

HOW TO BUILD A DECK

Introduction

Few home improvements can match a wood deck for usefulness, beauty and enhanced value to a home. For adults, decks offer outdoor living space for entertaining, sun bathing and dining. For children, they provide an excellent outdoor play area.

But the best news about a deck is that it is an ideal home improvement construction project for the average handyman or woman. Design is straightforward. No advanced carpentry skills or sophisticated tools are needed. If you can hammer a nail, saw on a straight line, and read a level, then building a deck should present no major problems.

What's more, the use of pressure-treated lumber helps assure that your project will be virtually maintenance-free and will provide enjoyment for decades to come. You won't even have to paint or stain the wood, unless you want to. Left unfinished, it weathers to a rustic gray. It is a good idea to seal the deck periodically to prevent the wood from checking, however.

There's enough information in this article to help you design and build an attractive wood deck.

Tools

Building a deck is easier and usually better done when proper tools are used. Certain property and construction conditions may necessitate special tools, but the following list will suffice for most deck projects:

- circular saw
- power drill
- tape measure
- hammer
- chalk line
- level
- combination square
- framing square
- hand saw

For safety, the following are recommended:

- gloves

- goggles
- dust mask

Preliminary Planning

The location and design of your deck should be influenced by several factors:

- *Anticipated use (private sunbathing, large parties, family relaxation, outdoor cooking)
- *Air currents (allow flow of gentle breezes, block out prevailing winds)
- *Existing structure (should be compatible)
- *Sunlight (desire sun or shade)
- *Privacy (screen certain areas, avoid street noise, landscaping)
- *View (emphasizes a good view, mask a poor one)
- *Safety (children or grandchildren, senior citizens)
- *Access to home (adjoin kitchen, living room or bedroom)
- *Terrain (elevated deck, ground level, split level)
- *Other personal needs and preferences

Decks originally gained popularity as a way of adding outdoor living space on hillside lots. However, many decks today are built on level ground where they offer firm, dry footing close to the home.

Decks can be built just inches high or elevated well above the ground. They may be freestanding or attached to the home or other building. They can even be built in a second-story above a garage, carport, or other roofed structure.

It's important; of course, to make certain the deck does not seal access to any utility or drainage lines. If you aren't sure of the location or depth of buried electric, telephone, gas, water or sewer lines, it's a good idea to ask your utilities.

Keep in mind how you intend to use your deck. Will it accommodate benches, lounge chairs, perhaps a table for outdoor dining? How many people will be using the deck at any given time? These are elements which must be considered in planning for proper size and design.

Once you have decided on the basic size, shape and location of your deck, check local building codes. You may find that there are restrictions as to height and size within your sub-division or community. A construction permit will probably be needed, but don't apply for one until you've finalized your planning.

Don't order any lumber or start work until you're sure that your plans meet local requirements. The information provided here should meet any local codes, but you will need to check to see if there are any particular requirements in your town.

Construction tips

Here are some additional suggestions that may help you in building your deck.

- o Always nail a thinner member to a thicker member.
- o Drive nails at a slight angle toward each other for greater holding power.
- o When toenailing, stagger opposing nails so they pass each other.
- o Nails and other hardware should be hot-dipped zinc-coated (galvanized) or equally well-protected material. Otherwise, weather may cause them to rust, leaving streaks on your deck.
- o For maximum holding power, use ring- or spiral-shank nails. They can help reduce warping of lumber.
- o To reduce splitting, when nailing close to the edge of a board, drill a pilot hole about three quarters the diameter of the nail. For dense or brittle wood, blunt the points by striking them carefully with a hammer. Blunt nails cut through; sharp ones pry apart.
- o Place nails no close to the edge than about half the board thickness and no closer to the end than the thickness of the board. When nailing closer to the edge, pre-drill holes.
- o Use 16d nails on nominal two-inch decking. Use two at each joint with 2 x 4's laid flat; use three for 2 x 6's laid flat.
- o Mill ends may not be square. Resquare and trim the ends. Take this step into consideration when figuring lengths and finished deck size. IT is a good idea to leave all the deck boards slightly longer than the finished size and cut them all to the final dimension after they are all nailed down.
- o With lag screws, use flat washer under head.
- o Use washers under nut and head of machine bolts and just under nut of carriage bolts.
- o Wear gloves to help avoid splinters.
- o Tops of upright structurals and joist ends should be beveled to a 30 to 45 degree angle for drainage to minimize moisture (see fig. 18, page 11). While pressure-treated wood resists end rot, it remains subject to splitting, checking and chipping caused by moisture-induced swelling and subsequent shrinkage, therefore sealing the deck is a good idea to protect the surface.
- o When staining wood, follow the manufacturers' instructions. Wood should be dry for best results.
- o Remember, you are about to do finish work, not rough framing. The results will be visible for years to come. There is no substitute for good construction techniques and workmanship. (This is not intended to scare you, just remind you.)

DESIGN

Decks consist of six parts: footings, posts, beams, joists, decking and railing. In planning for these you have three basic considerations: function, structural stability, and appearance.

The aesthetics of your deck will probably be most noticeable in your choice of railing and decking, but the location of posts and beams can have a major effect on the appearance of a raised deck.

In almost every instance, your choice lies between several small pieces of lumber or comparatively fewer large ones. A railing, for example, may be held by 2 x 4 posts spaced every 16 inches or less, or it may have 4 x 4 posts capped by a 2 x 6 spaced as far apart as eight feet. (Note: a 2 x 4 isn't always 2" x 4". Actual size of finished dry lumber is typically 1/2 inch smaller than the nominal size.

Your best guide at this stage is to look at various deck plans and inspect decks completed by friends and neighbors to help decide what you like best.

Choosing decking lumber presents similar alternatives. A popular choice is 2-inch thick lumber in widths of 4 or 6 inches. These can be alternated to make more interesting patterns. There is also 5/4 decking, which has rounded (bullnosed) edges to give the deck boards a more finished, softer look.

Develop your own design using the [tables](#) and information that follow. Clicking on the table reference will bring you to the table page. There will be an easy return link back to here on the table page. Take a look at the [Tables 1 through 5](#). The figures given are for maximum spans using pressure-treated wood. Inferior grade wood will not safely span the distances in these tables. More on how to use the tables will follow below.

The design and construction information presented here is for normal usage. If special loading conditions are anticipated or unusual circumstances exist, consult a competent designer.

SUPPORTING A DECK

Elevated decks have generally been supported by 4x4 and 6x6 solid timber posts. Under a properly designed deck, these can provide very satisfactory support. Deck posts support the deck above, they are its foundation. The first consideration, then, should be the ability of a post to support the structure and the people on it.

ACCESSORIES AND CONNECTORS

Some of the special connectors and accessories that you should be familiar with are:

- Lag screws
- Expansion bolt (for bolting into the cement foundation, if necessary)
- Carriage bolt
- spiral nails
- ring shank nails
- joist hangers
- post fasteners (to fasten a wooden post to a cement footer)

Make sure all connectors, nails, screws, bolts and related hardware are hot-dipped zinc-coated or otherwise rustproof. Remember, pressurized wood will remain in

serviceable condition long after ordinary nails and connectors have been weakened by corrosion. Rust will also cause unsightly stains. The same conditions that cause untreated wood to rot also cause metal to rust.

USE THESE TABLES TO HELP PLAN YOUR DECK

Let's say that your deck will extend eight feet from the house and be 14 ft. long. If it is to be just above ground level, there's little need for a railing. However, higher decks call for a sturdy railing.

[Table 1](#) shows the appropriate beam size. For example, the distance between the house and the beam is 8 ft. Using (2)2x12's as your beam members allows a span of 7 ft. between posts, a convenient figure for a deck 14 ft. long. A beam can be built up from two small pieces either nailed together or placed a few inches apart on either side of a post. Be sure you have a post under any joints in your beams.

To calculate the size post needed, multiply the beam spacing (eight ft.) by the post spacing (7 ft.). This gives you the load area-56 square feet. [Table 2](#) shows that for a load area less than 72 sq. ft. and a post height under 6 ft, a 4 x 4 post is adequate.

Decking in this example will be a 2 x 6 boards, laid flat. [Table 3](#) shows the safe spans for the decking.

Now refer to [Table 4](#). As in our example, your joists must span the 8 ft. between the house and the outer beam. That can be achieved with 2 x 8 joists spaced 24 inches apart. To avoid any springiness in your deck, however, you should design with joists 16 inches apart.

If a railing is desired, refer to [Table 5](#) to determine proper post sizes and spacing requirements. Be sure to check your local code here since the space between balusters is usually specified to be sure the small heads of children can not get stuck between them.

Estimating

After deciding the type, shape and size of deck you'll build, the next step is to estimate the materials you'll need. If you use a ready-made design, and the materials list is provided, this work is already done for you. But if you design your own deck, or use a variation from a standard plan, you'll have to estimate material requirements. In estimating, it's better to overestimate since you can always use any excess material in other projects, such as benches or planter boxes. There is nothing worse than running out of material and dashing off to the lumber yard before they close (hopefully) right in the middle of the project. (On the other hand, you may just looking for a break!)

First, draw a simple sketch of the deck; decking, rails, footings, posts and beams. Sketch the deck to scale, perhaps ¼" per foot. To save money, stick to standard lumber sizes and lengths to the fullest extent possible. For example, deck boards are usually stocked 2 x 4, 2,x 6, or 5/4 x 6 inch and 8, 10, 12,14 and 16 foot lengths. I usually keep a sale flier from the lumber yard handy to be sure I know what sizes of

lumber stock. For the decking, calculate using actual dimensions (5 ½ for a 6 in boards) and don't allow for spacing between boards. (More on that later, but I recommend little or no gap between the boards).

We present the second part of this article with step by step instructions in [How To Build A Deck Part 2](#).

Table 1 Minimum Beam Sizes

Length of Span ↓ ft	Spacing between posts (ft)						
	4	5	6	7	8	9	10
6	(2) 2x8s	(2) 2x8s	(2) 2x8s	(2) 2x10s	(2) 2x10s	(2) 2x10s	(2) 2x12s
7	(2) 2x10s	(2) 2x10s	(2) 2x10s	(2) 2x10s	(2) 2x10s	(2) 2x12s	(2) 2x12s
8	(2) 2x10s	(2) 2x10s	(2) 2x10s	(2) 2x12s	(2) 2x12s	(2) 2x12s	(3) 2x12s
9	(2) 2x10s	(2) 2x10s	(2) 2x12s	(2) 2x12s	(2) 2x12s	(3) 2x12s	*
10	(2) 2x10s	(2) 2x12s	(2) 2x12s	(3) 2x12s	(3) 2x12s	*	*
11	(2) 2x12s	(2) 2x12s	(3) 2x12s	(3) 2x12s	*	*	*
12	(2) 2x12s	(3) 2x12s	(3) 2x12s	(3) 2x12s	*	*	*

* Beams Larger than 2x12 recommended

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Table 2 Minimum Post sizes

ft)= Height post spacing (ft)	Load Area (sq. beam spacing x		
	48	72	96
up to 6	4x4	4x4	6x6
up to 8	6x6	6x6	6x6

Vertical loads figured as
concentric along axis.
No Lateral loads considered

Table 3 Recommended Spans for spaced deck boards

Spans in Inches Laid Flat				Laid on Edge
5/4x4	5/4x6	2x4	2x6	
16	16/24**	16	16/24**	48

**Although 24 inches is a safe span, undesirable deflection or springiness may occur.

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Table 4 Maximum allowable

spans for deck joists		
Joist size (inches)	Joist 16	spacing 24
2x6	9' -9"	7' -11"
2x8	12' -10"	10' -6"
2x10	16' -5"	13' -4"

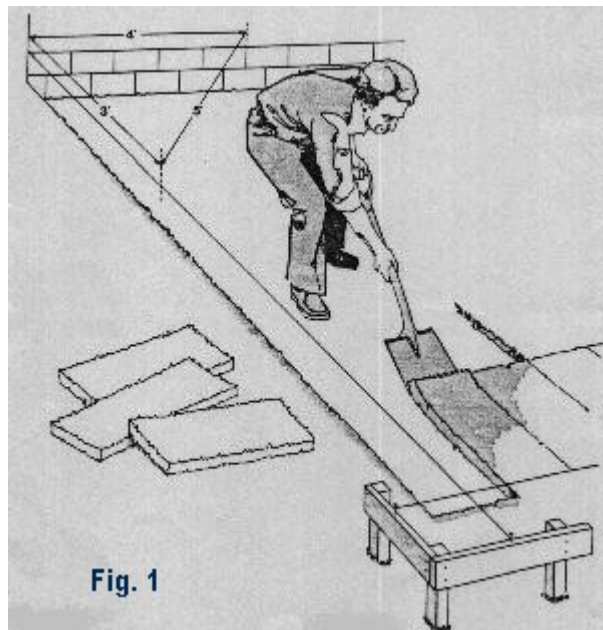
Table 5 Railings

Distance between posts	Post size (inches)	Cap size (inches)
2' to 3'	2x4	2x4
3' to 4'	2x4, 4x4	2x4, 2x6
4' to 6'	2x6, 4x4	2x6

Side rails can be nominal 1" or 2"
lumber of varying widths

Tables are based on lumber with 1200 psi bearing stress rating and a live load of 40 psf.

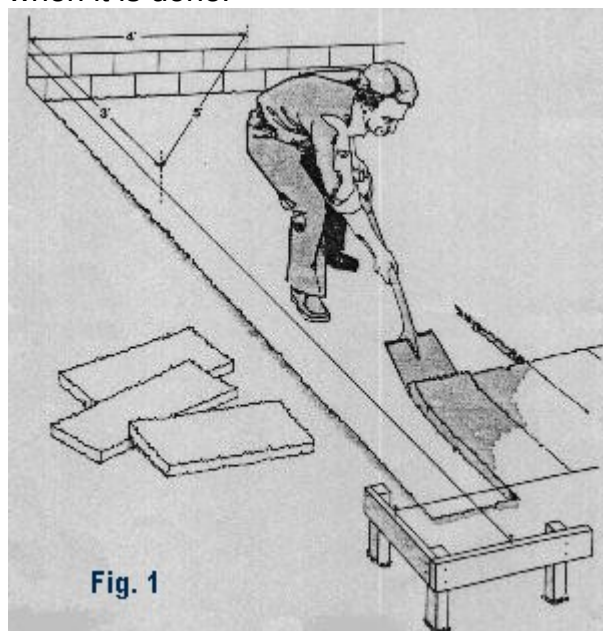
STEP-BY STEP METHOD OF DECK CONSTRUCTION



Step 1

Mark off the deck area using string and "batterboards" making sure that it is square. Batterboards are boards hammered in to the ground just outside the corners of where the deck will be. See Fig 1. The string will help you visualize the size and appearance of the finished deck and will also serve as a guide for excavation and post placement. But trust me, it will always look smaller this way than

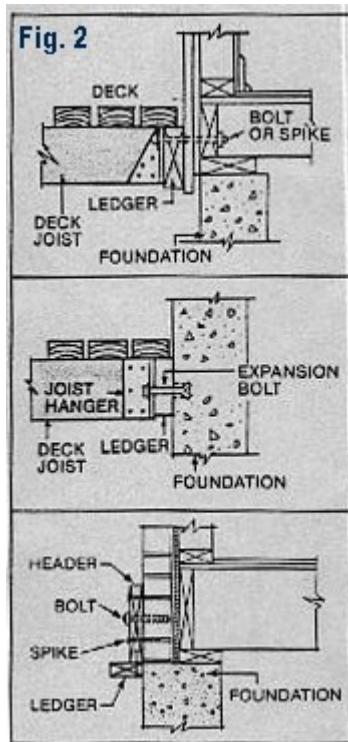
when it is done.



SQUARING WITH STRING

1. Attach string to house and/or batterboards to make sure its level.
2. Use a felt tip marker to mark the string 3' from the corner in one direction and 4' from the corner in other direction.
3. When the diagonal connecting these 2 points is 5', you have a right triangle and the angle at the corner will be 90°.

Note: To obtain the 5' measurement, move the string attached to batter board to the left or right until correct.



Step 2

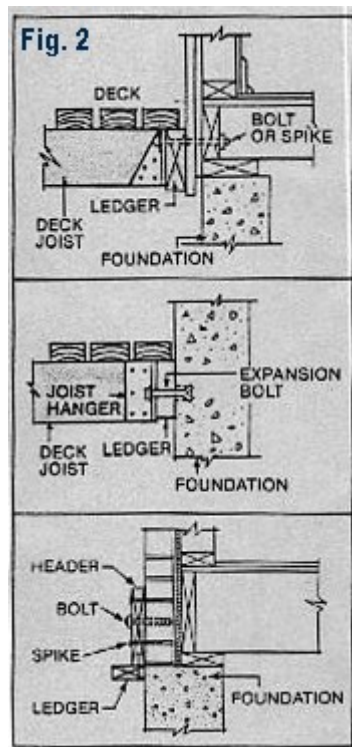
Prepare the site. With a spade or sod cutter, remove sod to a depth of 2 or 3 ". Uncover an area approximately 2 ft. larger than the planned deck. It's unlikely that grass would be able to grow in the shadow of your deck, so you might as well transfer the sod to a bare spot in your yard where it would be useful. To prevent weeds and unwanted vegetation from growing up through the deck, spread a sheet of polyethylene film over the area. You'll have to slit this to embed posts in the ground. After the posts have been installed, cover the sheet with gravel, pebbles or wood chips.

Step 3

A ledger/header board is the next step if you are attaching your deck to an existing structure.

The placement of the ledger/header determines the level of the deck floor, so be sure it is positioned at the correct height and is horizontal.

When fastening ledger/header boards to wood, the ledger should be held securely with bolts through the wall or lag screws. Use aluminum flashing to keep water from getting behind your ledger board. This should tuck up under your siding and bend down over the ledger, then down the face of the ledger board. Where aluminum or vinyl siding is in place, carefully cut siding away from house so that ledger/header board can be secured directly to the house. You may be able to use the bottom edge pieces of the siding above the deck to refinish the lower edge, so save these if possible. See figure 2. I will assume the joists are hung from the ledger and not resting on it, but be sure you account for the height of your deck boards when figuring the placement of the ledger. (Typically just 1 ½ inches down from the final height of the deck.)



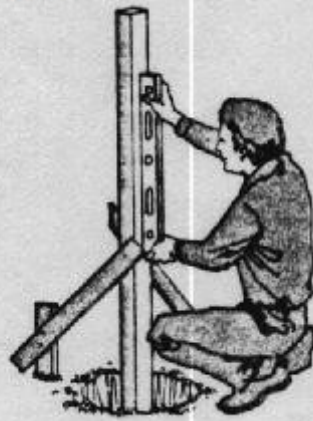
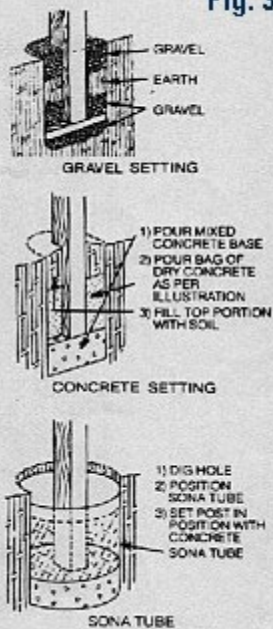
Step 4

Locate and dig holes for footings. In normal soil the holes should be a minimum of 24 to 36 inches deep, although the actual depth will depend on the height of the column and the depth of the frost line. Posts should go deeper than the frost line to avoid heaving during freeze and thaw cycles. Again, this is usually specified by code when the deck is attached to the house.

If you have many holes to dig and/or have difficult soil to dig in, you should rent a power posthole digger. These can be operated by one person, and certainly make the digging go MUCH faster. Typically to rent one will cost about \$50 for a day.

Fig. 3

Fig. 4

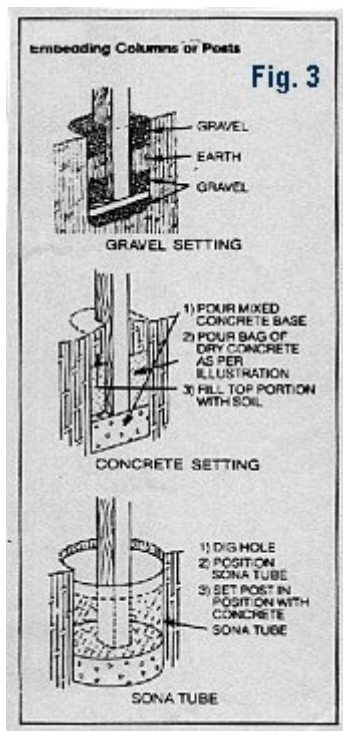


You can use pressure treated wood in the ground for your footings as follows. Fill the bottom of the hole with 6 inches of gravel and place a wood footer plate (2" x 6", or 2" x 8" cut off) on top of the gravel. Upright posts can then be positioned on this base (Fig. 3). Fill the posthole with alternating layers of 4 to 5 inches of gravel and earth. Tamp each layer until the hole is filled and post is plumb and

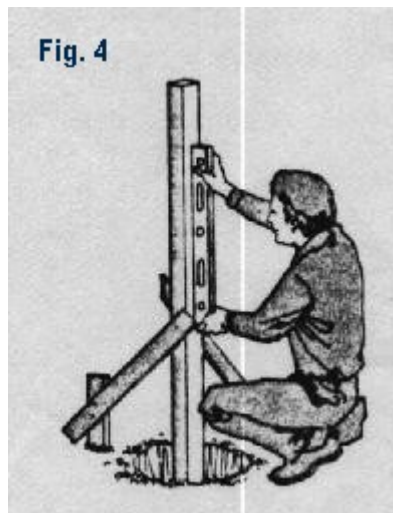
solid. If concrete collars are used, taper the tops downward and away from the post for drainage. Posts can also be set in concrete. Or my preferred method, uses a concrete footing to just above the ground level. Fill the post hole completely with concretet and use a section of "sono tube" (a heavy cardboard tube, 8 inches in diameter) to finish off the hole at ground level.

Make sure you have already purchased the hardware to attach the posts to the concrete so you can set the bolts in the concrete while it is wet.

For a complete article on preparing your footings see [Post Holes](#) (another article on this site).



When setting the posts directly in the holes, make sure they are plumb and in alignment with one another. Use a carpenter's level to check for vertical alignment (Fig. 4).



One advantage of using the concrete footings and the wood attached to them above ground, is the leveling and exact location can be set later, when the beams are positioned. It allows for some adjusting later (a little, but that is all you are usually looking for.)

Step 5

Secure beams to posts. Using a string and level, find the desired deck floor height on the posts. Or extend a long straight 2 by 4 from the ledger board to the posts and placing a level on the board, determine the post height. By subtracting the thickness of the joist (use the actual dimension not the nominal one), you will have determined the correct height for securing the top of the beam to the post. Carefully mark all 4 sides of the posts. Beams can rest on top of the post, or be fastened to the side. You may cut all posts except those serving as railing supports at this time. Fasten the beam to the post, keeping post and beam flush. Or set the beam atop the post nailing it down to the post.

Step 6

Attach joists. Joists are attached to the house with joist hangers and/or supported by a ledger board. Joists are placed on 16" or 24" centers, and attached to the beams and ribbon joist. Joists can be attached to the beams using joist hangers, or rest on the beam. If the joists are to extend over a beam, do not extend them more than 1/3 of their length.

Step 7

Install deck boards using hot-dipped zinc-coated 16-penny nails.

Separate boards using a small finishing nail as a spacer or set boards right up against each other. If pressure treated wood came dry, a space would be necessary for some



Fig. 5

expansion may take place when it gets wet. However, it typically is quite wet and will always shrink. I have found that when placed tight against each other they will shrink leaving an adequate gap. If you leave too large a gap while they are still wet, the gap may get quite large.

Your deck surface is an important part of your project, and the most visible. Make it simple with the boards set to end on the joists. If you could not get decking long enough to span your deck, stagger the butt end joints so they do not all end along the same joist.

You can trim your deck after nailing to assure a straight line (see Fig. 5). Do not allow an overhang exceeding 1 ½". For a more finished appearance, cut boards flush to the joist and add a fascia board.



Fig. 5

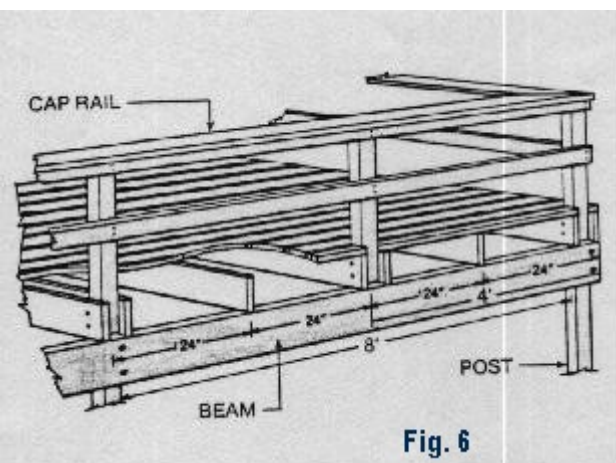


Fig. 6

If a board is slightly humped, install it with the bark side up when possible to minimize cupping. The weight of people and objects on the deck, and of the board itself, will tend to flatten it. A curved board can also be used; use a board to pry it to the desired position and nail securely.

Step 8

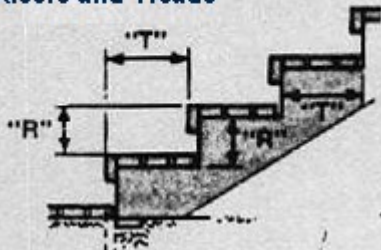
Install posts for railing. These can be a continuation of the posts which support the deck, or railing posts may be bolted to the outside joist or joist extensions.

Notice in Fig. 6 how the main posts continue up from the actual deck floor level and by doing so provide a good sturdy post. Intermittent posts or spacer posts can be used

A perspective view of a three-tiered wooden shelving unit. The unit consists of three horizontal shelves supported by vertical posts. The top shelf is labeled 'CAP RAIL'. The bottom shelf is labeled 'BEAM'. The unit is supported by four vertical posts, one of which is labeled 'POST'. Dimensions are indicated with arrows: the depth of the shelves is 24 inches; the distance between the vertical posts is 24 inches; the width of the unit is 4 feet; and the height of the unit is 8 feet.

Fig. 6

Suggested Ratios for Risers and Treads



"R"	"T"
7"	11"
6"	15½"
5½"	16"
5"	17"
4½"	18½"
4"	19½"

Table A

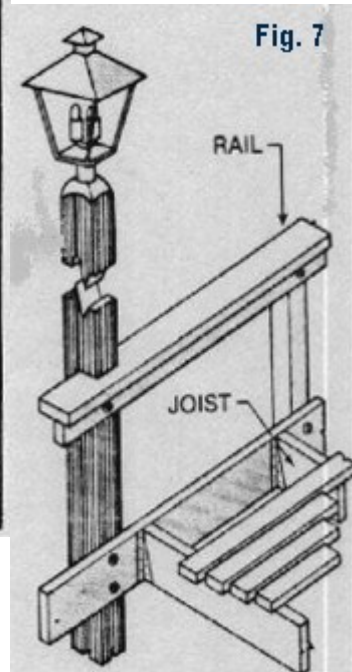


Fig. 7

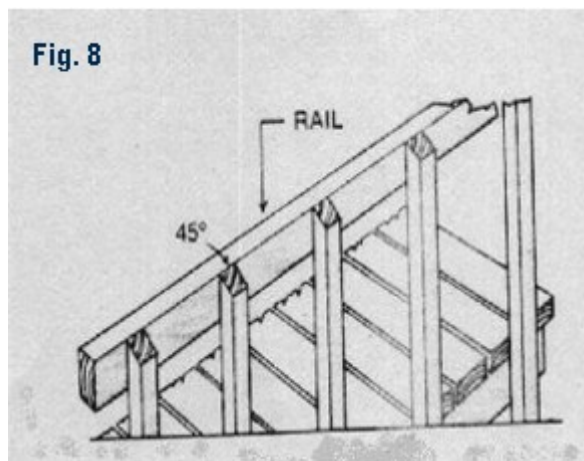


Fig. 8

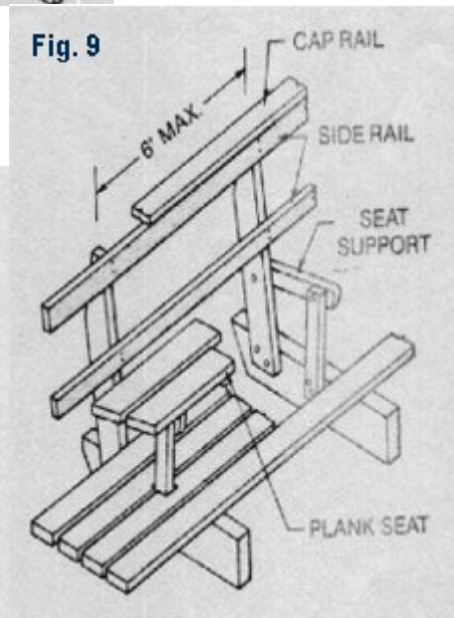


Fig. 9

The safety and beauty of your deck are enhanced by its railings. They can be plain or very elaborate, offering as much opportunity for individual preference as a fence.

Benches can be integrated into the railing on one or all sides. Bench seats should be at least 15" wide and 15" to 18" above the deck floor.

Privacy screens can enhance the beauty of your deck, as well as offering you privacy. They can also be used effectively under an elevated deck to create a storage facility or hide an unsightly hillside.

Step 9

Construct steps. Measure the vertical rise and decide upon the best riser size for each step. This will determine the number of steps needed. The adjacent table shows some

recommended ratios of tread length and riser height. Multiply the number of steps by the tread length to find the overall run of the stairs.

Using 2 x 4 or 2 x 6 boards for treads will reduce cupping problems common with wider boards.

It is also possible to purchase precut steps at certain lumberyards. A call ahead might eliminate some of the more difficult angle cutting you need to do.

Good Luck!