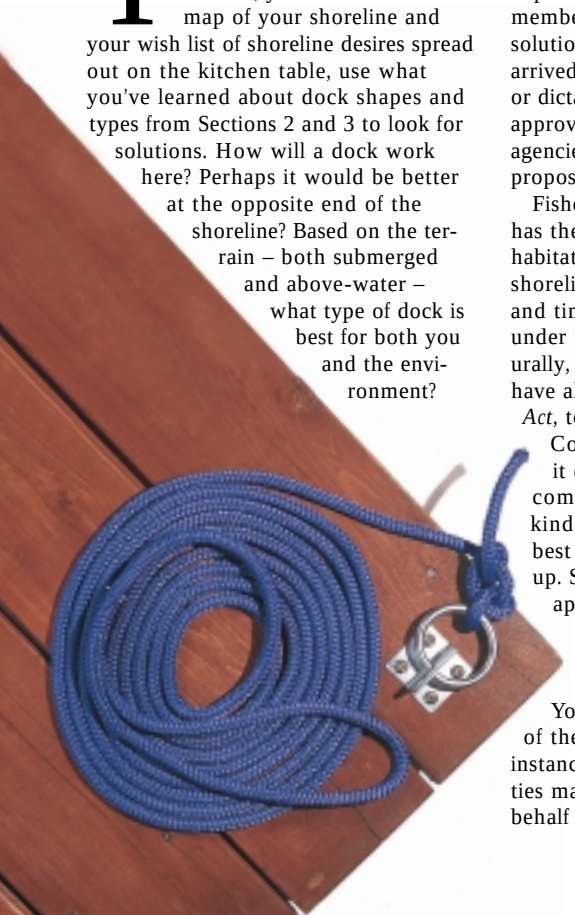
Lift docks These come in three flavours – lift pipe docks, lift floating docks, and lift suspension docks – each based on its non-lifting parent. The freeboard of each is the same as for non-lifting versions.

In concept, the lift dock appears to function much like the classic drawbridge. Yet while the drawbridge was historically raised to protect the castle from unwanted weekend guests, the lift dock gets raised for its own protection, hoisting it up out of reach of winter ice. (Although I suppose a lift dock could still be used in the traditional sense if unwanted guests arrive by boat.)

Size restrictions and environmental impact for the three versions of lift docks are the same as for their non-lifting counterparts.

THE APPROVAL PROCESS

The approval process begins with you. Makes sense; it is, after all, your dock. With the map of your shoreline and your wish list of shoreline desires spread out on the kitchen table, use what you've learned about dock shapes and types from Sections 2 and 3 to look for solutions. How will a dock work here? Perhaps it would be better at the opposite end of the shoreline? Based on the terrain – both submerged and above-water – what type of dock is best for both you and the environment?



What shape of dock will best accommodate your wish list of activities? Make copies of your original site map and let members of the family explore different solutions. When a consensus has been arrived at (through democratic process or dictatorial rule), the next step is to get approval from whatever government agencies might take an interest in your proposed dock.

Fisheries and Oceans Canada (DFO) has the responsibility to protect fish habitat anywhere in Canada. And since shoreline alterations can affect the life and times of a fish, your dock falls under the jurisdiction of the DFO. Naturally, this being Canada, the provinces have also got into the act (the *Fisheries Act*, to be specific), as have regional Conservation Authorities. Perhaps it doesn't need saying, but when it comes to getting approval for any kind of shoreline work it's always best to start at the bottom and work up. So in Ontario, your first stop for approval should be the local Conservation Authority, then the Ministry of Natural Resources (MNR), and finally the DFO.

You may not have to talk to each of these agencies separately. For instance, some Conservation Authorities may handle the entire process on behalf of the others, or the MNR may

do it all, but the only surefire way to find out is to ask (see the contact information on p. 23). It's also important to remember that some municipalities now require building permits for dock construction, so you'll need to check there too.

The size, shape, and location of your dock – or perhaps even whether you can have one at all – will all come under review by the powers that be, so don't be surprised if you're asked to make some changes. But making adjustments at this stage – when your dock is still in erasable pencil on paper – is much easier and more economical than altering the finished work. And, of course, fines have yet to be imposed for nonconforming plans (at least at the time of this writing).

TIPS FOR EASING THE PROCESS

Begin the mapping and designing process in the summer when you can accurately assess current and proposed waterfront activities. Present your plan to government agencies in the winter or late fall when those in charge of approvals have the time to look at your proposal and suggest alternatives should there be a problem. Waiting until spring to talk to the government gang could result in long delays before your plan is even considered, and don't expect much personal attention. By getting all the paperwork taken care of when the lake is frozen, you could be building your dock in the spring and sipping lemonade on its deck by summer. Having a shoreline map, photos, and a well thought out plan eases a bureaucrat's job (and they're all overworked, remember), which in turn will definitely improve the odds of getting a timely "okay" to proceed.

And no lemonade tastes sweeter than that sipped from a deck chair on your own dock, while your mind drifts with the breeze. Now, let's see…maybe an L-section attached to the end would just be enough to get the chair out into the sun. That's the other thing about docks – when construction stops, invariably the wish list begins anew.

FURTHER READING

MOST WELL-STOCKED BOOKSTORES WILL either carry, or can order, any of the publications listed below.

•*Cottage Life* magazine, 54 St. Patrick St., Toronto, ON M5T 1V1

Published six times a year, *Cottage Life* is an excellent source of information for anyone owning, or even renting, residential waterfront property.

Phone: 416-599-2000
Fax: 416-599-0500
E-mail: clmag@cottagelife.com

•*Cottage Water Systems*, Max Burns, Cottage Life Books, Toronto, ON
ISBN 0-9696922-0-X

Not about docks, but if preserving your bit of God's country is important to you, this is the best book available for people living or vacationing on property not serviced by municipal sewers and water (the situation for many waterfront residences). The book discusses where to find water, what could be in it, how to get the water into the cottage or house, pumps, water treatment, sewage treatment, outhouses, alternative toilets, and even how to cope with your plumbing when the world around you is white and frozen. (Contact info same as for *Cottage Life* magazine.)

•*Docks & Projects*, Cottage Life Books, Toronto, ON ISBN 0-9696922-1-8

A compendium of fun and useful things to make at the cottage, from deck chairs and loon nesting platforms to games, snow huts, and much more. It features docks, too, with complete plans for two floaters. The portion on dock building was written by me and subsequently expanded and updated in *The Dock Manual*. (Contact info the same as for *Cottage Life* magazine.)

•*The Dock Manual*, Max Burns, Storey Books, Pownal, VT
ISBN 1-58017-098-6

The only book dedicated to residential docks. All topics are covered in detail, from site planning to every dock type and the many variations available. Includes extensive how-to sections with lists of required tools and materials. Also features sections on mooring a dock, shore access (ramps), winterizing, boat lifts, and marine railways. There are also ten sets of plans and a list of suppliers and dock builders – everything you need to know in order to build the best dock for you and your shoreline.

Storey Books
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Web site: www.storey.com

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Web-site: www.trca.on.ca
(This Web-site for the Toronto region lists contact info for Ontario's 38 Conservation Authorities. Click the link for "Things you should know about us.")

FEDERATION OF
ONTARIO COTTAGERS' ASSOCIATIONS