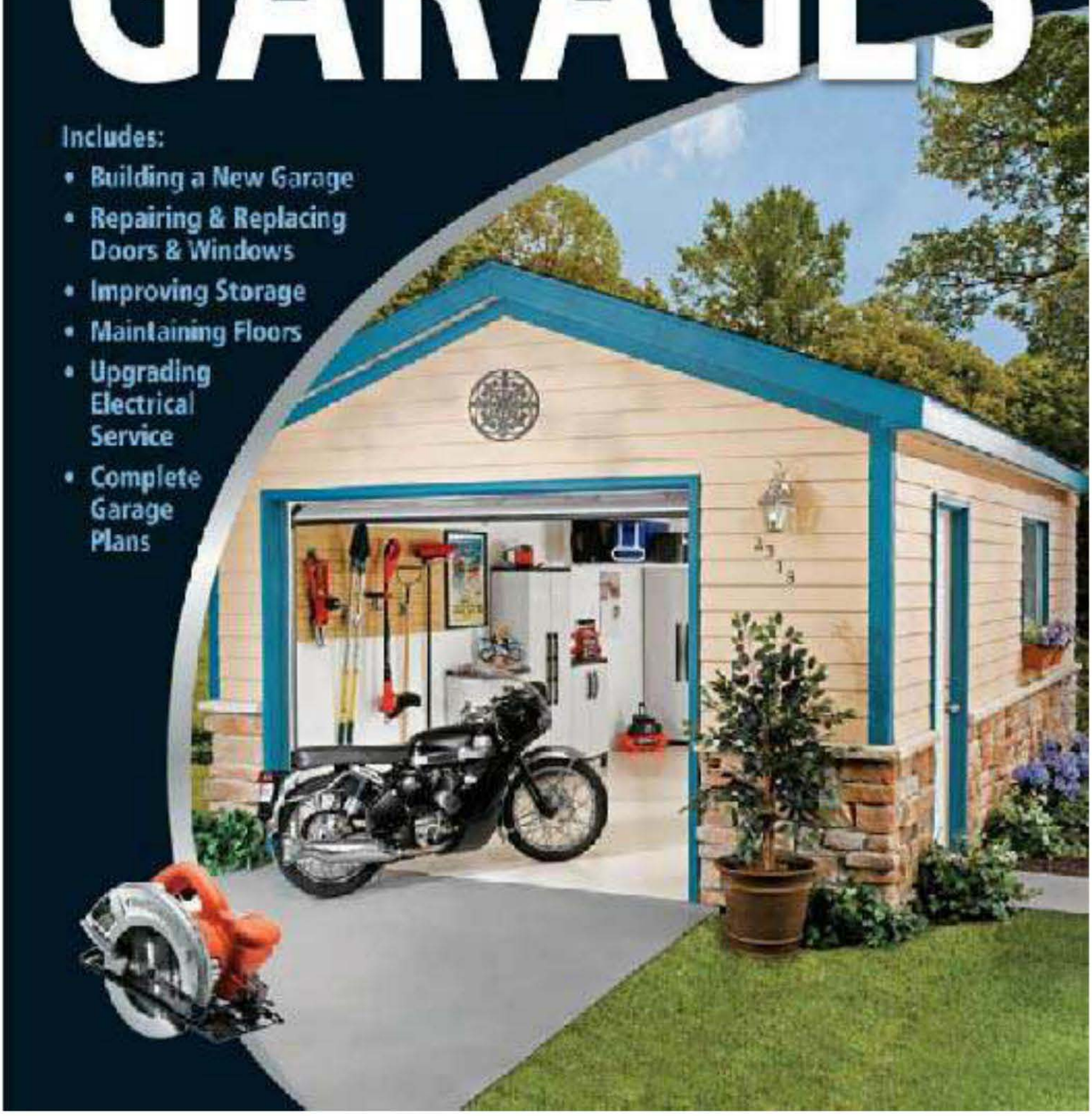
BLACK&DECKER

THE COMPLETE GUIDE TO

GARAGES

Includes:

- Building a New Garage
- Repairing & Replacing Doors & Windows
- Improving Storage
- Maintaining Floors
- Upgrading Electrical Service
- Complete Garage Plans



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The techniques shown in this book are general techniques for various applications. In some instances, additional techniques not shown in this book may be required. Always follow manufacturers' instructions included with products, since deviating from the directions may void warranties. The projects in this book vary widely as to skill levels required: some may not be appropriate for all do-it-yourselfers, and some may require professional help.

Consult your local building department for information on building permits, codes, and other laws as they apply to your project.

Contents

The Complete Guide to Garages

Introduction

First and foremost, a garage is a sheltered building where you can park your vehicles safely. But it can be much more than that, and it often is. A garage may also serve as an organized and climate-controlled workspace to pursue hobbies or as a utility shed for storing gardening and snow-removal equipment. It may be a workshop, a walk-in sports locker, or an overflow storage area. How can one room do it all? Truth be told, having a versatile, hard-working, well-organized garage is a very tall order—but with practical projects and the right approach it can definitely be done. You can have the garage you've always wanted, and this book will help you achieve it.

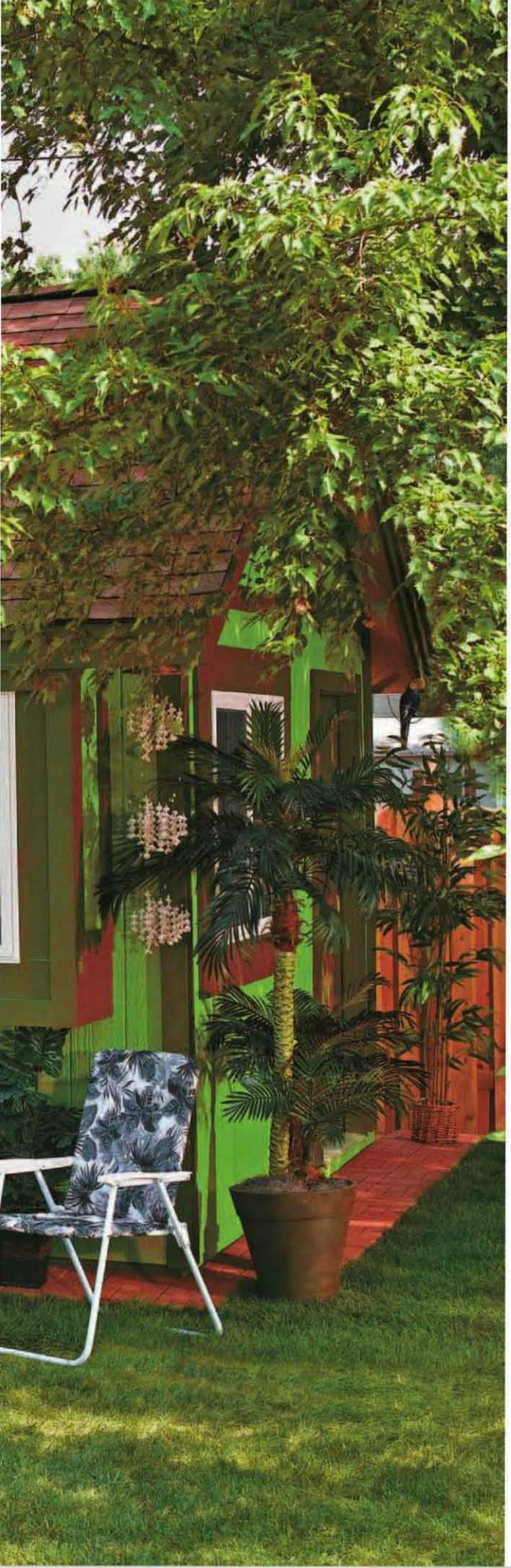
In *The Complete Guide to Garages*, we'll start from scratch and build from there. The "Gallery of Garages" section (pages 7 to 21) introduces you to a wide range of garage styles and spotlights the many and various ways we use them. It's a chance to let your imagination go and an opportunity to dream big. But if your garage space or budget requires you to keep things manageable, even one or two ideas from these gallery photos could open up a new storage idea or workspace possibility that you can adapt to your own space.

If your home does not have a garage or if your current model is basically a tear-down, this is one of the few books on the market that will teach you how to build a garage yourself. The first major section of the book, "Building a New Garage," walks you step by step through the process of constructing a detached, single-car garage. You'll learn how to frame and erect walls and build a rafter-style roof. We'll show you how to sheathe the structure, trim and shingle the roof like the pros do, and then install siding, windows, and doors.

Next, you'll find a complete set of measured plans for the garage seen in the first chapter, along with plans and how-to photos for two additional garages, a carport, and a garage workshop conversion. Or, use these three detailed garage projects to help acquaint yourself with the skills you'll need in order to build whatever garage you choose.

The second half of this book focuses on garage improvements to help you transform an existing garage. In "Garage Improvements," you can finish those bare stud walls and ceiling and then outfit them with pegboard, shelving, wall tracks, and cabinets to maximize every available inch of storage space. To bring lights to your many projects, turn to the "Electrical & Lighting Improvements" section for help. We'll show you how to insulate, run new outlets, hang a shop light, install a skylight, and add a heater—improvements that pay dividends in the long run. Maybe your dull, damp garage floor could use a facelift. The final section offers several painting and floor-covering options that will give you stunning results in less than a weekend's time.

Now is the perfect time to begin planning your new garage or tackling that first improvement project. Doing it yourself—and doing it right—is easier than you think. Let us show you how.

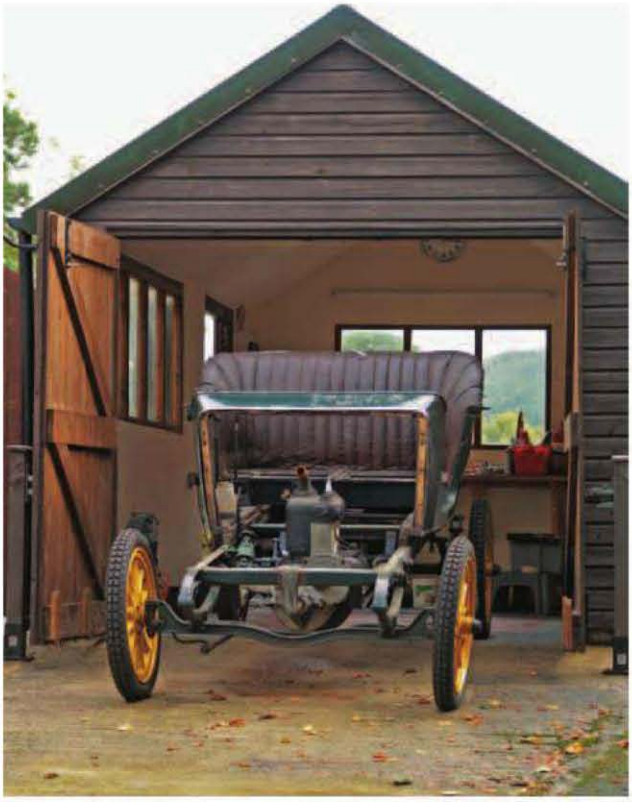


Gallery of Garages

It's remarkable what your garage can become when you approach it creatively and set the bar high. The gallery that follows will take you on a tour of several residential garages. As you're about to see, there's simply no reason why that covered parking spot at the head of your driveway can't evolve into the perfect entertainment room, mechanic's space, woodworking shop, or art studio you dream about. Sure, some of these examples might stretch the limits of budgets and practicality for everyday folks, but they testify to the fact that homeowners everywhere love their garages. Keep in mind that many of these homeowners would call their garage a perpetual "work in progress." Transforming a garage into an attractive, functional and even exciting part of your home doesn't happen overnight. It takes place slowly, one project at a time. But, it will never happen without that first good improvement project and the determination to get the job done.

So, enjoy this behind-the-scenes glimpse into truly inspirational garage spaces. We hope you catch the fever; then step out into your own garage and start dreaming.

With the right architecture, a garage can be far more than a spot to park cars. Here, the area above this garage provides another living space and elegantly ties the garage and home together.



Even a small detached garage can give you the room you need to explore that restoration project or other latent hobby. If you're up to the challenge, consider building the garage yourself.

A skylight is an effective way to bring natural light into your garage without creating the security concerns that arise when a window is installed.

Sometimes organized clutter still looks cluttered. The beauty of garage cabinetry is that it hides what you would ordinarily see. You effectively get a "less is more" feeling without actually losing any storage capability.

Racking and shelf systems offer the ultimate in garage storage organization. Creating a dedicated spot for everything is the best way to prevent creeping clutter from taking over your garage space.

If a workout or relaxation space is what you need, your garage can adapt to that purpose. No matter what your family's recreational pursuits may be, a garage can become that perfect work station with the right wall-hanging and storage systems.

Installing a durable floor covering adds years to your garage floor's life, as well as giving it a finished look.

No matter how modest your budget may be, even a few garage organizers will help you take back wasted space in your garage so you can put it to more productive use.

Garage windows don't have to be plain. An architecturally interesting window can be installed just about anywhere to fend off the monotony of the utility window.

Think carefully about how to organize your shelving layout. Integrate shelves around windows, the workbench, and areas for hanging items to make the best use of available wall space.

Give your garage a professional, industrial look by outfitting it with metal-clad cabinets and wall-hanging systems. You can buy these cabinets with polished chrome or brushed-finish surfaces, depending on the look you want.

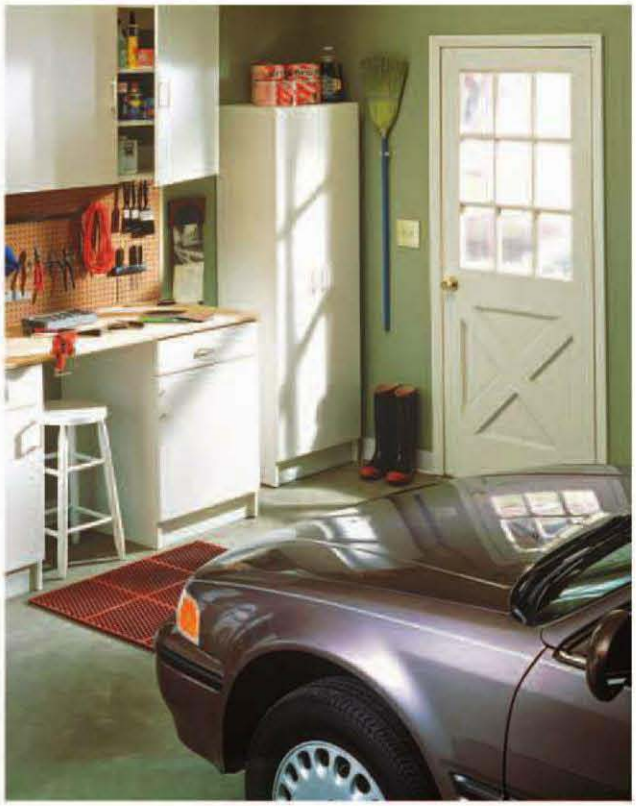
Want the "show" face of your garage to make a dramatic statement? Replace your ordinary sectional garage doors with custom frame-and-panel wood doors. There are a wide variety of wood types, styles, and window arrangements from which to choose.

It's a trophy garage space that's equipped for even your most prized possession.

Freestanding base cabinets and track-mounted wall units are combined with a removable slatted wall "backsplash" to form a work center that is sturdy, efficient, and portable.

Heavy-duty wall brackets, wire bins, and shelving can transform an empty garage wall into an organized storage spot for all your favorite sports equipment.

A single corner of your garage can offer serious storage potential when it's outfitted with the right set of cabinets.



A little natural lighting goes a long way toward making your garage more inviting and functional. Here, a service door with divided glass really serves as an entrypoint and a window.

A wall-track system, heavy-duty hooks, or even a ceiling hoist can get those seldom-used items up and out of the way.

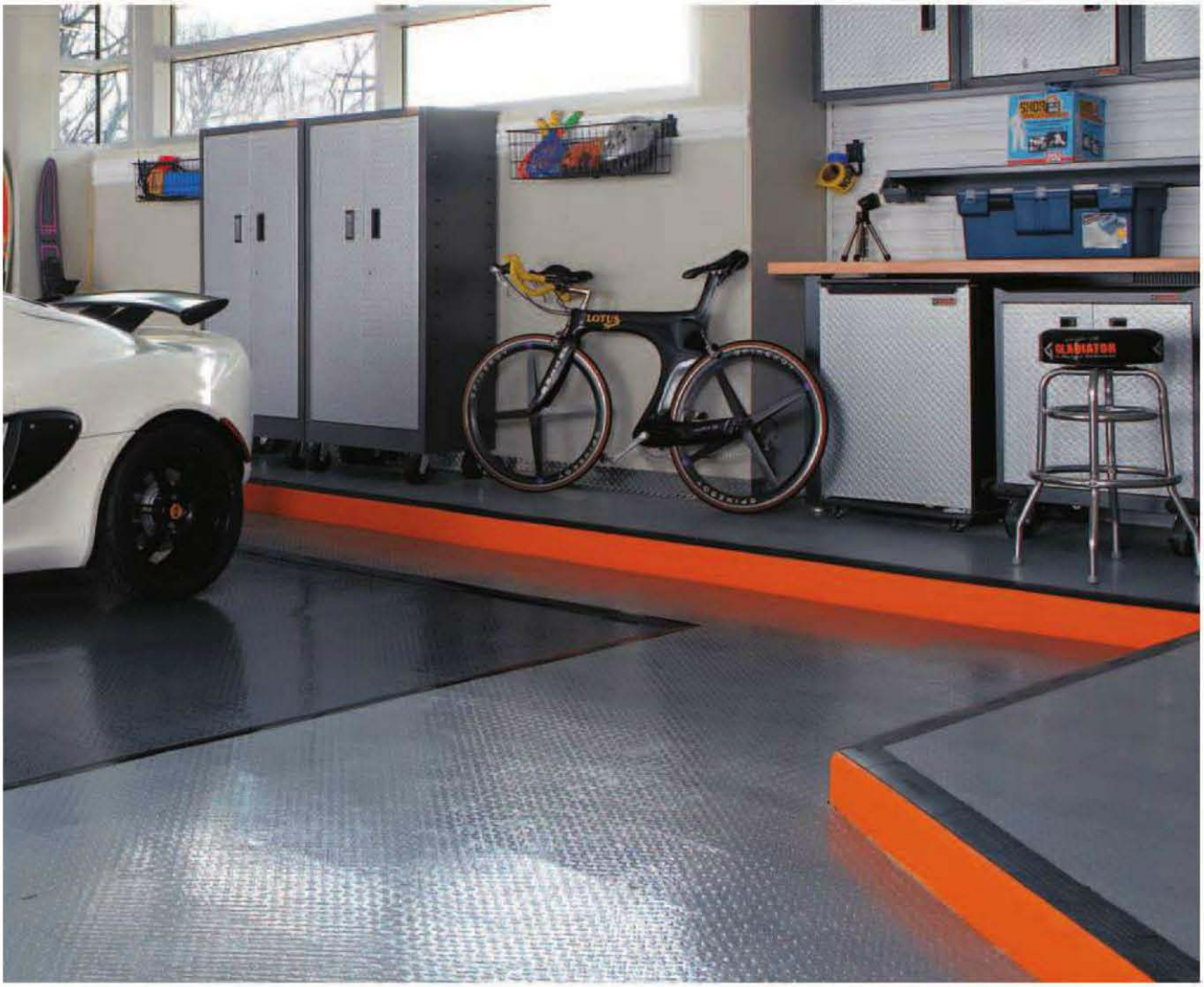
Epoxy-based garage floor paint comes in several attractive colors. You can even add granules to the paint to improve traction or enhance its appearance. Floor paint is applied much like wall paint, but be sure to check the moisture content of the concrete first, and clean the slab thoroughly.

White cabinets not only make your garage workspace look neat and clean, but they'll also help make the most of the room's available lighting.

Color choices, modular configurations, and specialized features continue to expand every year. Here, corner cabinets and a wall truck system combine for effective storage.

The first step to organizing a garage effectively is to identify what you really need to keep and store. Reduce unnecessary clutter, then come up with a plan that makes efficient use of the available space.

Heavy-duty shelf standards and brackets provide an effective system for storing bulky or seldom-used items.



Painting the floor is a low-cost way to add years to your garage base. It's easy, and paints are available in many colors.

Safety and organization are directly related when it comes to garage planning. Having dedicated cabinets (preferably lockable) for storing poisonous and flammable products greatly decreases the chances that an accident will occur.

An epoxy floor coating will seal small cracks, conceal old stains or minor wear, and, most importantly, give your garage floor a new luster and shine it's never had. To learn about two-part epoxy floor coating, see pages 206 to 213.

Recessed can lights and a translucent door will make your garage seem more welcoming at night. Accessory lighting also improves your home's security.

By installing some texturized flooring, adding a few matching cabinets, and choosing two or three colors to paint the walls (and even the floor), you've suddenly given the room a whole new dimension.

Imagine how your favorite hobbies could grow if you just had a dedicated place to pursue them.

A complete set of dedicated garage cabinets may be beyond your means, but why not start slowly and build a collection over time. Even one tall floor cabinet can provide lots of space for lawn and garden chemicals, sports equipment, extra paint or automotive supplies. Add more cabinets when you can, and before you know it, you'll have the most organized garage on the block!


MOTORCYCLE
RACES

Building a New Garage

Here you have the opportunity to follow along as we build a detached single-car garage from scratch. As you'll see in the plans on pages 94 to 101, the overall design is straightforward, so this structure will blend well with most home styles. There is still plenty of room to add your own special touches with the siding, roofing, doors, and windows you select. Even if you choose not to build this exact garage design, you can use the project to learn construction methods and techniques that can be adapted to whatever garage you decide to build.

Building a new garage can be an incredibly gratifying experience for an experienced do-it-yourselfer. You have the opportunity to practice a variety of skills, from pouring a foundation to framing and erecting walls and rafters to hanging soffits and fascia. If you've never dared to install siding or shingle a roof, this garage project provides a manageable way to explore those skills so you can bolster your confidence for bigger projects. We'll even show you how to install windows, a service door, and a sectional garage door so you can truly take on every aspect of this job.

In this chapter:

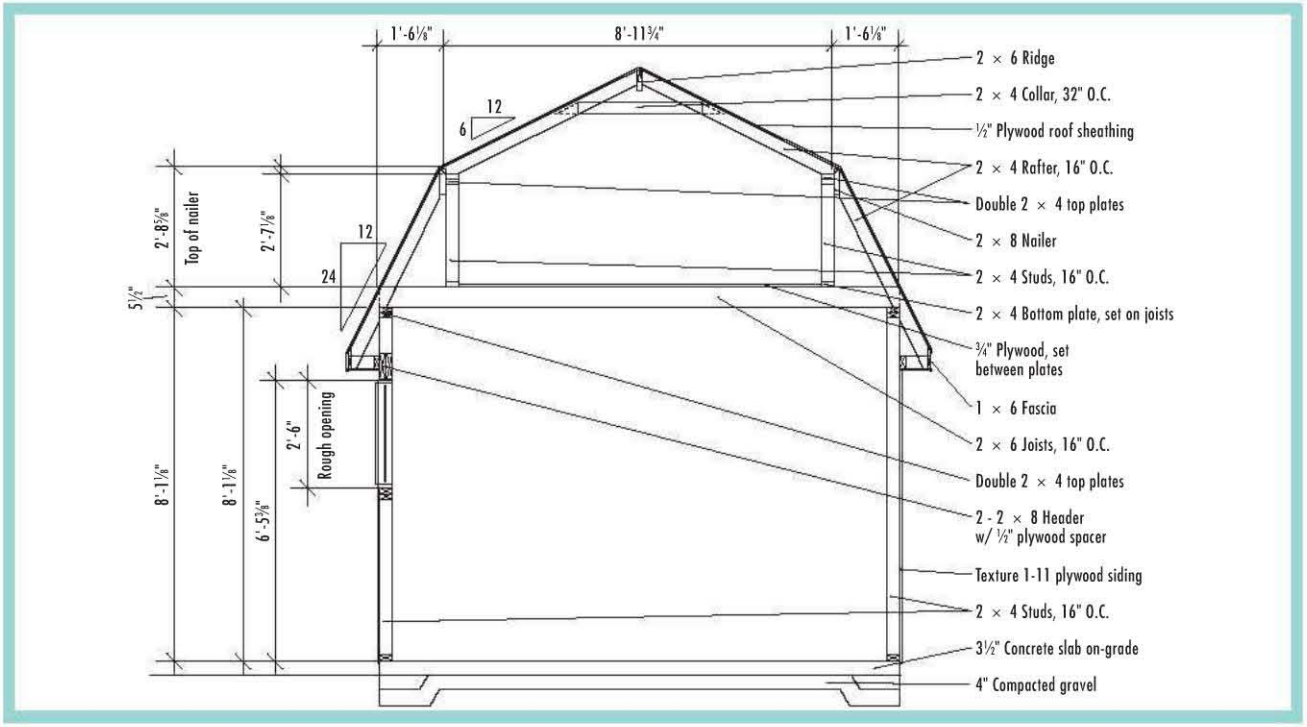
Making Plans

To successfully build your own garage you must have a complete set of construction drawings. At a minimum that will include a site drawing that shows your garage in situ relative to your house, including property boundaries and municipal sidewalks; elevation drawings from the front, back, and both sides; and a plan view drawing. You will need these along with a cost estimate for your building permit applications. Additional drawings, such as detail drawings of rafters or trusses and finishing details, and materials and cutting lists are also helpful. Finally, draft a plan with hard dates to create an overall project schedule. Be sure to flag any points where you'll need deliveries (such as ready-mix concrete for the slab) or a helper or two. It is important to be realistic when making plans.

Some of the projects in this book include complete construction drawings in the style of architectural blueprints (see Garage Plans, pages 91 to 101). If you're not familiar with reading plans, don't worry; they're easy to use once you know how to look at the different views. Flipping back and forth between the plan drawings and the project's step-by-step photos will help you visualize the actual structure.

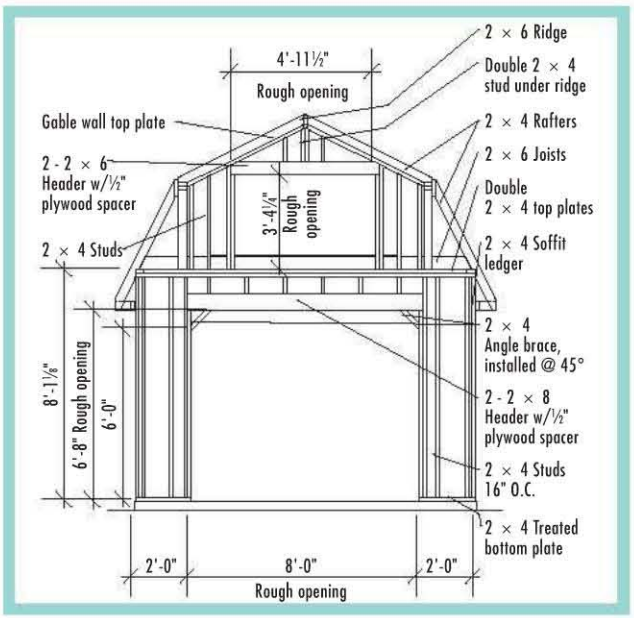
A complete plan for building your garage starts with detailed construction drawings. Based on your drawings, break the project into smaller tasks and try to estimate how long each phase will take and whether you will need to enlist help.

BUILDING SECTION



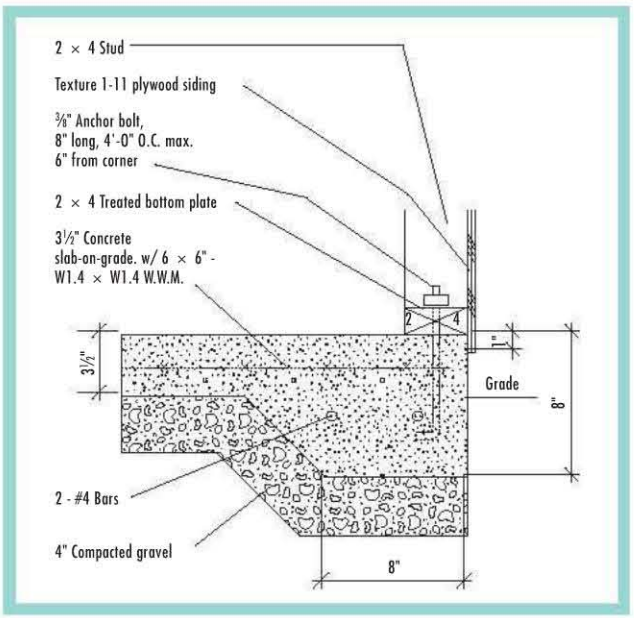
A building section is the most comprehensive drawing, giving you a side view of the structure sliced in half down the middle. It shows both the framing and finish elements.

FRONT FRAMING ELEVATION



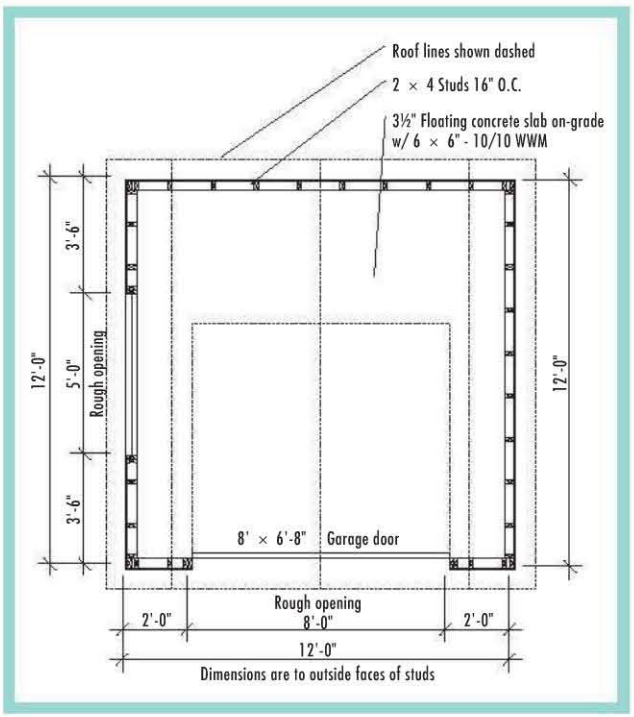
Elevations give you a direct, exterior view of the building from all sides. Drawings may include elevations for both the framing and the exterior finishes.

SILL DETAIL



Detail drawings and templates show close-ups of specific areas or parts of the structure. They typically show a side or overhead view.

FLOOR PLAN



Plan views are an overhead perspective, as if looking straight down from above the structure. Floor plans show the layout of the walls or upright supports with the top half of the structure sliced off. There are also foundation plans, roof framing plans, and other plan views.

Planning Considerations ▸

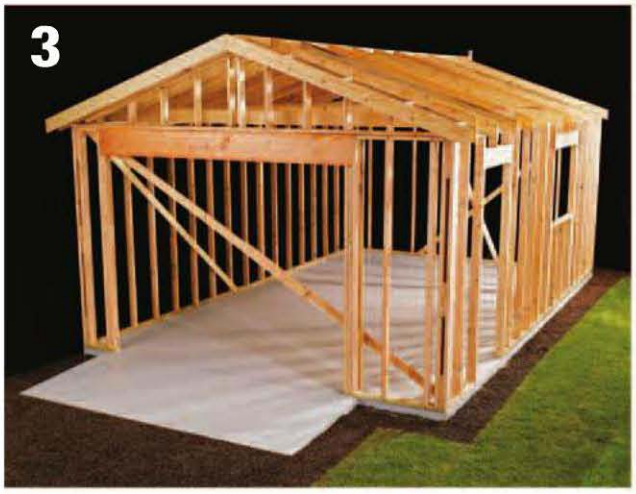
In most cases, deciding where to locate a detached garage is pretty obvious. But here are some points to keep in mind as you evaluate possible locations:

- **Soil and drainage:** To ensure that your foundation will last (whatever type it is), locate your garage on solid soil in an area that won't collect water.
- **Utility lines:** Contact local utility providers to find out where the water, gas, septic, and electrical lines run through your property. Often, local ordinances and utility companies require lines to be marked before digging.
- **Building permits:** Obtain permits, if your local jurisdiction requires them.
- **Setback requirements:** Most zoning laws dictate that all buildings, fences, etc., in a yard must be set back a specific distance from the property line. This setback may range from 6" to 3 ft. or more.
- **Neighbors:** Out of respect—and to prevent complaints that could later interfere with the building process—talk to your neighbors about your project.

Overview: Building a Garage

Building the Foundation (pages 28 to 33)

Framing & Erecting Walls (pages 34 to 43)



Installing Roof Framing (pages 44 to 51)

Sheathing Walls (pages 52 to 55)

Installing Fascia & Soffit (pages 56 to 59)

Building the Roof (pages 60 to 67)

Installing Windows & Service Doors (pages 68 to 75).
Installing Overhead Garage Doors (pages 76 to 81)

Installing Siding & Trim (pages 82 to 89)

Building the Foundation

A concrete slab with an adjoining concrete apron and driveway is the most common garage foundation setup.

The slab foundation commonly used for garages is called a slab-on-grade foundation. This combines a 3½- to 4"-thick floor slab with an 8- to 12"-thick perimeter footing that provides extra support for the walls of the building. The whole foundation can be poured at one time using a simple wood form.

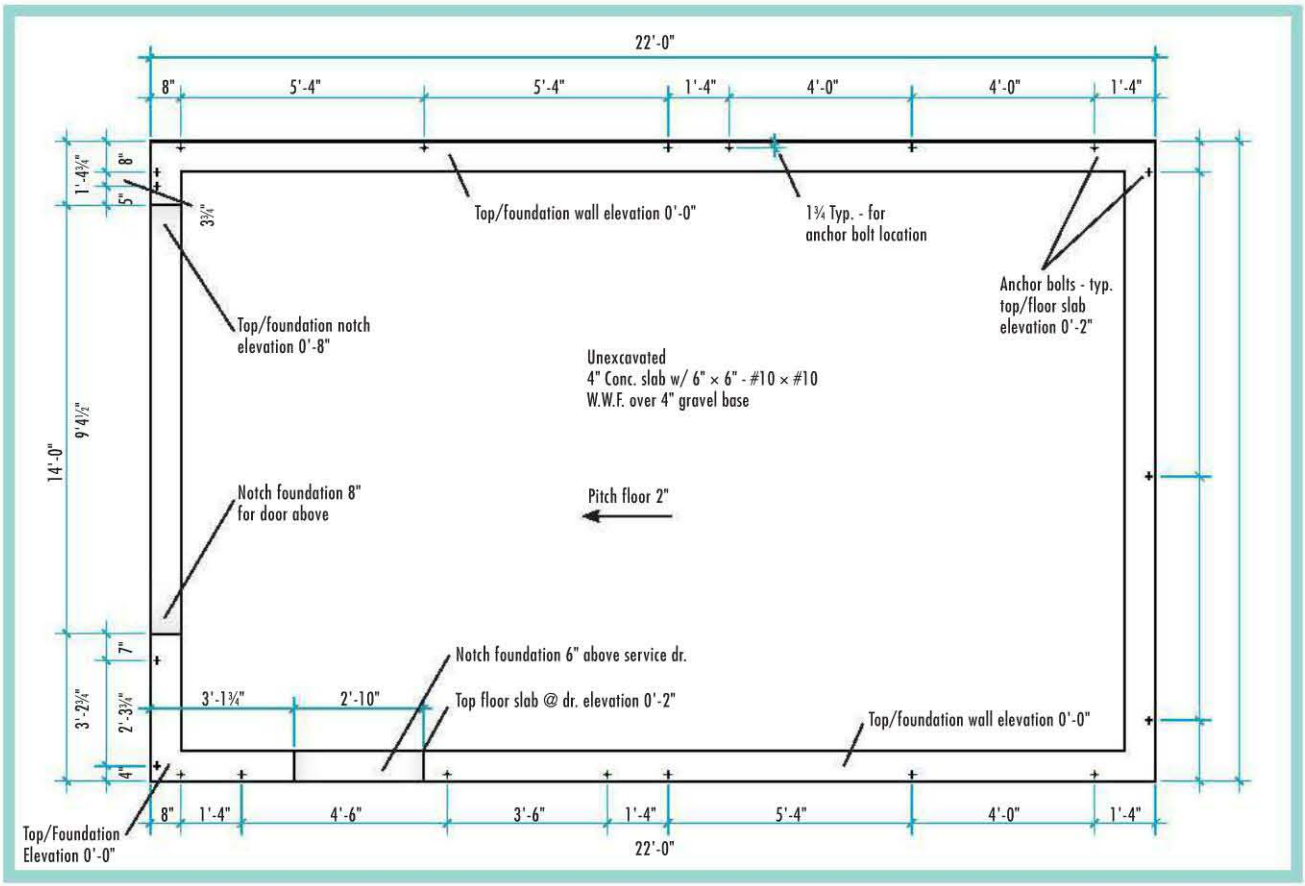
Because they sit above ground, slab-on-grade foundations are susceptible to frost heave; in cold-weather climates they are suitable only for detached buildings. Specific design requirements also vary by locality, so check with the local building department regarding the depth of the slab, the metal reinforcement required, the type and amount of gravel required for the subbase, and whether a plastic or other type of moisture barrier is needed under the slab.

The slab shown in this project has a 3½"-thick interior with an 8"-wide × 8"-deep footing along the perimeter. The top of the slab sits 4" above ground level (grade). There is a 4"-thick layer of compacted gravel underneath the slab and the concrete is reinforced internally with a layer of 6 × 6" 10/10 welded wire mesh (WWM). In some areas, you may be required to add rebar in the foundation perimeter. Check the local code. After the concrete is poured and finished, 8"-long J-bolts are set into the slab along the edges. These are used later to anchor the wall framing to the slab.

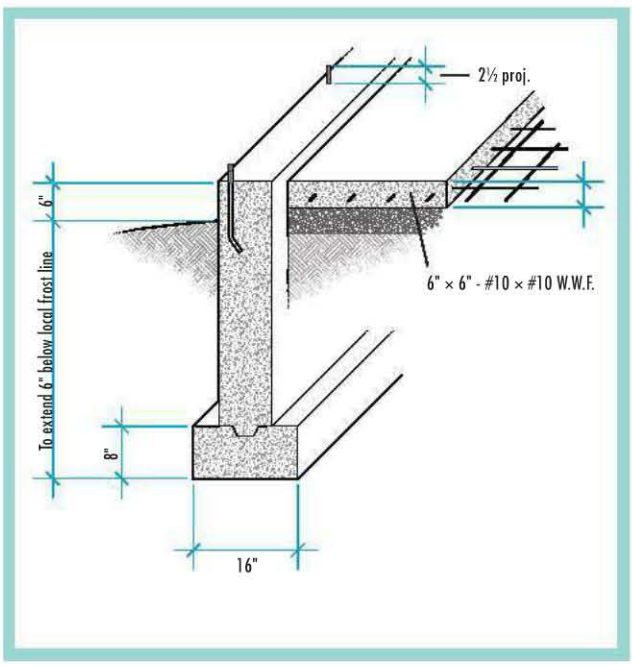
A slab for a garage requires a lot of concrete. Considering the amount involved, you'll probably want to order ready-mix concrete delivered by truck to the site (most companies have a one-yard minimum). Order air-entrained concrete, which will hold up best, and tell the mixing company that you're using it for an exterior slab.

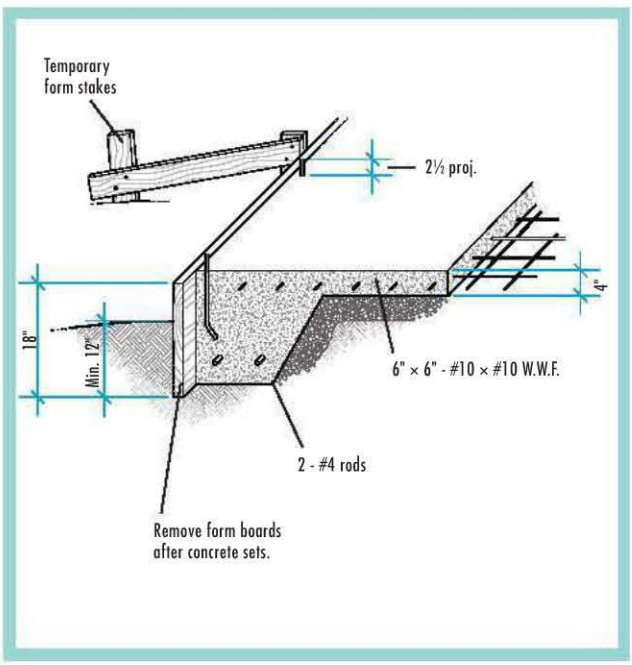
Tools & Materials ▸

- Work gloves & eye protection
- Stakes & boards
- Mason's lines
- Plumb bob
- Shovel
- Long level
- Tape measure
- Drill
- Wheelbarrow
- Bull float
- Wood or magnesium concrete float
- Concrete groover tool
- Concrete edging tool
- Paint roller
- Compactable gravel
- 2 × 8 lumber
- 3" deck screws
- Metal mending plates
- Re-wire mesh
- Concrete
- J-bolts
- Concrete cure & seal



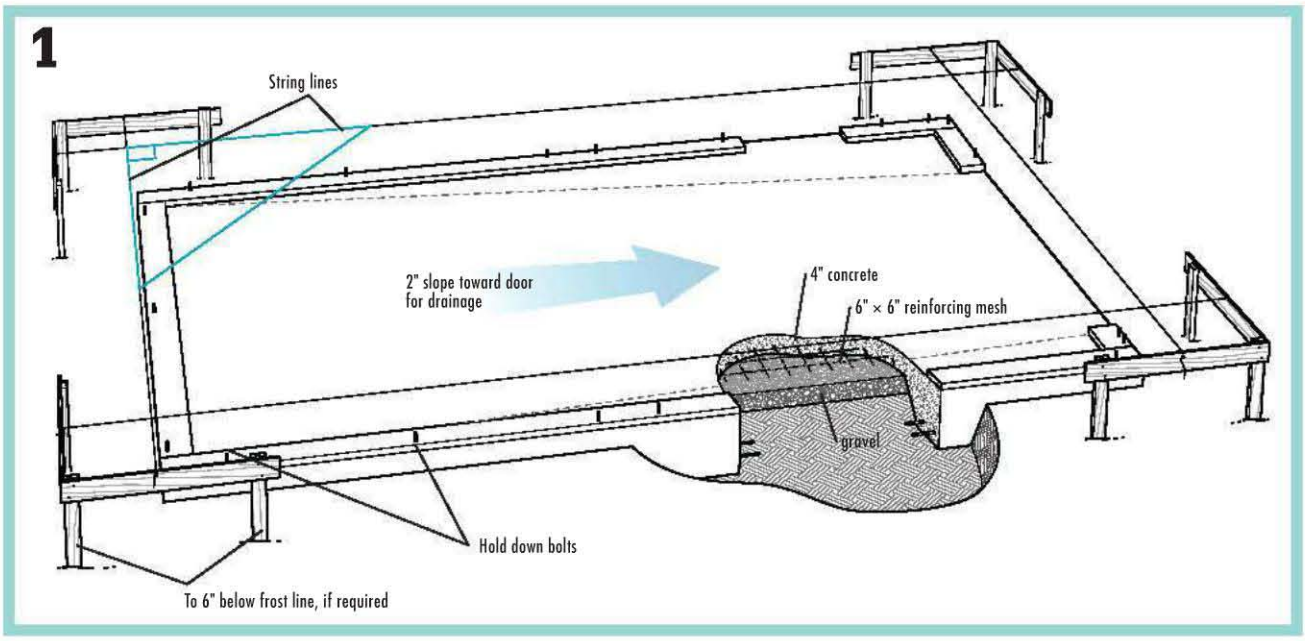
A plan view of the slab should include J-bolt locations, door locations, and footing sizes. Also indicate the overall dimensions and the direction and height of the floor pitch.





The garage slab cannot simply float on the ground. It requires footings around the perimeter. For detached garages, an 8 × 16" footing will comply with most local codes. For attached garages, the footings must extend past the frostline. In both cases, an ample layer of drainage rock is required to help minimize movement from freezing and thawing.

How to Pour a Concrete Slab



Begin to lay out the excavation with pairs of batterboards installed at each corner of the garage slab site. Position them about 2 ft. outside the perimeter of the slab area so you'll have plenty of room to work. Run level mason's lines between the batterboards to establish the final size of the slab. Drop a plumb bob down from the intersections of the strings, and drive a stake at each corner.

Excavate the area about 2 ft. wider and longer than the staked size of the slab. The poured slab should slope 2" total from the back wall to the overhead door wall to facilitate drainage. Remove 3 to 4" of soil from the excavation area, and dig a deeper trench around the perimeter for the footing. The outside of the footing should line up with the mason's lines. Slope the soil to create a transition between the excavated interior and the footing. Check your local building codes to determine the correct footing size and depth for your climate and soil conditions.

Fill the excavation area with 4" of compactable gravel, letting it spill down into the 12"-deep footings that frame the perimeter. Tamp the gravel level and smooth it with a rented plate compactor. The gravel surface should maintain the 2" total back-to-front slope. Depending on your soil conditions, some concrete contractors recommend laying 6-mil polyethylene sheeting over the compacted base to form a moisture barrier. *Tip: Install electrical conduit underneath the slab if you will be providing underground electrical service.*

Build a form for pouring the slab using 2 × 8 lumber or strips of exterior-rated plywood. The inside dimensions of the form should match the final slab size. If necessary on long runs, join the lumber end-to-end, reinforcing the butt joints with metal mending plates screwed to the outside surfaces. Fasten the form pieces together at the corners with 3" deck screws. Position the form so it aligns with the mason's lines. The form should also follow the 2" total back-to-front slope.

Drive wood stakes along the outsides of the form at 4-ft. intervals. Place two stakes at each corner. Set the tops of the stakes flush with the top edges of the form (or slightly below the tops). As you drive the stakes, periodically check the form for level and measure from corner to corner to ensure that it's square. Measure down from the mason's lines to position the form 4" above grade. Attach the stakes to the form with deck screws to hold the form in place.

Add re-wire reinforcement according to the requirements in your area. Here, rows of 6 × 6 10/10 wire mesh are set onto spacers (chunks of brick) in the pour area. Overlap the sheets of mesh by 6", and stop the rows about 2" in from the insides of the form. Fasten the mesh together with wire tie. *Option: Reinforce the footings by laying out two rows of #4 rebar 2" above the bottom of the trench by wire-tying it to shorter pieces of rebar driven into the gravel. Space the rows about 4" apart. You'll need to dig out the gravel to accomplish this.*

Estimating Concrete ▸

Calculate the amount of concrete needed for a slab of the design shown on this page using this formula:

Width × Length × Depth, in feet (of main slab)
Multiply by 1.5 (for footing edge and spillage)
Divide by 27 (to convert to cubic yards).

Example—for a 12 x 12-ft. x 3½" slab:
12 × 12 × 3½" = 42
42 × 1.5 = 63
63 ÷ 27 = 2 1/16 approx. (2.33 cubic yards)

Concrete Coverage

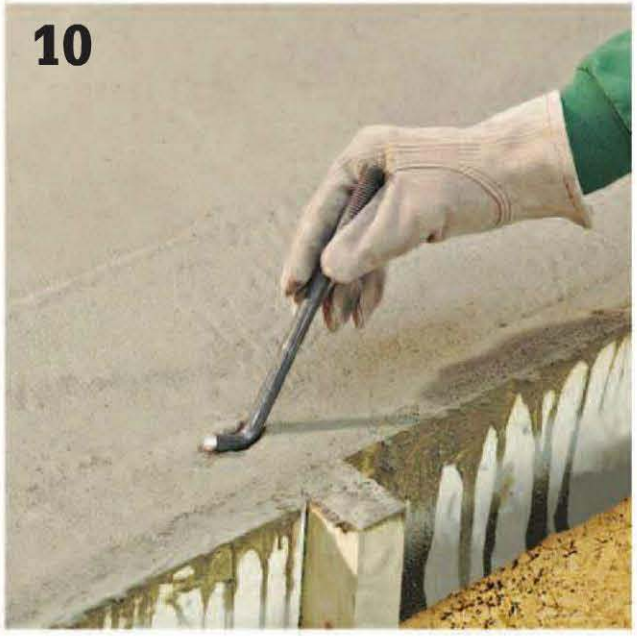
Volume	Slab Thickness	Surface Area
1 cu. yd.	2"	160 sq. ft.
1 cu. yd.	3"	110 sq. ft.
1 cu. yd.	4"	80 sq. ft
1 cu. yd.	5"	65 sq. ft.
1 cu. yd.	6"	55 sq. ft.
1 cu. yd.	8"	40 sq. ft.

(continued)

Pour the concrete. Have ready-mix concrete delivered to your job site and place it into the forms with wheelbarrows and shovels (make sure to have plenty of help for this job). Fill a form with concrete, starting at one end. Use a shovel to settle the concrete around the reinforcement and to remove air pockets. Fill the form to the top. *Note: In most municipalities you must have the forms and subbase inspected before the concrete is poured.*

Strike off the concrete once a section of a form is filled. The best way to do this is to have two helpers strike off (screed) the wet concrete with a long 2 × 6 or 2 × 8 that spans the width of the form. Drag the screed board back and forth along the top of the form in a sawing motion to level and smooth the concrete. Fill any voids ahead of the screed board with shovelfuls of concrete.

Smooth the surface further with a bull float as soon as you're finished screeding, working across the width of the slab. Floating forces aggregate down and draws sand and water to the surface to begin the smoothing process.

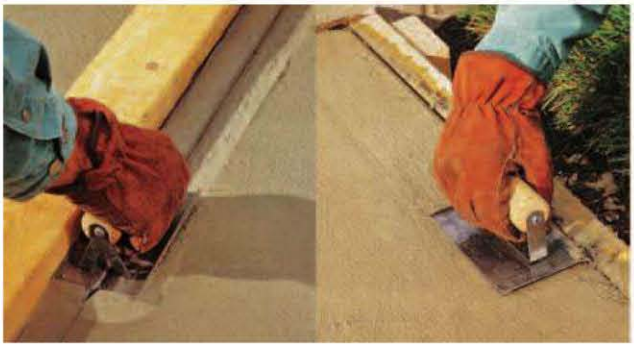


Push J-bolts down into the concrete, wiggling them slightly to eliminate air pockets. Twist the bottom hooked ends so they face into the slab. Position the J-bolts 1¾" from the edges of the slab, aligned with your layout marks. Leave 2½" of bolt thread exposed, and make sure the J-bolts are plumb. Smooth the surrounding concrete with a wooden or magnesium concrete float.

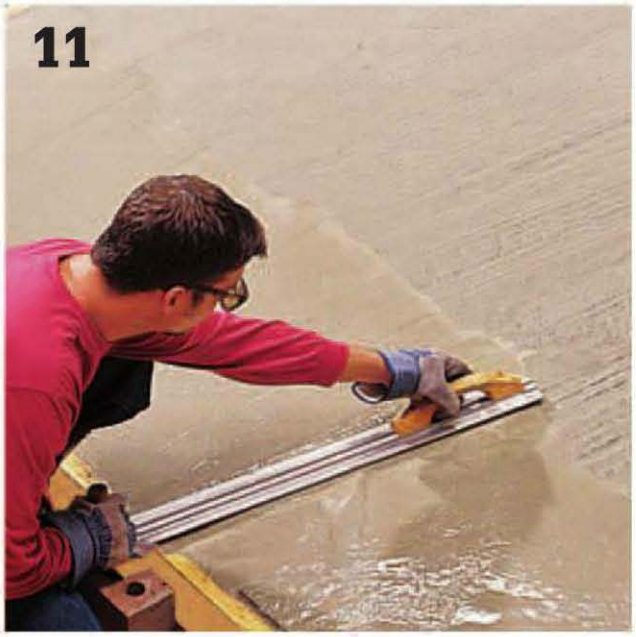
Bleed Water ▸

Timing is key to an attractive concrete finish. When concrete is poured, the heavy materials gradually sink, leaving a thin layer of water—known as bleed water—on the surface. Let bleed water dry before proceeding with other steps. Follow these rules:

- Settle and screed the concrete and add control joints immediately after pouring and before bleed water appears.
- Let bleed water dry before floating or edging. Concrete should be hard enough that foot pressure leaves no more than a ¼"-deep impression.
- Do not overfloat the concrete; it may cause bleed water to reappear. Stop floating if a sheen appears, and resume when it is gone.



Optional: Cut control joints using a groover (left photo) if your local codes require them (dividing slabs into 10 × 10-ft. sections is standard). Lay a long 2 × 12 to span the slab and line up one edge so it's centered on the slab's length. Use a 2 × 4 (or the 2 × 12) as a guide for cutting across the slab with a groover tool. Then, round the edges of the slab next to the forms using an edging tool (right photo). *Note: Instead of grooving, you may cut control joints in the dried concrete using a concrete saw.*



Use a magnesium or wood hand-held float to refine the slab's finished surface as soon as the bleed water evaporates (see Bleed Water, left). Work the float back and forth, starting from the middle of the slab and moving outward to the edges. Use large scraps of 2"-thick rigid foam insulation as kneeling pads while you work.

Apply a coat of cure and seal product (See Resources, page 235) to the surface once it dries so you do not have to water the concrete surface during the curing stage. After a couple of days, strip off the forms. Wait at least one more day before you begin building on the slab.

Framing & Raising Walls

Framing and erecting walls should prove to be one of the more enjoyable aspects of your new garage project. You'll be able to assemble the entire skeleton of the building fairly rapidly, especially if you work with a helper or two and use a pneumatic nail gun for fastening and a power miter saw for cutting. Assembling walls isn't a complicated process. In fact, if you set aside a full day for the job, you'll probably have all the walls assembled and standing on the slab before sundown—maybe even sooner.

We'll use fundamental stick-framing techniques and 2 × 4s to assemble the walls of this garage. In terms of the tools you need, be sure to have a circular saw or power miter saw on hand with a quality (carbide-tipped) crosscutting or combination blade installed. You also need a framing square, speed square, or combination square; a long level, a 25- or 50-foot tape measure, string line, and a framing hammer or pneumatic framing nailer.

As you lay out each wall section, carefully inspect the studs and top and bottom plates to make sure they're straight and free of large splits, knots, or other defects. Separate your lesser-quality lumber for use as wall braces or shorter pieces of blocking. If you end up with a lot of bad studs, call your supplier and request a better supply.

Tools & Materials ▸

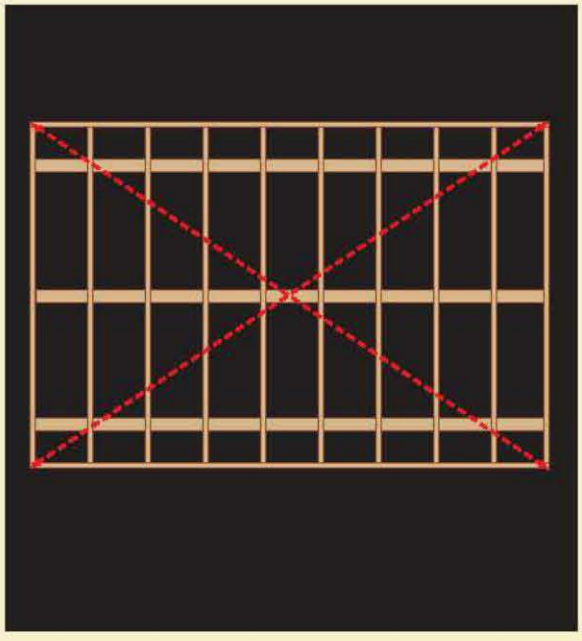
- Work gloves & eye protection
- Combination square
- Drill & spade bit
- Miter saw
- Marker
- Speed square
- Tape measure
- Hammer (or pneumatic nailer)
- Caulk gun
- Mason's line
- Reciprocating saw
- Stakes
- Pressure-treated 2× lumber for sole plates
- 2× pine lumber (2 × 4, 2 × 8, 2 × 12)
- Galvanized common nails (8d, 10d, 16d)
- 1 × 4 bracing
- Deck screws
- Galvanized washers & nuts for J-bolts
- ½" plywood
- Construction adhesive

Raising the garage walls is an exciting time in your project, as the structure begins to emerge rapidly with relatively little effort.

Tips for Framing ▸

The best hand-nailing technique for joining framing members depends on whether you assemble the framed wall and then raise it, or you add boards one at a time in their final position. If you're assembling the wall on the floor or ground, end-nail the studs to the plates whenever you can (left sample). End-nailed joints, usually made with 10d common nails, are strong and fast to make. To double up wall studs or headers, facenail the parts (right sample) with 8d common nails. Facenailing is also used for attaching jack studs to king studs. To fasten a vertical stud to a top or sole plate that is already in place, toenailing (middle sample) is your best option.

A pneumatic framing nailer makes fast work of frame carpentry. Typical collated strips have nails with diameters roughly equivalent to an 8d nail and varying in length between 2⅜" and 2½". Framing nailers can be relatively expensive but are also available for rent at larger rental centers.



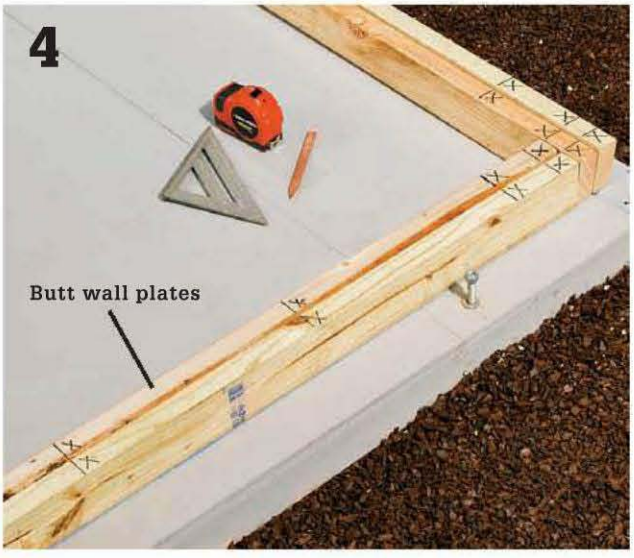
Measure the diagonal distances once you have assembled each wall. The distances between opposite corners will be equal when the walls are square.

How to Frame a Garage

Prepare the sole plates. Select straight pressure-treated lumber for the wall sole plates and cut them to length. Position the bottom plates on the slab and up against the J-bolts. Follow your plans to determine which walls run to the edges of the slab (called through walls) and which butt into the other walls (called butt walls). Use a combination square and pencil to extend a line across the bottom plate at each J-bolt location.

Drill guide holes for J-bolts. Make a tick mark on the J-bolt layout marks 1¾" in from the outside edge of the bottom wall plates to determine where to drill the J-bolt through-holes. Drill through the bottom plate at each hole location with a ⅝" or ¾" spade bit to allow some room for adjusting the plate on the slab. Slip a backer board beneath the workpiece before finishing the hole.

Make plates for the through walls: Cut a cap plate for the first wall so its length matches the sole plate. Stand both plates on edge and line up the ends. If the first wall is a through wall, make marks at 1½" and 3" to indicate the end stud and extra corner stud. Mark the next stud at 15¼" according to your stud layout. Step off the remaining studs at 16" on center. Mark double studs at the opposite end of the wall. Draw Xs to the side of each of these marks to designate on which side of the marks the studs should go. Extend these stud layout marks across both edges of the cap and sole plates.

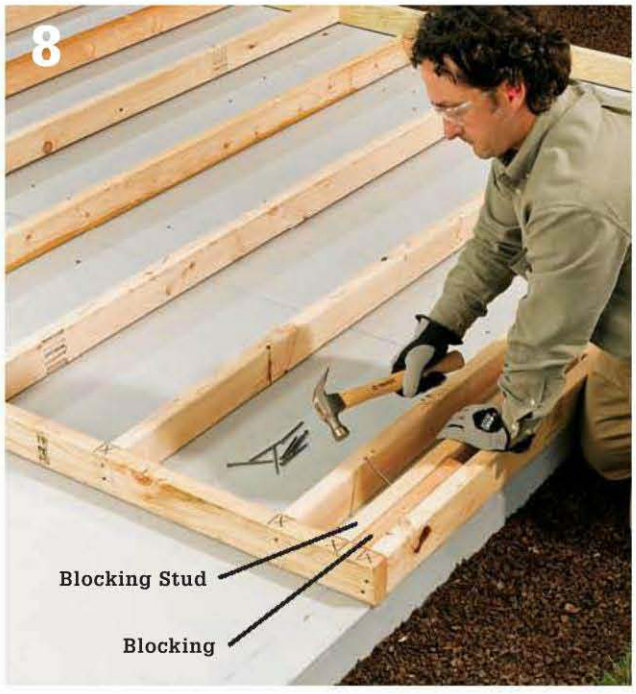


Make plates for butt walls: For laying out the stud spacing on butt walls, the end studs will be aligned with the ends of the top and bottom plates. Mark the second stud 15¼" from the plate ends, and step off the rest of the studs at 16" on center. Extend the lines across both wall plates and draw Xs to the right of your stud marks.

Cut wall studs to length. Select the number of studs you'll need to build the first wall, and sight down their edges to make sure they're straight. Inspect for deep end checks or loose knots (a check is a lengthwise separation of the wood; an end check is one occurring on an end of a piece). Set defective studs aside for use as blocking. For the single garage shown here, cut the studs to 7 ft., 8⅝" (92⅝").

Assemble the back wall. Position the marked wall plates about 8 ft. apart with the stud markings facing up. Lay out the studs between the plates, and start by nailing the bottom plate to the wall studs with pairs of 16d galvanized common nails or pneumatic framing nails. Make sure the edges of the studs and plates are flush and the studs line up with their layout marks on the plate. Drive two nails through the plate into the stud ends to secure them. Nail the top plate to the studs the same way.

Add end blocking for through wall. Cut three 12" lengths of 2 × 4s to serve as blocking between the end and second studs on through walls. Space the blocking evenly top to bottom along the inside face of the end studs. Nail the blocking in place.



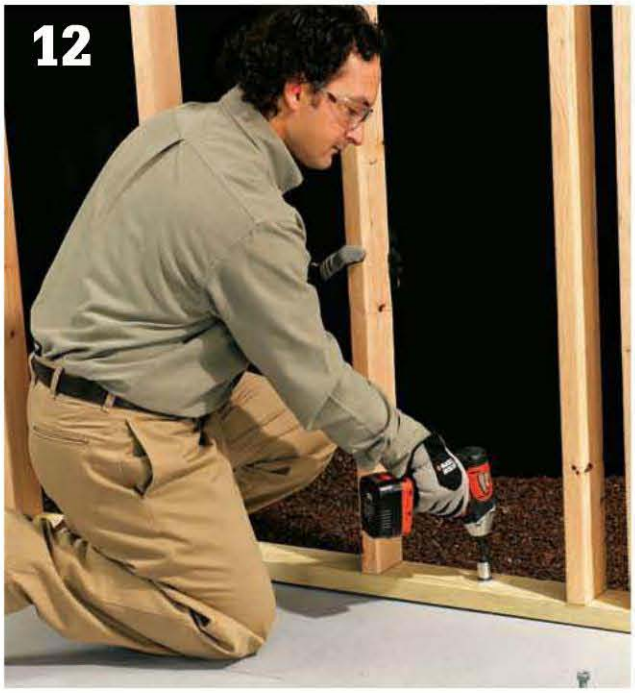
Nail blocking stud in place. Butt the second stud against the blocking, and nail the top and bottom plates to it. Drive more nails through the second stud and into the blocking.

(continued)

Square up the wall. Check the wall for squareness by measuring from corner to corner and comparing the diagonals (see page 35). If the measurements are not equal, push the longer-dimension corners inward as needed until the diagonals are the same.

Install temporary bracing. Once the wall is square, install a temporary 1 × 4 brace across the wall plates and studs to stabilize the wall and keep it square. Use deck screws or 8d nails to tack the brace diagonally across the wall, driving two fasteners into the top and bottom plates and one nail into every other stud. Leave these braces in place until the walls are ready to be sheathed.

Set up the back wall. Before standing the first wall up, nail a temporary brace to each end stud to hold the wall in position after it is raised. Drive one 16d nail through the brace and into the end stud about 7 ft. up from the bottom plate to act as a pivot. Tip the wall up and onto the J-bolts with the aid of a helper. Swing the end braces out into the yard, and attach them to stakes in the ground. Check the wall for plumb with a long level held against the studs before fixing the braces to the stakes. Erect any adjoining walls that do not have window or door openings.



Anchor the wall plates. Use a hammer to tap the bottom plate into final position on the slab, and attach it to the J-bolts with galvanized washers and nuts.

Mark window and door openings. For walls with windows or a service door, mark the positions of king and jack studs when you are laying out the top and bottom plates. Identify these studs with a K or J instead of an X to keep them clear. Mark the cripple studs with a C as well.

(continued)

Frame window and door openings. Measure and cut the jack studs to length following your garage plans. For either window or door jack studs, make the jack stud length equal to the height of the rough opening minus 1½" for the bottom plate (door framing) or 3" for a double rough sill (window framing). Facenail the jack studs to the king studs with 10d common nails spaced every 12".

Make the headers. The header seen here is assembled from doubled-up 2 × 8 lumber sandwiched around a piece of ½" plywood sized to match. Fasten the header pieces together with wavy beads of construction adhesive and 16d nails spaced every 12". Make sure the ends and edges are aligned. Drive the nails at a slight angle to keep them from protruding, and nail from both sides of the header.

Install the headers. Set the headers in position on top of the jack studs and drive 16d nails through the king studs and into the ends of the header to fasten it in place. Use six nails (three per end) for 2 × 8 headers.

Install cripple studs above. First, cut the cripple studs to fit between the header and the wall's top plate, and then toenail them in place with three 8d nails on each end. Drive two nails through one face and one nail through the center of the opposite face.

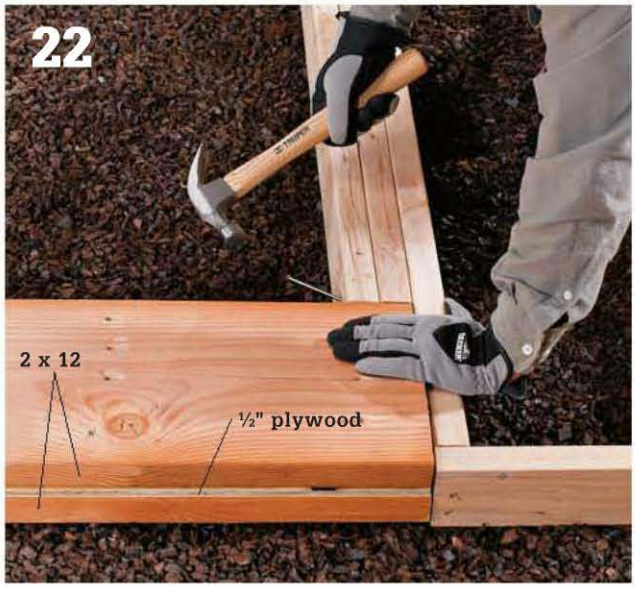
Install cripple studs below. When framing for a window, measure down from the bottom edge of the header to position the rough sill and establish the rough opening dimensions. Cut two rough sill pieces to length from 2 × 4s and facenail them together with 10d nails. Toenail the sill to the jack studs with 16d nails. Cut and nail cripple studs between the rough sill and the wall's bottom plate to complete the window framing.

Join wall sections. For long walls, your garage plans may require you to build the wall in two sections and nail these together before erecting the wall. Facenail the wall sections with pairs of 8d nails spaced every 12" along the adjacent end-wall studs.

Raise window/door wall. You'll need three or four helpers to tilt the heavy wall up and into position on the slab. Adjust the wall as needed so it butts against the short wall and lines up properly on the slab. Check the wall for plumb along several studs, and attach a temporary staked brace to the unsupported end. Install washers and nuts on the J-bolts to fasten the wall to the slab.

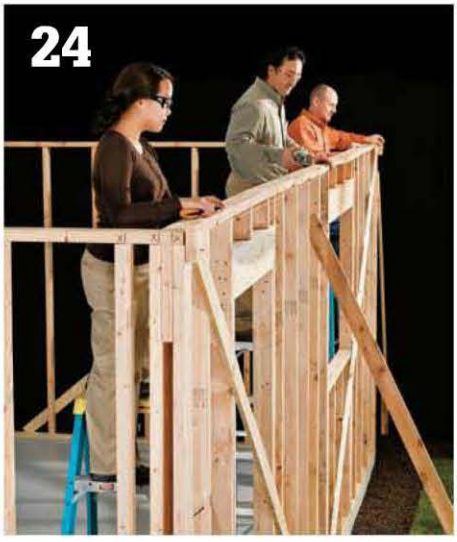
(continued)

Nail walls together. Drive 16d nails through the end stud of the butted wall into the end studs and blocking of the through wall. Space these nails every 12" along the length of the walls. Prior to nailing the second long wall, you can remove the temporary brace and stake that hold the back wall in position.

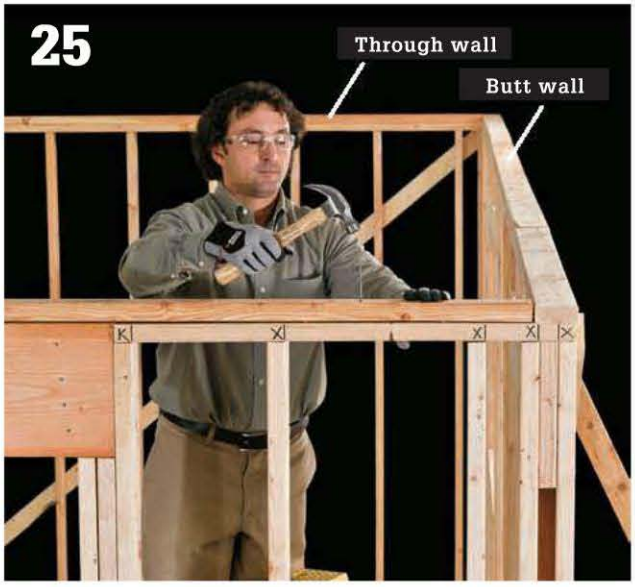


Assemble the garage door wall. Follow the instructions in your garage plans to assemble the front wall and the sectional garage door rough framing. Sectional garage doors typically have a doubled-up 2 × 12 header sandwiching a piece of ½"-thick plywood. Build the header just as you would a window or service door header. The header will be supported by double jack studs. This wall may or may not have a continuous top wall plate and cripple studs above the header, depending on the height of your garage walls.

Position the front wall. Remove temporary braces and stakes supporting the front and side walls, then tip the front wall up and into position against the side walls. Line up the ends of the side walls with the front wall, and nail the walls together through the end studs with 16d nails. Install washers and nuts on the front wall J-bolts.



Test walls for flatness. Check the long walls for bowing by tacking a scrap block of 2 × 4 at the top outside corner of each wall. Drive another nail partially into these blocks, and then string a mason's line between the nails. Pull the line taut, and measure the distance between the string and the wall's top plate. The distance should be 1½" all along the wall.



Lock the walls together. Cut top plates to length from 2 × 4s to make tie plates. Make the through-wall tie plates 7" shorter than the through-wall top plate 3½" on each side. Cut the tie plates for butted walls 7" longer than the butt-wall top plate. This way, the double top plates on butted walls will overlap the through-wall top plates, locking the walls together. Facenail all four tie plates to the wall top plates with 10d nails. Drive two nails in the overlapped corners, then single nails every 16" along the plates.

Cut out the threshold. Cut away the bottom plate from the rough opening of the service door with a reciprocating saw with the blade installed upside down. Make these cuts flush with the edge of the jack studs so the door jamb will fit properly in the opening.

Frame the overhead door opening. *Note: If you have already purchased your sectional garage door, check the door opening requirements in the installation manual and compare them to these instructions before proceeding with this step.* Facenail a 2 × 6 around each side and the top to frame the sectional garage door rough opening on the inside face of the front wall. These boards form blocking for installing the garage door and garage door opener later. Position the blocking flush with the faces of the jack studs and the bottom edge of the door header. Fasten the blocking with 10d nails. Wait until you are preparing to install the door to install trimboards and stop molding.

Installing Roof Framing

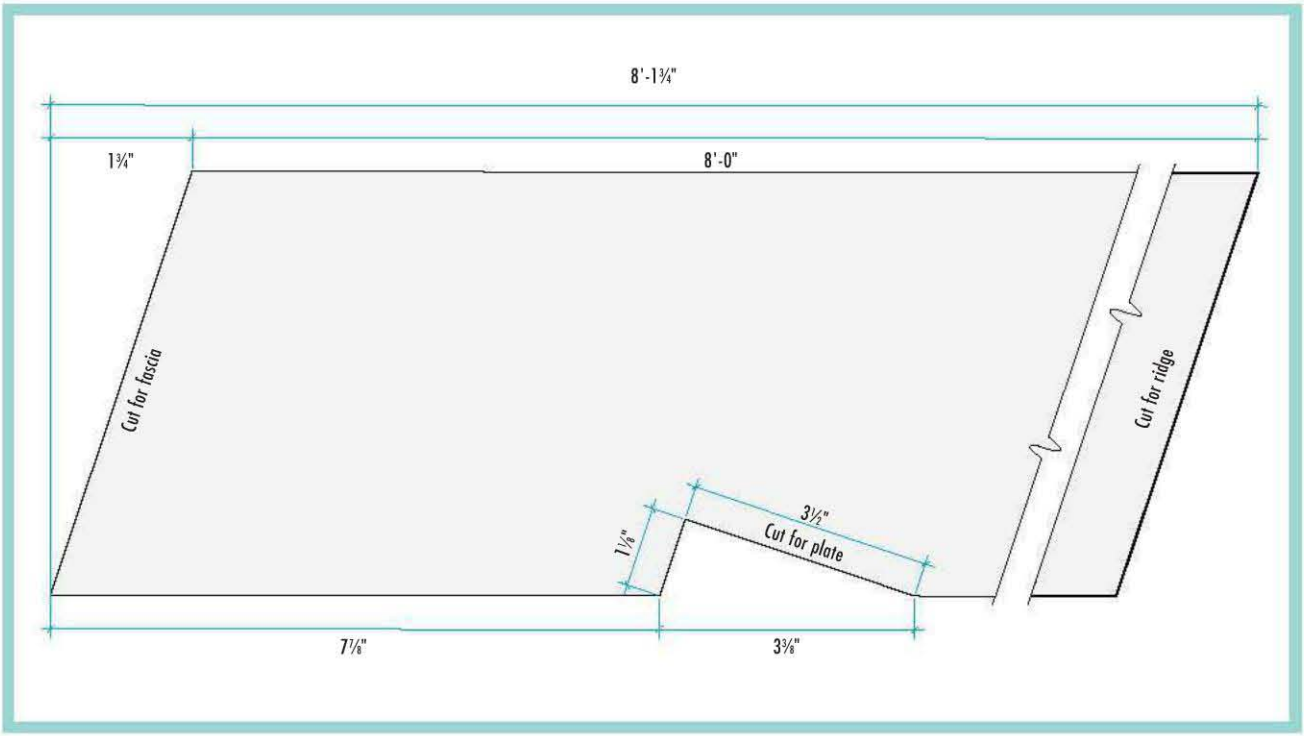
This garage has a simple gable-style roof consisting of only two roof planes with flat gable end walls. For that reason, we'll frame the roof using rafters as the principal structural members. Rafters extend from the wall top plates and meet at a ridgeboard at the roof's peak. They're a traditional form of roof construction on both simple and complex roof designs, and rafters are also a more economical option than custom-built trusses. If you're unfamiliar with roof framing, constructing this rafter roof will be an excellent opportunity to learn some important basic skills.

Building the roof frame is a departure from wall framing because you can't nail whole sections of the roof together at once and set them in place. Instead, you'll cut all the rafters to size and shape to match the slope of the roof, and then install them in pairs "stick built" style. For a garage this small, 2 × 6s spaced 24" on center are sufficiently strong to serve as rafter boards, unless your area is beset with extreme snow loads. Since the garage's roof ridge runs from front to back, rafters are installed perpendicular to the length of the building. A third important component of rafter framing—horizontal collar or rafter ties—span the width of the structure and can function as ceiling joists. Collar ties help keep the walls from spreading apart by locking several pairs of rafters together into triangulated frames, similar to a roof truss.

Tools & Materials ▸

- Work gloves & eye protection
- Carpenter's pencil
- Speed square
- Tape measure
- Miter saw
- Framing square
- Ladders
- Jigsaw
- Circular saw
- Hammer (or pneumatic nailer)
- Long level
- 2 × 6 lumber
- 2 × 4 lumber
- Rafter ties
- Galvanized common nails (10d, 16d)
- 2 × 4 braces
- Collar ties

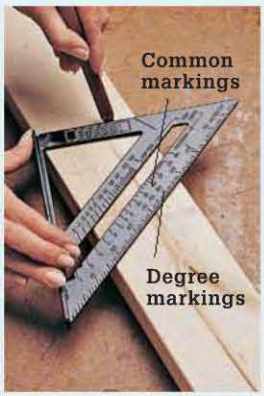
A system of rafters, ridgeboard, and collar ties creates the framework for this garage's simple gable-style roof. Rafters are a traditional, sturdy, and economical option for this project, but custom-built trusses are another viable option here.

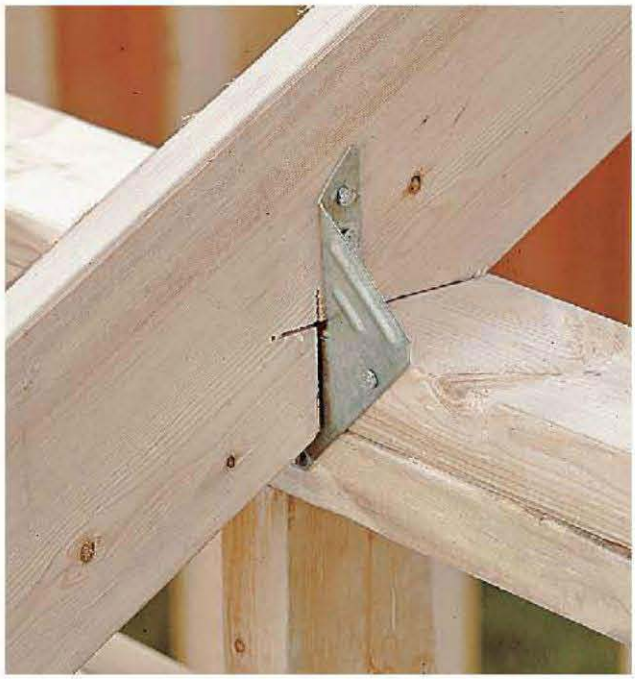


This template may be used as a guide for laying out the birdsmouth cuts on the rafter ends for the garage project seen here.

Using a Speed Square ▸

A speed square is a handy tool for marking angled cuts using the degree of the cut or the roof slope. Set the square flange against the board edge and align the pivot point with the top of the cut. Pivot the square until the board edge is aligned with the desired degree marking or the rise of the roof slope, indicated in the row of common numbers. Mark along the right-angle edge of the square.





Metal rafter ties add strength to the connection between the rafter and the top plate of your garage walls. They also help with alignment and minimize any splintering of the rafter caused by toenailing. In some areas of the country where hurricanes and tornadoes are common, metal rafter ties are required by local codes.

How to Install Roof Framing

Make a pair of pattern rafters. Choose two straight 2 × 6s to create a full-size pattern rafter for each leg of a rafter pair. Mark a cutting line on one end of each pattern with the correct angle formed with the ridgeboard. Refer to your garage plans to determine the correct roof pitch (which determines the cutting angle). Then, measure from the top of the ridge angle along the rafter to determine its overall length and draw a second reference line for the plumb cut at the eave end. Make the plumb cuts with a power miter saw (best choice) or a circular saw. Lay out and cut the birdsmouths on the pattern rafters, using a speed square (page 45). Use a framing square to create the level and plumb lines that form the birdsmouth cuts. The birdsmouth will enable the roof rafters to rest on the wall double top plates at the correct roof pitch. Use the pattern rafters as templates for marking the rest of the rafters.

Check the fit. Set your pattern rafters in position on top of the side walls with a 2 × 8 spacer block tacked between them to represent the ridgeboard. You'll know you have a good fit if the top angled ridge cuts meet the ridgeboard flush and the birdsmouth cuts sit flush on the wall plates. Have a helper position and check the fit of these parts. Adjust the angles, if necessary, to improve the fit of the parts.

Cut all the rafters. Use the pattern rafter to trace the plumb cuts and birdsmouth onto the workpieces for all of the rafters. Set the cutting angle on your power miter saw to match the plumb cut and cut each rafter at the cutting lines. Then, finish the rafters by cutting the birdsmouths with a jigsaw, or circular saw and handsaw.

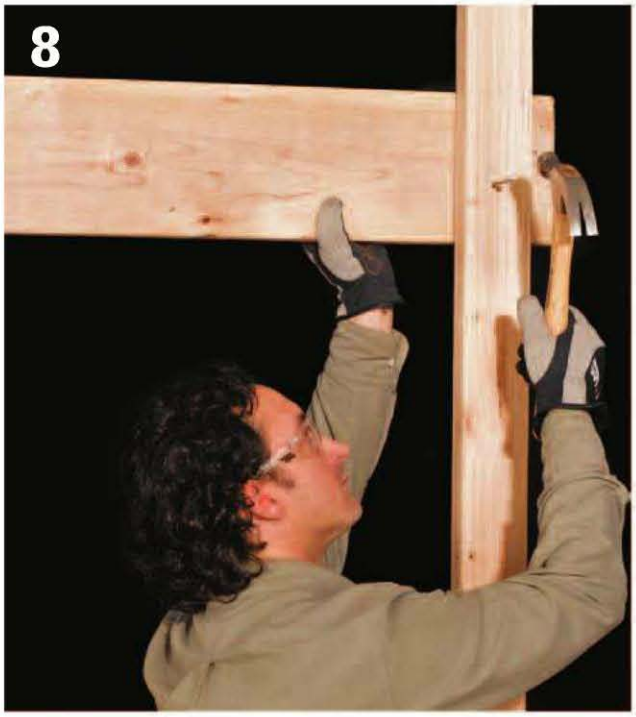
Plot the rafter locations. Mark the location of each rafter on the doubled top plates. The rafters begin at the ends of the walls, and the intermediate rafters should line up over the wall studs that are spaced 16" on center. Use a speed square to extend a rafter layout line up from each wall stud layout line to the top plate. Mark an X next to the line to indicate which side of the line the rafter should go. Mark the position of all the rafters.

Install rafter ties. If building codes in your area require it, or if you simply want a stronger structure, nail metal rafter connector plates (often called rafter ties) to the wall top plates before installing the rafters.

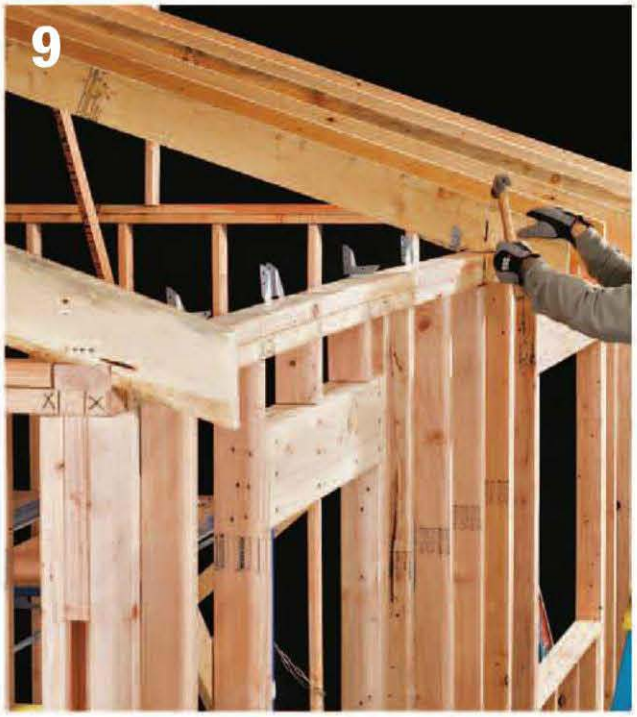
Mark the ridgeboard. Select a straight, flat 2 × 8 for the ridgeboard. It should be several feet longer than the roof length. Lay the board face-down over the tops of the end walls and flush against a side wall. Adjust the ridgeboard so it overhangs the end walls evenly. Use a square to transfer the rafter layout lines and X marks from the wall double top plate to the ridgeboard. Then, flip the ridgeboard over and mark the rafter locations on the opposite face.

(continued)

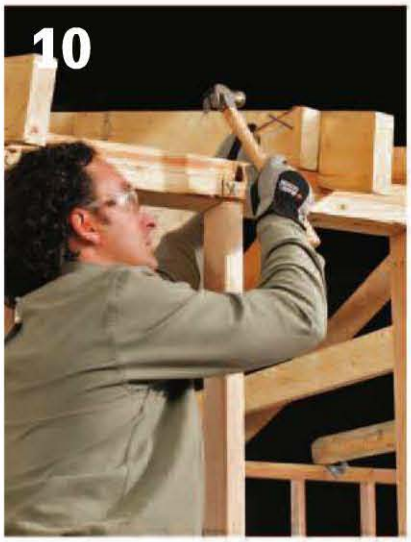
Install the ridgeboard. To make it easier to begin the rafter installation, nail the first two end rafters to the ridgeboard before lifting them into place on the walls. Facenail the ridgeboard to one end rafter through the top plumb cut with three 16d nails. Make sure the rafter is properly lined up with the ridgeboard layout line. Toenail the opposite rafter to the ridgeboard. Then, with several helpers lift the end rafters and ridgeboard into position on the wall plates. Have a helper hold up the opposite end of the ridgeboard while you toenail the end rafters to the wall plates.



Install a temporary brace. Toenail a temporary 2 × 4 brace vertically to the opposite end wall. Choose a brace longer than the roof will be high. Rest the ridgeboard against the brace and adjust it until it is level. Use 10d nails to nail the ridgeboard temporarily to the brace to hold it in position.



Install the rest of the rafters. With the ridgeboard braced and leveled, fit and install the rest of the rafters, fastening them with 16d nails. Toenail the rafters to the metal rafter ties at birdsmouths, and either facenail or toenail the rafters to the ridgeboard, depending on which rafter you are installing for each pair. Check the ridgeboard periodically for level as you work. When you reach the opposite end of the roof, remove the temporary ridge brace and install the end rafters.



Install collar ties. Follow your garage plans to lay out and cut collar ties to size. Collar ties prevent the garage walls from spreading apart under roof loads. Angle-cut the top ends of each collar tie if necessary to match the roof slope. Install the collar ties by facenailing them to the rafters with three 10d nails at each end.

Install gable top plates. On the gable ends of the roof, you'll need to install additional studs under the rafters to provide nailing surfaces for wall sheathing. Start by cutting a pair of 2 × 4 gable wall top plates that will extend from the sides of the ridgeboard down to the wall double top plates.

Lay out and install gable studs. These should be positioned by holding a long level against the wall studs and transferring layout lines to the edges of the gable top plates. Plan for a gable stud to line up over each wall stud. Cut the gable studs to fit and toenail them to the gable and wall top plates.

Install lookouts. Follow your plans to lay out the locations of the lookout blocking that will form gable overhangs on the roof. Cut the blocking to size, and facenail through the end rafters to install it to the outside faces of the end rafters. Make sure the top edges of the blocking and rafters are flush before driving the nails. Also mark the gable overhang length on each end of the ridgeboard, and cut it to final length with a circular saw or handsaw.

Complete the overhang. Lay out and cut the gable overhang rafters to size and shape using your pattern rafter as a template. *Note: Gable end rafters do not have birdsmouths. Nail these rafters to the lookout blocking and ridgeboard to complete the roof framing.*

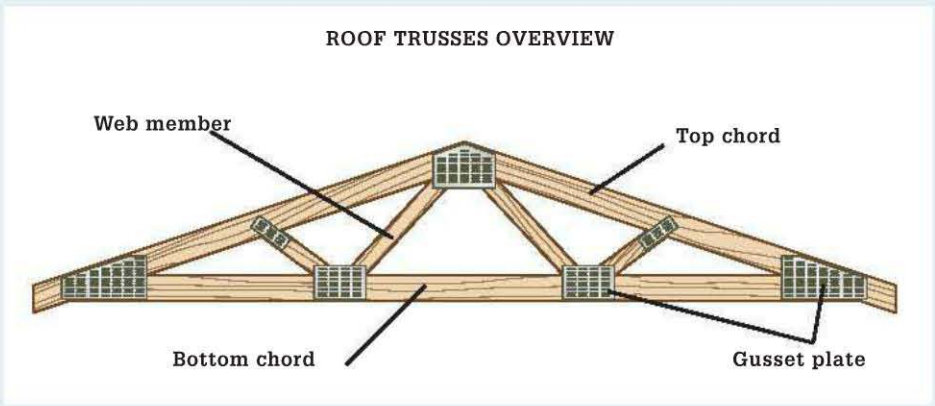
Option: Roof Trusses ▸

Custom-made roof trusses save time and practically guarantee that your roof will be square and strong. They add considerably to the project cost, however, and must be ordered well in advance.

Trusses are engineered roof support members that can be used instead of hand-cut rafters to support your roof. You can build them yourself or you can order them premade to match your building size and preferred roof pitch. A truss has a triangular shape with two matching top chords that meet a horizontal bottom chord. Diagonal crossbracing, called webs, are fitted between the top chords and the bottom chord. Typically, the joints between chords and web members are reinforced with metal or plywood gusset plates.

Trusses are designed so the ends of the bottom chord rest on the top plates of the side walls. Consequently, you don't have to cut tricky birdsmouths or rafter angles—you simply fasten the bottom chord by toenailing or using metal hangers. The relative ease that can be installed may make up for the higher costs compared to rafters. But unless your garage is very small, you will likely need to rent a crane, forklift, or other mechanical assistant to raise the trusses into position.

Most professional garage contractors employ trusses because they go up quickly and don't require complicated cutting. There are limitations, however. If you are purchasing the truss premade, you can pretty well wager that the quality of the lumber won't be as high as the dimensional lumber you'd use to make rafters. The presence of the bottom chord will cut into your open space in a garage, potentially limiting the storage options. But if you are planning to install a ceiling in your garage, the chords can be put to work as ceiling joists.



A manufactured truss consists of two top chords and a lower chord with web members installed between chords for strength. The joints are usually reinforced with metal or plywood gussets. Unlike rafter roofs, a truss roof does not have a ridgepole.

Working with Trusses

Use long 2 × 4 braces clamped to the end wall to temporarily clamp or tack the end truss in position. If the truss is sized correctly there should be no need to adjust it side to side, but you'll need to make sure it is flush with the end wall and plumb before you nail it into place.

Secure the trusses to the walls with metal truss ties or rafter ties. These are required in high-wind areas but are a good idea anywhere because they strengthen the roof and help in alignment.

Toenail trusses to wall plates with 16d nails. Typically, the two end trusses are installed first and then a mason's line is stretched between the tails of the top chords to use as an alignment reference. A temporary brace with truss spacing marked to match the wall plates is installed as you go to stabilize the trusses and create the correct spacing. Remove the brace before installing the roof decking.

Dos & Don'ts for Working with Trusses ▸

- DO set trusses on blocking for their protection when storing.
- DO have plenty of help when it's time to raise the trusses.
- DO NOT cut trusses for any reason.
- DO NOT exceed the span spacing for which the truss is rated.
- DO provide your truss dealer with an accurate plan drawing of your garage.
- DO NOT walk on trusses if they are being stored lying flat.
- DO NOT install trusses in high winds.
- DO use temporary braces to ensure that trusses stay plumb during installation.

Sheathing Walls

Once the garage walls are framed and erected, all exterior wall surfaces, including the angled areas up the gable walls, should be covered with a layer of oriented strand board (OSB) or CDX plywood sheathing. Wall sheathing serves two basic purposes: it strengthens the wall framing by locking the studs to a stiff outer "skin," and it provides a uniform backing for nailing the siding and trim in place. The minimum sheathing thickness for 16" O.C. stud walls is ⅜", and ½" material is even better.

Provided you've framed your garage walls correctly, you should be able to install sheathing in full 4 × 8 sheets because the stud spacing will enable the sheets to be nailed along the edges and ends evenly. You can hang sheathing horizontally or vertically, but generally the horizontal approach makes large sheets easier to manage. Install a bottom coarse of sheathing first all around the building so you can use the top edge as a handy ledger for resting and nailing off the top course. To speed the process along, sheathe right over service door and window openings, and then cut these openings again once all the sheathing is in place.

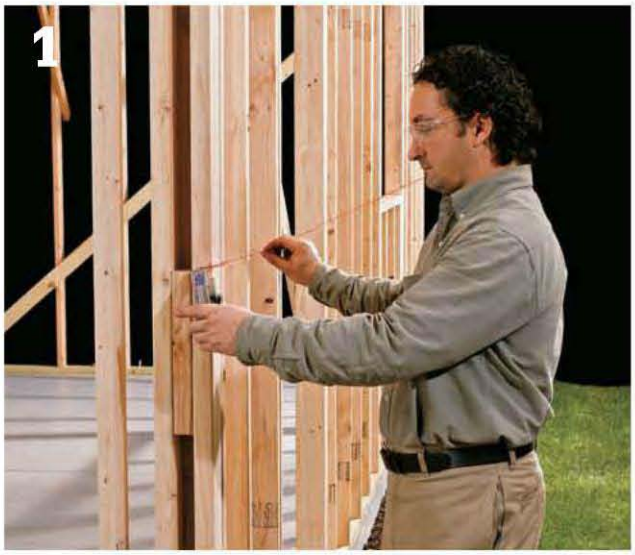
Even exterior-rated sheathing isn't immune to the effects of wind-driven rain, especially around nail holes. It's good practice to cover sheathing with 15-pound building paper or housewrap. Install it horizontally, working from the bottom of the walls up and overlapping the seams by at least 2". If you use housewrap, be sure to tape all seams with housewrap tape recommended for the brand of wrap you are using. Housewrap will begin to degrade from sunlight in just a few weeks, so be sure to get your permanent siding on promptly.

Tools & Materials ▸

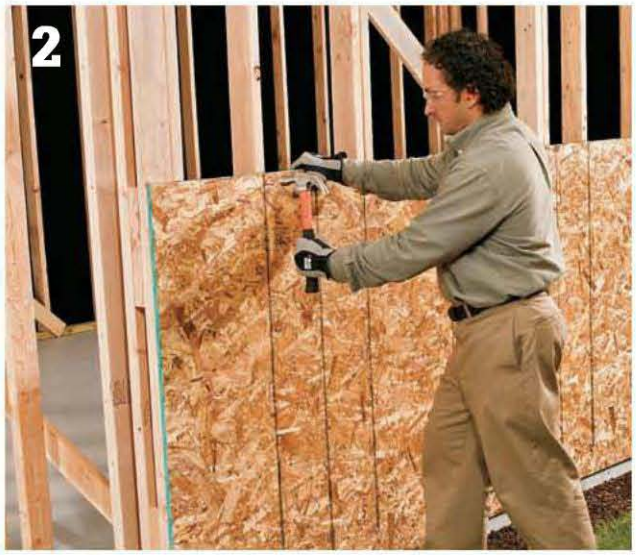
- Work gloves & eye protection
- Chalk line
- Tape measure
- Marker
- Hammer (or pneumatic nailer)
- Drill & bits
- Reciprocating saw
- Cap nails
- Utility knife
- OSB sheathing
- Common nails (6d)
- Housewrap
- Housewrap tape

Wall sheathing stiffens building wall framing and creates a uniform backing for siding and trim. A layer of building paper or housewrap seals the sheathing from moisture infiltration.

How to Install Wall Sheathing



Snap a layout line. Use a chalk line to create a level line 47" up the walls, measured from the bottom of the bottom plate. Snap a line the full length of each wall. At this height, the bottom course of sheathing will cover the bottom wall plate and overlap the foundation by 1", minimizing water infiltration. Several inches of slab should still be visible after the sheathing is installed. Sheathing should not contact the soil.



Install the first sheet. Position the first full sheet of OSB sheathing in one corner so the top edge lines up with the chalk line. One end of the sheet should align with the edge of the framed wall and the other should fall midway across a stud. Attach the sheathing with 6d common nails. Space the nails every 6" around the perimeter and every 12" at the intermediate studs. Before nailing, snap chalk lines across the sheet to show the centerlines of every wall stud. Install all first-course panels. *Note: Go ahead and sheath over door and window openings. You can cut out the sheathing later.*

Install the second course. Begin this course with a half sheet of OSB to establish a staggered pattern. Snap chalk lines across this sheet, too, to show nailing locations of studs. If necessary, trim the second-course panels so the tops are flush with the top edges of the wall-cap plate. Maintain a gap of ⅛" between the first and second course panels to allow for expansion and contraction (6d nails can be used as spacers between panels).

Mark the door and window openings. Drill through the sheathing at all corners of the door and window openings (you can drive nails if you prefer), and then connect the holes (or nails) with straight cutting lines.

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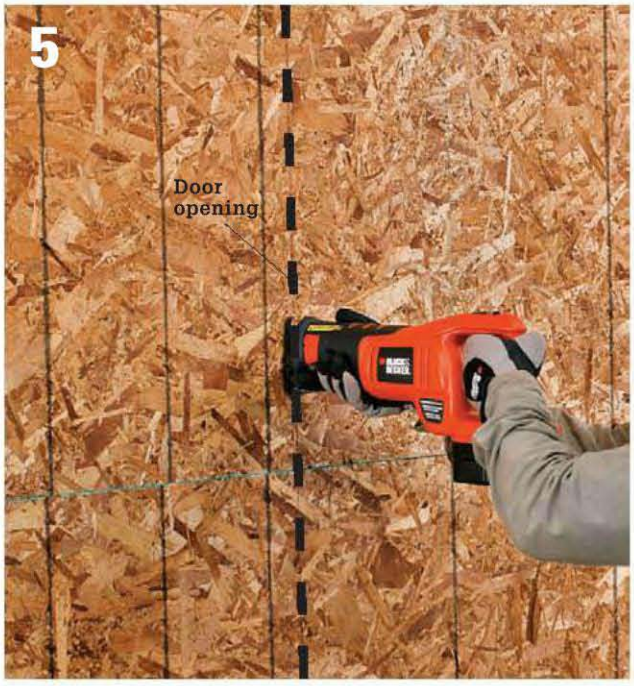
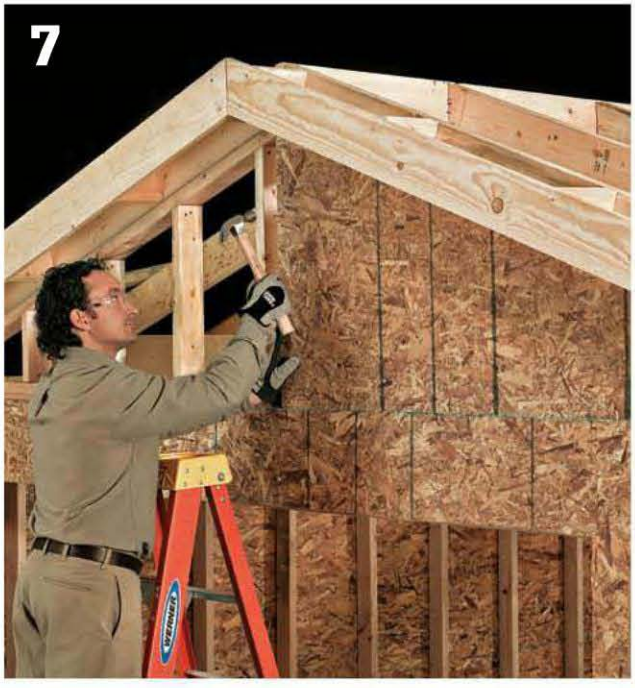
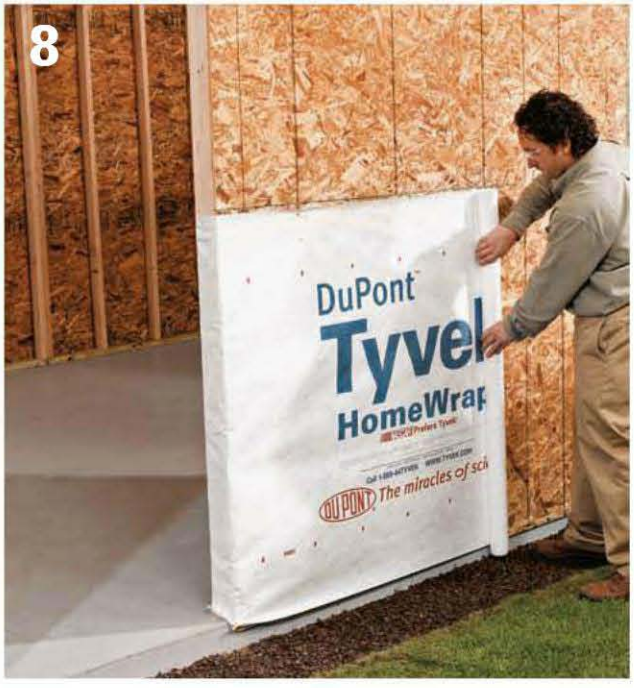


Cut out the door and window openings, using a reciprocating saw. Cut carefully so the sheathing does not extend into the opening.

Sheath the next wall frame. The panels for the adjoining wall should overlap the ends of the panels on the first wall without extending beyond them. Complete installing full panels on all four walls.



Install sheathing in gable areas. After the first courses are installed on the walls with roof gables, lay out and cut second-course panels that follow the eave line. Mark stud locations and attach these gable sheathing panels with 6d nails, maintaining ⅛" gaps between panels.



Begin installing housewrap. Begin at the bottom courses if the product you're using is not wide enough to cover a wall in one piece. *Note: Housewrap is a one-way permeable fabric that helps keep moisture from entering the structure from the exterior. Installing it makes sense only if you are planning to add finished interior walls in the garage.*

Attach the housewrap with housewrap nails. Drive at least three housewrap nails spaced evenly along each wall stud.

Finish installing the housewrap. All seams should overlap by at least 6 to 12", with horizontal seams overlapping from above.

Cut out windows and doors. Make a long X cut in the housewrap, connecting corners diagonally at window and door openings. Use a utility knife to make the cut. Staple down the extra housewrap in the window rough opening so it wraps around the jack studs, header, and rough sill.

Tape the seams. To seal the housewrap, apply housewrap tape along all horizontal and vertical seams. *Note: Housewrap is not rated for long-term exposure to the sun, so do not wait more than a few weeks after installing it before siding the garage.*

Installing Fascia & Soffits

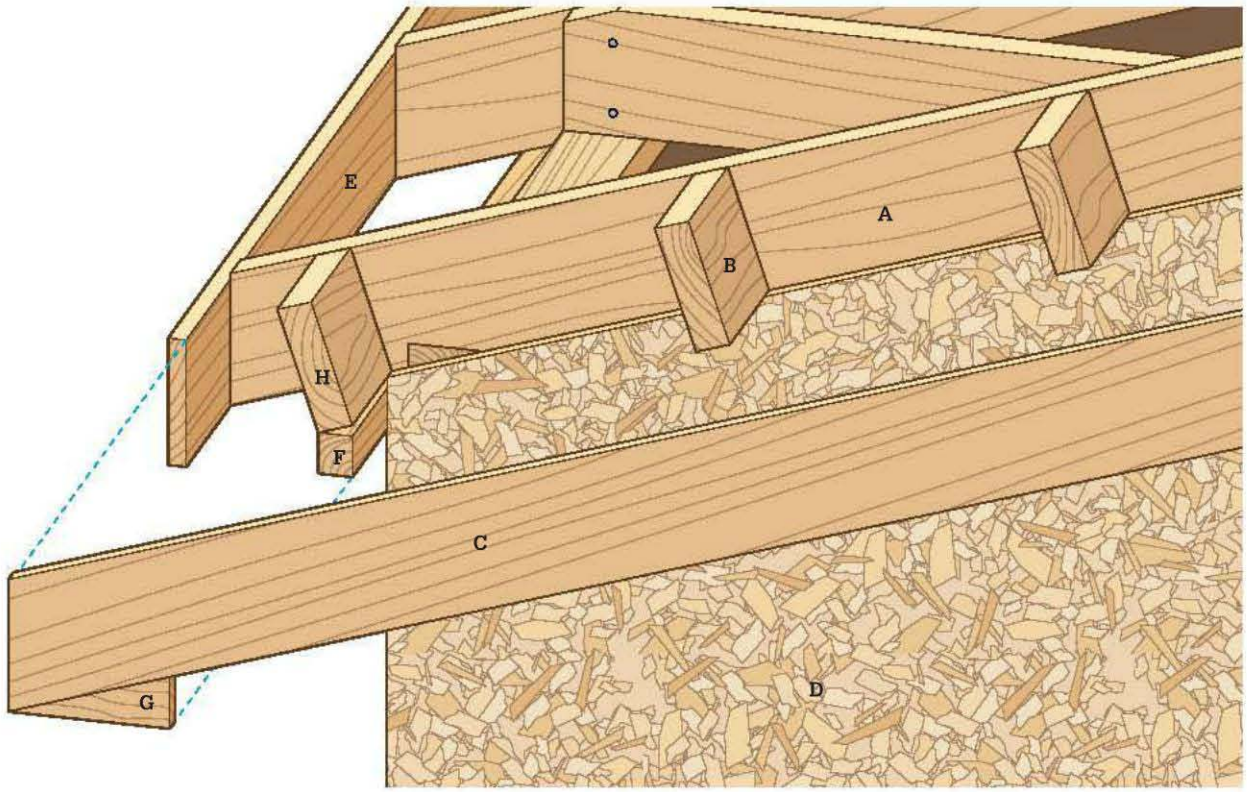
Fascia and soffits form transitions from your garage's roof to the wall siding. Fascia consists of 1× pine or cedar boards, sometimes called subfascia, that cover the ends of the rafters at the roof eaves to keep weather and animal pests out. It also serves as an attachment surface for gutters. The faces of the gable end rafters are also covered with fascia boards to continue the roof trim pattern all around the building. Generally, fascia boards are installed before the roof sheathing to ensure that the roof sheathing will overlap them once it's in place. You can paint your garage fascia to protect it, or cover it with manufactured aluminum fascia that matches the soffit color.

A soffit extends from the fascia to the wall. It encloses the bays between the rafters or trusses and provides an important means of ventilation beneath the roof deck. Sometimes a soffit is made of exterior plywood with vents cut into it, but the soffit we show here is ventilated aluminum strips, available in a range of colors to match aluminum or vinyl siding. Install your garage soffit before hanging the siding so you can nail it directly to the wall sheathing.

Tools & Materials ▸

- Work gloves & eye protection
- Miter saw
- Hammer (or pneumatic nailer)
- Speed square
- Chalk line
- Circular saw
- Aviation snips
- Caulk gun
- 1 × 8 lumber
- Common nails (16d)
- Galvanized casing nails (8d)
- 2 × 2 lumber (if needed)
- 2 × 6 scrap lumber
- Vented aluminum soffit panels with mounting strips
- Rolled aluminum flashing with color-matched nails
- Fascia covers
- Color-matched caulk

Fascia and soffits enclose roof rafters to keep weather and pests out while providing a means of roof ventilation and a graceful transition from the roof to the walls.



Components of the cornice system built here include: (A) End rafters, (B) 2× lookout blocking, (C) Gable overhang rafters, (D) Wall sheathing, (E) 1 × 8 subfascia (eaves), (F) 2× soffit blocking-eaves (continuous strip along wall), (G) 2× gable rafter blocking, (H) 2× cornice blocking.

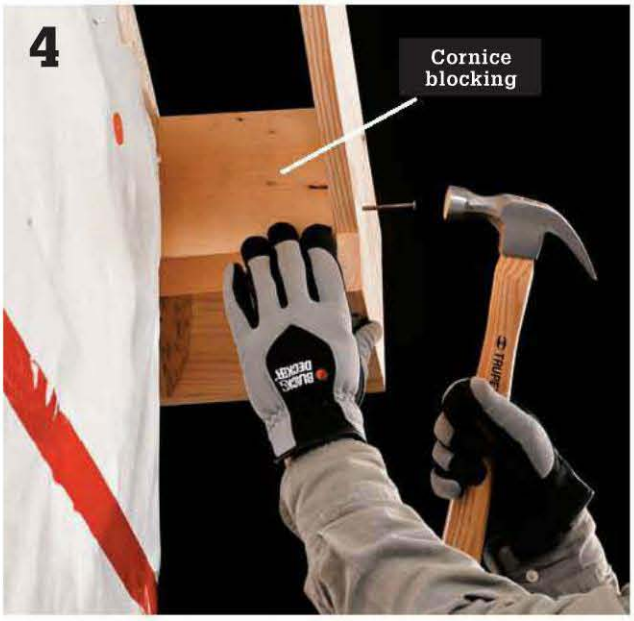
Install the subfascia. Cut pieces of 1 × 8 to make subfascia strips that fit into the fascia area. Attach them to the rafter tails with 8d galvanized casing nails. The ends of the subfascia should be flush with the faces of the gable overhang rafters. Use a speed square held against the top edges of the rafters to adjust the subfascia up or down until the square meets it halfway through its thickness. This will allow the roof sheathing to overhang the rafter tails for proper drainage. Once the subfascia is properly adjusted, drive three nails per rafter tail to secure it.

Make vertical joints. If your subfascia or fascia boards are not long enough to cover a wall in one piece, use overlapping scarf joints to join the ends. Miter cut the ends of the scarf joint parts so they overlap and fall over a rafter tail. Drive three 8d nails through both joint parts to secure them to the rafter.

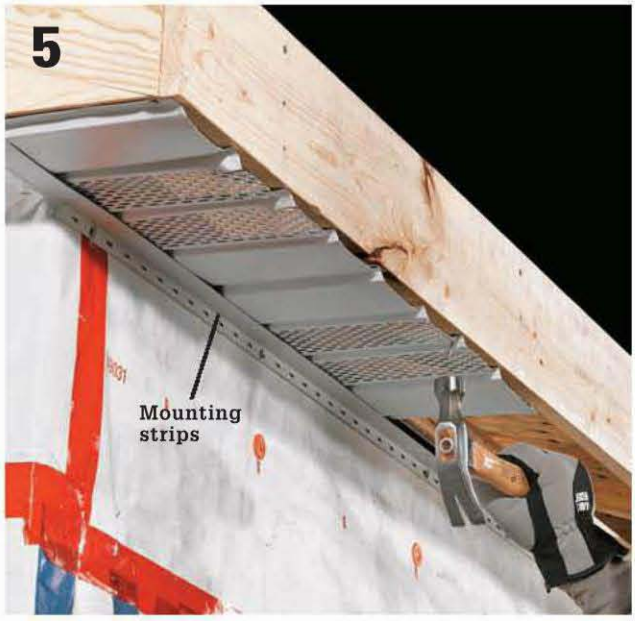
(continued)

Option: If you will be installing wood soffit panels, install 2 × 2 soffit blocking. (The garage seen here will be equipped with metal soffits that do not need backer blocking.) The blocking should be positioned so the bottom edge is flush with the soffit groove or backer in the fascia. Cut the soffit blocking so it extends beyond the ends of the walls to create a nailing surface for any filler pieces that will be installed with the cornice. Nail the soffit blocking to the wall studs with 10d nails, one nail per stud.

Add cornice filler pieces. Measure and cut triangular blocking to fit underneath the gable end rafter tails. Lay out the blocking so it forms a plumb bottom to the rafter tails. Toenail this blocking to the rafters. If soffit blocking is present, screw or nail the cornice blocking to the end of the soffit blocking. Lay out, cut, and nail 1× subfascia boards to cover the gable rafters and the ends of the ridgeboard. Miter cut the ends of the subfascia where they meet at the roof ridge.



Install cornice blocking. Cut and fit short lengths of 2 × 6 scrap between the gable and end rafters and the wall to box in the cornice. Drive 16d nails through the subfascia and end rafters to attach the blocking.



Enclose the eaves. Cut strips of vented aluminum soffit to enclose the eaves of the roof. Hang mounting strips for the soffit panels on the garage walls (if you did not install backer boards—see Option, above). Attach the free edges of the soffit to the bottom of the subfascia with siding nails. The soffit panels should stop flush with the subfascia.

Install soffit in the gables. Lay out and snap chalk lines on the gable walls for installing soffit hanger strips, and then mount the hanger strips (or the blocking). Cut, fit, and nail the soffit panel strips to the subfascia and soffit blocking to close up the rake ends of the roof.

Enclose the cornices. Cut and bend pieces of rolled aluminum flashing to fit over the roof cornices and cover the blocking. Nail this flashing to the cornices with color-matched siding nails. Wrap this flashing around the eave subfascia boards by 1 to 2" so you can install metal fascia to overlap it.

Install fascia covers. Measure the width of the subfascia boards, and cut fascia covers to fit. Fit the fascia in place over the subfascia boards so the bottom lip overlaps the soffits. Nail through the lip every 16" into the subfascia with color-matched siding nails. Fasten the top of the fascia within ½" of the cut edge so the nail heads will be covered by drip edge molding later. At the cornice, bend the last piece of fascia cover at a right angle to turn the corner (make relief cuts with aviation snips first).

Finish installing fascia covers. Install the fascia covers on the gable ends, stopping just short of the cornices. At the cornices, bend a piece of fascia cover to turn the corner, and trim the end so it will make a straight vertical seam. Caulk the seam with caulk tinted to match your fascia cover color.

Building the Roof

Now that your garage fascia and soffits are installed, it's time to sheathe the roof deck, install roofing, and add a ridge vent (optional). The purpose of roof sheathing is obvious: it reinforces the rafters to help stiffen the roof, and it provides a flat, continuous surface for attaching the roofing. As with wall sheathing, you can use either oriented strand board (OSB) or CDX plywood for roof sheathing, but make sure it's at least ½" thick to carry the combined weight of the roofing material and snow loads (if applicable). If you accurately placed your rafters at the roof framing stage, the sheathing should install quickly, with minimal waste, and all seams should fall at the rafter locations. Stagger the joints from one row of sheathing to the next.

After constructing the roof deck, install a layer of 15# or 30# roofing felt (also called building paper). Roofing felt protects the sheathing and serves as an important second line of defense against leaks beneath the roofing. Roll out and nail the felt horizontally, starting at the eaves and overlapping the felt as you work your way up to the peak. Once the felt is in place, you can install a metal drip edge around the roof perimeter and then proceed with the roof covering. We used asphalt shingles for this project, but feel free to use roofing material to match your home's roof—cedar shingles, metal roofing, or even clay tiles are other good options.

Finally, you can provide excellent ventilation by topping off your garage roof with a continuous ridge vent. A ridge vent combined with vented soffits allows convection to draw cool air in through the eave or gable vents and exhaust hot air out at the roof peak.

Tools & Materials ▸

- Work gloves & eye protection
- Tape measure
- Hammer (or pneumatic nailer)
- Circular saw
- Aviation snips
- Stapler
- Utility knife
- Chalk line
- Roofing hammer
- Framing square
- ½" CDX or OSB sheathing panels
- Box nails (8d)
- Metal drip edge
- Roofing nails
- Building paper (15# or 30#)
- Shingles
- Continuous ridge vent (optional)

A top-notch garage roof includes roof deck sheathing, drip edge, roofing felt, shingles, and a continuous ridge vent. When properly installed, your garage roof should last as long as your house roof.

Asphalt Shingles ▸

Asphalt shingles are usually rated by life span, with 20-, 25-, and 40-year ratings the most common (although some now claim to be 50-year shingles). Functionally, these ratings should be used for comparison purposes only. In fact, the average life span of an asphalt shingle roof in the United States is 8 to 10 years.

The term multitab shingle refers to any asphalt shingle manufactured with stamped cutouts to mimic the shapes of slate tile or wood shakes. Multitab cutouts are made and installed in single thickness 3-ft. strips, so these tabbed reveals show up. The ubiquitous term for them is three-tab, but two- and four-tab styles are also available. Generally, the tabs are spaced evenly along each sheet of shingle to provide a uniform appearance and a stepped, brick-laid pattern on the roof. However, some manufacturers also offer styles with shaped corners or randomly spaced tabs trimmed to different heights for a more unique look.

How to Prepare the Roof Deck

Install the first course of roof decking. Start sheathing the roof at one of the lower corners with ½" CDX plywood or oriented strand board (OSB) that's rated for sheathing. Where possible, use a full 8-ft.-long sheet or a half sheet with the seam still falling midway across a rafter or truss. Align the sheet so it overlaps the gable subfascia and touches the eave subfascia. Fasten the sheet to the rafters with 8d box nails spaced every 6" along the edges and 12" along the intermediate rafters. Lay out and install the rest of the sheathing to complete the first row, spacing the sheets ⅛" apart to allow for expansion.

Install the second row of decking. Start with a half sheet (approximately) to stagger the vertical gaps between rows. Make sure the end of the half sheet falls midway along a rafter. Continue to sheathe the roof up to the ridge, but stop nailing within 6" of the ridge. This area will be cut away to install a continuous ridge vent later. Add decking to the other side of the roof up to the ridge.

Install drip edge on eaves. Cut a 45° miter at the end of a piece of drip edge flashing and position it along one eave edge of the roof. The mitered end should be positioned to form a miter joint with the drip edge that will be installed on the rake edge after the building paper is laid. Attach the drip edge with roofing nails driven every 12". Install drip edge up to the ridge, overlapping any butt joints by 2". Flash both eave edges.

Begin installing building paper. Snap a chalk line across the roof sheathing 35⅝" up from the roof edge. At this location, the first row of building paper will overhang the drip edge by ⅜". Roll out 15# or 30# building paper along the eaves with the top edge aligned with the chalk line. Staple it to the sheathing every 12" along the edges and one staple per sq. ft. in the field area. Trim the gable ends of the paper flush with the edges of the sheathing. If you live in a cold climate and plan to heat your garage, install self-adhesive ice-guard membrane for the first two courses.

Install the second underlayment course. Snap another chalk line across the first row of underlayment, 32" up from the eaves. Roll out the second row of building paper with the bottom edge following the chalk line to create a 4" overlap. Staple it in place. Cover the entire roof up to the ridge with underlayment, overlapping each row by 4".

Install drip edge on rakes. Cut a 45° miter at the end of the first piece of drip edge, and install it along the rake edge of the roof, covering the underlayment. Fit the mitered end over the eave's drip edge, overlapping the pieces by 2". The gable drip edge should be on top. Nail the drip edge all the way to the peak, and then repeat for the other three rake edges.

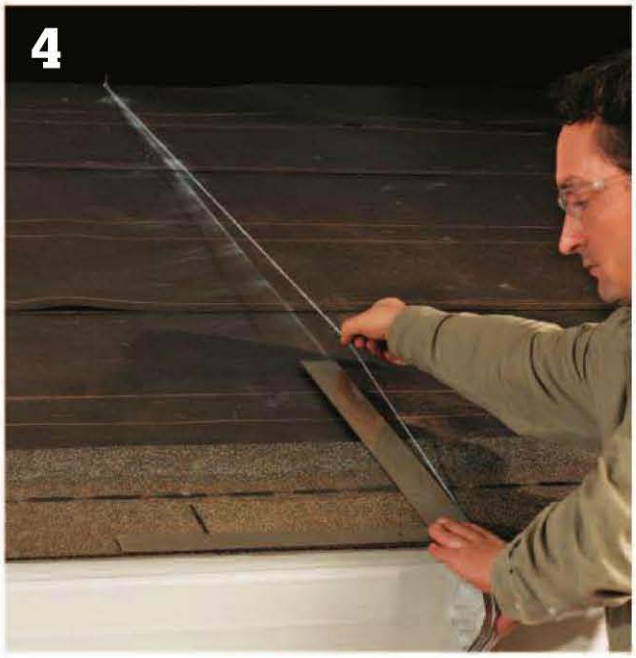
How to Install Shingles

Mark starting lines. Snap a chalk line for the starter course on each roof deck. The lines should be created all the way across the roof deck, 11½" up from the eave edge (½" less than the height of the shingle) to mark the top edge of the starter course of shingles for each roof deck. This will result in a ½" shingle overhang for standard 12" three-tab shingles.

Install the starter course. Trim off one half of an end tab on a shingle. Position the shingle upside down so the tabs are aligned with the chalk line and the half tab is flush against the rake edge of the roof. Drive roofing nails near each end, 1" down from each slot between the tabs. Continue the row with full shingles nailed upside down to complete the starter course. Trim the last shingle flush with the opposite rake edge.

(continued)

Install the first full course. Apply the first full course of shingles over the starter course with the tabs pointing down. Start from the same corner you began the starter course. Place the first shingle so it overhangs the rake edge by ⅜" and the eaves by ½". The top edge of the first course should align with the top of the starter course.

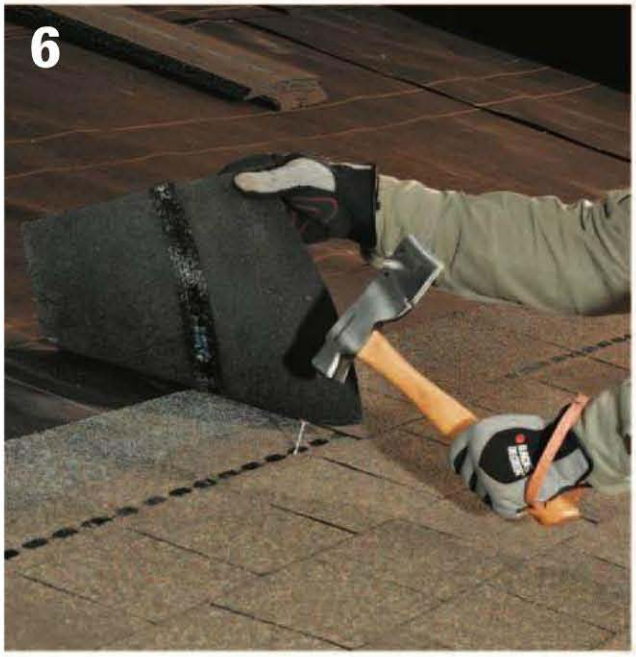


Create a vertical reference line. Snap a chalk line from the eave's edge to the ridge to create a vertical line to align the shingles. Choose a spot close to the center of the roof, located so the chalk line passes through a slot or a shingle edge on the first full shingle course. Use a framing square to establish a line perpendicular to the eave's edge.

Working on Roofs ▸

When working on the roof and staging heavy bundles of shingles, it's a good idea to share the job with a helper. Set up ladders carefully, stay well clear of overhead power lines, and work cautiously near the eaves and rake ends of the roof to prevent accidents. Get off the roof if you are tired, overheated, or if impending bad weather threatens your safety.

Set shingle pattern. If you are installing standard three-tab shingles, use the vertical reference line to establish a shingle pattern with slots that are offset by 6" in succeeding courses. Tack down a shingle 6" to one side of the vertical line and 5" above the bottom edge of the first-course shingles to start the second row. Tack down a shingle for the third course 12" from the vertical line. Begin at the vertical line for the fourth course. Repeat.



Fill in shingles. Add shingles in the second through fifth courses, working upward from the second course and maintaining consistent reveals. Insert lower-course shingles under any upper-course shingles left partially nailed, and then nail them down.

Test shingle alignment regularly. After each three-course cycle, measure from the bottom edge of the top row of shingles to the closest layout line on the building paper, and take several of these measurements along the course. If the row is slightly out of alignment, make incremental adjustments over the next few courses to correct it—don't try and get it back all in one course.

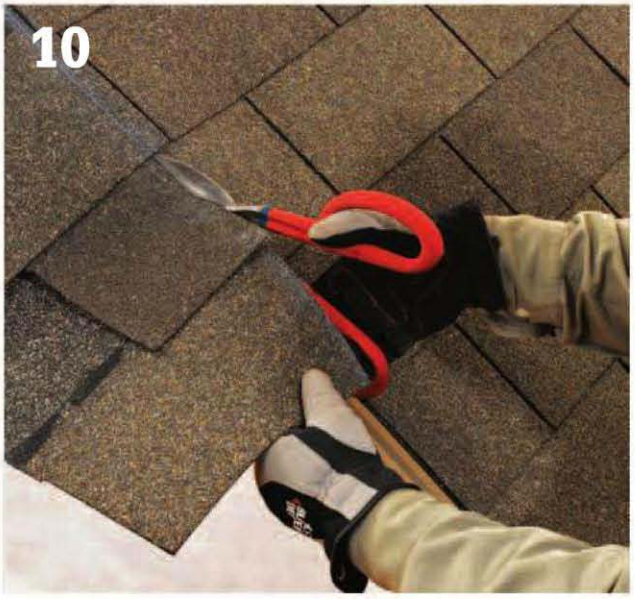
Cutting Ridge Caps ▸

Cut three 12"-sq. cap shingles from each three-tab shingle. With the back surface facing up, cut the shingles at the tab lines. Trim the top corners of each square with an angled cut, starting just below the seal strip to avoid overlaps in the reveal area.

Shingle up to the ridge. At the ridge, shingle up the first side of the roof until the top of the uppermost reveal area is within 5" of the ridge (for standard three-tabs). Trim the shingles along the peak. Shingle the other side of the roof up to the peak. If you plan to install a continuous ridge vent, skip to page 66.

(continued)

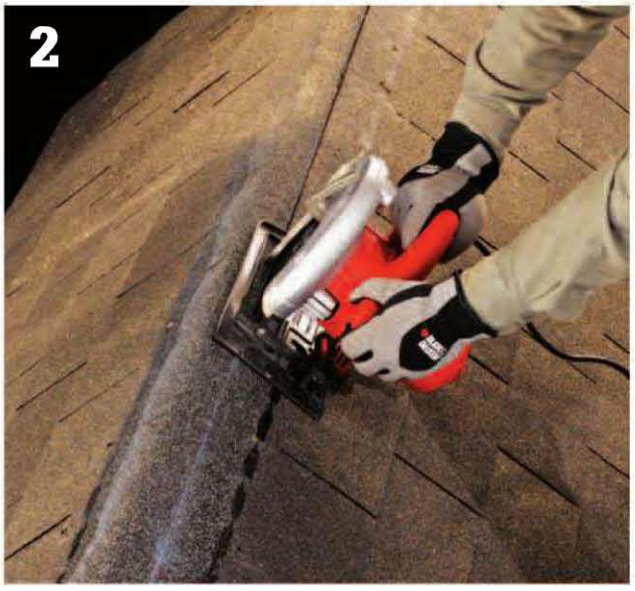
Install ridge cap shingles. Start by installing one shingle at one end so equal amounts hang down on each side of the ridge. Measure this distance and snap straight chalk lines to the other end of the roof, extending the lines formed by the edges of the shingles. Nail in the tapered area of each shingle so the next shingle will cover the nail head. Complete the installation of the ridge shingles.



Trim shingles. Mark and trim the shingles at the rake edges of the roof. Snap a chalk line down the roof to trim neatly and accurately. Use old aviation snips to cut the shingles. You may use a utility knife with backer board instead. Let the shingles extend ⅜" beyond the rake drip edge to form an overhang.

How to Install a Continuous Ridge Vent

Mark cutting lines. Measure from the ridge down each roof the distance recommended by the ridge vent manufacturer. Mark straight cutting lines at this distance on each deck, snapping a pair of chalk lines.

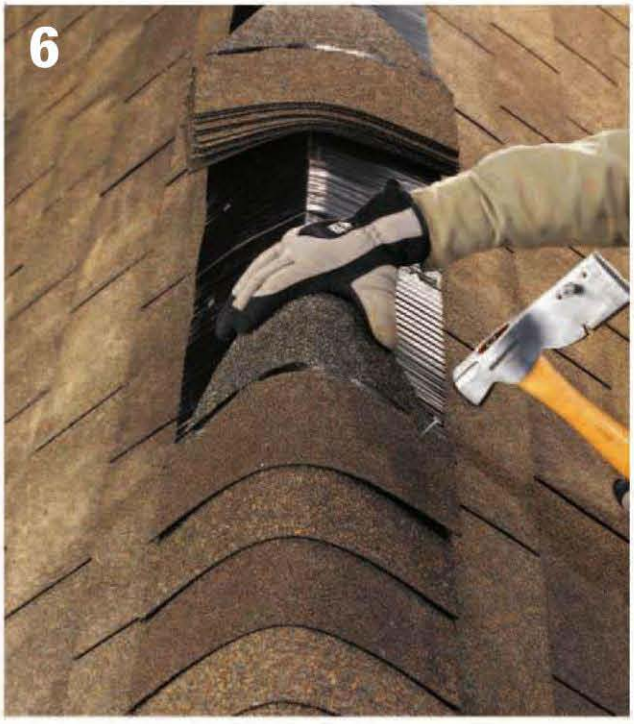


Cut out roof sections. Using a circular saw equipped with an old blade, cut through the shingles and sheathing along the cutting lines. Be careful not to cut into the rafters. Stop both cuts 6 to 12" from the gable ends. Make two crosscuts up and over the ridge to join the long cuts on the ends. Remove the shingles and sheathing from the continuous ridge vent area. Drive additional roofing nails through the shingles and sheathing along the cut edges to secure the roof to the rafters.

Mark installation reference lines. Test-fit the continuous ridge at one end, measuring down from the ridge half the width of the ridge vent, and marking that distance on both ends of the roof. Join the marks with two more chalk lines to establish the position for the edges of the continuous ridge vent.

Attach the ridge vent. Center the ridge vent over the opening, aligning the end with the rake edge of the roof. The edges of the vent should be even with the chalk lines. Drive long (1½") roofing nails through the vent and into the roof where indicated by the manufacturer.

Add sections. Butt new pieces of continuous ridge vent against the pieces you have installed and nail the ends. Install the vent along the full length of the roof, including the end areas with shingles still intact.



Add ridge cap shingles (see page 66, step 9). Cover the ridge vent with ridge cap shingles, nailing them with two 1½" roofing nails per cap. Overlap the shingles as you would on a normal ridge. Trim the end ridge cap shingle flush with the other rake-edge shingles.

Installing Windows & Service Doors

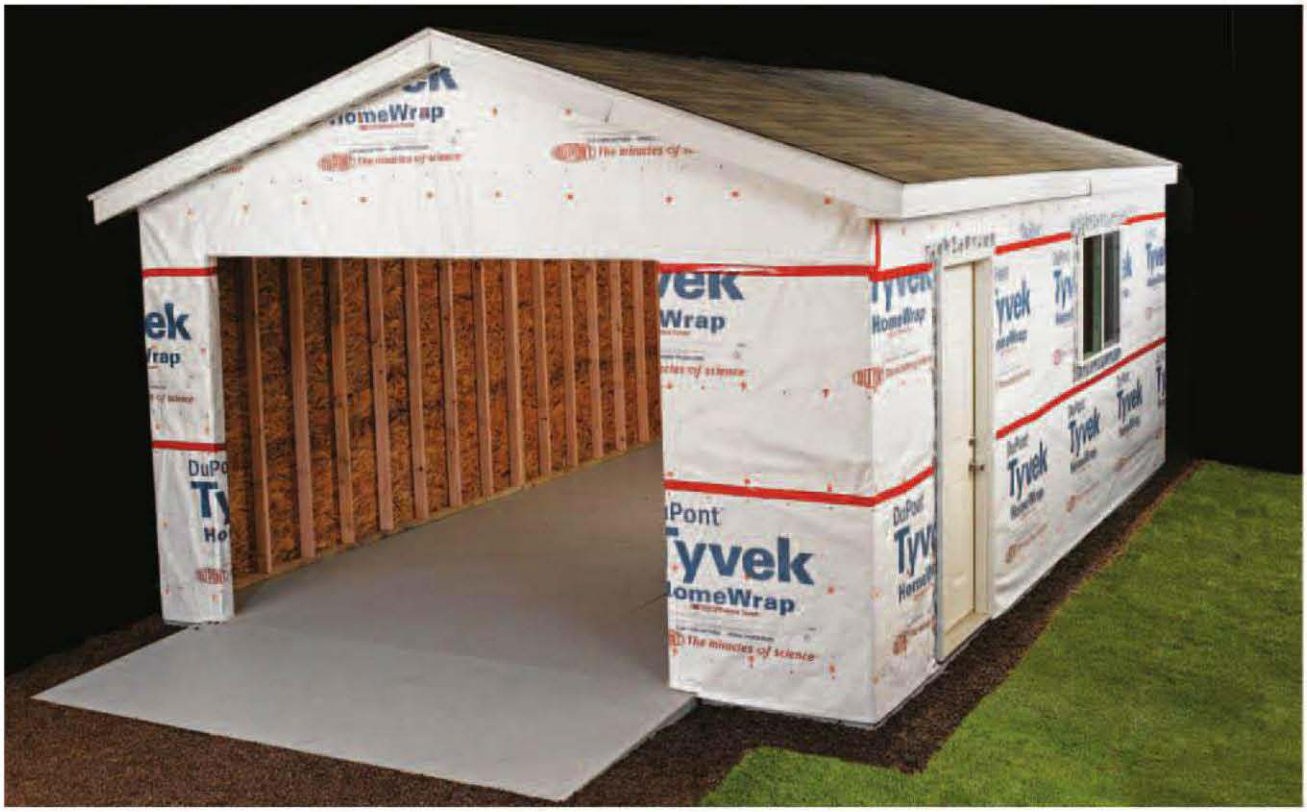
Most garages, like the detached garage featured here, have a service door for added safety and accessibility. A window also makes sense for a garage, bringing improved ventilation and a pleasant source of ambient light. This section will show you how to install both features. If you already have experience hanging doors and windows, you'll find the process for installing them in a garage is no different from installing them in a home. However, it's a good idea to review these pages to refamiliarize yourself with the techniques you should follow to do the job correctly.

Installing doors and windows are similar operations. First, you'll need to seal the rough openings in the walls with self-adhesive flashing tape to prevent moisture infiltration. Tape should be applied from the bottom of the doorway or the windowsill first, working up to the header and overlapping the tape to shed water. Once you've inserted the window or door in its opening, you'll need to shim it, adjusting for level and plumb, before nailing the jamb framework and brick mold in place.

When you have the option, hang the service door and window before proceeding with the siding (which we'll cover in the next section). That way, you'll be able to fit the siding up tight against the brickmold for a professional finish.

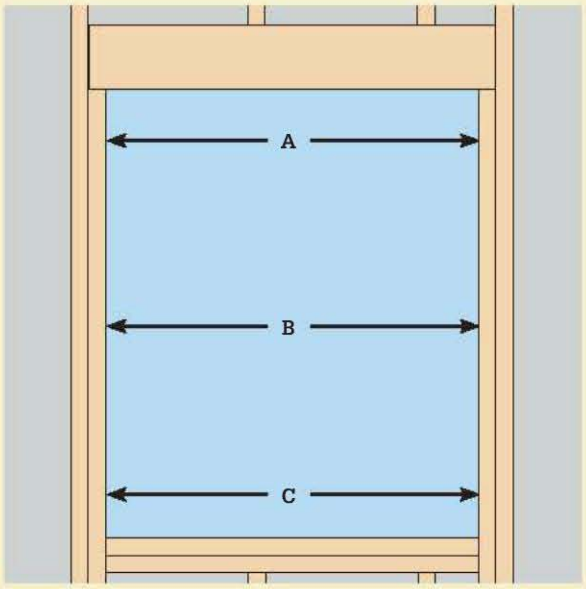
Tools & Materials ▸

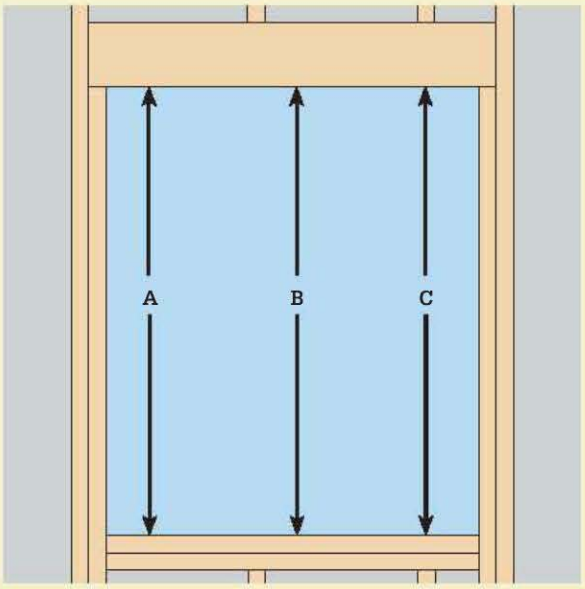
- Work gloves & eye protection
- Utility knife
- Caulk gun
- Level
- Hammer
- Screwdriver
- 9" self-adhesive flashing tape
- Silicone caulk
- Window
- 2" Roofing nails
- Shims
- Casing nails (6d)
- Drip cap
- Expanding foam insulation
- Service door
- Lockset



A sturdy service door and lockset will give your new garage added accessibility without compromising security. Installing one is a fairly simple project. A vinyl- or aluminum-clad garage window will bring a breath of fresh air and improve your task lighting when working in the garage.

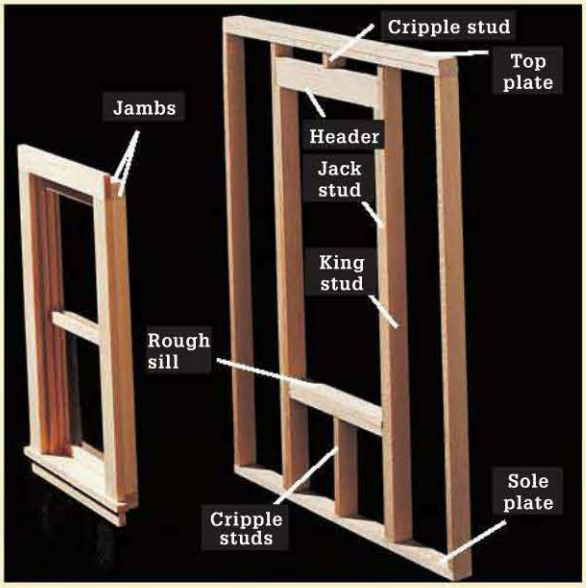
Tips for Sizing & Framing ▸





Determine the exact size of your new window or door by measuring the opening carefully. For the width (left photo), measure between the jack studs in three places: near the top, at the middle, and near the bottom of the opening. Use the same procedure for the height (right photo), measuring from the header to the sill near the left edge, at the middle, and near the right edge of the opening. Use the smallest measurement of each dimension for ordering the unit.

Door opening: The structural load above the door is carried by cripple studs that rest on a header. The ends of the header are supported by jack studs (also known as trimmer studs) and king studs that transfer the load to the sole plate and the foundation of the house. The rough opening for a door should be 1" wider and ½" taller than the dimensions of the door unit, including the jambs. This extra space lets you adjust the door unit during installation.



Window opening: The structural load above the window is carried by a cripple stud resting on a header. The ends of the header are supported by jack studs and king studs that transfer the load to the sole plate and the foundation of the house. The rough sill, which helps anchor the window unit but carries no structural weight, is supported by cripple studs. To provide room for adjustments during installation, the rough opening for a window should be 1" wider and ½" taller than the window unit, including the jambs.

How to Install a Garage Window

Flash the rough sill. Apply 9"-wide self-adhesive flashing tape to the rough sill to prevent moisture infiltration below the window. Install the flashing tape so it wraps completely over the sill and extends 10 to 12" up the jack studs. Fold the rest of the tape over the housewrap to create a 3" overlap. Peel off the backing and press the tape firmly in place. Install tape on the side jambs butting up to the header, and then flash the header.

Option: You can save a step (and some material) by installing the flashing on the sides and top after the window is installed, as seen in this skylight installation. The disadvantage to doing it this way instead of flashing the entire opening and then flashing over the window nailing flanges after installation (see step 8) is that the inside faces of the rough frame will not be sealed against moisture.

Caulk the opening. Apply a ½"-wide bead of caulk around the outside edges of the jack studs and header to seal the window flange in the opening. Leave the rough sill uncaulked to allow any water that may penetrate the flashing to drain out.

Position the window. Set the window unit into the rough opening, and center it side to side. Check the sill for level.

Tack the top corners. Drive a roofing nail through each top corner hole of the top window flange to tack it in place. Do not drive the rest of the nails into the top flange yet.

Plumb the window. Have a helper hold the window in place from outside while you work inside the garage. Check the window jamb for square by measuring from corner to corner. If the measurements are the same, the jamb is square. Insert shims between the side jambs and rough opening near the top corners to hold the jambs in position. Use additional shims as needed to bring the jamb into square. Recheck the diagonals after shimming.

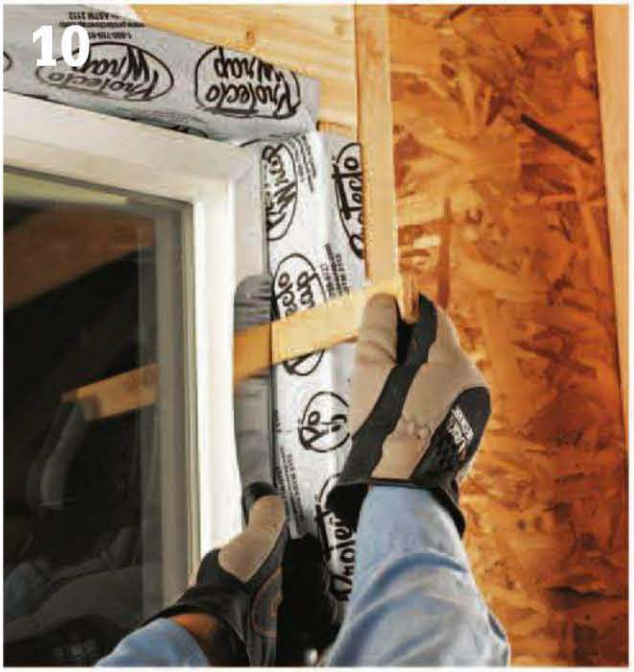
Nail the flange. Drive 2" roofing nails through the flange nailing holes and into the rough sill to secure it. Handnail this flange, being careful not to damage the flange or window cladding.

Nail the jambs. Drive 6d (2") casing nails through the jambs and top corner shims to lock them in place. Add more shims to the centers and bottom corners of the jamb, and test the window action by opening and closing it. If it operates without binding, nail through the rest of the shims.

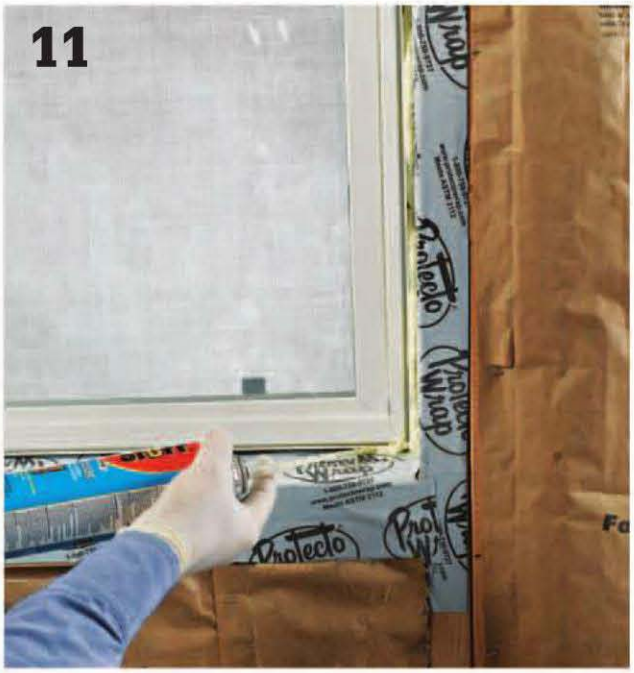
(continued)

Flash the side flanges. Seal the side flanges with flashing tape, starting 4 to 6" below the sill flashing and ending 4 to 6" above the top flange. Press the tape firmly in place.

Install the drip cap. Cut a piece of metal drip edge to fit over the top window jamb. This is particularly important if your new window has an unclad wooden jamb with preinstalled brickmold. Set the drip edge in place on the top jamb, and secure the flange with a strip of wide flashing tape. Do not nail it. Have the tape overlap the side flashing tape by 6". *Note: If you plan to trim the window with wood brickmold or other moldings, install the drip edge above that trim instead.*



Finish the installation. Cut the shim ends so they are flush with the inside of the wall using a utility knife or handsaw.



Spray expanding foam insulation around the perimeter of the window on the interior side if you will be insulating and heating or cooling your garage.

Service Door Buyer's Tips ▸

- If you plan to use your new garage as a workshop, buy the widest service door that will suit your building. That way, you won't have to open your sectional garage door every time you want to pull out the lawnmower or trash cans.
- Although primed wood service doors are less expensive than aluminum- or vinyl-clad doors, they're generally not a better value in the long run. Normal wear and tear and the effects of the elements will mean you'll need to keep up with regular scraping and painting in order to keep your wooden door in good condition. A clad door, on the other hand, requires little or no maintenance over the life of the door.
- Another option for many of today's quality service doors is to purchase a jamb made of composite materials instead of wood. A composite jamb will not wick water up when it rains, and it's impervious to rot and insects.

How to Install a Service Door

Flash the opening sides. Apply two strips of 9"-wide self-adhesive flashing tape to cover the jack studs in the door's rough opening. Cut a slit in the tape and extend the outer ear 4 to 6" past the bottom edge of the header. Fold the tape over the housewrap to create a 3" overlap. Peel off the backing and press the tape firmly in place.

Flash the header. Cover the header with a third piece of self-adhesive flashing tape, extending the ends of the tape 6" beyond the side flashing. Fold the extra tape over the housewrap to form a 3" overlap.

Seal the opening. Apply a ½"-wide bead of caulk up the outside edges of the jack stud area and around the header to seal the brickmold casing.

(continued)

Position the door in the opening. Set the bottoms of the side jambs inside the rough opening, and tip the door into place. Adjust the door so it's centered in the opening.

Adjust the door. Orient pairs of shims so the thick and thin ends are reversed, forming a rectangular block. Insert the shims into the gap between the rough framing and the hinge-side jamb. Spread the shims closer together or farther apart to adjust the total thickness until they are pressure-fitted into the gap. Space the shims every 12" along the jamb, and locate two pairs near the hinges. Check the hinge jamb for plumb and to make sure the shims do not cause it to bow. Drive pairs of 6d casing nails through the jambs at the shim locations.

Shim the latch side. Insert pairs of shims every 12" in the gap between the latch-side jamb and the rough framing. With the door closed, adjust the shims in or out until there's a consistent ⅛" gap between the door and the jamb. Then drive pairs of 6d casing nails through the jamb and shims to secure them.

Attach the brickmold. Drive 2½" galvanized casing nails through the brickmold to fasten it to the jack studs and header. Space the nails every 12". Trim off the shims so they are flush with the inside wall using a utility knife or handsaw.

How to Install a Lockset

Insert the lock bolts for the lockset (and deadbolt, if installing one) into their respective holes in the door. These days, new exterior doors are almost always predrilled for locksets and deadbolts. Screw the bolt plates into the premortised openings.

Fasten the lock mechanisms by tightening the screws that draw the two halves together. Do not overtighten.

Door Security

Add metal door reinforcers to strengthen the area around the lockset or deadbolt. These strengthen the door and make it more resistant to kick-ins.

Add a heavy-duty latch guard to reinforce the door jamb around the strike plate. For added protection, choose a guard with a flange to resist pry-bar insertion. Attach the guard with 3" screws that will penetrate through the jamb and into the wall studs.

Installing Overhead Garage Doors

Your sectional garage door will bear the brunt of everything Mother Nature and an active household throws at it—seasonal temperature swings, moisture, blistering sunlight, and the occasional misfired half-court jump shot. If that isn't enough, the average sectional garage door cycles up and down at least four times per day, which totals up to around 1,300 or more uses every year. For all of these reasons, it pays to install a high-quality door on your new garage so you can enjoy a long service life from it.

These days, you don't have to settle for a drab, flat-panel door. Door manufacturers provide many options for cladding colors, panel texture and layout, exterior hardware, and window styles. Today's state-of-the-art garage doors also benefit from improved material construction, more sophisticated safety features, and enhanced energy efficiency. When you order your new door, double-check your garage's rough opening and minimum ceiling height to be sure the new door will fit the space properly.

Installing a sectional garage door is easier than you might think, and manufacturers make the process quite accessible for average do-it-yourselfers. With a helper or two, you should have little difficulty installing a new garage door in a single day. The job is really no more complex than other window and door replacements if you work carefully and exercise good judgment. Garage door kits come with all the necessary hardware and detailed step-by-step instructions. Since garage door styles vary, the installation process for your new door may differ from the photo sequence you see here, so always defer to the manufacturer's instructions. This will ensure the door is installed correctly and the manufacturer will honor the product warranty.

Tools & Materials ▸

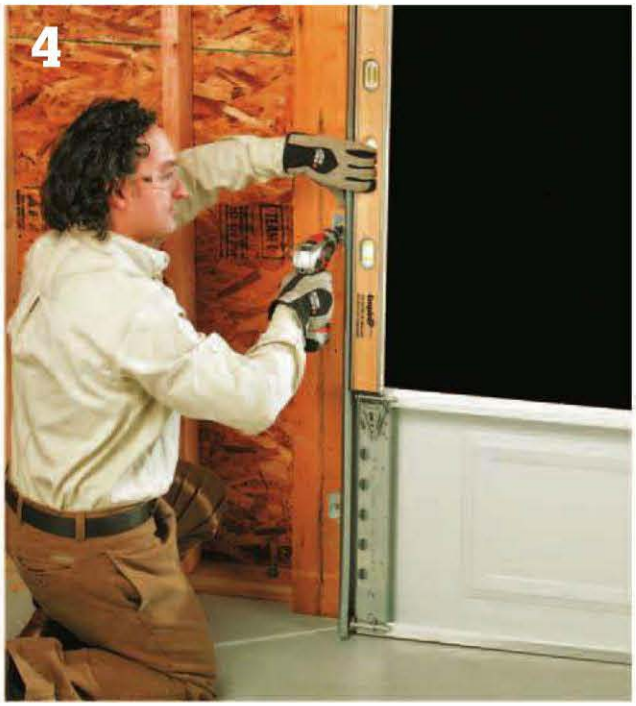
- Work gloves & eye protection
- Tape measure
- Long level
- Drill with nut drivers
- Stepladder
- Ratchet wrench with sockets
- Adjustable wrench
- Hammer
- Sectional garage door with tracks & mounting brackets
- 16d nails
- Doorstop molding

The sectional garage door you choose for your garage will go a long way toward defining the building's appearance and giving you trouble-free performance day in and day out.

Measure for the door. Measure the width of the header, the headroom clearance to the rafter collar ties (or bottom truss chords), and the inside opening of the doorway. Check these measurements against the minimum requirements outlined in the instruction manual that comes with your sectional garage door.

Assemble door tracks. Working on the floor, lay out and assemble the vertical tracks, jamb brackets, and flag angle hardware. Install the door bottom seal and the roller and hinge hardware on the bottom door section.

Install the first section. Set the bottom door section into position against the side jambs, and adjust it left or right until the side jambs overlap it evenly. Check the top of the door section for level. Place shims beneath the door to level it, if necessary. Have a helper hold the door section in place against the jambs until it is secured in the tracks.



Attach the tracks. Slip a vertical track over the door section rollers and against the side jamb. Adjust it for plumb, then fasten the jamb brackets to the side jamb blocking with lag screws. Carefully measure, mark, and install the other vertical track as well.

(continued)

Attach the lift cables. Depending on your door design, you may need to attach lift cables to the bottom door section at this time. Follow the instructions that come with your door to connect these cables correctly.

Install the door hinges. Fasten the end and intermediate hinges to the bottom door section, and then install roller brackets and hinges on the other door sections. Attach hinges to the top edges of each door section only. This way you'll be able to stack one section on top of the next during assembly.

Add next sections. Slip the next door section into place in the door tracks and on top of the first section. Connect the bottom hinges (already attached to the first section) to the second door section. Repeat the process until you have stacked and installed all but the top door section.

Option: The top door section may require additional bracing, special top roller brackets, and a bracket for securing a garage door opener. Install these parts now following the door manufacturer's instructions.

Install the top section. Set the top door section in place and fasten it to the hinges on the section below it. Support the door section temporarily with a few 16d nails driven into the door header blocking and bent down at an angle.

Complete track installation. Fasten the horizontal door tracks to the flag angle brackets on top of the vertical track sections. Temporarily suspend the back ends of the tracks with rope so they are level.

Install rear hanger brackets. This step will vary among door opener brands. Check your door instruction manual for the correct location of rear hanger brackets that will hold the horizontal door tracks in position. Measure, cut, and fasten sections of perforated angle iron together with bolts, washers, and nuts to form two Y-shaped door track brackets. Fasten the brackets to the collar tie or bottom truss chord with lag screws and washers following the door manufacturer's recommendations.

Attach the extension springs. The door opener here features a pair of smaller springs that run parallel to the horizontal door tracks, not parallel to the door header as larger torsion springs are installed. The springs are attached to cables that attach to the rear door hanger brackets.

(continued)

Test to make sure the door tracks properly. Raise it about halfway first. You'll need at least one helper here. Slide a sturdy support underneath the door bottom to hold the door and then inspect to make sure the rollers are tracking and the tracks are parallel.

Attach the spring cables. The door should be fully raised and held in place with C-clamps tightened onto the tracks to prevent it from slipping down. The tension in the springs should be relieved. The cables in this case are tied off onto a 3-hole clip that is then hooked onto the horizontal angle bracket near the front of the tracks.

Attach the doorstop molding. Measure, cut, and nail sections of doorstop molding to the door jambs on the outside of the door to seal out weather. A rolled vinyl doorstop may come with your door kit. If not, use strips of 1 × 2 treated wood or cedar for this purpose.

Option: Install a garage door opener. See pages 232 to 234.

Garage Door Opener Safety Tips ▸

Whether you're adding an opener to a new or an old garage door, these tips will help make it a safe part of your home. (Also see pages 226 to 231 for information on repairing garage doors.)

- Before beginning the installation, be sure the garage door manually opens and closes properly.
- If you have a one-piece door, with or without a track, read all additional manufacturer's installation information.
- The gap between the bottom of the garage door and the floor must not exceed ¼". If it does, the safety reversal system may not work properly.
- If the garage has a finished ceiling, attach a sturdy metal bracket to the structural supports before installing the opener. This bracket and hardware are not usually provided with the garage door opener kit.
- Install the wall-mounted garage door control within sight of the garage door, out of reach of children (at a minimum height of 5 ft.), and away from all moving parts of the door.
- Never use an extension cord or two-wire adapter to power the opener. Do not change the opener plug in any way to make it fit an outlet. Be sure the opener is grounded.
- When an obstruction breaks the light beam while the door is closing, most door models stop and reverse to full open position, and the opener lights flash 10 times. If no bulbs are installed, you will hear 10 clicks.
- To avoid any damage to vehicles entering or leaving the garage, be sure the door provides adequate clearance when fully open.
- Garage doors may include tempered glass, laminate glass, or clear-plastic panels—all safe window options.

Make sure your garage door opener is securely supported to trusses or ceiling framing with sturdy metal hanging brackets.

Use the emergency release handle to disengage the trolley only when the garage door is closed. Never use the handle to pull the door open or closed.

Installing Siding & Trim

Siding will protect your new garage from the elements, of course, but it also serves as a way to visually tie the garage to your home. Ideally, you should choose the same siding for the garage as you have on your house, but if you decide to go with a different material it should mimic the same pattern, such as horizontal laps, overlapping shakes, or vertical boards and battens. These days, material options for garage siding are more varied than ever. You might choose wood, vinyl, aluminum, fiber-cement lap siding, cedar or vinyl shakes, faux brick and stone, or stucco. Or, depending on your home's siding scheme, it might be a combination of two different siding materials that complement one another.

Each type of siding will typically have its own unique installation process, and each application requires the correct underlayment, fasteners, and nailing or bonding method. The installation process can even vary among manufacturers for the same product type.

For the garage project shown here, we install a combination of fiber-cement lap siding and cast veneer stone.

Tools & Materials ▸

Work gloves & eye protection
For stone veneer:
Aviation snips
Hammer
Trowel
Mixing trough
Stiff-bristle brush
Angle grinder with diamond blade
Mason's hammer
Trowel
Grout bag
Jointing tool
Expanded metal lath
Building paper
Type N mortar
Masonry sand
Veneer stone
Sill blocks
2 × 2" zinc-coated L-brackets
Metal flashing

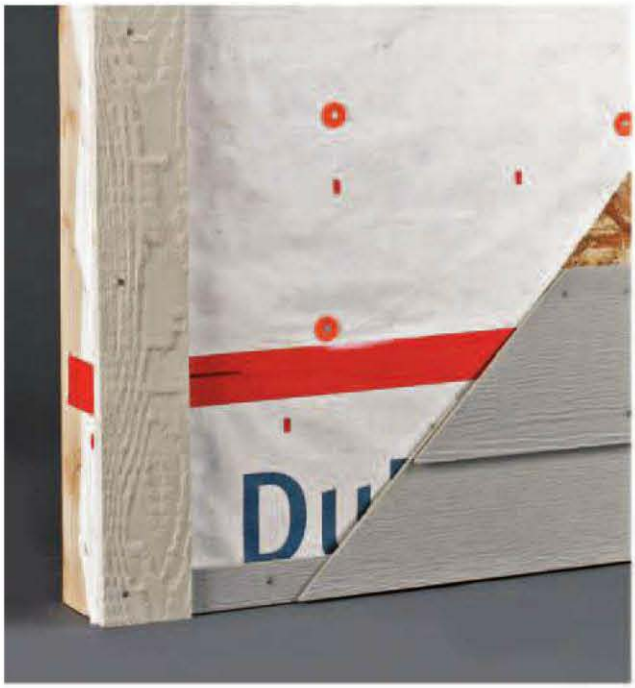
For Fiber-cement siding:
Work gloves & eye protection
Hammer
Tape measure
Bevel gauge
Circular saw
Paint brush
Chalk line
Drill with bits
Cementboard shears
Caulk gun
Jigsaw with masonry blades
Fiber cement corner boards
Casing nails (6d)
Fiber cement frieze boards
Primer paint
Fiber cement siding
Dust respirator
Silicone caulk
Paint

A combination of faux stone and lap siding, with accenting corner trim, transforms what could otherwise be an ordinary garage into a structure that adds real curb appeal to your home.

Garage Siding Types

Vinyl lap siding is inexpensive, relatively easy to install, and low maintenance. Some styles can be paired with custom profiled foam insulation boards. Matching corner trim boards are sold, but you can also make your own wood trim boards and paint them.

Wood lap siding comes in wide or narrow strips and is normally beveled. Exterior-rated wood that can be clear coated is common (usually cedar or redwood). Other wood types are used, too, but these are usually sold preprimed and are suitable for painting only.



Fiber-cement lap siding is a relative newcomer but its use is spreading quickly. It is very durable but requires some special tools for cutting and installation.

Specialty siding products like these cast veneer stones are often used as accents on partial walls (see the photo on previous page). They can also be used to side one wall of a structure. For the most part, their effectiveness (and your budget) would be diminished if they were used to cover the entire structure.

Cast veneer stones are thin synthetic masonry units that are applied to building walls to imitate the appearance of natural stone veneer. They come in random shapes, sizes, and colors, but they are scaled to fit together neatly without looking unnaturally uniform. Outside corner stones and a sill block (used for capping half-wall installations) are also shown here.

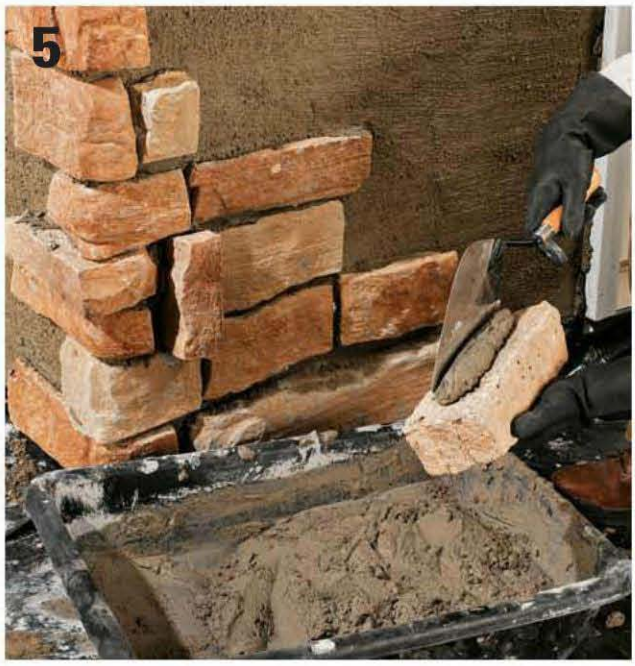
How to Install Cast Veneer Stone

Prepare the wall. Veneer stones can be applied to a full wall or as an accent on the lower portion of a wall. A top height of 36 to 42" looks good. A layer of expanded metal lath (stocco lath) is attached over a substrate of building paper.

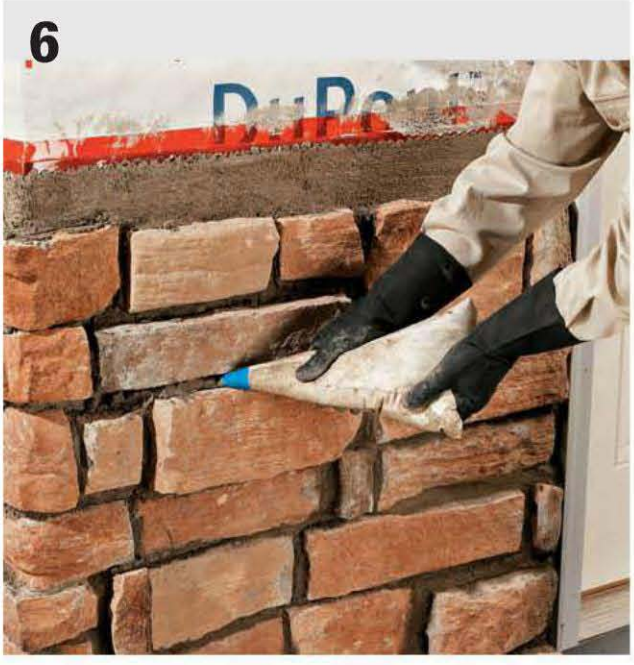
Apply a scratch coat. The wall in the installation area should be covered with a ½- to ¾"-thick layer of mortar. Mix one part Type N mortar to two parts masonry sand and enough water to make the consistency workable. Apply with a trowel, let the mortar dry for 30 minutes. Brush the surface with a stiff-bristle brush.

Test layouts. Uncrate large groups of stones and dry-lay them on the ground to find units that blend well together in shape as well as in color. This will save an enormous amount of time as you install the stones.

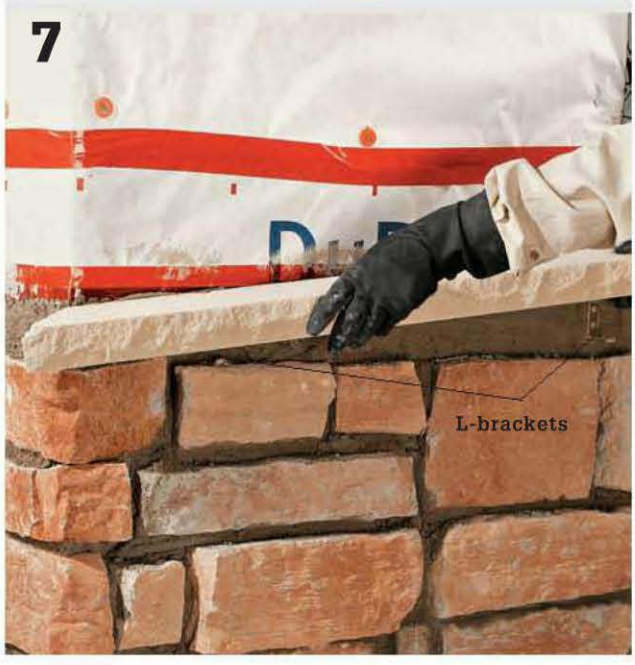
Cut veneer stones, if necessary, by scoring with an angle grinder and diamond blade along a cutting line. Rap the waste side of the cut near the scored line with a mason's hammer or a maul. The stone should fracture along the line. Try to keep the cut edge out of view as much as you can.



Apply the stones. Mix mortar in the same ratios as in step 2, but instead of applying it to the wall, apply it to the backs of the stones with a trowel. A ½"-thick layer is about right. Press the mortared stones against the wall in their position. Hold them for a few second so they adhere.



Fill the gaps between stones with mortar once all of the stones are installed and the mortar has had time to dry. Fill a grout bag (sold at concrete supply stores) with mortar mixture and squeeze it into the gaps. Once the mortar sets up, strike it smooth with a jointing tool.



Install sill blocks. These are heavier and wider than the veneer block so they require some reinforcement. Attach three 2 × 2" zinc-coated L-brackets to the wall for each piece of sill block. Butter the backs of the sill blocks with mortar and press them in place, resting on the L-brackets. Install metal flashing first for extra protection against water penetration.

Tools for Working with Fiber-cement Siding ▸

The garage shown here will be covered with durable and rot-resistant fiber-cement lap siding. The best tool for cutting it is electric cementboard shears (available at rental centers) that make straight cuts without raising harmful silica dust. You can also cut fiber-cement with a circular saw and fiber-cement blade or with a jigsaw, but both will create more dust than shears create. Bore holes with a drill and twist bits or hole saws. To install fiber-cement siding, drill pilot holes and hand nail with siding nails; or use a pneumatic coil nailer with special fiber-cement siding nails. Wear a quality dust respirator when cutting or drilling fiber cement.

How to Install Fiber-cement Lap Siding

Install corner boards. Nail one board flush with the wall corner and even with the bottom of the wall sheathing using 6d galvanized casing nails. Keep nails 1" from each end and ¾" from the edges. Drive two nails every 16". Overlap a second trim board on the adjacent side, aligning the edge with the face of the first board, and nail in place.

Trim windows and doors. Measure and cut brickmold or other trim to fit around the windows and doors. The trim joints can either be butted or mitered, depending on your preference. For miter joints, cut corners at 45° and nail with 2½" galvanized casing nails. Drive pairs of nails every 16".

Install frieze boards. Cut the frieze boards to match the width of the corner boards. Butt them against the corner trim, and nail them to the wall studs directly under the soffits on the eaves with 6d galvanized casing nails.

Install gable frieze boards. Use a bevel gauge to transfer the gable angle to the frieze boards, and miter cut the ends to match. Install the gable frieze boards so they meet neatly in a miter joint at the roof peak. Nail them to the gable wall plates and studs with pairs of 2" 6d galvanized casing nails every 16".

Install starter strips. Install strips of lath (or narrow pieces of siding) along the bottom of the walls, flush with the bottom edges of the wall sheathing. The lath will tip the first row of siding out to match the overlap projection of the other rows. Attach the lath to the wall studs with 6d galvanized casing nails. Snap vertical chalk lines to mark wall stud locations.

Install first board. Cut the first siding board so it ends halfway over a stud when the other end is placed ⅛" from a corner trim board. Prime the cut end before installing it. Align the siding with the bottom edge of the lath, keeping a ⅛" gap between the siding and the corner board. Nail the panel at each stud location 1" from the top edge with siding nails. Keep nails at least ½" in from the panel ends to prevent splitting.

(continued)

Install second board. Mark and cut the second piece of siding to length. Wear a dust respirator when cutting the siding, especially if you use a circular saw instead of electric cementboard shears.

Install the next board. Set the second siding board in place over the lath, spaced to create a gap of ⅛" where it would butt against the first board. Nail the siding board to the wall at stud locations. Install more siding boards to complete the first row. Snap level chalk lines across the wall to mark layout lines for the remaining rows of siding. Set this pattern so each row of siding will overlap the row below it by 1¼".

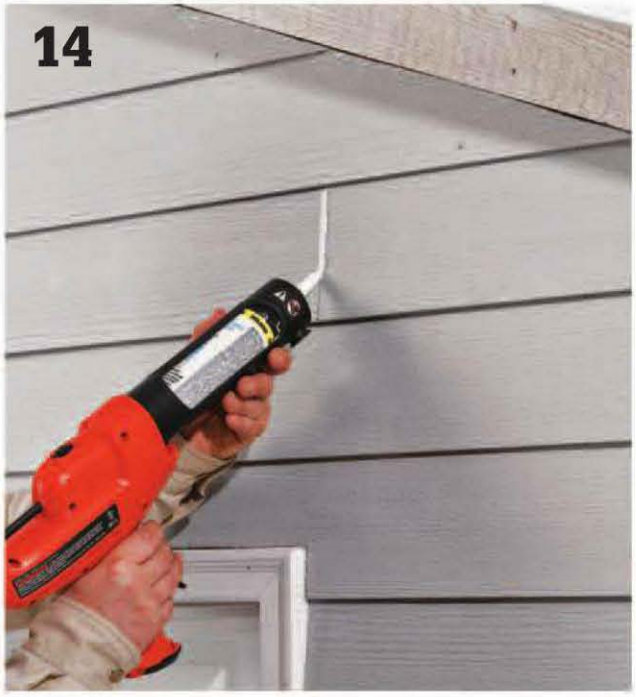
Install next rows. As you install each row of siding, stagger the joints between the end boards to offset the seams by at least one wall stud.

Work around windows and doors. Slide a piece of siding against the horizontal trim, and mark the board ⅛" from the outside edges of the trim. Use these marks to draw perpendicular lines on the board, and make a mark on the lines to represent the correct overlap. Connect these marks with a long line, and make the cutout with a jigsaw equipped with a masonry blade. Fit and nail the notched panel around the opening.

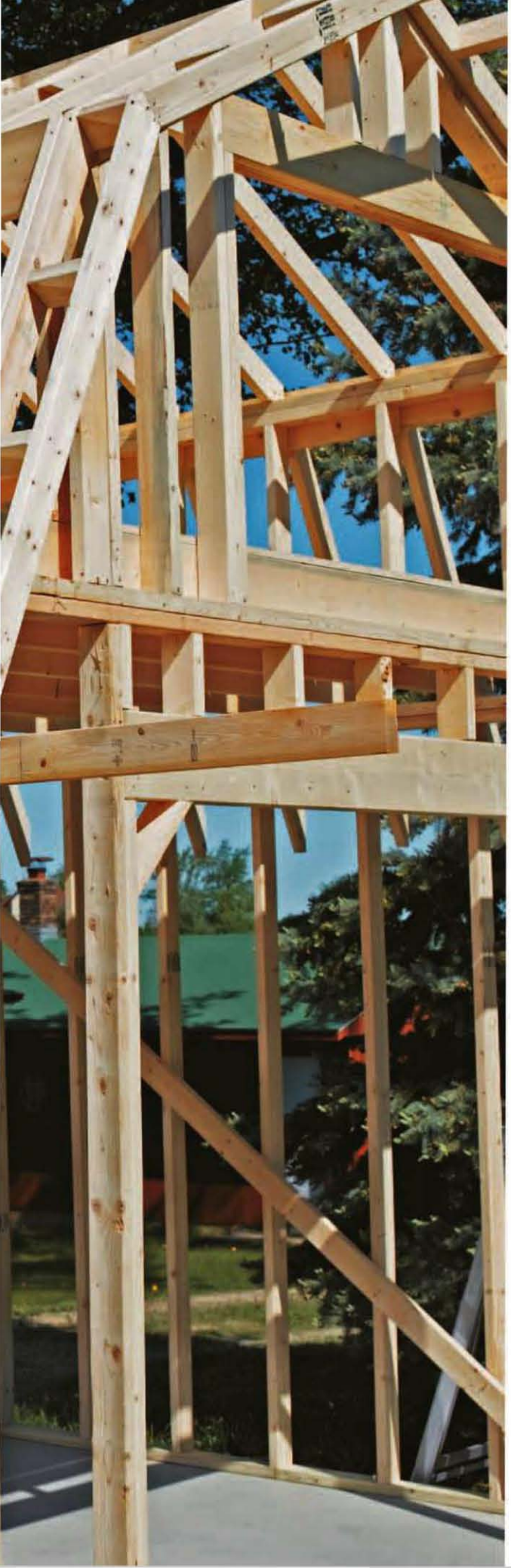
Install top row. Unless you get lucky or have planned very carefully, the top row of siding boards will likely require rip-cutting to make sure that your reveals and setbacks are maintained. With a circular saw and a straightedge guide, trim off the top of the boards so the cut tops butt up against the frieze. Nail the cut boards in place.

Transfer gable angles. Use a bevel gauge to determine the roof angle on the gable ends of the roof. Transfer the angle to the siding panels that butt against the gable frieze boards, and cut them to fit.

Fill in under gables. Drill pilot holes though the angled corners of gable siding pieces to keep them from splitting. Drive the nails through the holes to install the boards.



Caulk gaps. Fill all gaps between boards and between boards and trim with flexible, paintable caulk. Paint the siding and trim as desired.



Garage Plans

A garage is a major structure, so building one should not be done without a complete set of plan drawings. In fact, you will need an accurate set of plans just to get the building permit for your garage. You'll also need a detailed materials list for ordering supplies and making a plan. Most of the plans featured in this book were created and sold as complete plan packages by a building plan publisher (see Resources, page 235). You'll find many vendors who sell these products online, through mail order businesses, or at bookstores and building centers.

You may also hire a local architectural firm to help you design the structure and draft plans. Or, if you are an inveterate do-it-yourselfer, you can design the garage and draw up the plans yourself. This is a bit chancy if you don't have a lot of experience, but there are computer-assisted design programs that can help. Or, many home centers provide software-based design and estimating assistance if you purchase your materials through them.

In this chapter:

Single Detached Garage

Building a detached garage is quite possibly the most complex DIY job you ever undertake. But if you have a good working plan and approach the job realistically with measured confidence, you can do it. The one-stall detached garage featured here (see Resources, page 235) is about as simple a design as you'll find. The only really tricky part is cutting the rafter ends and making the cornices. You can simplify these tasks, however, by replacing the rafters with a truss system (see pages 50 to 51).

The plan drawings that follow on the next five pages deal primarily with the structure of the building. Finished details such as trim and siding are left somewhat open, since it is likely that you'll choose appearances and products that match your own house. The one built here features fiber-cement siding on top, with the bottom section of each wall sided with cast veneer stone. As shown, this garage is 14 feet wide and 22 feet from front to back. If you choose to alter any of the dimensions for your project, do so with great care and make certain to update all of your part dimensions.

On the four pages following the plan drawings for this garage, you'll find a few additional garage plans that may fit your needs a little more closely or inspire you to create your own design or modified design.

This efficient garage is built from the ground up using common building materials available at any building center. This plan was the basis for the Building a New Garage chapter featured on the previous pages. The materials lists and plan drawings are included in the following five pages of this chapter.

Materials & Cutting List ▸

Material List

Description	Quantity/Size	Board Ft.
Wall plate treated	1 pc. / 2 × 4 × 14'	9
Wall plate treated	5 pcs. / 2 × 4 × 12'	40
Precut wall studs	58 pcs. / 2 × 4 × 8'	309
Wall plates	3 pcs. / 2 × 4 × 14'	28
Wall plates	6 pcs. / 2 × 4 × 12'	48
Wall plates	3 pcs. / 2 × 4 × 10'	20
Header over garage door	2 pcs. / 2 × 12 × 10'	40
Header blocking	2 pcs. / 2 × 4 × 10'	13
Header over sash & door	2 pcs. / 2 × 8 × 10'	27
Cripple studs	6 pcs. / 2 × 4 × 8	32
Garage door hardware surround	1 pc. / 2 × 4 × 10'	7
Garage door hardware surround	2 pcs. / 2 × 4 × 8'	11
Corner brace	6 pcs. / 1 × 4 × 12'	24
Rafter tie	5 pcs. / 2 × 6 × 14'	70
Rafters & gable blocking	12 pcs. / 2 × 6 × 18'	216
Ridgeboard	2 pcs. / 2 × 8 × 12'	32
Gable studs	3 pcs. / 2 × 4 × 12'	24
Gable nailer	4 pcs. / 2 × 4 × 8'	21
Soffit nailer	4 pcs. / 2 × 2 × 12'	16
Horizontal hardboard siding 10½ exp.	617 sq. ft. / 7/16" × 12"	617 sq. ft.
Metal corners for siding	40 pcs.	
Rake fascia	2 pcs. / 1 × 8 × 18'	12
Rake soffit	2 pcs. / 1 × 6 × 18'	18
Rake shingle mold	36 L.F.	
Fascia & soffit	8 pcs. / 1 × 8 × 12'	64
Aluminum foil kraft paper	1 roll / 36" wide	
C-D Ext. plywood roof sheathing	13 pcs. / 4' × 8' × ½"	416 sq. ft.
Roofing felt	1 roll / 15#	
Asphalt shingles	4⅓ sq. / 235#	
Sliding window unit	1 ea. / 4 × 3'	
Exterior caulk	2 tubes / 101	

Description	Quantity/Size	Board Ft.
Garage service door 5 panel	1 ea. / 2'8" × 6'8"	
Sectional up & over garage door	1 ea. / 9 × 7'	
Door jambs	42 L.F. / 1 × 4'	
Brickmold casing	42 L.F.	
Shingle mold stop	42 L.F.	
Concrete slab foundation & floor	8 cu. yd.	
Concrete figures		
Wire mesh	308 sq. ft. / 6 × 6 × #10	
Reinforcing bars	144 L.F. / ½" dia.	
Exterior paint	3 gal.	

Nails

16d common nails coated	20 lb.
10d common nails coated	2 lb.
8d common nails coated	2 lb.
6d common nails coated	5 lb.
8d galvanized siding nails	5 lb.
1¼" galvanized roofing nails	15 lb.
8d casing nails	2 lb.
Anchor bolts w/ nuts & washers	20 ea. / ½" dia. × 12"
Key in knob cylinder lockset	1 ea.
Door butts	1 pr. / 3½ × 3½"

Optional

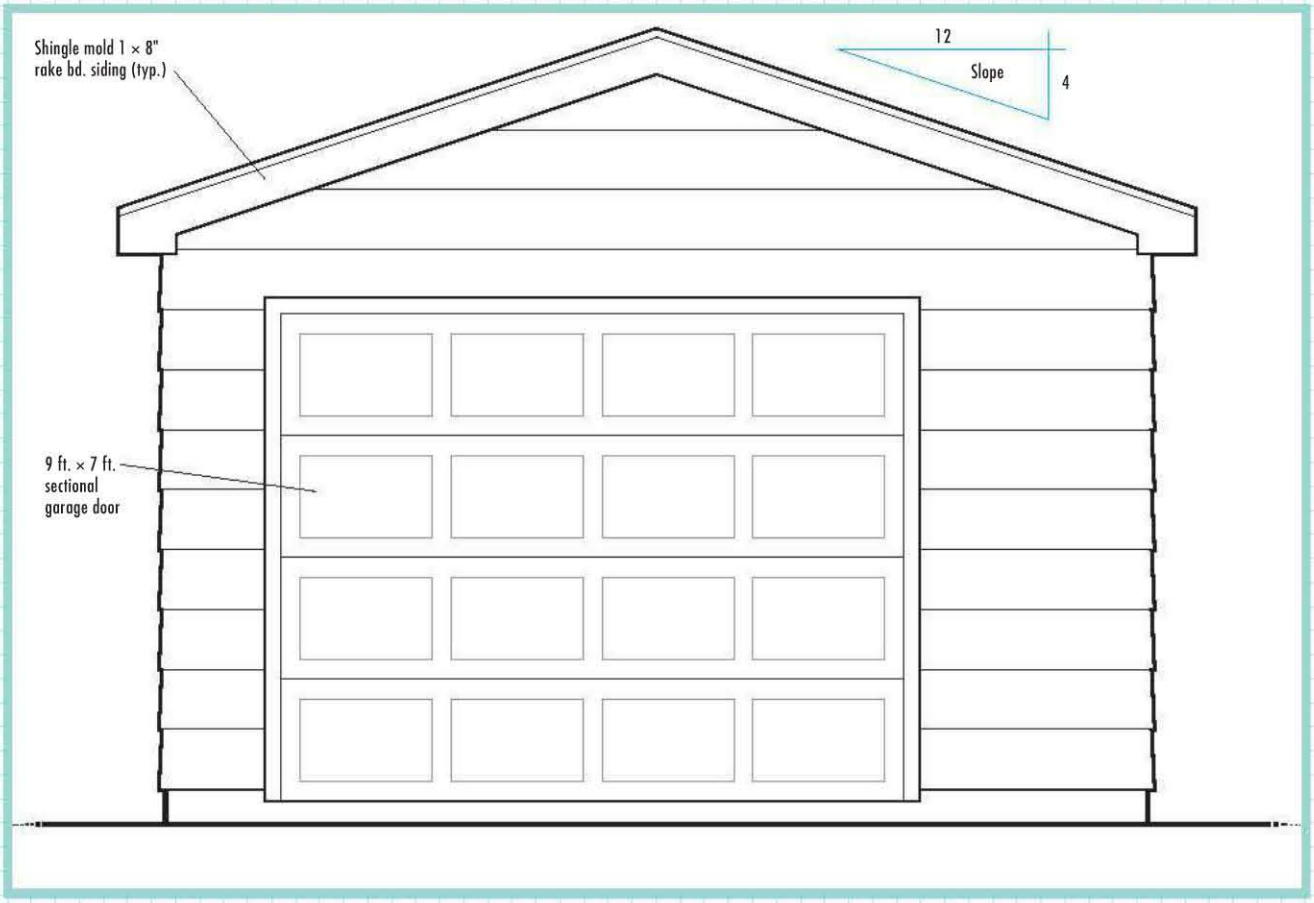
Ext. plywood sheathing (corner bracing)	8 pcs. / 4' × 8' × ½"
Insulating sheathing	12 pcs. / 4' × 8' × ½"
Galvanized nails	10 lb. / 1½"

Optional for Alternate Formed Foundation

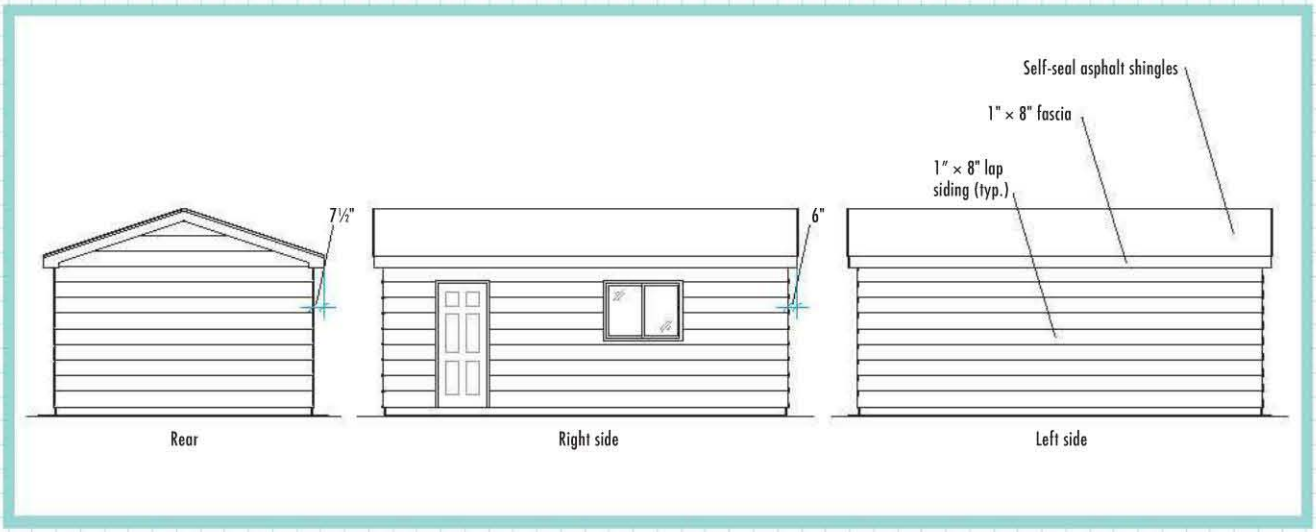
Concrete for footing	3 cu. yd.
Concrete for walls	6 cu. yd.
Concrete for floor	4 cu. yd.

These plans have been prepared to meet professional building standards. However, due to varying construction codes and local building practices, these drawings may not be suitable for use in all locations. Results may vary according to quality of material purchased and the skill of the builder.

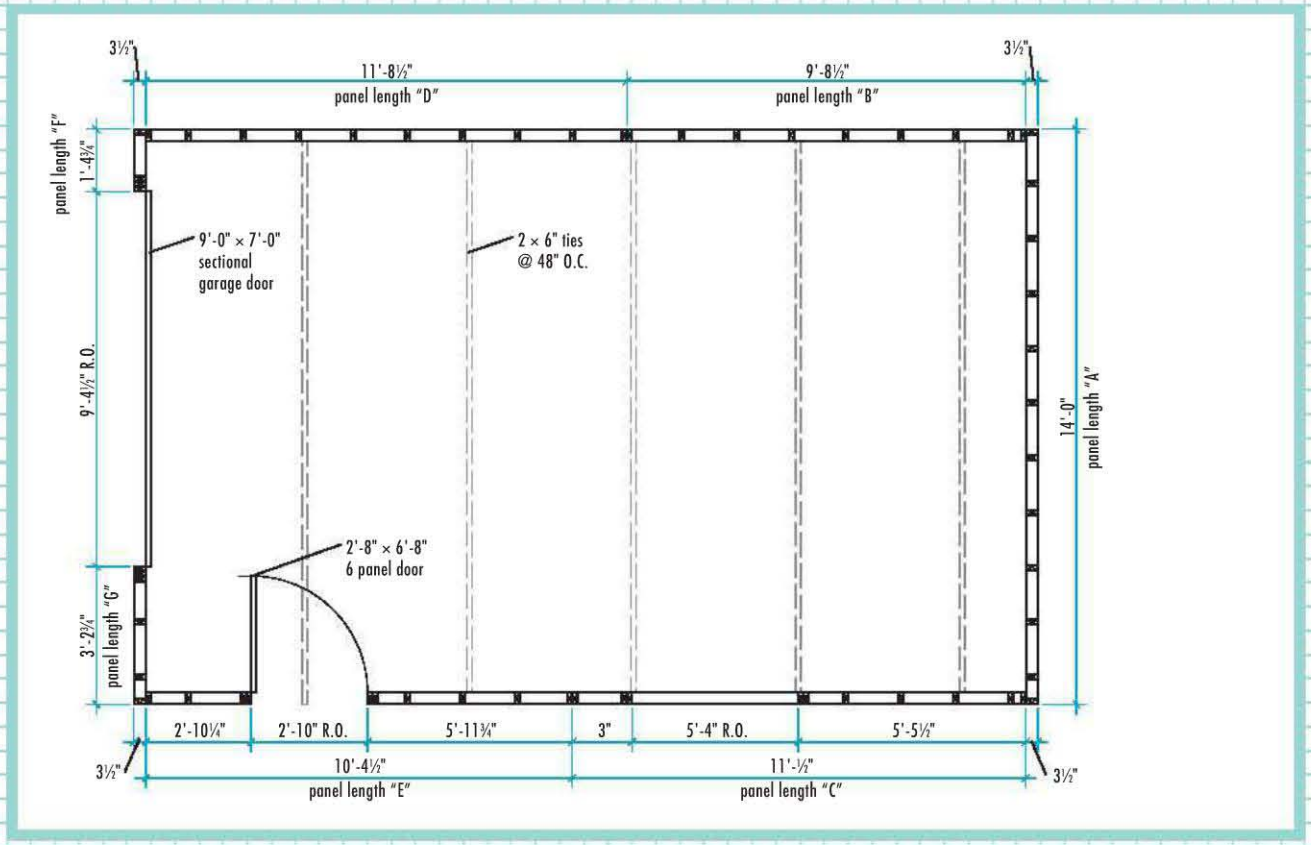
Foundation Plan



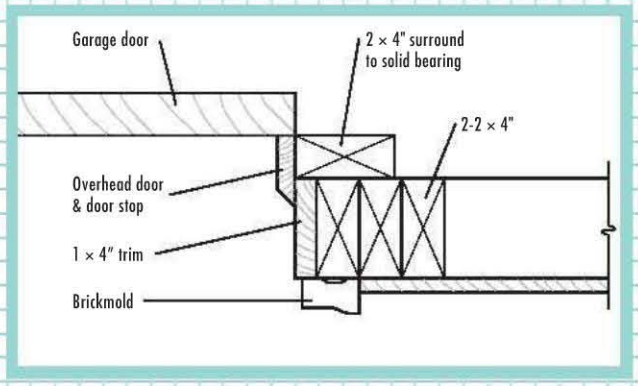
Elevations



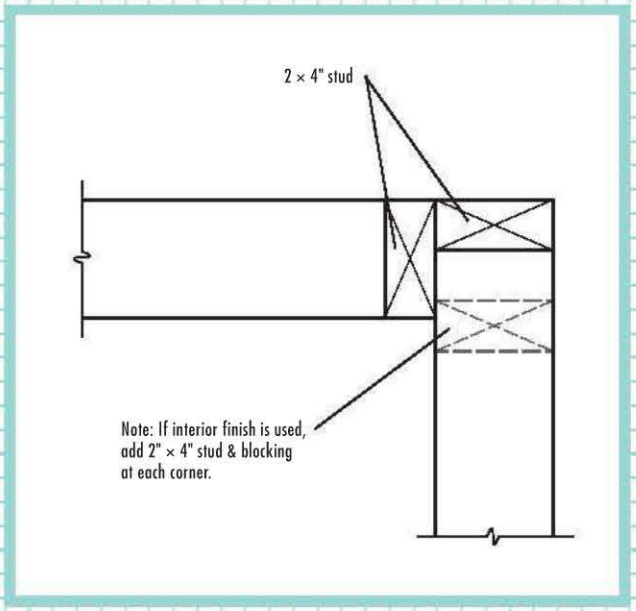
Wall Framing Plan



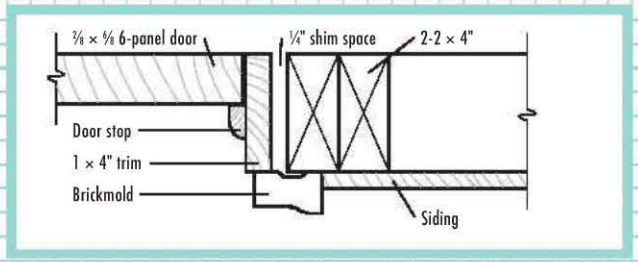
Overhead Door Jamb Detail



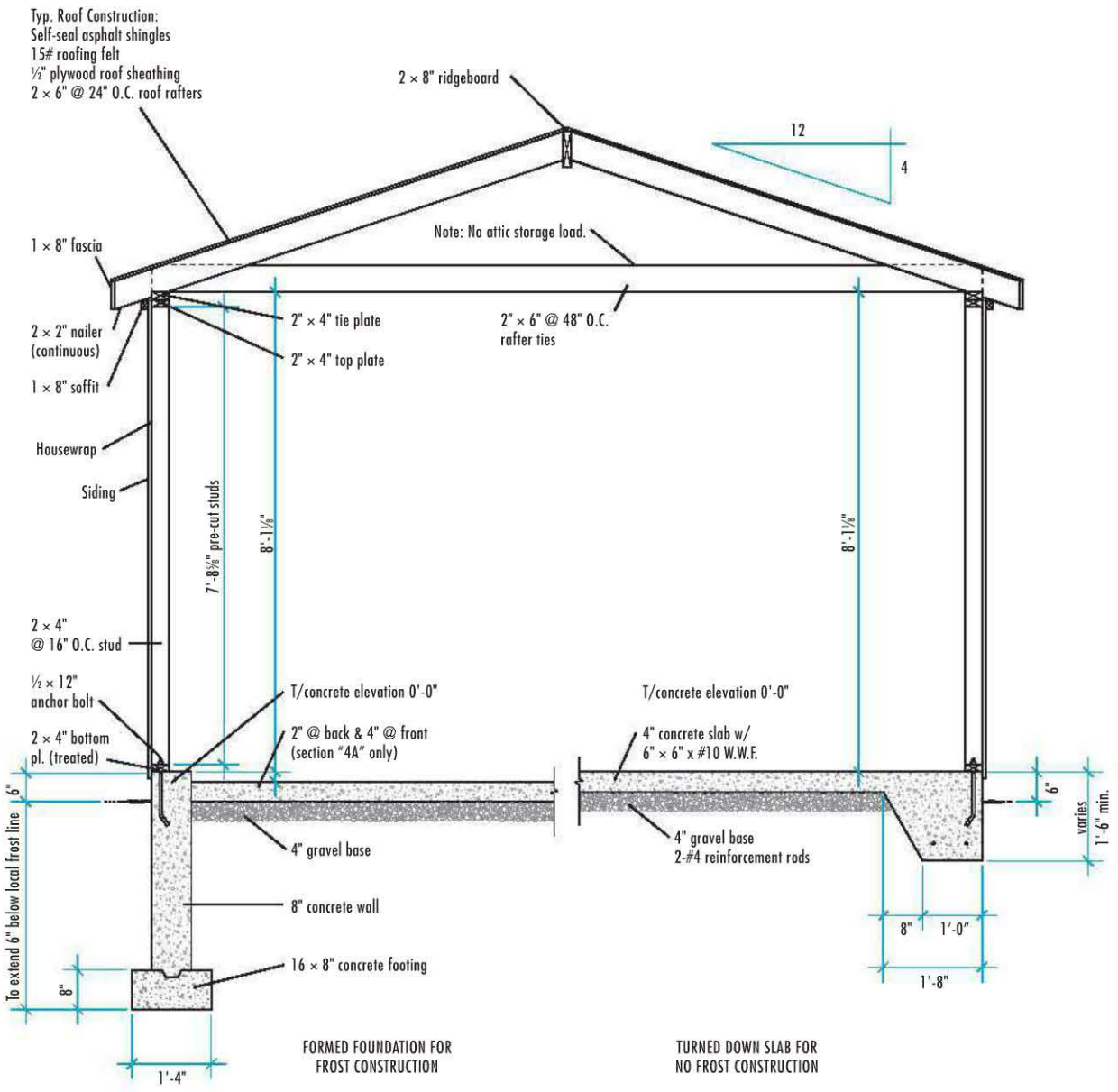
Typical Corner Detail



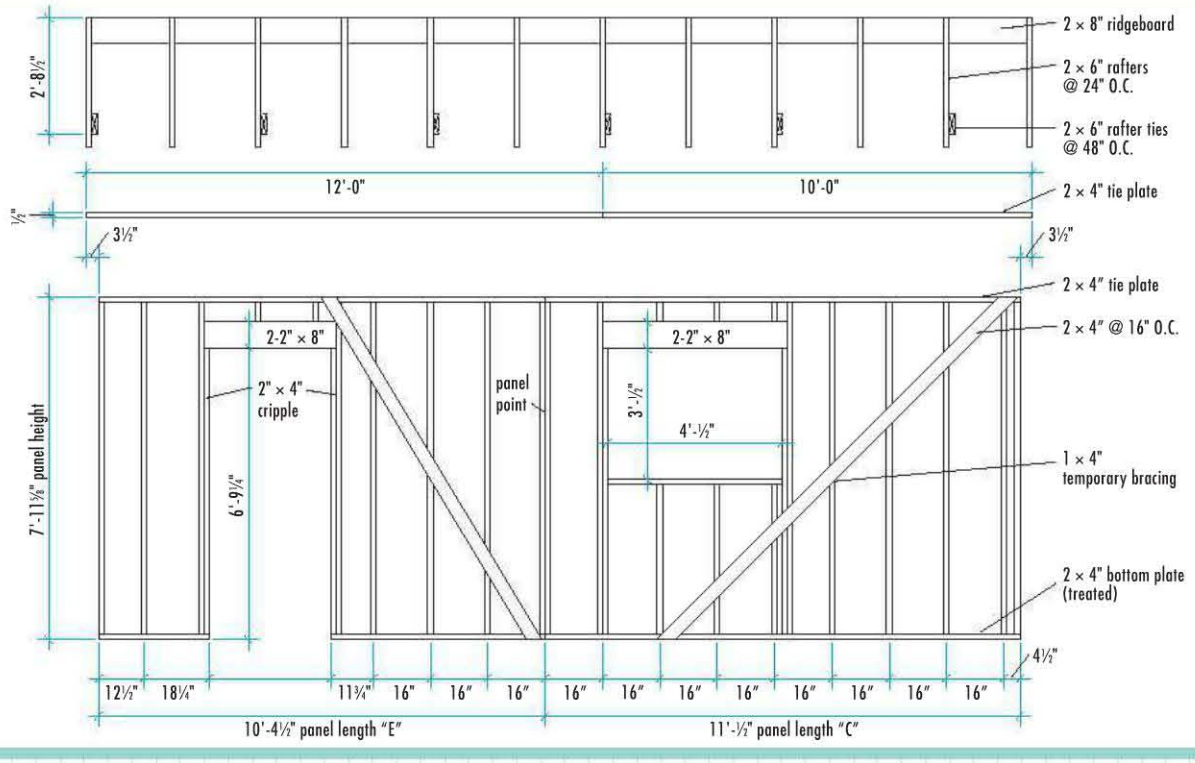
Service Door Jamb Detail



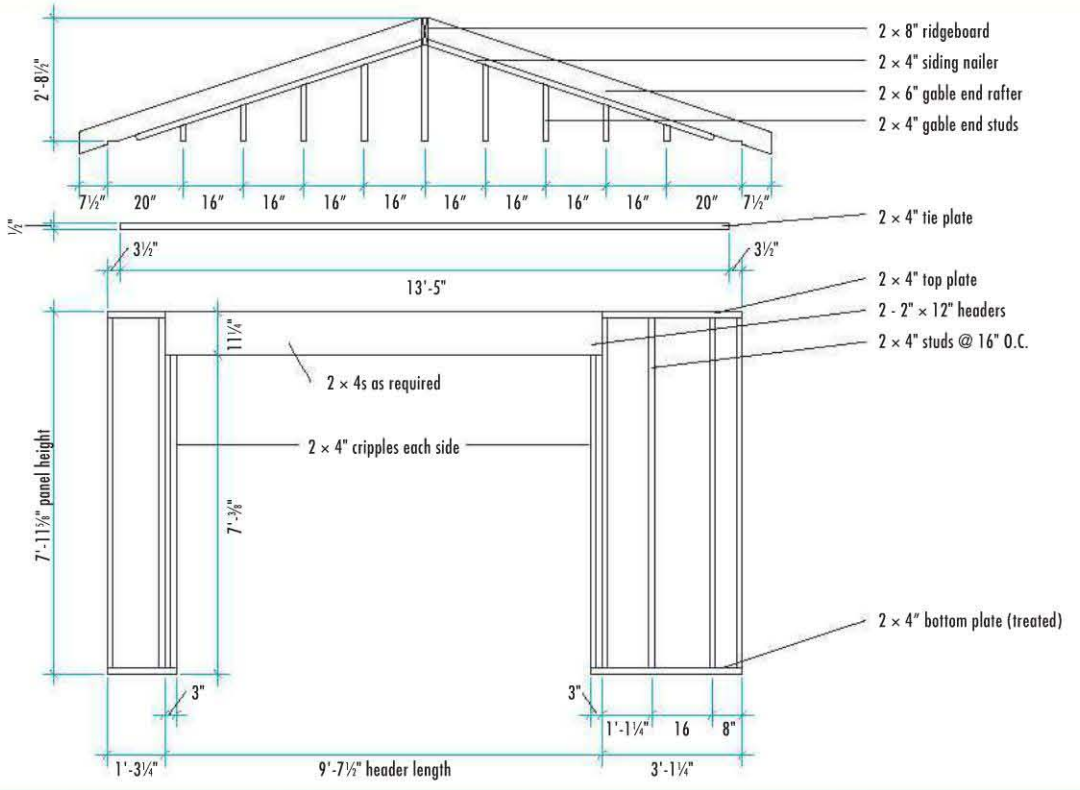
Foundation Plan



Side Wall Framing Plan



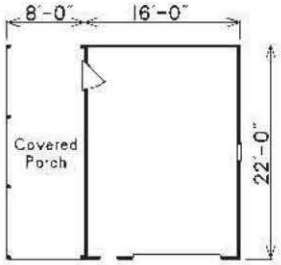
Front Framing Plan



Additional Garage Plans

Garage with Covered Porch

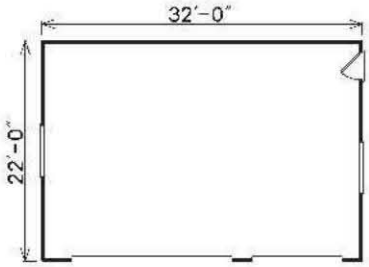
- Size: 24 × 22 ft.
- Building height: 13 ft.
- Roof pitch: 5/12
- Ceiling height: 8 ft.
- Overhead door: 9 × 7 ft.
- Roomy garage has space for storage
- Distinctive covered porch provides perfect area for entertaining



Design #002D-6010

Three-Car Detached Garage

- Size: 32 × 22 ft.
- Building height: 12 ft., 2"
- Roof pitch: 4/12
- Ceiling height: 8 ft.
- Overhead doors: 9 × 7 ft., 16 × 7 ft.
- Side entry for easy access
- Perfect style with many types of homes

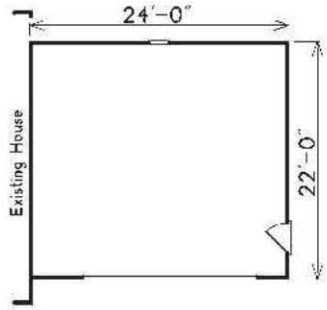


Design #002D-6011

Visit www.projectplans.com to order and view garage plans.

Two-Car Detached Garage

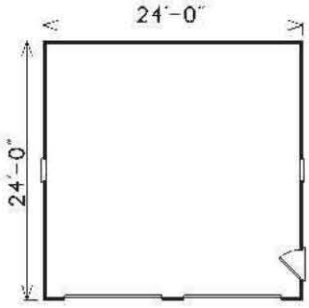
- Size: 24 × 22 ft.
- Building height: 14 ft.
- Roof pitch: 5/12
- Ceiling height: 8 ft.
- Overhead door: 16 × 7 ft.
- Design with wonderful versatility



Design #002D-6014

Victorian Garage

- Size: 24 × 24 ft.
- Building height: 16 ft., 7"
- Roof pitch: 8/12
- Ceiling height: 8 ft.
- Overhead doors: (2) 9 × 7 ft.
- Accented with Victorian details
- Functional side entry

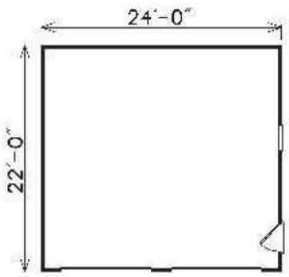


Design #002D-6018

Visit www.projectplans.com to order and view garage plans.

Reverse Gable Garage

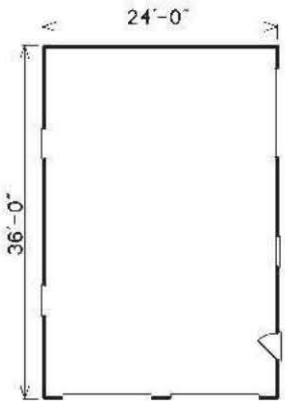
- Size: 24 × 22 ft.
- Building height: 14 ft., 8"
- Roof pitch: 5/12, 8.5/12
- Ceiling height: 8 ft.
- Overhead doors: (2) 9 × 7 ft.
- Roof overhang above garage doors adds custom look
- Handy side door



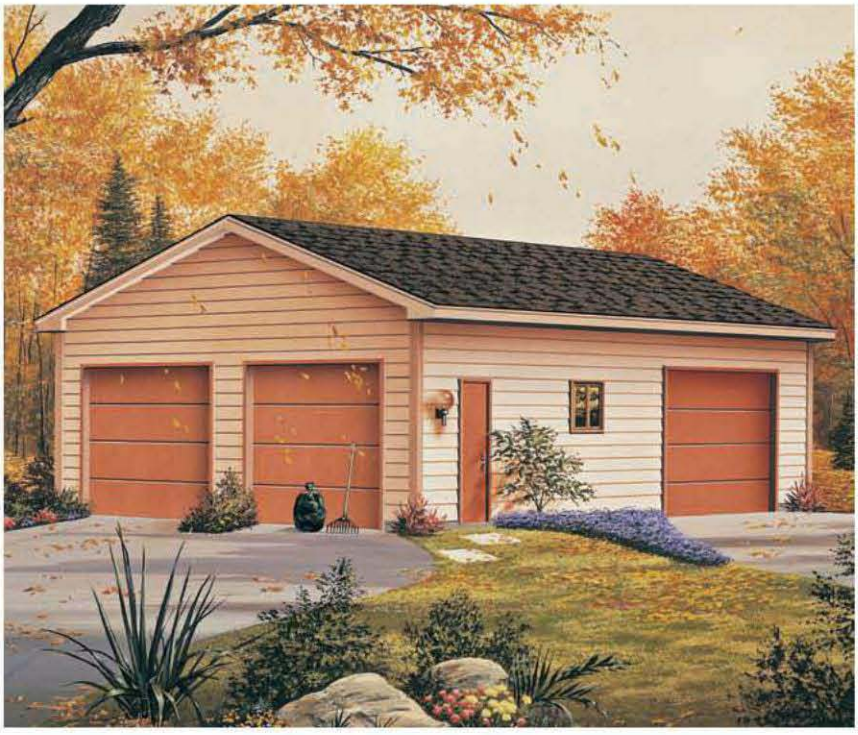
Design #002D-6040

Three-Car Garage/Workshop

- Size: 24 × 36 ft.
- Building height: 14 ft., 6"
- Roof pitch: 4/12
- Ceiling height: 10 ft.
- Overhead doors: (2) 9 × 8 ft.
- Oversized for storage
- Ideal size for workshop or maintenance building



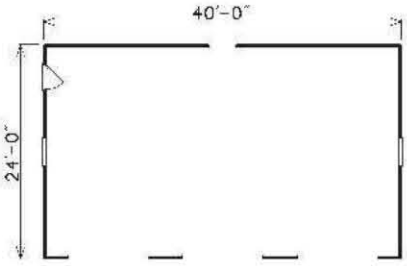
Design #002D-6042



Visit www.projectplans.com to order and view garage plans.

Three-stall Garage

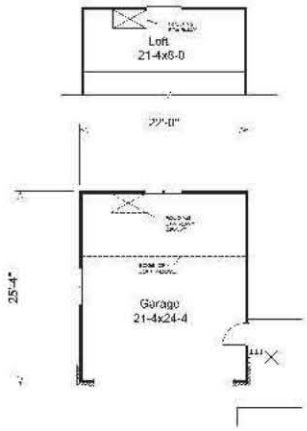
- Size: 40 × 24 ft.
- Building height: 15 ft., 6"
- Roof pitch: 6/12
- Ceiling height: 9 ft.
- Overhead doors: (3) 9 × 7 ft.
- Oversized with plenty of room for storage
- Side door for easy access



Design #002D-6046

Garage with Loft

- Size: 22 x 25 ft. 4"
- Building height: 20 ft., 6"
- Roof pitch: 7/12 (main), 3/12 (roof dormer)
- Ceiling height: 8 ft.
- Overhead door: 18 × 7 ft.
- Slab foundation



Design #002D-6008

Visit www.projectplans.com to order and view garage plans.

Compact Garage

The compact garage is named for its exceptional versatility and ample storage space. This classic gabled outbuilding has a footprint that measures 12 × 16 feet and it includes several useful features. For starters, its 8-foot-wide overhead garage door provides easy access for large equipment, supplies, projects, or even a small automobile. The foundation and shed floor is a poured concrete slab, so it's ideal for heavy items like lawn tractors and stationary tools.

To the right of the garage door is a box bay window. This special architectural detail gives the building's façade a surprising houselike quality while filling the interior with natural light. And the bay's 33"-deep × 60"-wide sill platform is the perfect place for herb pots or an indoor flower box. The adjacent wall includes a second large window and a standard service door, making this end of the garage a pleasant, convenient space for all kinds of work or leisure.

Above the main space of the compact garage is a fully framed attic built with 2 × 6 joists for supporting plenty of stored goods. The steep pitch of the roof allows for over 3 feet of headroom under the peak. Access to the attic is provided by a drop-down staircase that folds up and out of the way, leaving the workspace clear below.

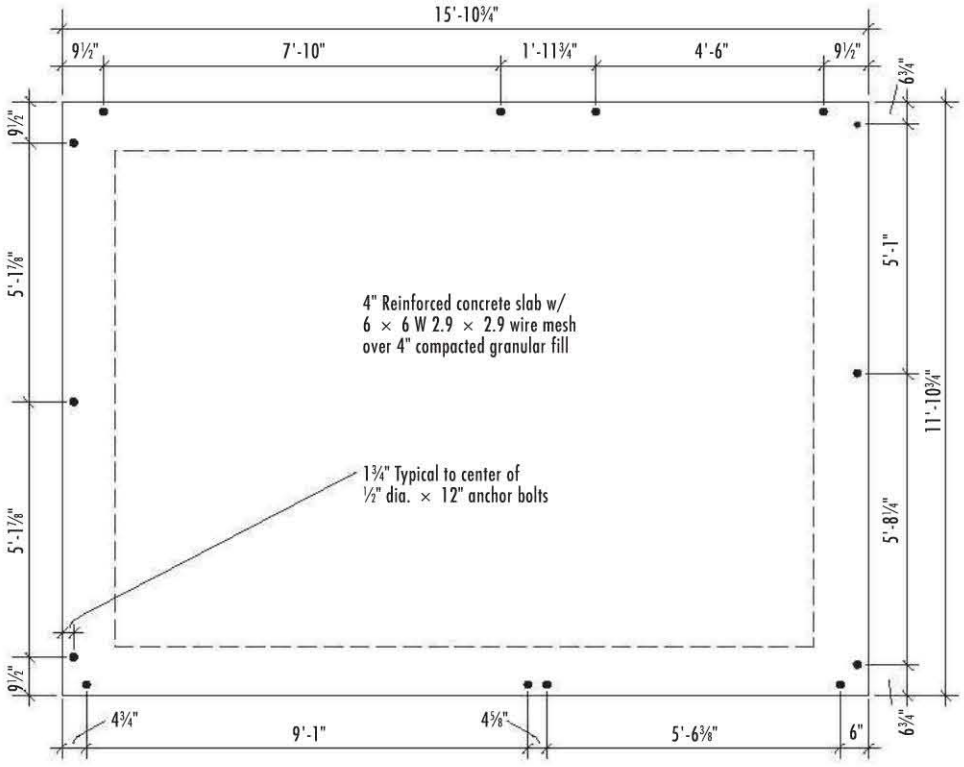
The garage door, service door, staircase, and both windows of the garage are prebuilt factory units that you install following the manufacturer's instructions. Be sure to order all of the units before starting construction. This makes it easy to adjust the framed openings, if necessary, to match the precise sizing of each unit. Also consult your local building department to learn about design requirements for the concrete foundation. You may need to extend and/or reinforce the perimeter portion of the slab, or include a footing that extends below the frost line. An extended apron (as seen in the Gambrel Garage, page 116) is very useful if you intend to house vehicles in the garage.

Cutting List ▸

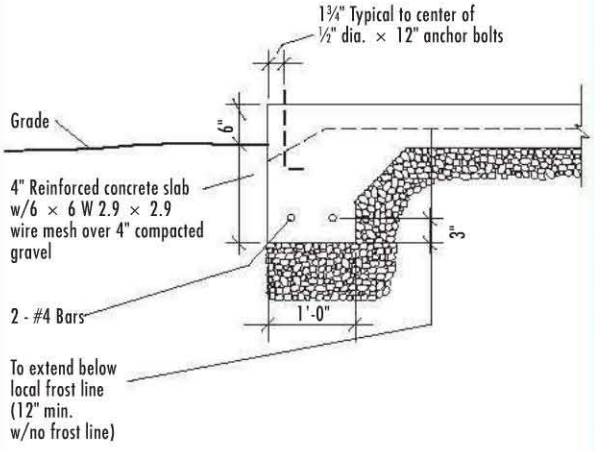
Description	Quantity/Size	Material
Foundation		
Drainage material	2.75 cu. yd.	Compactible gravel
Concrete slab	Field measure	3,000 psi concrete
Mesh	200 sq. ft.	6 × 6", W1.4 × W1.4 welded wire mesh
Reinforcing bar	As required by local code	As required by local code
Wall Framing		
Bottom plates	1 @ 16', 2 @ 12' 1 @ 10'	2 × 4 pressure treated
Top plates	2 @ 14', 4 @ 12' 4 @ 10'	2 × 4
Standard wall studs	51 @ 8'* *may use 92⅝" precut studs	2 × 4
Diagonal bracing	5 @ 12'	1 × 4 (std. lumber)
Jack studs	5 @ 14'	2 × 4
Gable end studs	5 @ 8'	2 × 4
Header, overhead door	2 @ 10'	2 × 12
Header, windows	2 @ 10'	2 × 12
Header, service door	1 @ 8'	2 × 12
Header & stud spacers		See Sheathing, right
Box Bay Framing		
Half-wall bottom plate	1 @ 8'	2 × 4 pressure-treated
Half-wall top plate & studs	3 @ 8'	2 × 4
Joists	3 @ 8'	2 × 6
Window frame	4 @ 12'	2 × 4
Sill platform & top	1 sheet @ 4 × 8'	½" plywood
Rafter blocking	1 @ 8'	2 × 8
Roof Framing		
Rafters (& lookouts, blocking)	36 @ 10'	2 × 6
Ridgeboard	1 @ 18'	2 × 8
Attic		
Floor joists	16 @ 12'	2 × 6
Floor decking	6 sheets @ 4 × 8'	½" plywood
Staircase	1 unit for 22 × 48" rough opening	Disappearing attic stair unit
Exterior Finishes		
Eave fascia	2 @ 18'	2 × 8 cedar
Gable fascia	4 @ 10'	1 × 8 cedar

Description	Quantity/Size	Material
Drip edge & gable trim	160 lin. ft.	1 × 2 cedar
Siding	15 sheets @ 4 × 8'	⅝" T 1-11 plywood siding w/ vertical grooves 8" on center (or similar)
Siding flashing	30 lin. ft.	Metal Z-flashing
Overhead door jambs	1 @ 10', 2 @ 8'	1 × 6 cedar
Overhead door stops	3 @ 8'	Cedar door stop
Overhead door surround	1 @ 10', 2 @ 8'	2 × 6
Corner trim	8 @ 8'	1 × 4 cedar
Door & window trim	4 @ 8', 5 @ 10'	1 × 4 cedar
Box bay bottom trim	1 @ 8'	1 × 10 cedar
Roofing		
Sheathing (& header, stud spacers)	14 sheets @ 4 × 8'	½" exterior-grade plywood roof sheathing
15# building paper	2 rolls	
Shingles	4⅔ squares	Asphalt shingles—250# per sq. min.
Roof flashing	10'6"	
Doors & Windows		
Overhead garage door w/hardware	1 @ ⅞ × 7⅛	
Service door	1 unit for 38 × 72⅞" rough opening	Prehung exterior door unit
Window	2 units for 57 × 41⅜"	Casement mullion window unit—complete
Fasteners & Hardware		
J-bolts w/nuts & washers	14	½"-dia. × 12"
16d galvanized common nails	3 lb.	
16d common nails	15 lb.	
10d common nails	2½ lb.	
8d box nails	16 lb.	
8d common nails	5 lbs.	
8d galvanized siding nails	10 lb.	
1" galvanized roofing nails	10 lb.	
8d galvanized casing nails	3 lb.	
Entry door lockset	1	

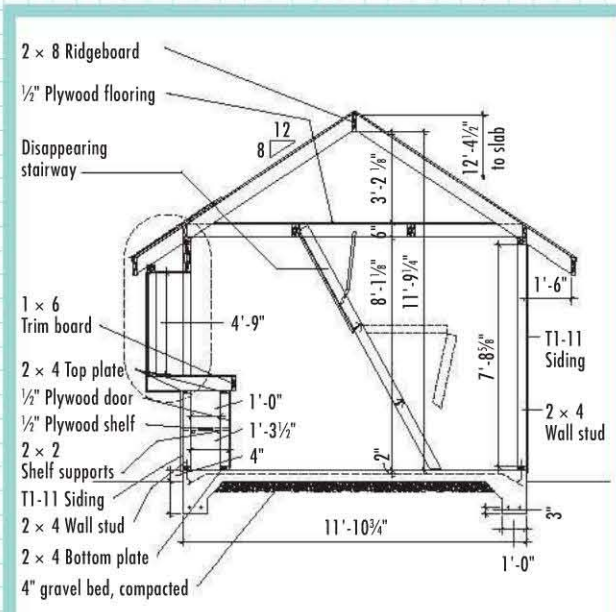
Foundation Plan



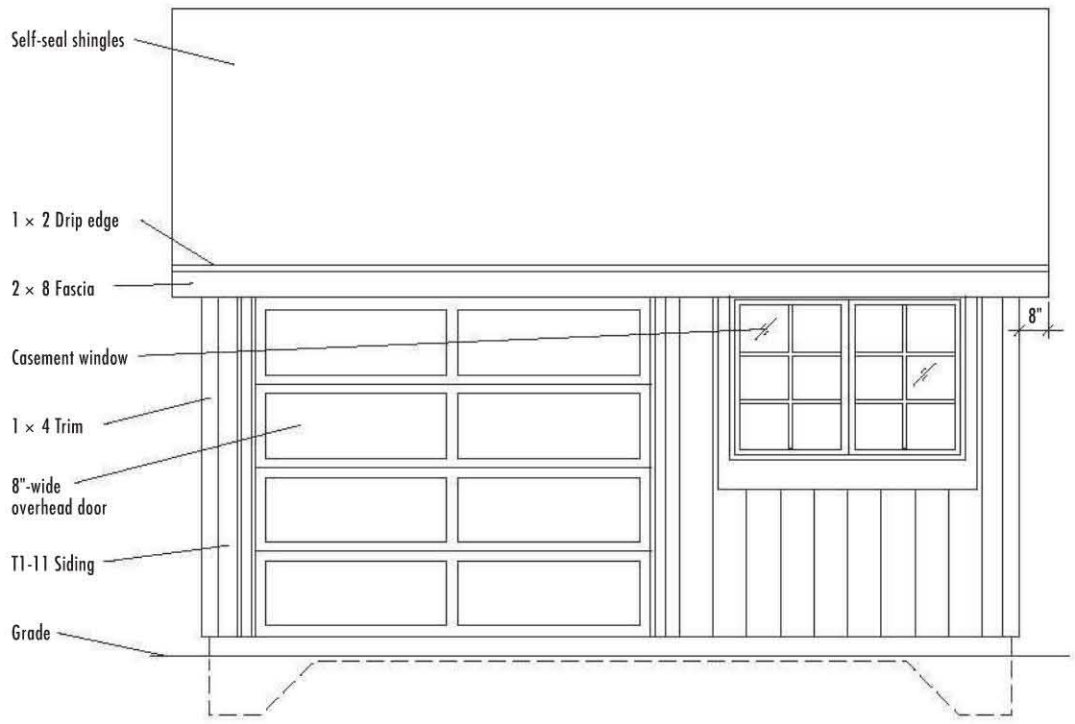
Foundation Detail



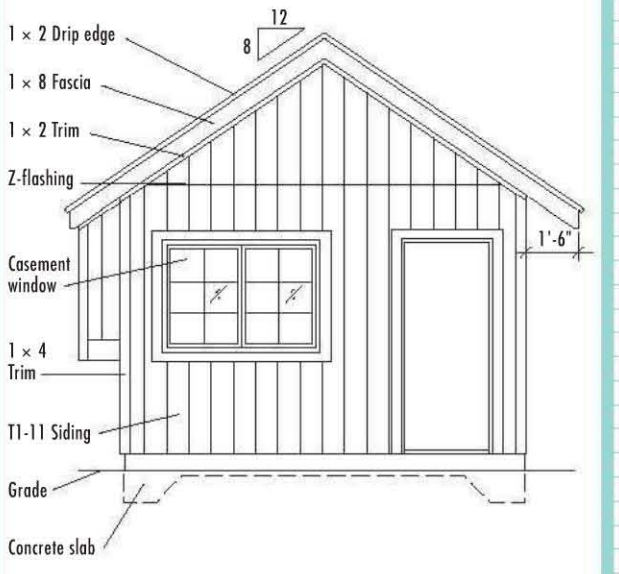
Building Section



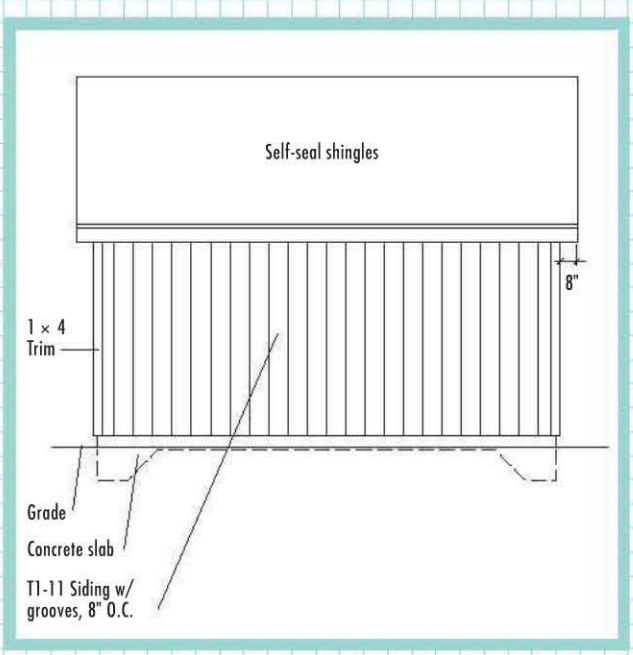
Front Elevation



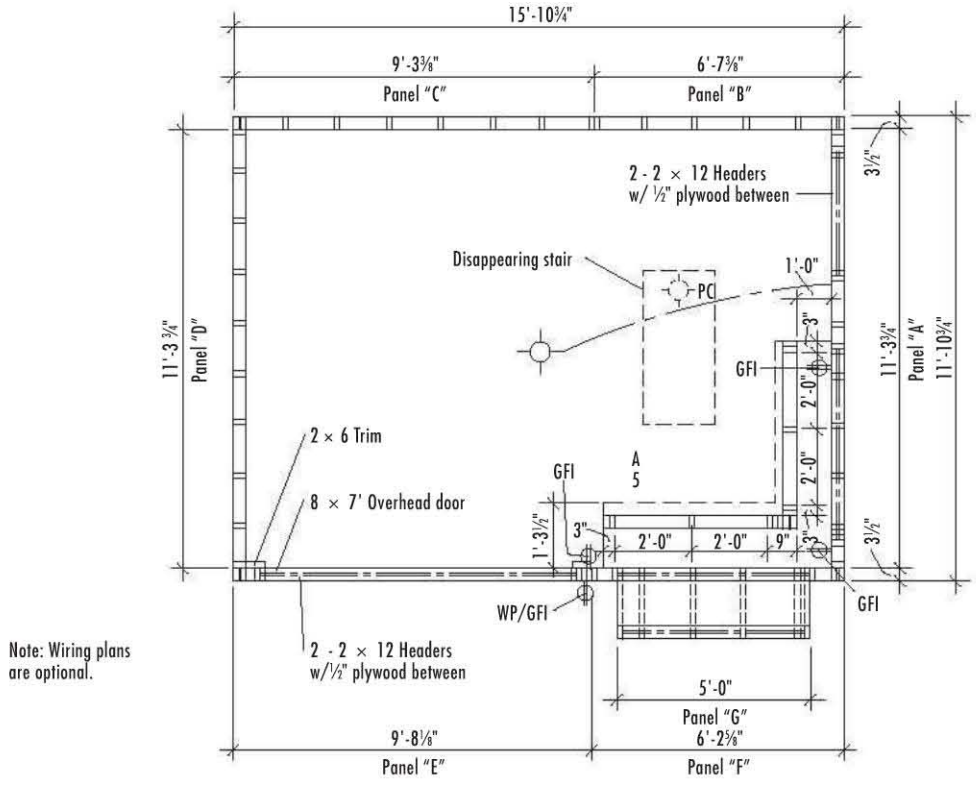
Right Side Elevation



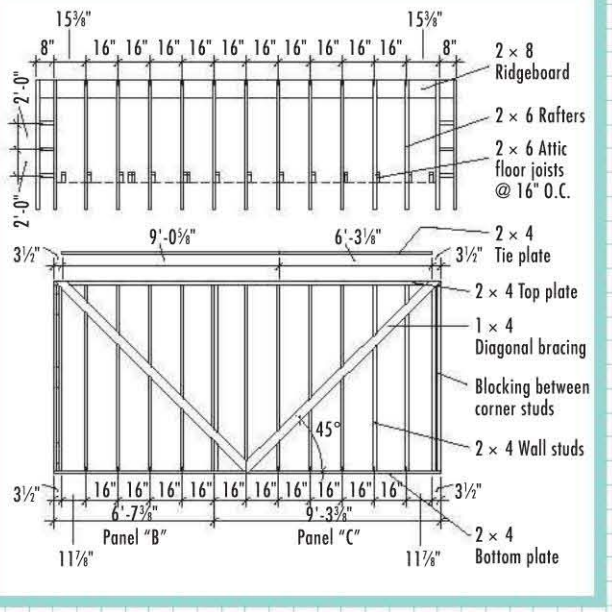
Rear Elevation



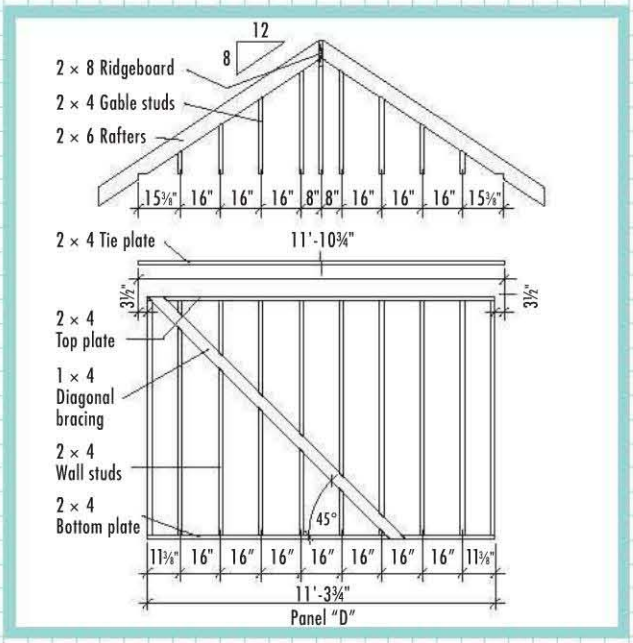
Wall Framing Plan



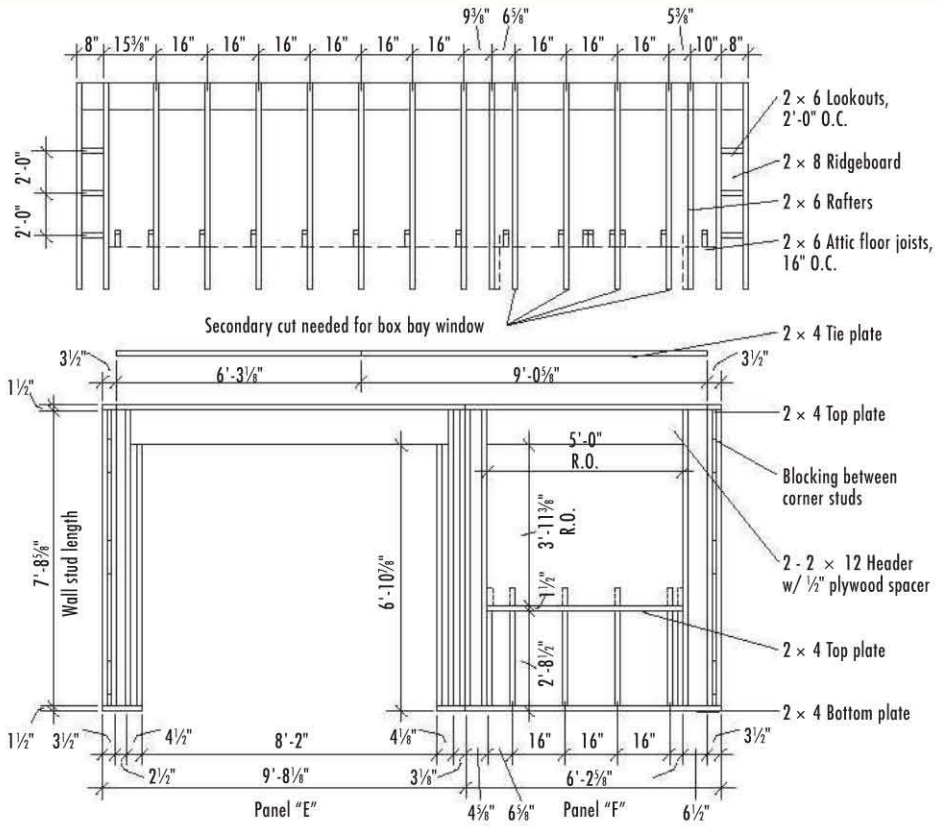
Back Side Framing



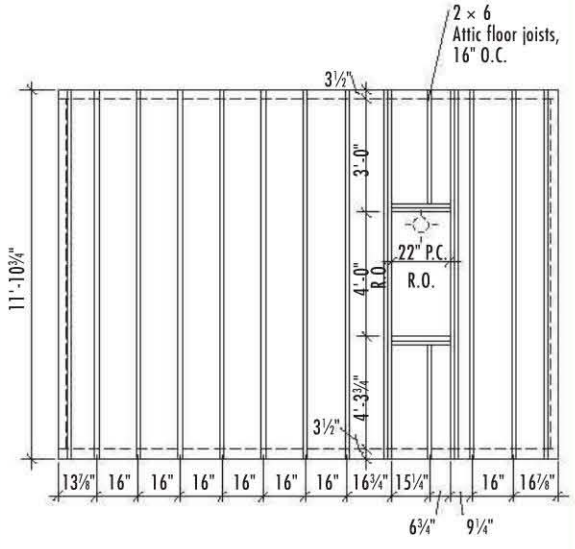
Left Side Framing



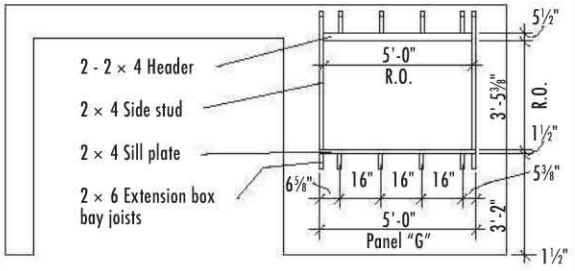
Front Side Framing



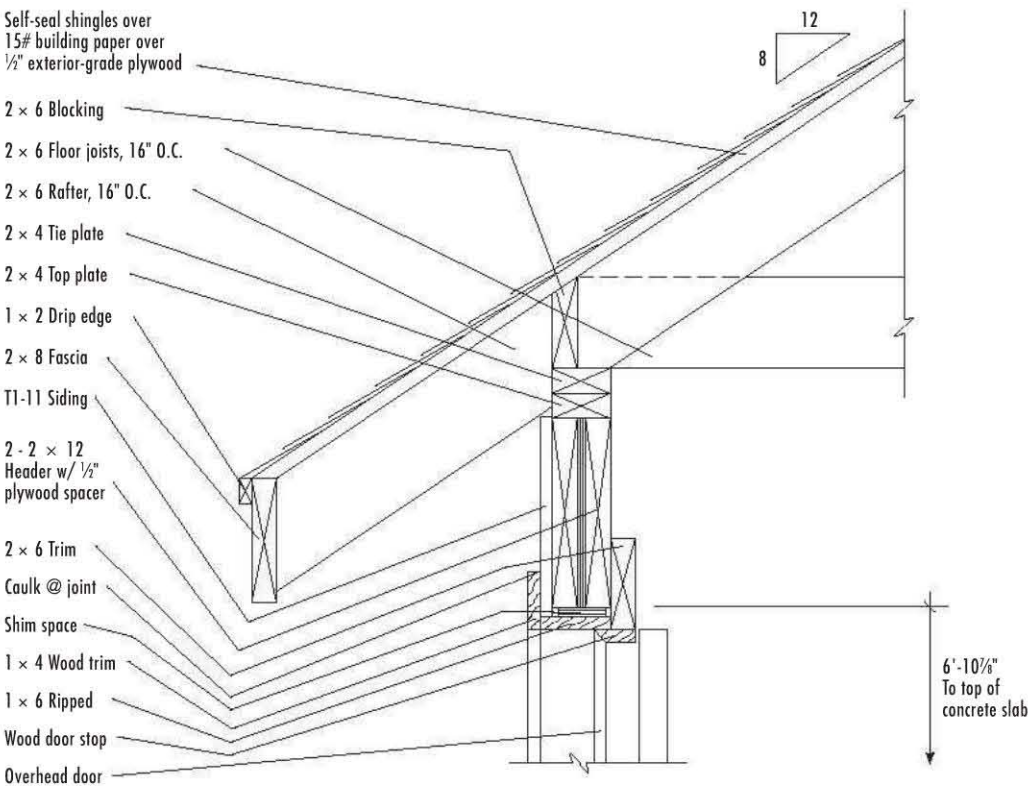
Attic Floor Joist Framing



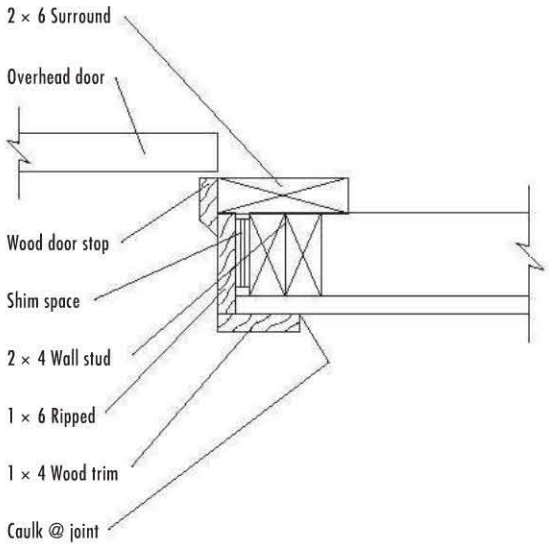
Box Bay Window Framing



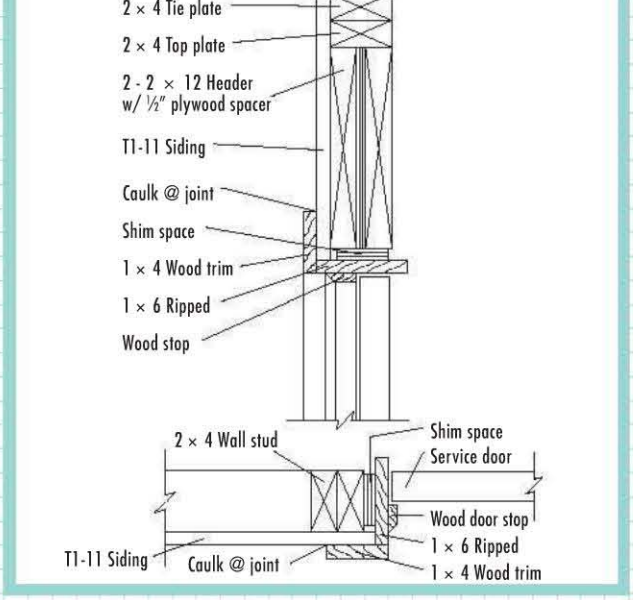
Overhead Door Header Detail



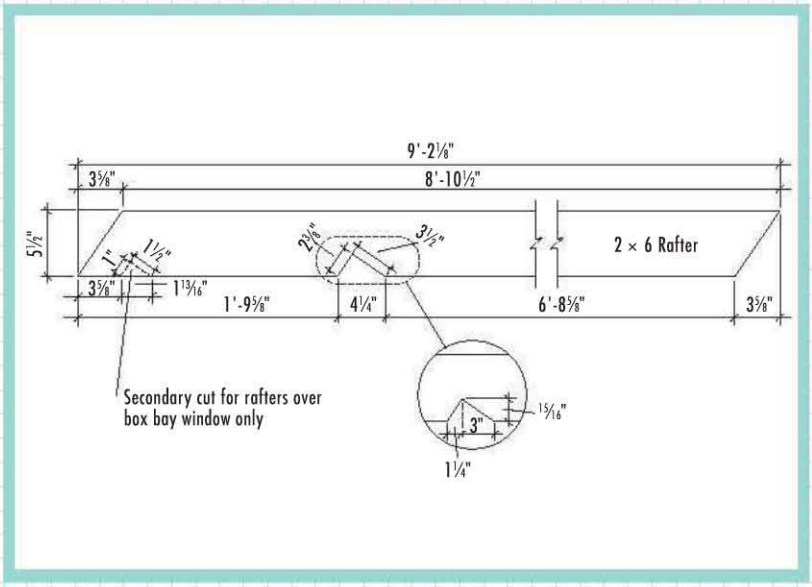
Overhead Door Jamb Detail



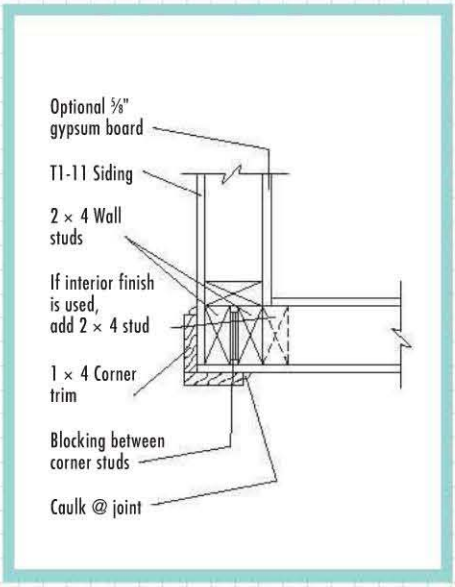
Service Door Header/Jamb Detail



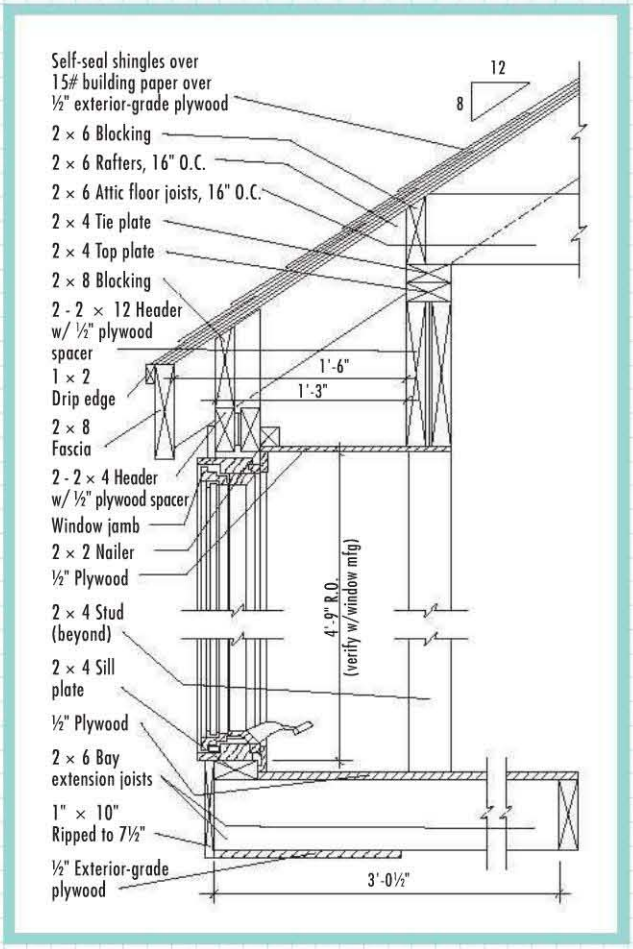
Rafter Template



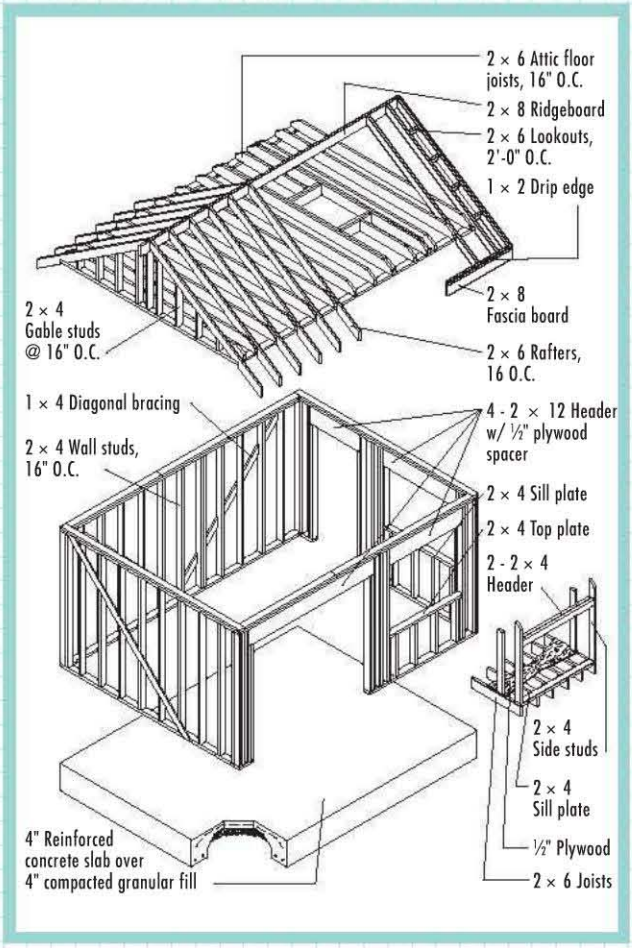
Corner Detail



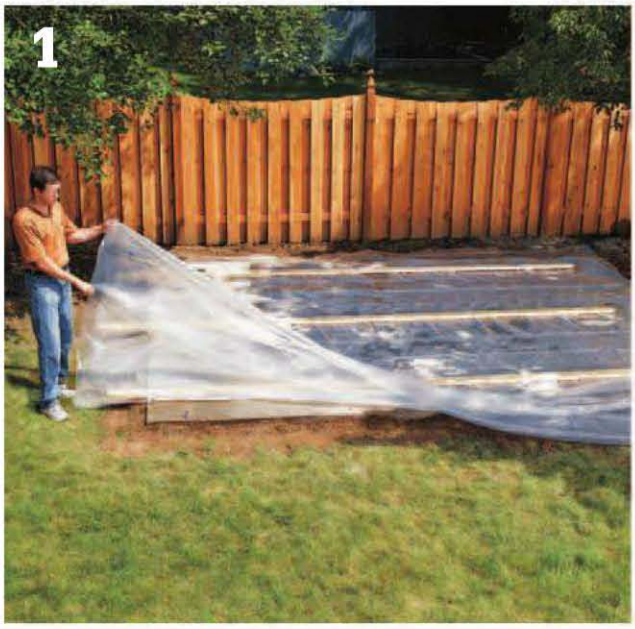
Box Bay Window Detail



Isometric



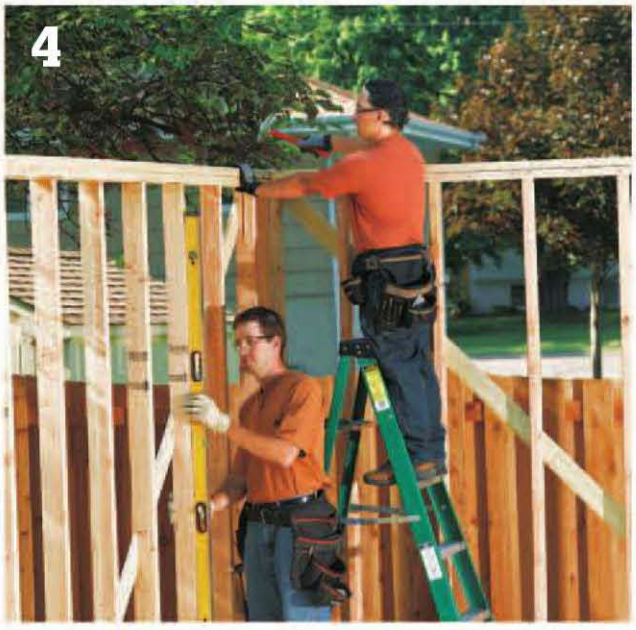
How to Build the Compact Garage



Build the concrete foundation using the specifications shown in the Foundation Detail (page 105) and following the basic procedure on pages 28 to 33. The slab should measure 190¾" × 142¾". Set the 14 J-bolts into the concrete as shown in the Foundation Plan (page 105). *Note: All slab specifications must comply with local building codes.*

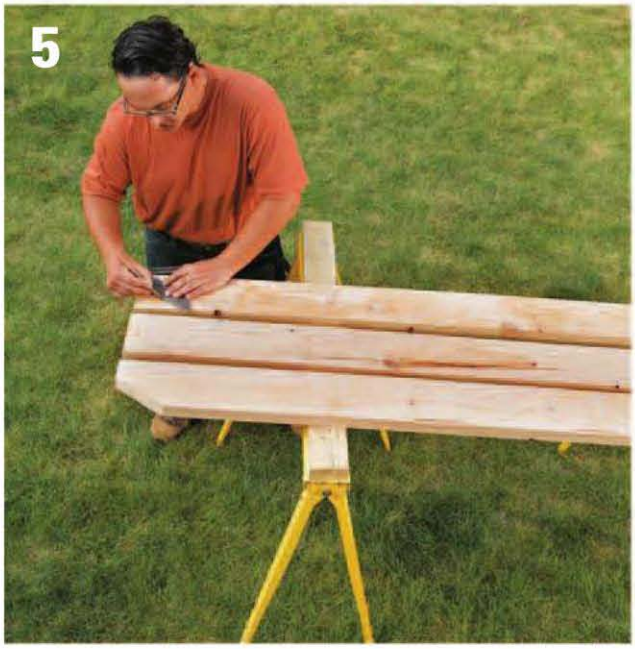
Snap chalk lines for the bottom plates so they will be flush with the outside edges of the foundation. You can frame the walls in four continuous panels or break them up into panels A through F, as shown in the Wall Framing Plan (page 107). We completely assembled and squared all four walls before raising and anchoring them.

Frame the back wall(s) following the Back Side Framing (page 107). Use pressure-treated lumber for the bottom plate, and nail it to the studs with galvanized 16d common nails. All of the standard studs are 92⅝" long. Square the wall, then add 1 × 4 let-in bracing.

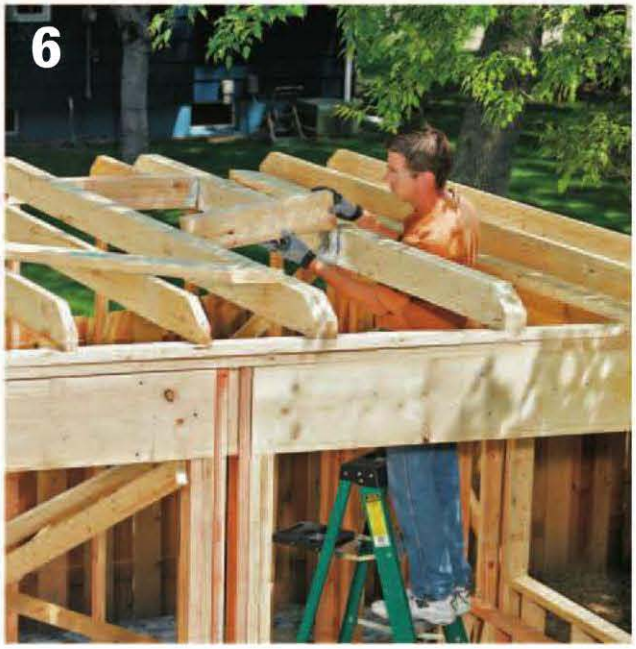


Raise the back wall and anchor it to the foundation J-bolts with washers and nuts. Brace the wall upright. Frame and raise the remaining walls one at a time, then tie all of the walls together with double top plates. Cover the outside of the walls with T1-11 siding.

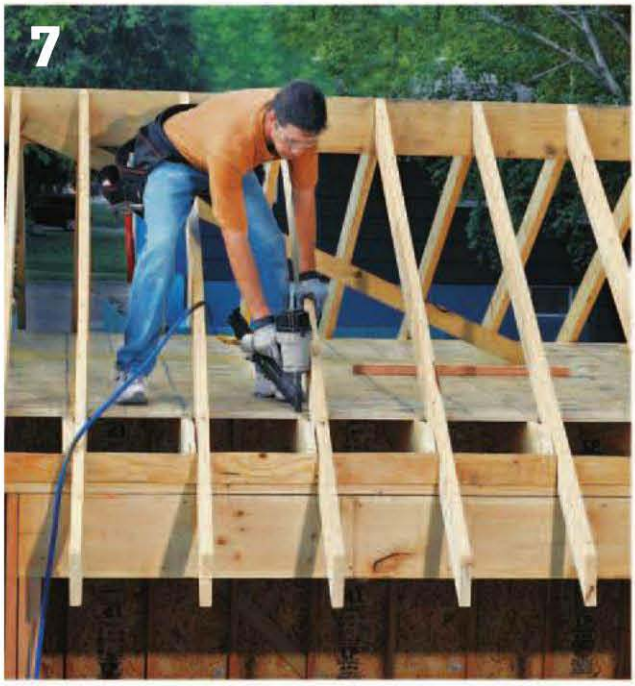
(continued)



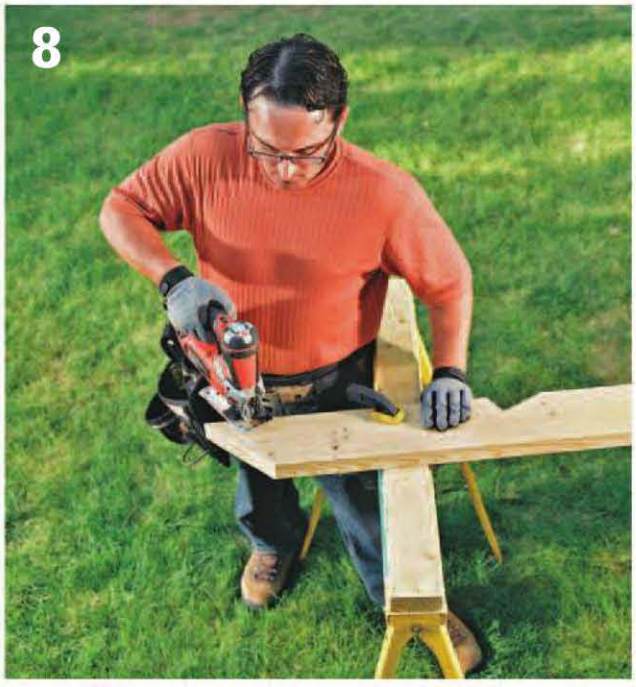
Cut fifteen 2 × 6 attic floor joists at 142¾". Cut the top corner at both ends of each joist: Mark 1⅞" along the top edge and 15/16" down the end; connect the marks, then cut along the line. Clipping the corner prevents the joist from extending above the rafters.



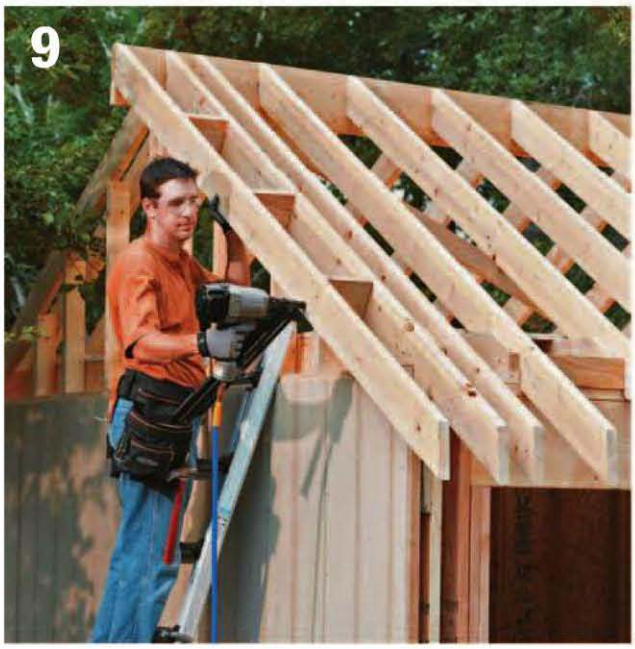
Mark the joist layout onto the wall plates following the Attic Floor Joist Framing (page 108). Leave 3½" between the outsides of the end walls and the outer joists. Toenail the joists to the plates with three 8d common nails at each end. Frame the rough opening for the staircase with doubled side joists and doubled headers; fasten doubled members together with pairs of 10d nails every 16". Install the drop-down staircase unit following the manufacturer's instructions.



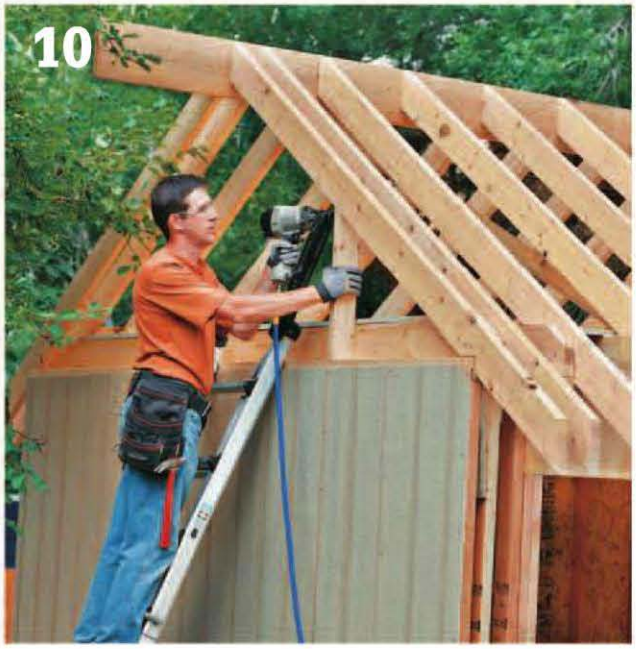
Cover the attic floor with ½" plywood, fastening it to the joists with 8d nails.



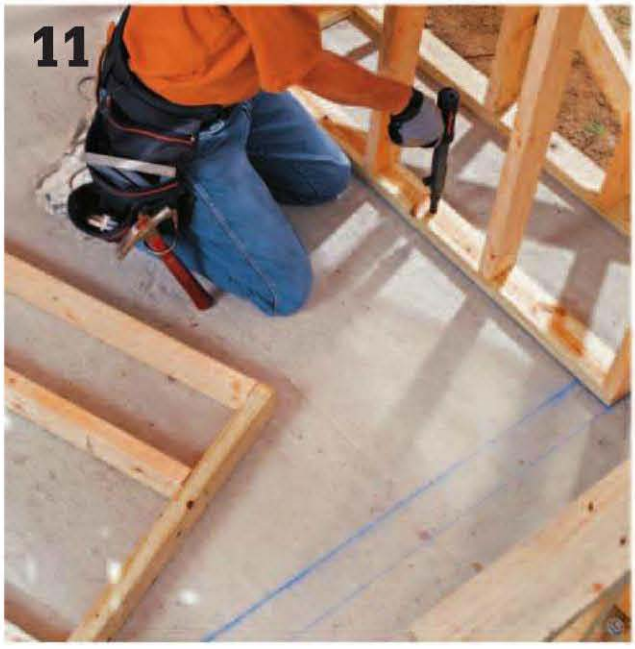
Use the Rafter Template (page 110) to mark and cut two pattern rafters. Test-fit the rafters and adjust the cuts as needed. Cut all (24) standard rafters. Cut four special rafters with an extra birdsmouths cut for the box bay. Cut four gable overhang rafters—these have no birdsmouths cuts.



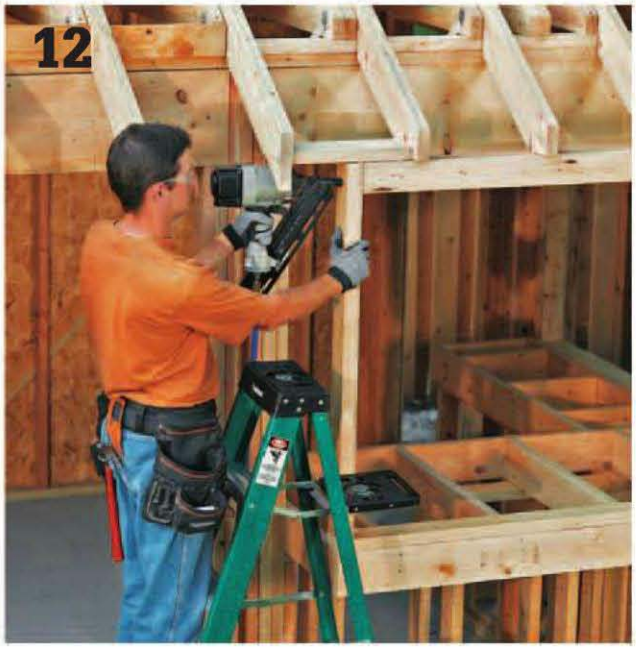
Cut the 2 × 8 ridgeboard at 206¾". Mark the rafter layout on the ridge and wall plates as shown in the Front Side Framing (page 108) and Back Side Framing (page 107). Frame the roof following the steps on pages 46 to 51. Install 6½"-long lookouts 24" on center, then attach the overhang rafters. Fasten the attic joists to the rafters with three 10d nails at each end.



Mark the stud layout for the gable end walls onto the end wall plates following the Side Framing (page 107). Transfer the layout to the rafters, using a level. Cut each of the 2 × 4 studs to fit, mitering the top ends at 33.5°. Install the studs flush with the end walls.



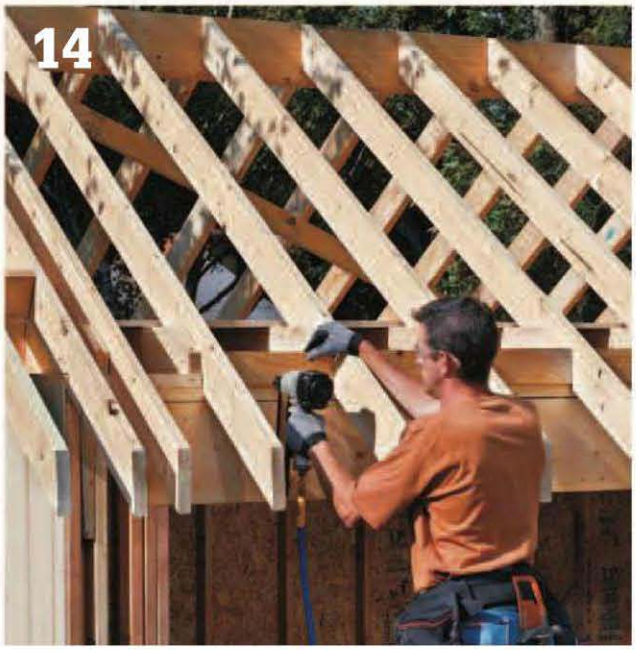
Construct the 2 × 4 half wall for the interior apron beneath the box bay. Cut two plates at 60" (pressure-treated lumber for bottom plate); cut five studs at 32½". Fasten one stud at each end, and space the remaining studs evenly in between. Mark a layout line 12" from the inside of the shed's front wall (see the Building Section page 105). Anchor the half wall to the slab using masonry screws or a powder-actuated nailer.



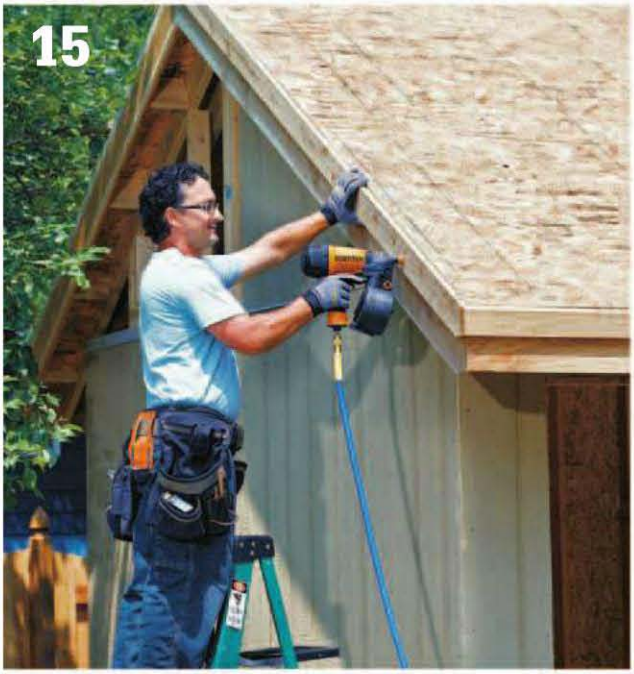
Cut six 2 × 6 joists at 36½". Toenail the joists to the inner and outer half walls following the layout in the Box Bay Window Framing (page 108); the joists should extend 15" past the outer shed wall. Add a 60"-long 2 × 4 sill plate at the ends of the joists. Cut two 2 × 4 side studs to extend from the sill plate to the top edges of the rafters (angle top ends at 33.5°), and install them. Install a built-up 2 × 4 header between the side studs 41⅜" above the sill plate.

(continued)

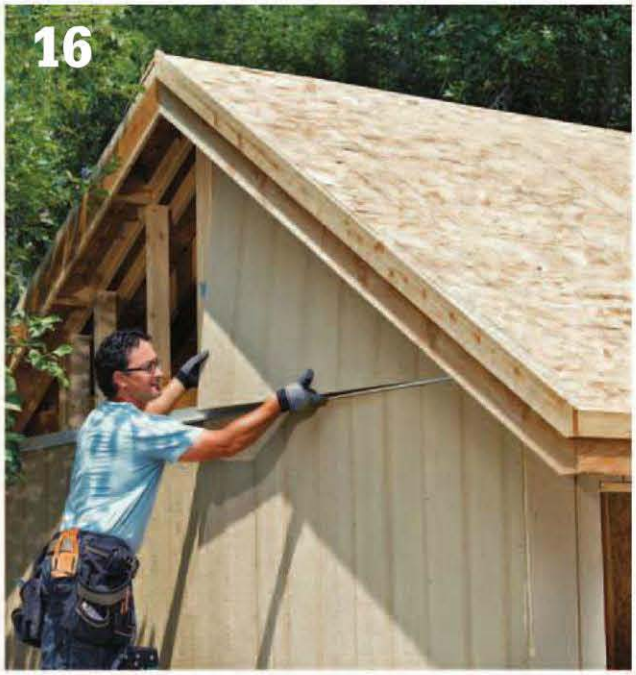
Install a 2 × 2 nailer ½" up from the bottom of the 2 × 4 bay header. Cover the top and bottom of the bay with ½" plywood as shown in the Box Bay Window Detail on page 110. Cut a 2 × 4 stud to fit between the plywood panels at each end of the 2 × 4 shed wall header. Fasten these to the studs supporting the studs and the header.



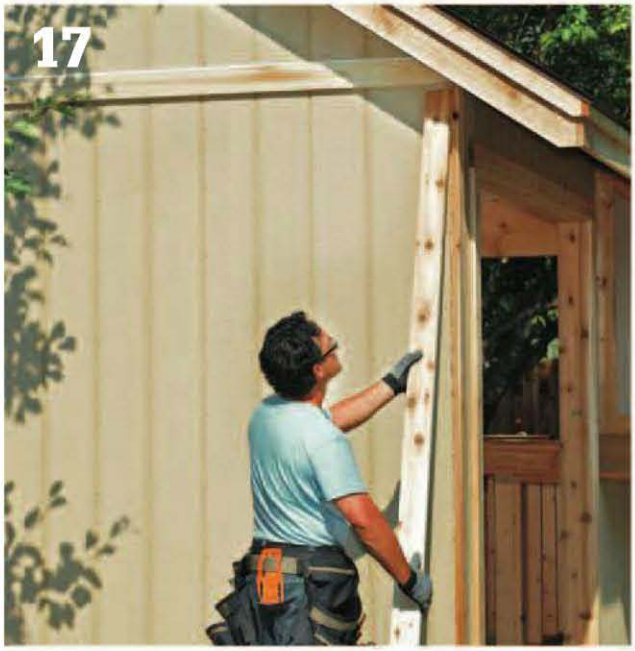
Bevel the side edge of the 2 × 6 blocking stock at 33.5°. Cut individual blocks to fit between the rafters and attic joists, and install them to seal off the rafter bays. See the Overhead Door Header (page 109). The blocks should be flush with the tops of the rafters. Custom-cut 2 × 8 blocking to enclose the rafter bays above the box bay header. See the Box Bay Window Detail on page 110.



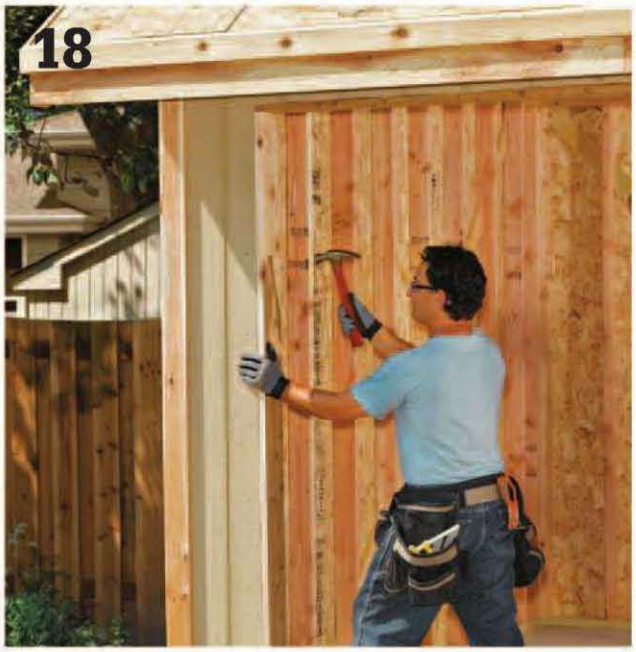
Add 2 × 8 fascia to the ends of the rafters along each eave so the top outer edge is flush with the top of the roof sheathing. Cover the gable overhang rafters with 1 × 8 fascia. Add 1 × 2 trim to serve as a drip edge along the eaves and gable ends so it will be flush with the top of the roof sheathing.



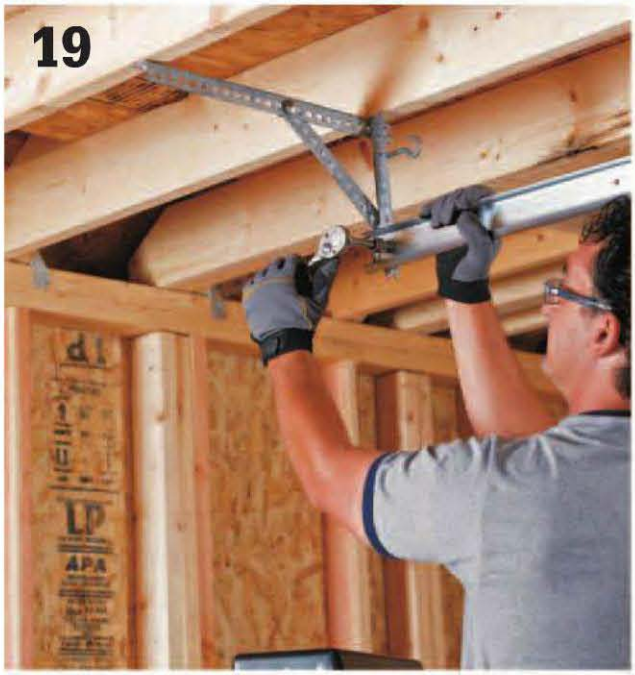
Add Z-flashing above the first row of siding, then cut and fit T1-11 siding for the gable ends. Cover the horizontal seam with 1 × 4 trim snugged up against the flashing.



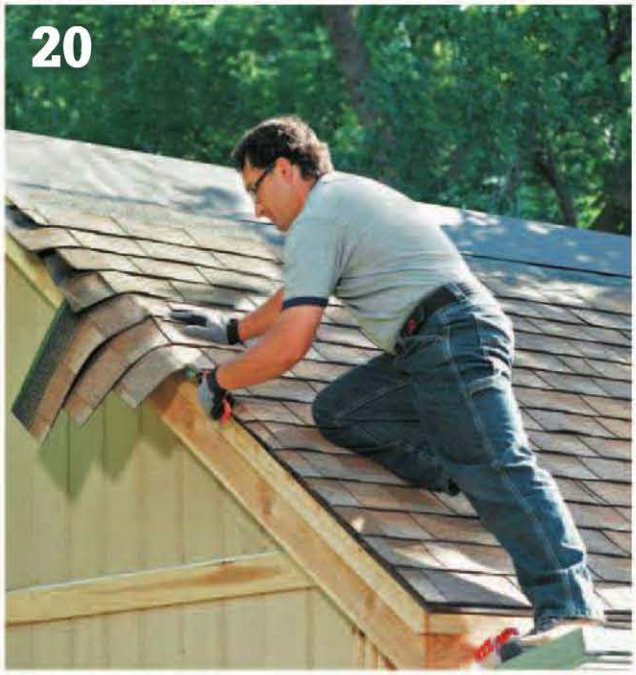
To complete the trim details, add 1 × 2 along the gable ends and sides of the box bay. Use 1 × 4 on all vertical corners and around the windows, service door, and overhead door. Rip down 1 × 10s for horizontal trim along the bottom of the box bay. Also cover underneath the bay joists with ½" exterior-grade plywood.



Rip cut 1 × 6 boards to 4⅛" wide for the overhead door jambs. Install the jambs using the door manufacturer's dimensions for the opening. Shim behind the jambs if necessary. Make sure the jambs are flush with the inside of the wall framing and extend ⅝" beyond the outside of the framing. Install the 2 × 6 trim as shown in the Overhead Door Header and Overhead Door Jamb on page 109.



Install the two windows and the service door following the manufacturers' instructions. Position the jambs of the units so they will be flush with the siding, if applicable. Install the overhead door, then add stop molding along the top and side jambs. See the Service Door Header/Jamb Detail on page 109.



Install ½" plywood roof sheathing starting at the bottom ends of the rafters. Add building paper and asphalt shingles following the steps on pages 62 to 67.

Gambrel Garage

Following classic barn designs, this 12 × 12-foot garage has several features that also make it a workshop. The garage's 144-square-foot floor is a poured concrete slab with a thickened edge that allows it to serve as the building's foundation. Designed for economy and durability, the floor can easily support heavy machinery, woodworking tools, and recreational vehicles.

The garage's sectional overhead door makes for quick access to equipment and supplies and provides plenty of air and natural light for working inside. The door opening is sized for an 8-foot-wide × 7-foot-tall door, but you can buy any size or style of door you like—just make your door selection before you start framing the garage.

Another important design feature of this building is its gambrel roof, which maximizes the usable interior space (see next page). Beneath the roof is a sizeable storage attic with 315 cubic feet of space and its own double doors above the garage door. *Note: We added a patio section to the front of this garage. This optional slab will appear throughout the how-to photos.*

The Gambrel Roof

The gambrel roof is the defining feature of two structures in American architecture: the barn and the Dutch Colonial house. Adopted from earlier English buildings, the gambrel style became popular in America during the early seventeenth century and was used on homes and farm buildings throughout the Atlantic region. Today, the gambrel roof remains a favorite detail for designers of sheds, garages, and carriage houses.

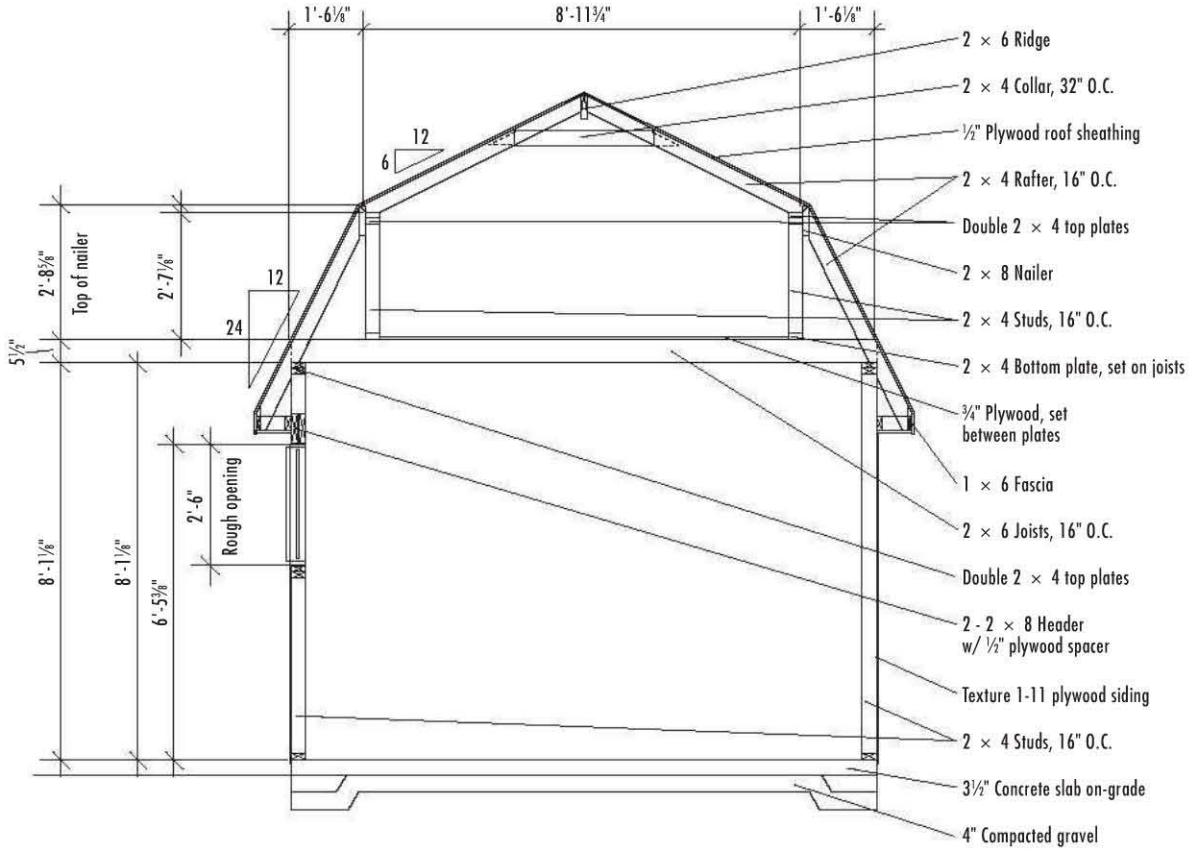
The basic gambrel shape has two flat planes on each side, with the lower plane sloped much more steeply than the upper. More elaborate versions incorporate a flared eave known as a Dutch kick, that was often extended to shelter the front and rear façades of the building. Barns typically feature an extended peak at the front, sheltering the doors of the hayloft. The main advantage of the gambrel roof is the increased space underneath the roof, providing additional headroom for upper floors in homes or extra storage space in outbuildings.

Cutting List ▸

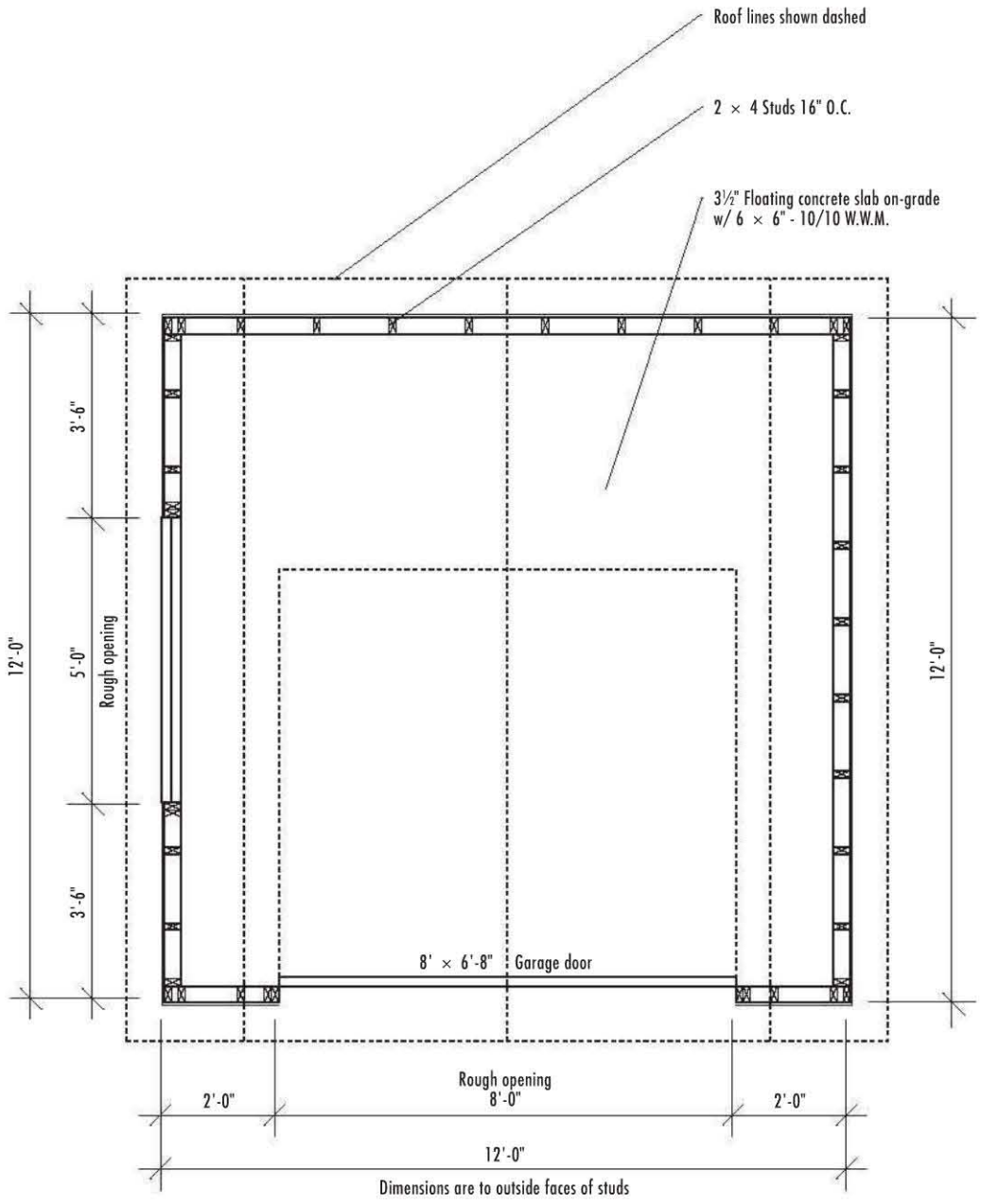
Description	Quantity/Size	Material
Foundation		
Drainage material	1.75 cu. yd.	Compactible gravel
Concrete slab	2.5 cu. yd.	3,000 psi concrete
Mesh	144 sq. ft.	6 × 6", W1.4 × W1.4 welded wire mesh
Wall Framing		
Bottom plates	4 @ 12'	2 × 4 pressure treated
Top plates	8 @ 12'	2 × 4
Studs	47 @ 92⅝"	2 × 4
Headers	2 @ 10', 2 @ 6'	2 × 8
Header spacers	1 @ 9', 1 @ 6'	½" plywood—7" wide
Angle braces	1 @ 4'	2 × 4
Gable Wall Framing		
Plates	2 @ 10'	2 × 4
Studs	7 @ 10'	2 × 4
Header	2 @ 6'	2 × 6
Header spacer	1 @ 5'	½" plywood—5" wide
Attic Floor		
Joists	10 @ 12'	2 × 6
Floor sheathing	3 sheets @ 4 × 8'	¾" tongue & groove exterior-grade plywood
Kneewall Framing		
Bottom plates	2 @ 12'	2 × 4
Top plates	4 @ 12'	2 × 4
Studs	8 @ 10'	2 × 4
Nailers	2 @ 14'	2 × 8
Roof Framing		
Rafters	28 @ 10'	2 × 4
Metal anchors—rafters	20, with nails	Simpson H2.5
Collar ties	2 @ 6'	2 × 4
Ridgeboard	1 @ 14'	2 × 6
Lookouts	1 @ 10'	2 × 4
Soffit ledgers	2 @ 14'	2 × 4
Soffit blocking	6 @ 8'	2 × 4
Exterior Finishes		
Plywood siding	14 sheets @ 4 × 8'	⅝" Texture 1-11 plywood, grooves 8" O. C.
Z-flashing—siding	2 pieces @ 12'	Galvanized 18-gauge
Horizontal wall trim	2 @ 12'	1 × 4 cedar
Corner trim	8 @ 8'	1 × 4 cedar
Fascia	6 @ 10', 2 @ 8'	1 × 6 cedar
Subfascia	4 @ 8'	1 × 4 pine
Plywood soffit	1 sheet @ 10'	⅜" cedar or fir plywood
Soffit vents	4 @ 4 × 12"	Louver w/ bug screen
Z-flashing—garage door	1 @ 10'	Galvanized 18-gauge

Description	Quantity/Size	Material
Roofing		
Roof sheathing	12 sheets @ 4 × 8'	½" plywood
Shingles	3 squares	250# per square (min.)
15# building paper	300 sq. ft.	
Metal drip edge	2 @ 14', 2 @ 12'	Galvanized metal
Roof vents (optional)	2 units	
Window		
Frame	3 @ 6'	¾ × 4" (actual) S4S cedar
Stops	4 @ 8'	1 × 2 S4S cedar
Glazing tape	30 lin. ft.	
Glass	1 piece—field measure	¼" clear, tempered
Exterior trim	3 @ 6'	1 × 4 S4S cedar
Interior trim (optional)	3 @ 6'	1 × 2 S4S cedar
Door		
Frame	3 @ 8'	1 × 6 S4S cedar
Door sill	1 @ 6'	1 × 6 S4S cedar
Stops	1 @ 8', 1 @ 6'	1 × 2 S4S cedar
Panel material	4 @ 8'	1 × 8 T&G V-joint S4S cedar
Door X-brace/panel trim	4 @ 6', 2 @ 8'	1 × 4 S4S cedar
Exterior trim	1 @ 8', 1 @ 6'	1 × 4 S4S cedar
Interior trim (optional)	1 @ 8', 1 @ 6'	1 × 2 S4S cedar
Strap hinges	4	
Garage Door		
Frame	3 @ 8'	1 × 8 S4S cedar
Door	1 @ 8' × 6' - 8"	Sectional flush door w/2" track
Rails	2 @ 8'	2 × 6
Trim	3 @ 8'	1 × 4 S4S cedar
Fasteners		
Anchor bolts	16	⅜" × 8", with washers & nuts, galvanized
16d galvanized common nails	2 lb.	
16d common nails	17 lb.	
10d common nails	2 lb.	
10d galvanized casing nails	1 lb.	
8d common nails	3 lb.	
8d galvanized finish nails	6 lb.	
8d box nails	6 lb.	
6d galvanized finish nails	20 nails	
3d galvanized box nails	½ lb.	
⅞" galvanized roofing nails	2½ lb.	
2½" deck screws	24 screws	
1¼" wood screws	48 screws	
Construction adhesive	2 tubes	
Silicone-latex caulk	2 tubes	

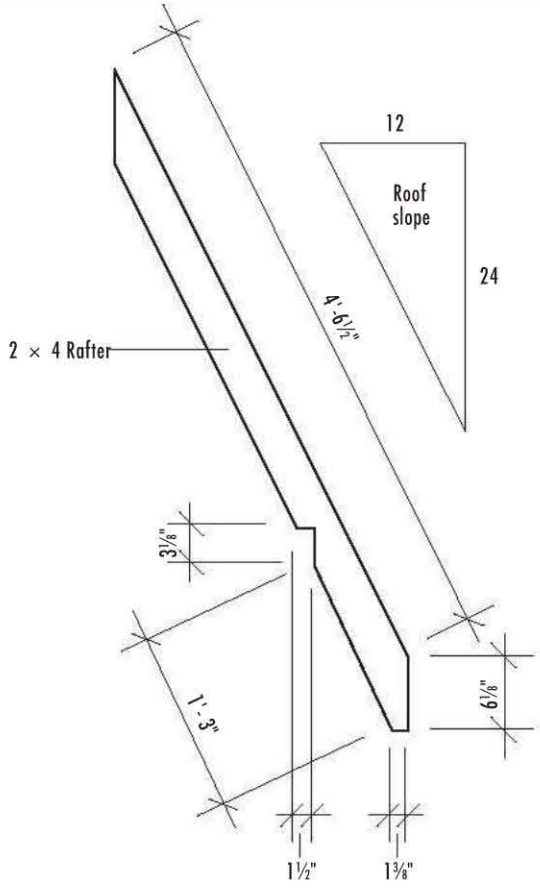
Building Section

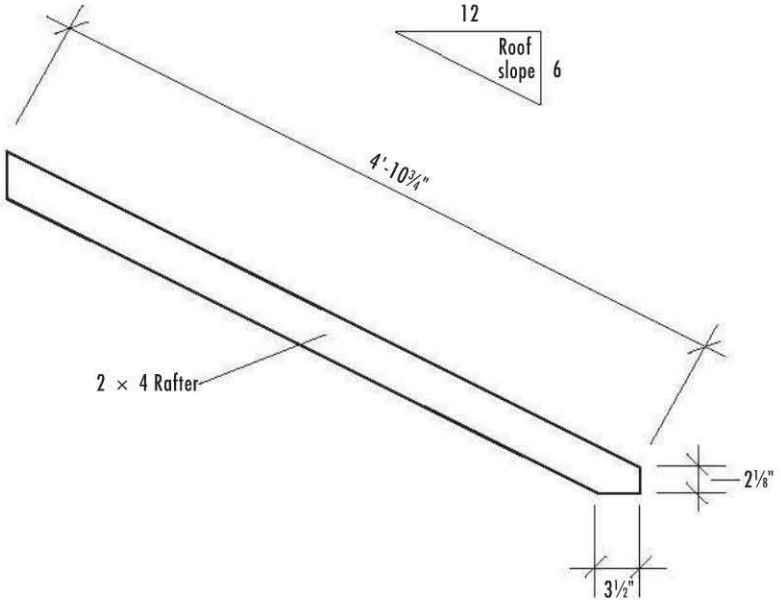


Floor Plan

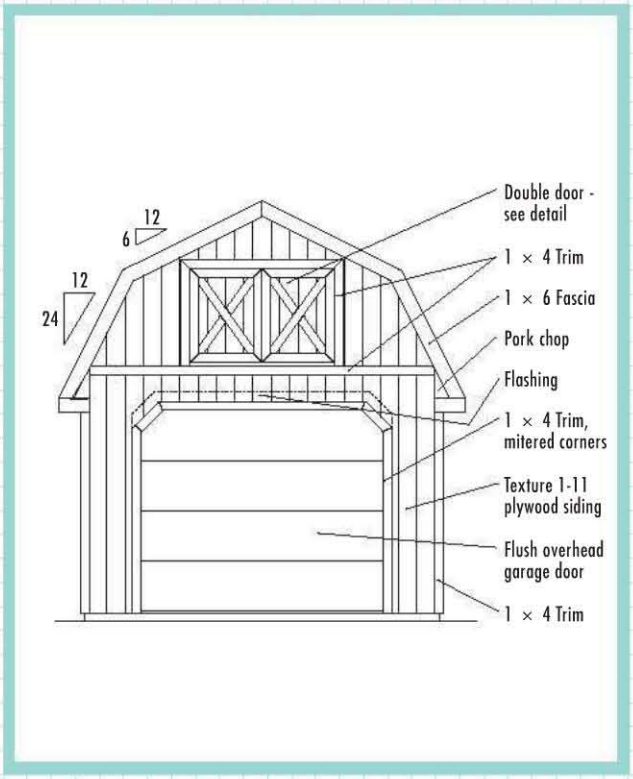

Roof lines shown dashed
2 × 4 Studs 16" O.C.
3½" Floating concrete slab on-grade
w/ 6 × 6" - 10/10 W.W.M.
12'-0"
3'-6"
5'-0"
Rough opening
3'-6"
12'-0"
8' × 6'-8"
Garage door
2'-0"
Rough opening
8'-0"
2'-0"
12'-0"
Dimensions are to outside faces of studs

Rafter Templates

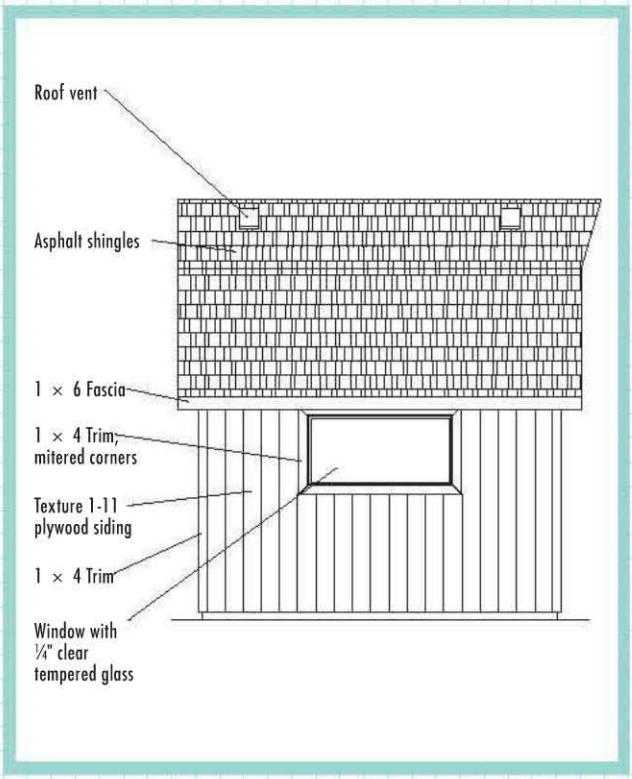




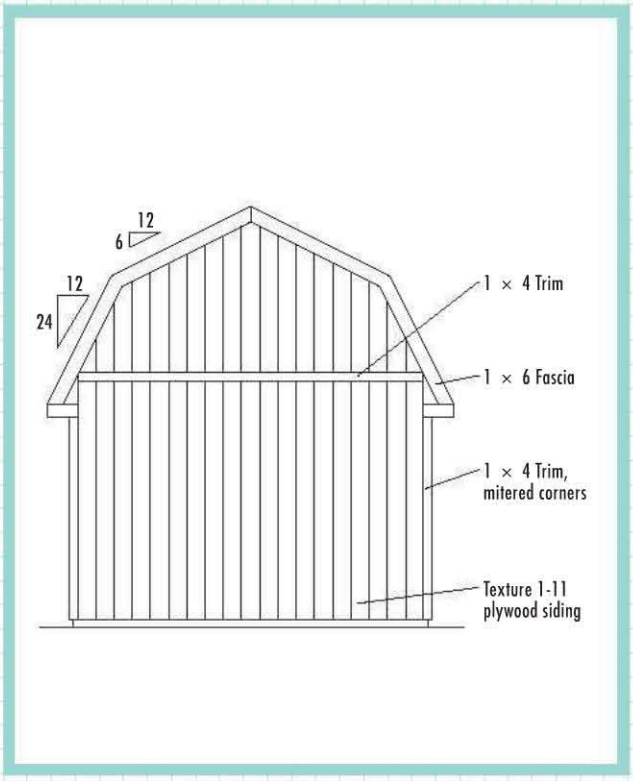
Front Elevation



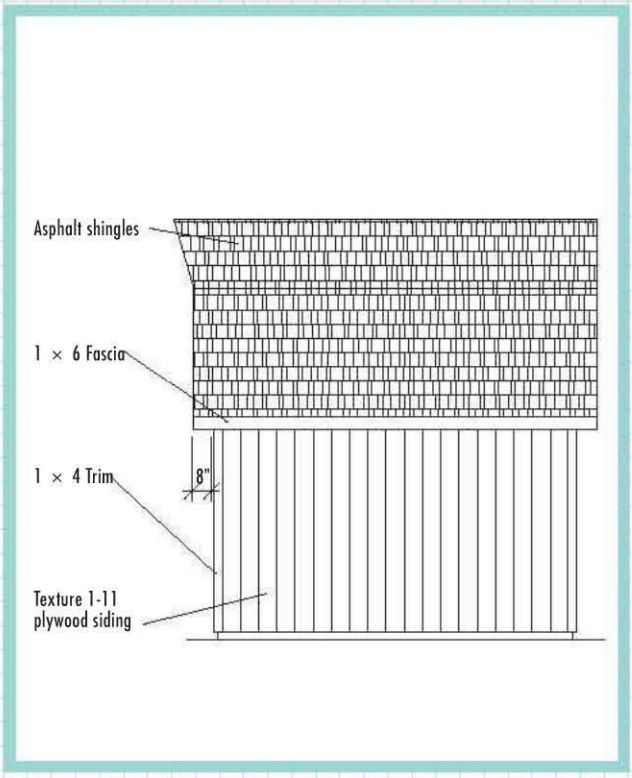
Left Side Elevation



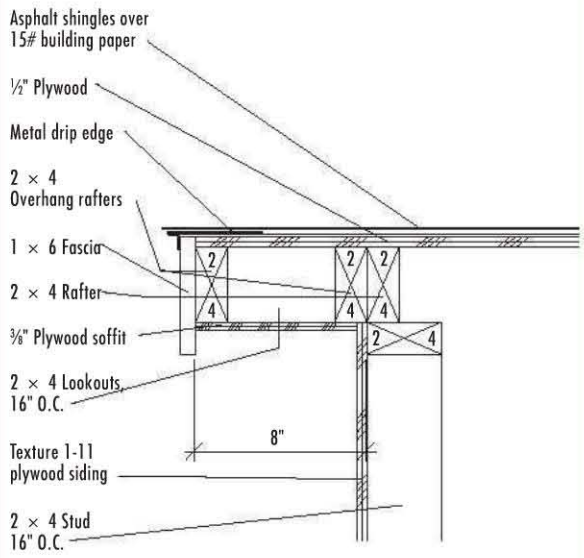
Rear Elevation



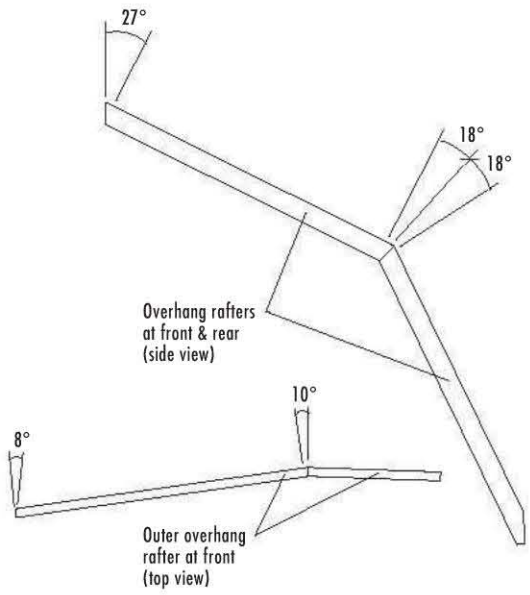
Right Side Elevation



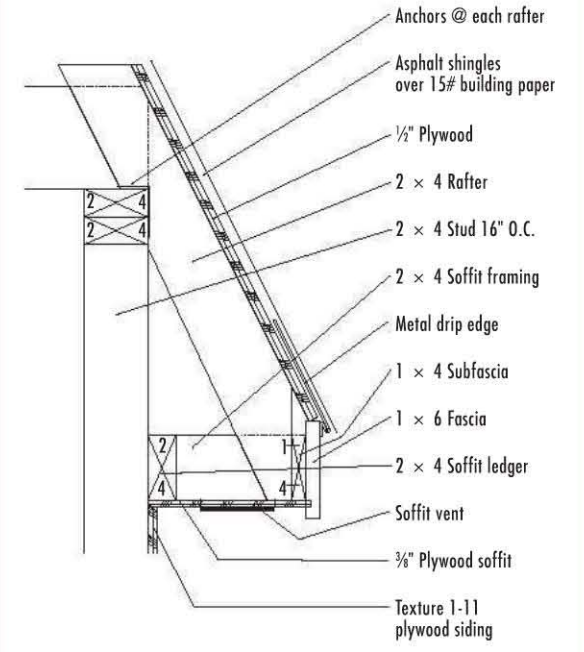
Gable Overhang Detail



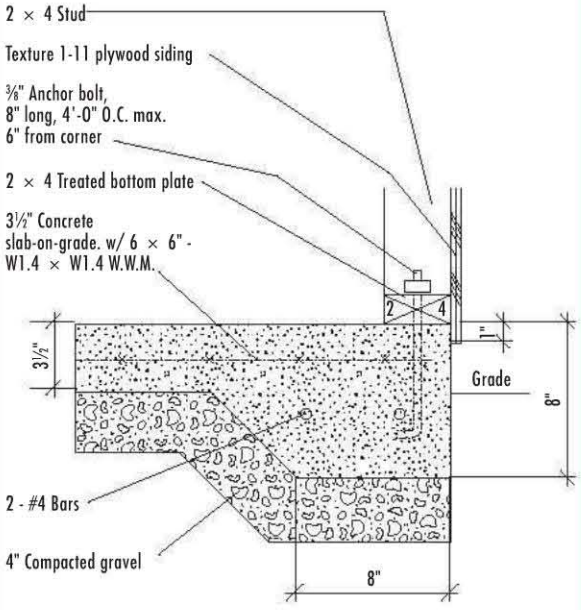
Gable Overhang Rafter Details



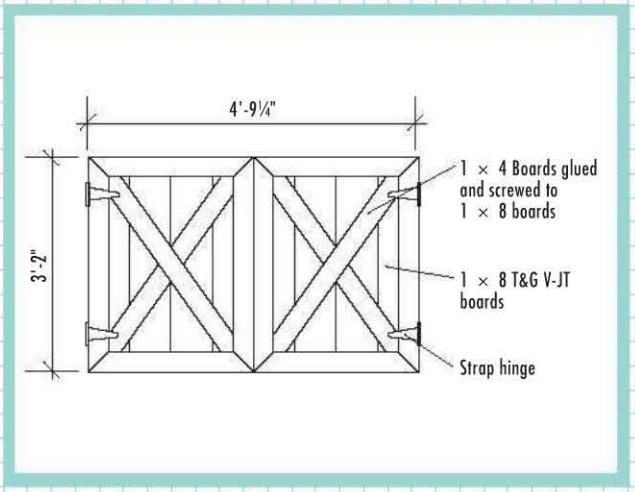
Eave Detail



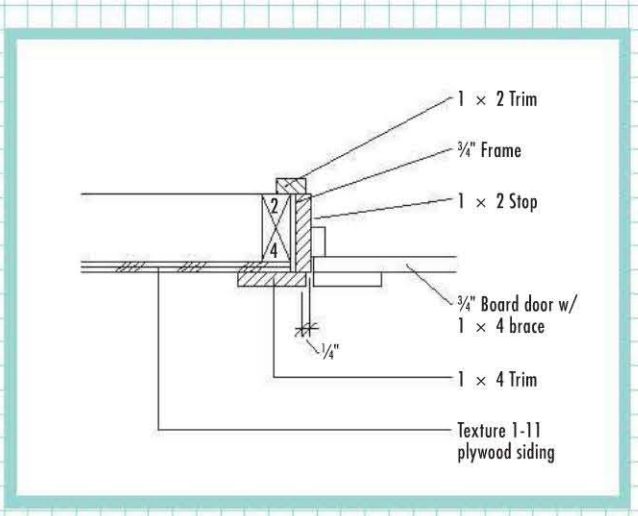
Sill Detail



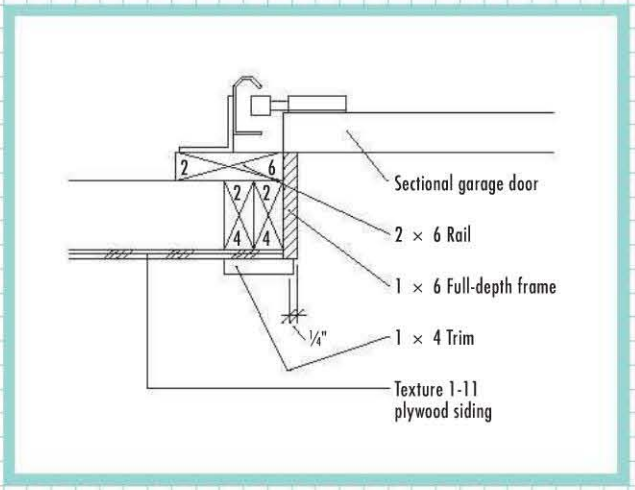
Attic Door Elevation



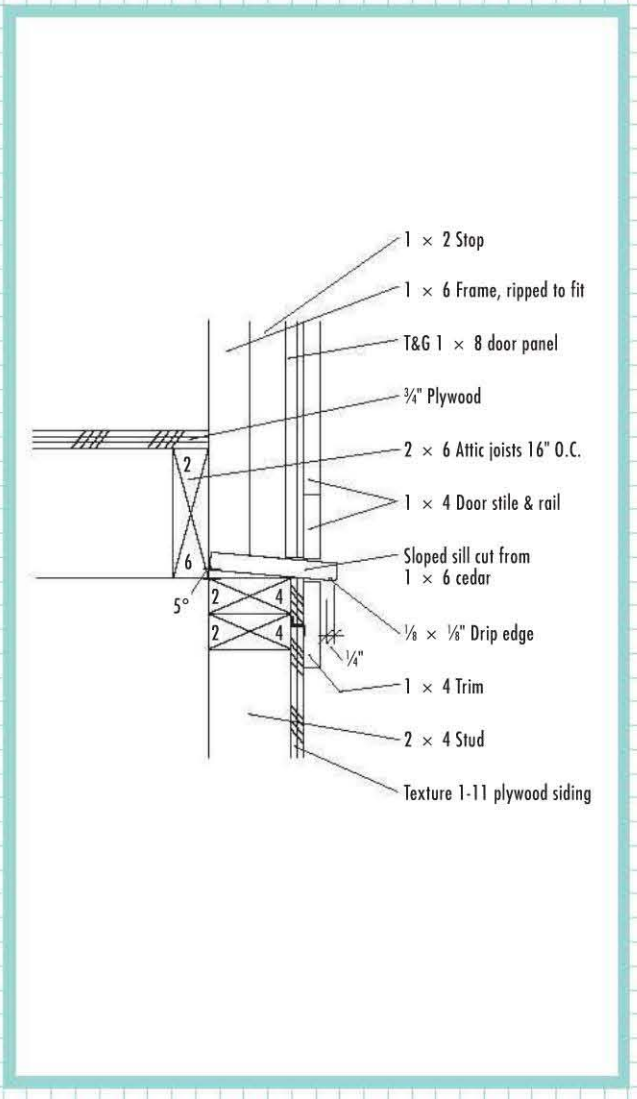
Attic Door Jamb Detail



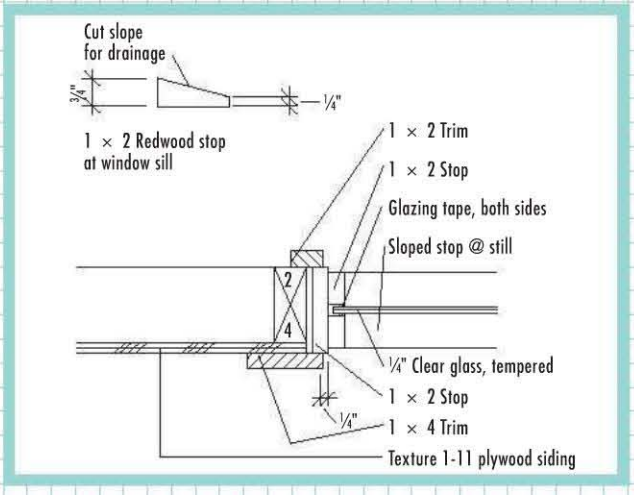
Garage Door Trim Detail



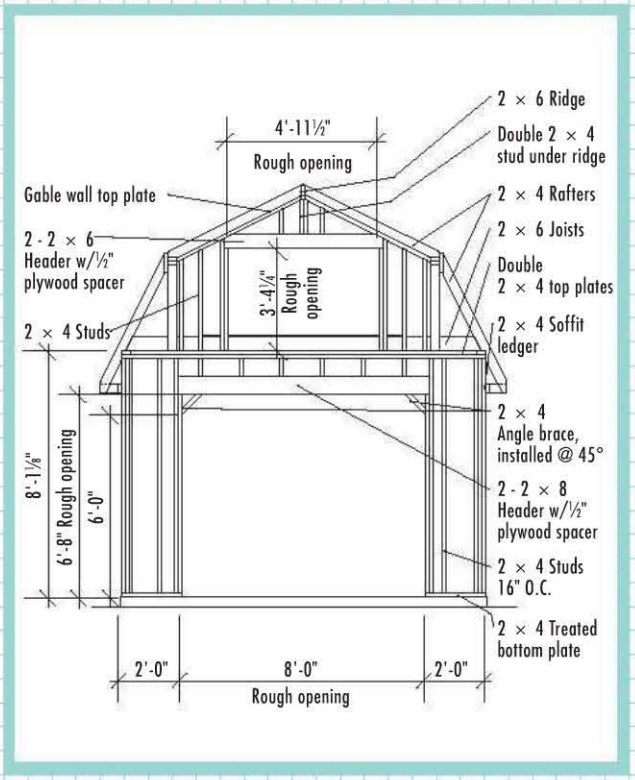
Attic Door Sill Detail



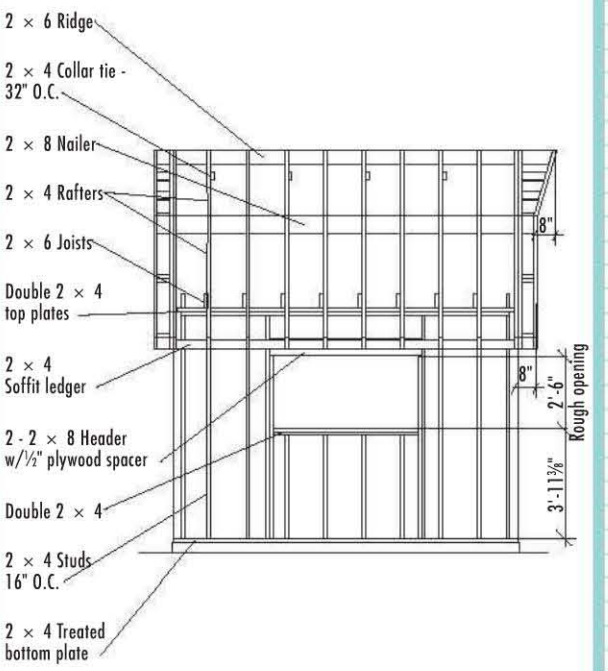
Window Jamb Detail



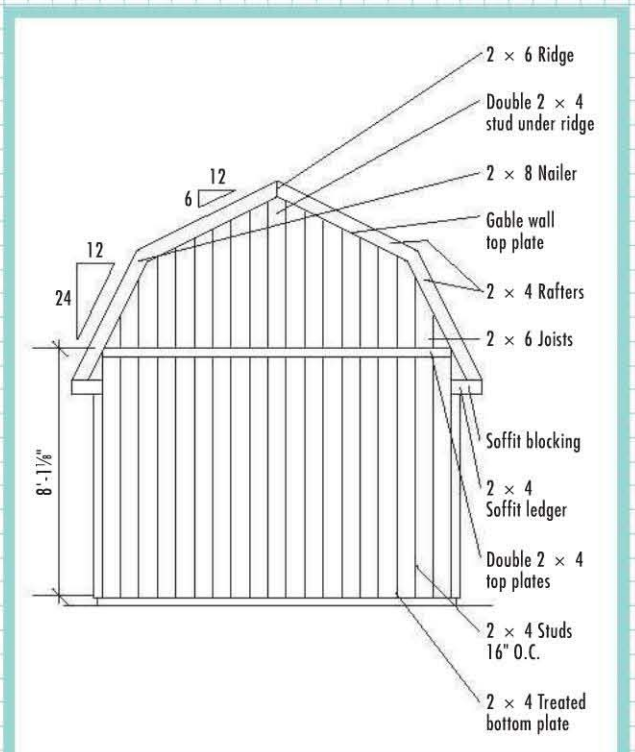
Front Framing Elevation



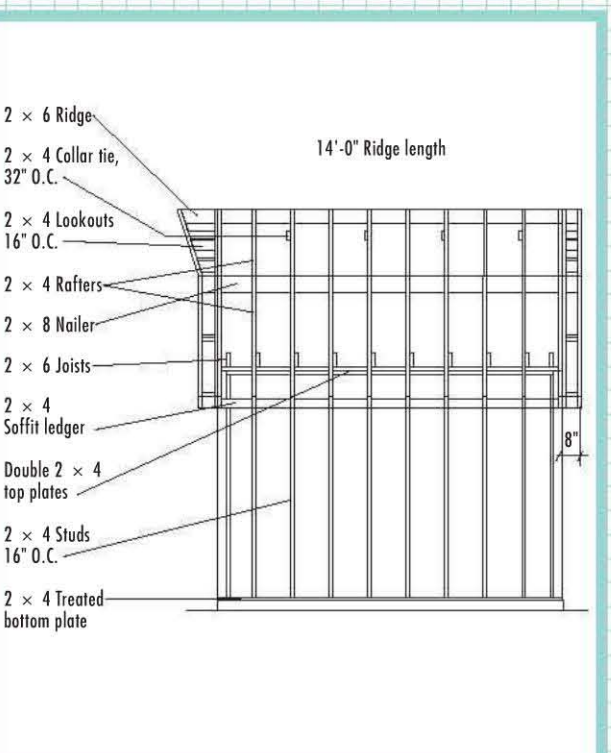
Left Side Framing Elevation



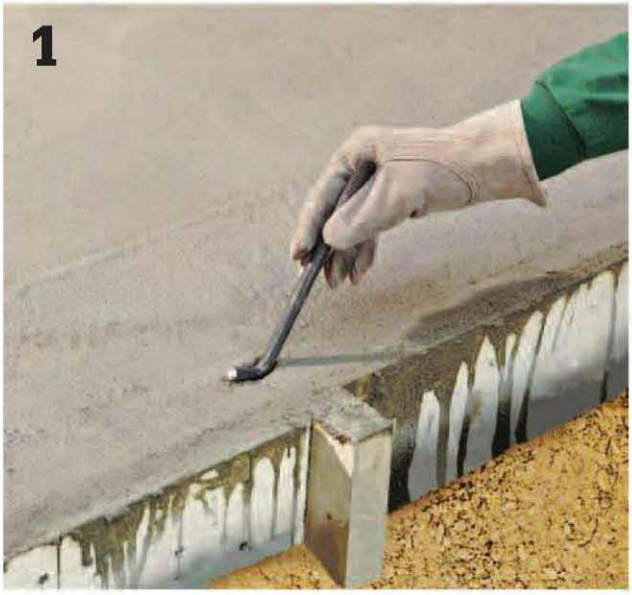
Rear Framing Elevation



Right Side Framing Elevation



How to Build the Gambrel Garage



Build the slab foundation at 144" × 144". Set J-bolts into the concrete 1¾" from the outer edges and extending 2½" from the surface. Set a bolt 6" from each corner and every 48" in between (except in the door opening). Let the slab cure for at least three days before you begin construction.

Snap chalk lines on the slab for the wall plates. Cut two bottom plates and two top plates at 137" for the sidewalls. Cut two bottom and two top plates at 144" for the front and rear walls. Use pressure-treated lumber for all bottom plates. Cut 38 studs at 92⅝", plus 2 jack studs for the garage door at 78½" and 2 window studs at 75⅞". *Note: Add the optional slab now, as desired.*

Construct the built-up 2 × 8 headers at 99" (garage door) and 63" (window). Frame, install, and brace the walls with double top plates one at a time following the Floor Plan (page 120) and Elevation drawings (page 122). Use galvanized nails to attach the studs to the sole plates. Anchor the walls to the J-bolts in the slab with galvanized washers and nuts.

Build the attic floor. Cut ten 2 × 6 joists to 144" long, then clip each top corner with a 1½"-long, 45° cut. Install the joists as shown in the Framing Elevations drawings (page 125), leaving a 3½" space at the front and rear walls for the gable wall studs. Fasten the joists with three 8d nails at each end.

Frame the attic knee walls. Cut four top plates at 144" and two bottom plates at 137". Cut 20 studs at 26⅝" and 4 end studs at 33⅝". Lay out the plates so the studs fall over the attic joists. Frame the walls and install them 18⅛" from the ends of the joists, then add temporary bracing. *Option: You can begin building the roof frame by cutting two 2 × 8 nailers to 144" long. Fasten the nailers to the knee walls so their top edges are 32⅝" above the attic joists.*

Cover the attic floor between the knee walls with ½" plywood. Run the sheets perpendicular to the joists, and stop them flush with the outer joists. Fasten the flooring with 8d ring-shank nails every 6" along the edges and every 12" in the field of the sheets.

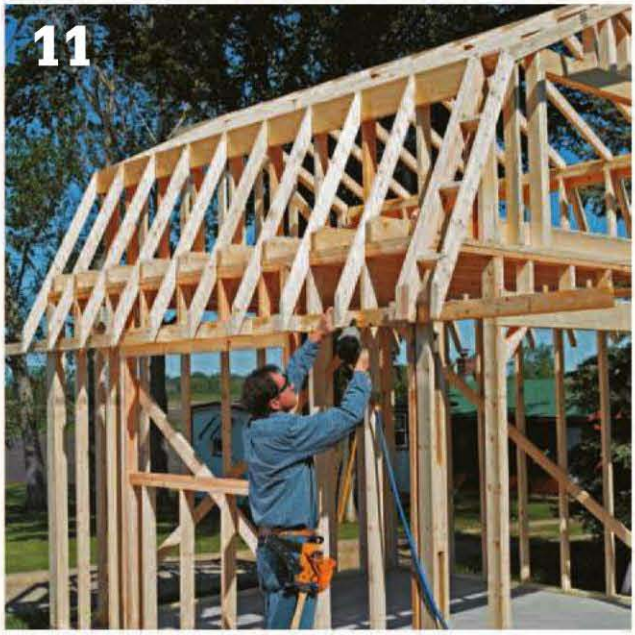
Mark the rafter layouts onto the top and outside faces of the 2 × 8 nailers; see the Framing Elevations drawings (page 125).

Cut the 2 × 6 ridgeboard at 168", mitering the front end at 16°. Mark the rafter layout onto the ridge. The outer common rafters should be 16" from the front end and 8" from the rear end of the ridge.

(continued)

Use the Rafter Templates (page 121) to mark and cut two upper pattern rafters and one lower pattern rafter. Test-fit the rafters and make any needed adjustments. Use the patterns to mark and cut the remaining common rafters (20 total of each type). For the gable overhangs, cut an additional eight lower and six upper rafters following the Gable Overhang Rafter Details (page 123).

Install the common rafters. Then reinforce the joints at the knee walls with framing connectors. Also nail the attic joists to the sides of the floor rafters. Cut four 2 × 4 collar ties at 34", mitering the ends at 26.5°. Fasten them between pairs of upper rafters, as shown in the Building Section (page 119) and Framing Elevations drawing (page 125).

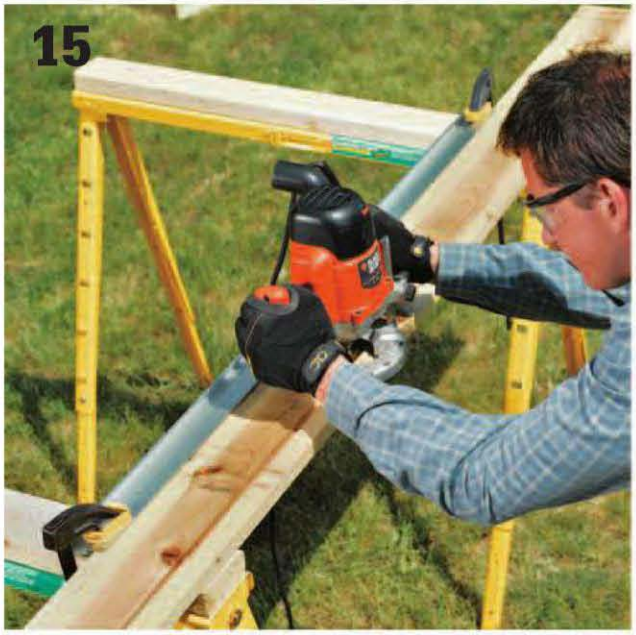


Snap a chalk line across the sidewall studs, level with the ends of the rafters. Cut two 2 × 4 soffit ledgers at 160" and fasten them to the studs on top of the chalk lines with their ends overhanging the walls by 8". Cut twenty-four 2 × 4 blocks to fit between the ledger and rafter ends, as shown in the Eave Detail (page 123). Install the blocks.

Frame the gable overhangs. Cut twelve 2 × 4 lookouts at 5" and nail them to the inner overhang rafters as shown in the Left and Right Side Framing Elevations (page 122). Install the inner overhang rafters over the common rafters using 10d nails. Cut the two front (angled) overhang rafters; see the Gable Overhang Rafter Details (page 123). Install those rafters; then add two custom-cut lookouts for each rafter.

To complete the gable walls, cut top plates to fit between the ridge and the attic knee walls. Install the plates flush with the outer common rafters. Mark the stud layout onto the walls and gable top plate. See the Front and Rear Framing Elevations (page 125). Cut the gable studs to fit and install them. Construct the built-up 2 × 6 attic door header at 62½"; then clip the top corners to match the roof slope. Install the header with jack studs cut at 40¼".

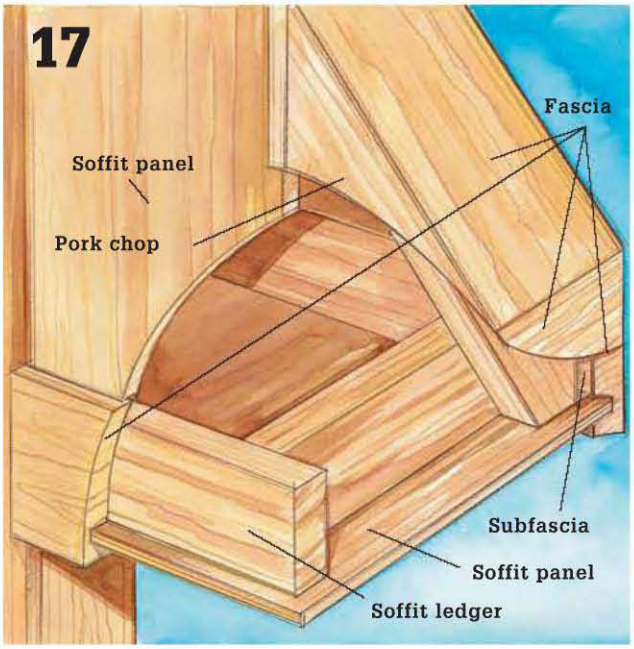
Install siding on the walls, holding it 1" below the top of the concrete slab. Add Z-flashing along the top edges, and then continue the siding up to the rafters. Below the attic door opening, stop the siding about ¼" below the top wall plate. As shown in the Attic Door Sill Detail (page 124). Don't nail the siding to the garage door header until the flashing is installed.



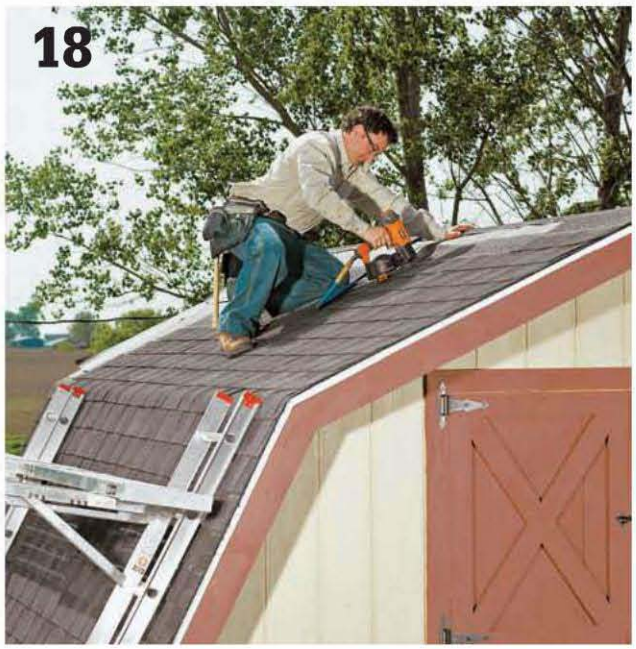
Mill a ⅜"-wide × ¼"-deep groove into the 1 × 6 boards for the horizontal fascia along the eaves and gable ends (about 36 lin. ft.); see the Eave Detail (page 123). Use a router or table saw with a dado-head blade to mill the groove, and make the groove ⅞" above the bottom edge of the fascia.

Install the 1 × 4 subfascia along the eaves, keeping the bottom edge flush with the ends of the rafters and the ends flush with the outsides of the outermost rafters. Add the milled fascia at the eaves, aligning the top of the groove with the bottom of the subfascia. Cut fascia to wrap around the overhangs at the gable ends but don't install them until step 17.

(continued)

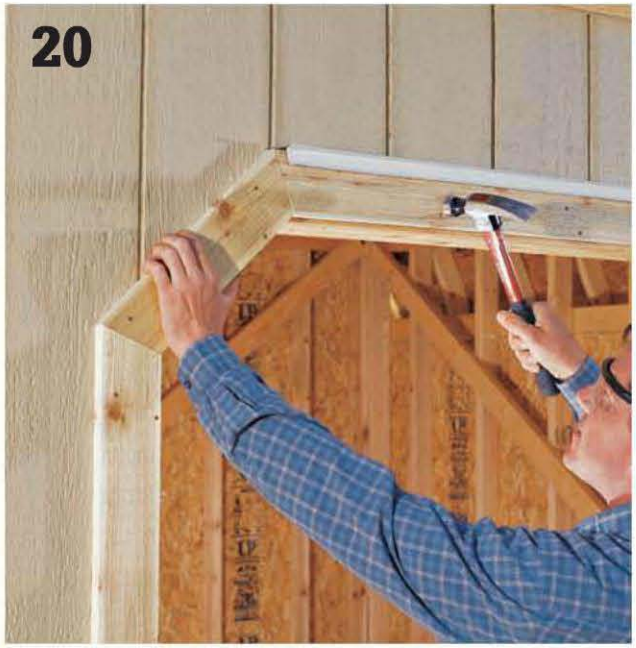


Add fascia at the gable ends, holding it up ½" to be flush with the roof sheathing. Cut soffit panels to fit between the fascia and walls, and fasten them with 3d galvanized nails. Install the end and return fascia pieces at the gable overhangs. Enclose each overhang at the corners with a triangular piece of grooved fascia (called a pork chop) and a piece of soffit material. Install the soffit vents as shown in the Eave Detail (page 123).

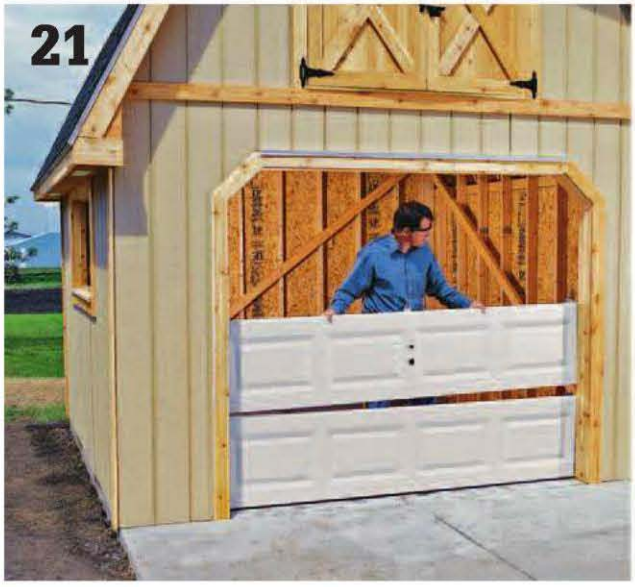


Sheath the roof starting at one of the lower corners. Add metal drip edge along the eaves, followed by building paper; then add drip edge along the gable ends over the paper. Install the asphalt shingles (see pages 63 to 66). Plan the courses so the roof transition occurs midshingle, not between courses; the overlapping shingles will relax over time. If desired, add roof vents (pages 66 to 67).

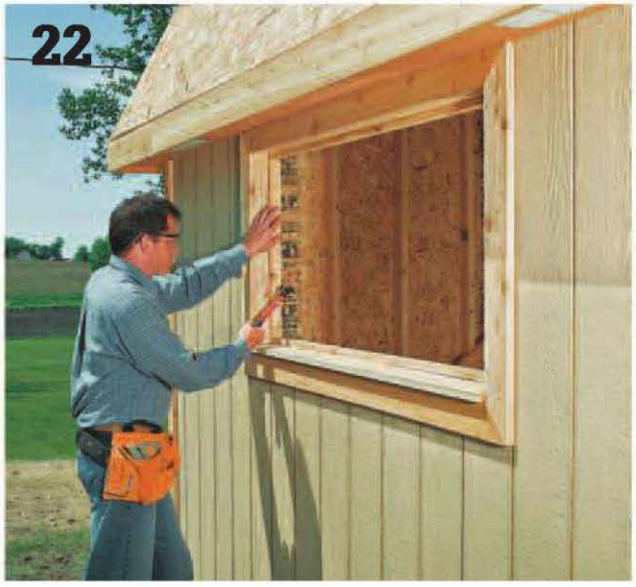
Cover the Z-flashing at the rear wall with horizontal 1 × 4 trim. Finish the four wall corners with overlapping vertical 1 × 4 trim. Install the 2 × 6 rails that will support the garage door tracks following the door manufacturer's instructions to determine the sizing and placement; see the Garage Door Trim Detail (page 124).



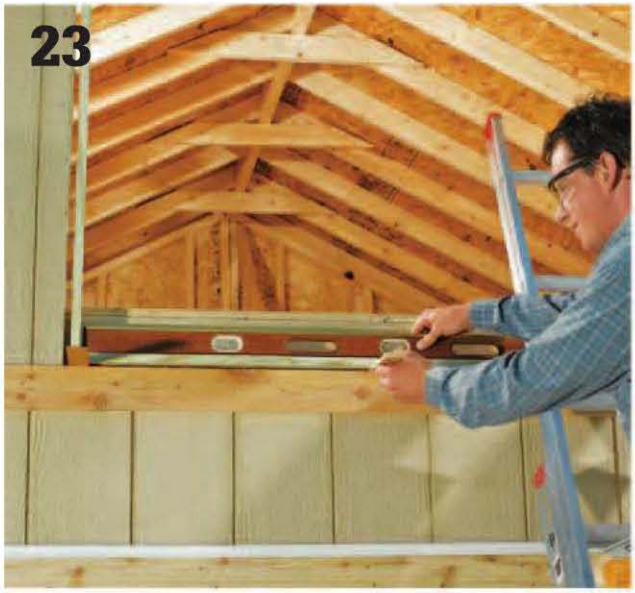
For the garage door frame, rip 1 × 8 trim boards to width so they cover the front wall siding and 2 × 6 rails, as shown in the Garage Door Trim Detail (page 124). Install the trim, mitering the pieces at 22.5°. Install the 1 × 4 trim around the outside of the opening, adding flashing along the top. See the Front Elevation (page 122).



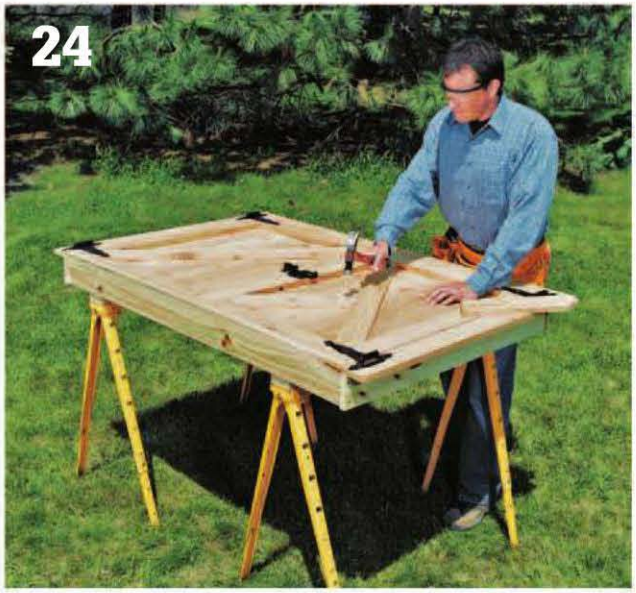
Install the garage door in the door opening following the manufacturer's directions.



Build the window frame, which should be ½" narrower and shorter than the rough opening. Install the frame using shims and 10d galvanized casing nails, as shown in the Window Jamb Detail (page 124). Cut eight 1 × 2 stop pieces to fit the frame. Bevel the outer sill stop for drainage. Order glass to fit or cut your own plastic panel. Install the glazing and stops using glazing tape for a watertight seal. Add the window trim.



For the attic door frame, rip 1 × 6s to match the depth of the opening and cut the head jamb and side jambs. Cut the sill from full-width 1 × 6 stock; then cut a kerf for a drip edge (see the Attic Door Sill Detail, page 124). Fasten the head jamb to the side jambs and install the sill at a 5° slope between the side jambs. Install the door frame using shims and 10d casing nails. Add shims or cedar shingles along the length of the sill to provide support underneath. The front edge of the frame should be flush with the face of the siding. Add 1 × 2 stops at the frame sides and top ¾" from the front edges.



Build the attic doors as shown in the Attic Door Elevation (page 124), using glue and 1¼" screws. Each door measures 28⅝" × 38", including the panel braces. Cut the 1 × 8 panel boards about ⅛" short along the bottom to compensate for the sloping sill. Install the door with two hinges each. Add 1 × 4 horizontal trim on the front wall up against the doorsill; then trim around both sides of the door frame. Prime and paint as desired.

Carport

A carport provides a low-cost alternative to a garage, protecting your vehicle from direct rain, snow, and sunlight. Because it is not an enclosed structure, a carport is not held to the same building restrictions as a garage. This carport plan provides a 10 × 16-foot coverage area that is large enough to accommodate most full-size vehicles. To help ease the building process, premanufactured trusses are used. When ordering trusses, specify the roof pitch, distance being spanned, and the amount of overhang of the rafter tails. Also, place your order a few weeks in advance of your project start date. Many home centers and lumber yards carry in-stock trusses in standard dimensions and roof pitches, such as a 10-foot span with a 6-in-12 pitch—the dimensions used in this project.

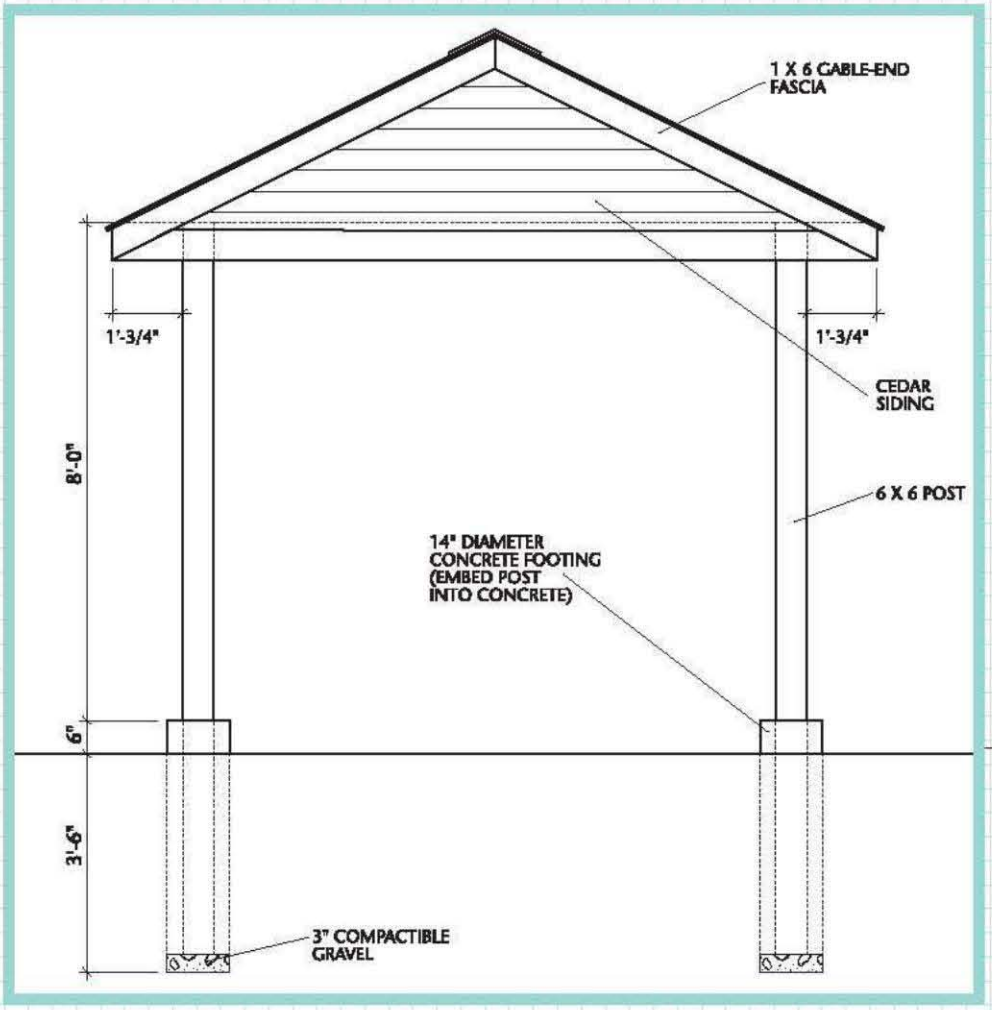
This project also features metal roofing panels, an attractive and easy-to-install roofing material that does not require a roof deck. The trusses are tied together with 2 × 4 purlins, which also provide nailers for the metal roof panels. The panels are fastened with self-tapping metal roofing screws with rubber washers to prevent water leakage. Because of the scale of this project, recruit the help of at least one other person.

A carport is faster, easier, and cheaper to build than a full garage, but the storage and security benefits these structures offer are more limited.

Materials & Cutting List ▸

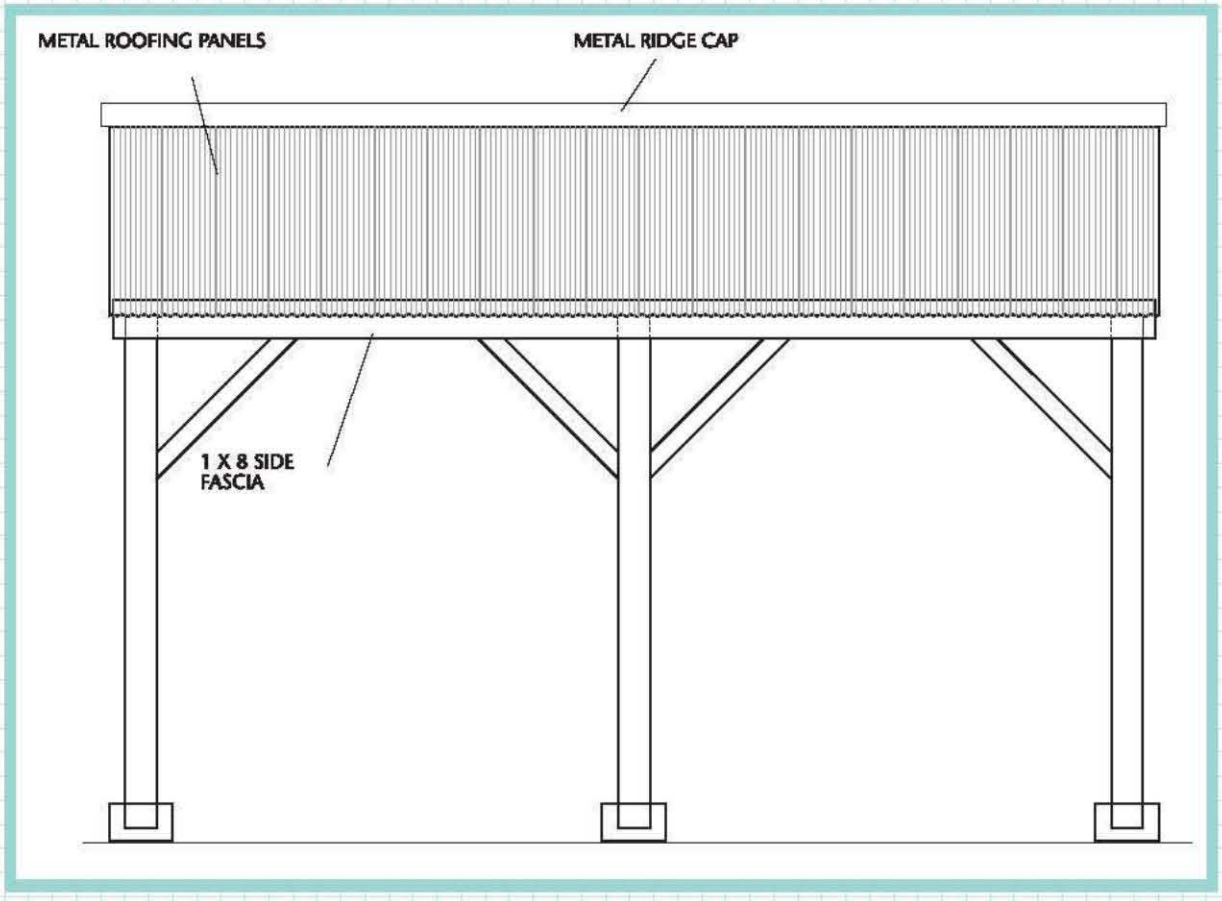
Description	Quantity/Size	Material
Foundation		
Batterboards/braces	10 @ 8'-0"	2 × 4
Drainage material	1⅔ cu. ft.	Compactible gravel
Concrete tube forms	6 @ 14"-dia.	
Concrete	field measure	3,000 psi concrete
Beam Framing		
Posts (6)	6 @ 12'	6 × 6 rough-sawn cedar
Side beams (4)	4 @ 16'	2 × 8 pressure treated
End beams (2)	2 @ 12'	2 × 8 pressure treated
Lateral beams (4)	4 @ 10'	2 × 8 pressure treated
Diagonal supports (8)	4 @ 8'	4 × 4 cedar
Roof Framing		
Gable braces (8)	4 @ 10', 2 @ 8'	2 × 4
Trusses, 2 end and 11 common (13)	13 @ 10' span	2 × 4 with 6-in-12 pitch
Purlins (10)	20 @ 8'	2 × 4
Metal hurricane ties	22, with nails	Simpson H-1
Metal hurricane ties	4, with nails	Simpson H-2.5
Roofing		
Metal roofing panels	8 @ 4' × 8'	with ridge cap and sealer strip
Gable Finishes		
Gable-end purlin blocking (16)	3 @ 8'	2 × 2
Blocking (8)	5 @10'	1 × 6
Gable sheathing (4)	2 @ 4 × 8'	¾" CDX plywood
Gable end fascia (4)	4 @ 8'	1 × 6 cedar
Side fascia (2)	4 @ 10'	1 × 8 cedar
Siding		
Siding (14)	14 @ 8'	cedar siding with 6" reveal

Description	Quantity/Size	Material
Fasteners		
1½" deck screws		
2½" deck screws		
6d galvanized common nails		
8d galvanized common nails		
8d joist hanger nails		
10d galvanized common nails		
⅜" x 4" galvanized lag screws	48, with washers	
⅜" x 5" galvanized lag screws	12, with washers	
10d ringshank nails		
6d galvanized casing nails		
6d siding nails		
1" self-tapping metal roofing screws with rubber washers (as specified by metal roofing manufacturer)		
2½" self-tapping metal roofing screws with rubber washers (as specified by metal roofing manufacturer)		

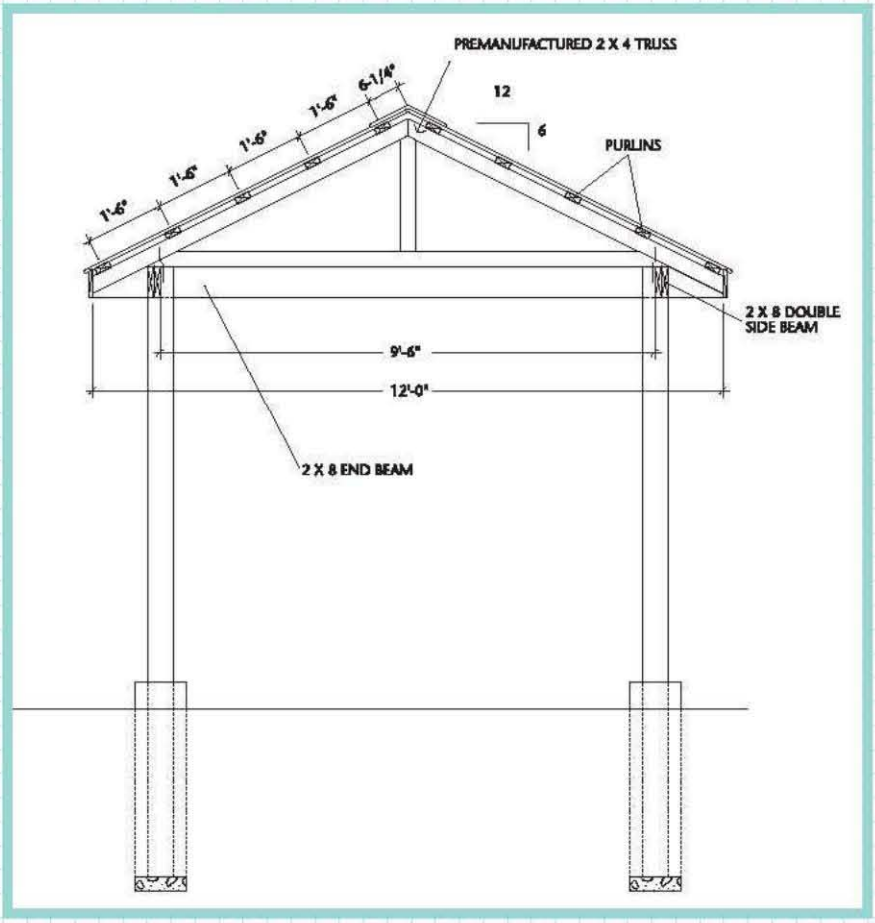


Front Elevation

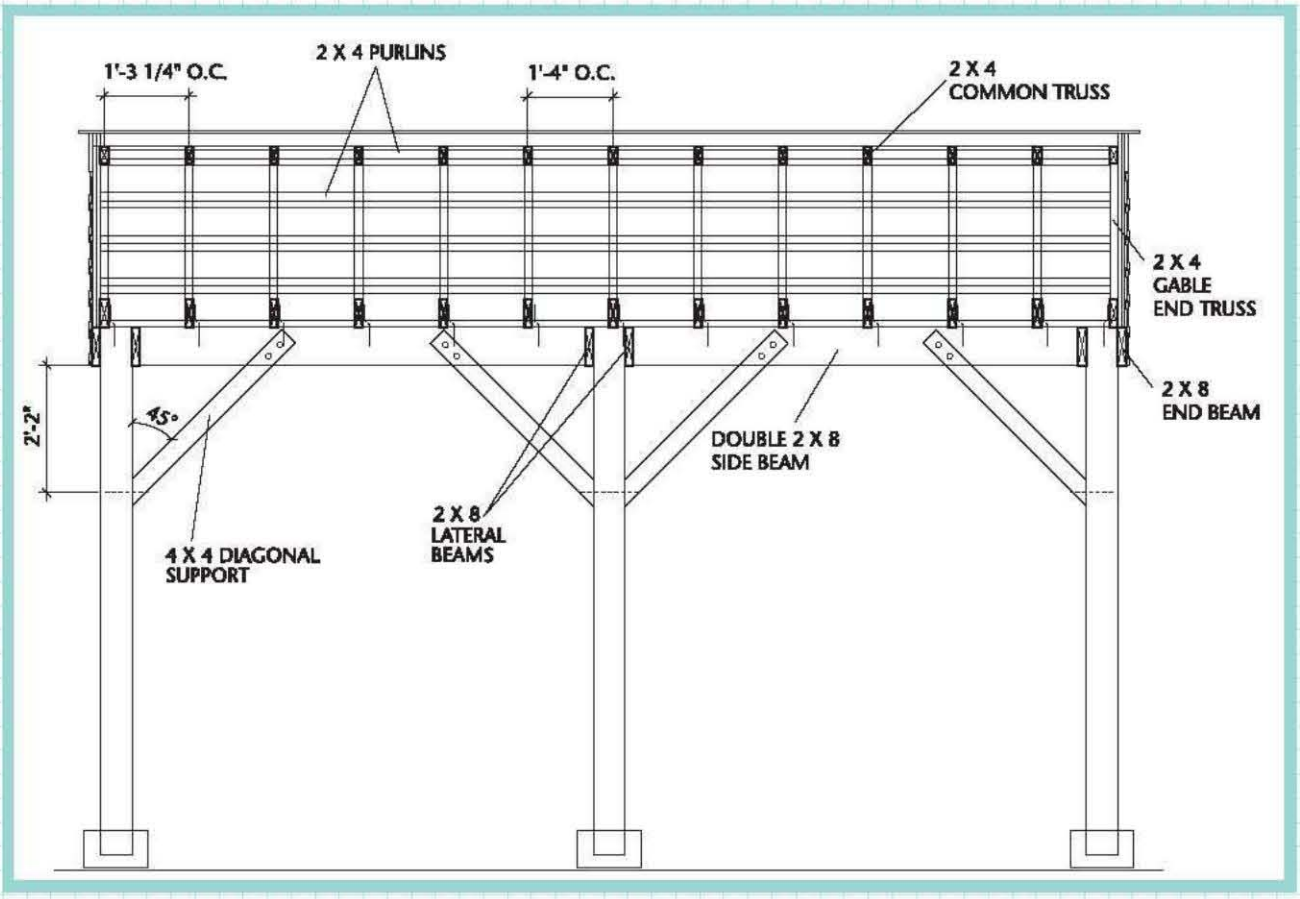
Side Elevation



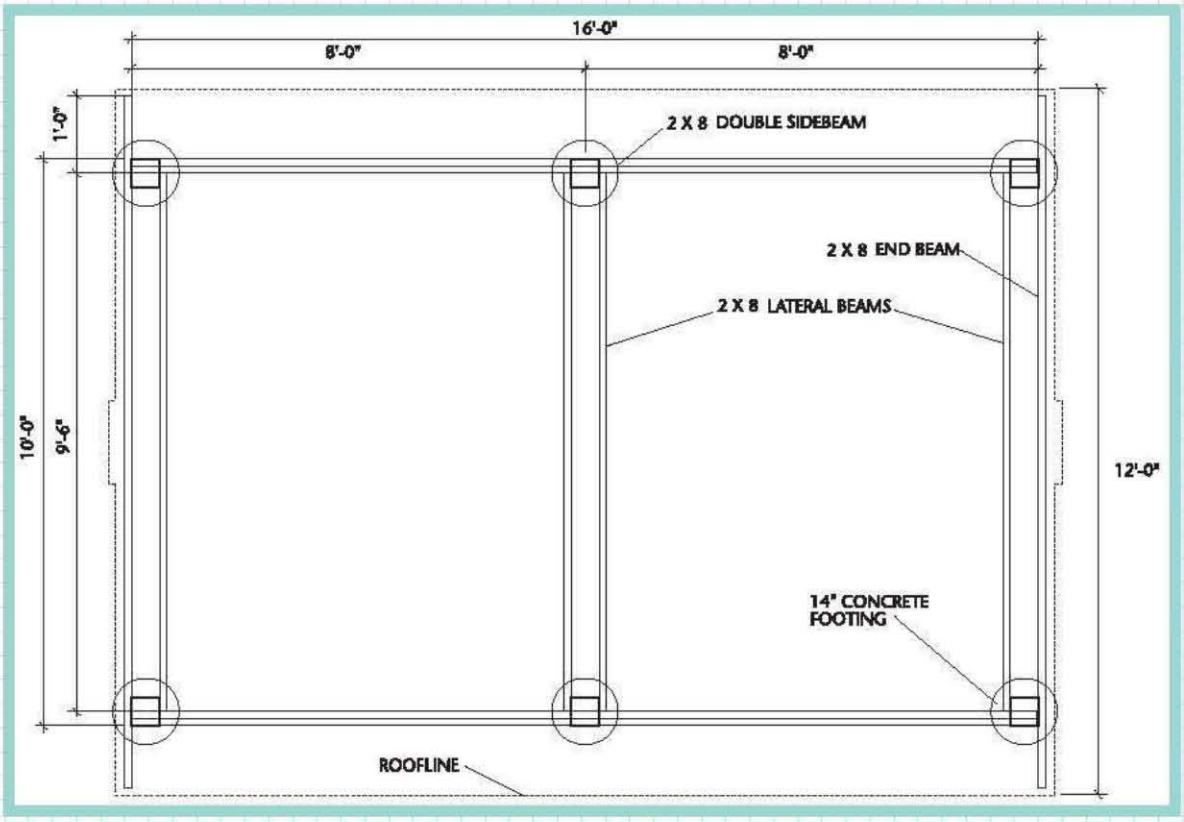
Front Section



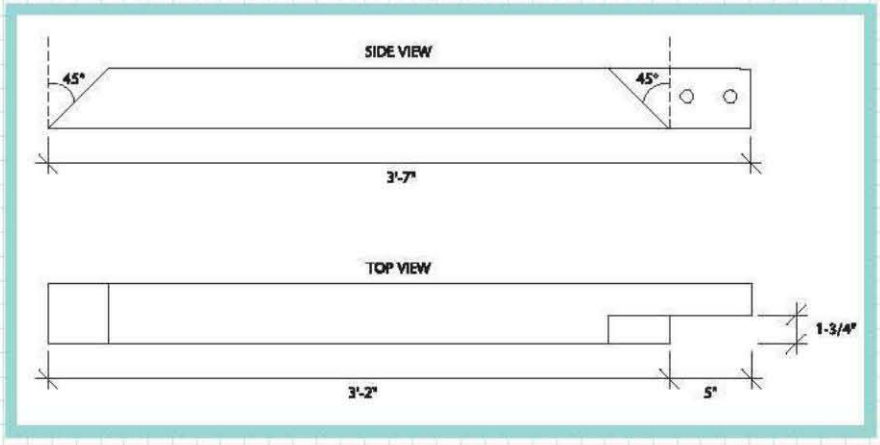
Side Section

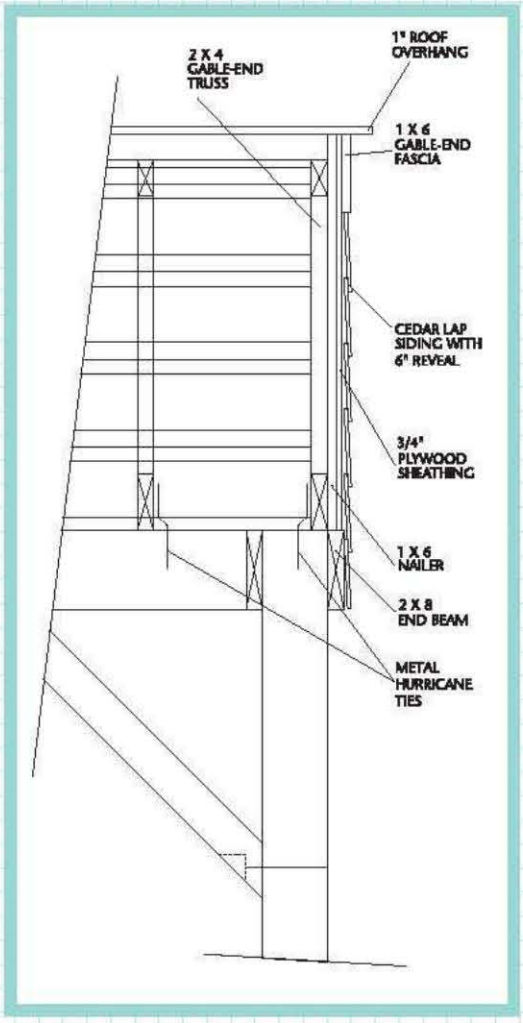


Beam Framing Plan



Diagonal Support Detail





Gable End Detail

How to Build a Carport

Lay out the rough location of the carport with stakes and string, creating an area 10 feet wide and 16 feet long. Install ten 2 × 4 batterboard sets with crosspieces about 2" below the tops of the stakes. Run level mason's strings between the batterboards at planned post locations. Measure and mark the exact post locations on the layout strings according to your plan, and then drive wooden stakes to mark their locations on the ground.

Dig post footing holes for 14"-dia. footings at least 6" deeper than your local frost line. Use a power auger or clamshell digger. Make sure the holes are centered on the stakes. Many local building codes require bell-shaped flares at the footing bases. Pour 2 to 3" of compactable gravel into each footing hole. Set a concrete tube form into each hole, then insert a 6 × 6 post that's slightly longer than the final post height. Brace and plumb the posts, check alignment, and then fill footing holes with concrete.

Trim the post tops. Mark the finished height onto one post and draw a cutting line. Transfer the cutting line to all other posts using a mason's string and line level or a laser level as a reference. Trim the posts to height. Scribe a 3"-wide × 7¼"-deep notch on the outside face of each post, and then cut the notches with a circular saw.

Install the side beams. Cut four 2 × 8s at 192" using a circular saw. Then clamp the boards together in pairs and facenail with 10d common nails to make the side beams. Lift the beams into the notches and clamp into position so the ends of the beams are flush with the edges of the posts. Fasten each beam with two ⅜ x 5" galvanized lag screws and washers.

(continued)

Install end beams. Cut two 2 × 8 end beams at 144" using a circular saw. Then lift and position the end beams against the ends of the posts with the top edges flush with the post tops. The beams should extend 12" past each post on each end. Securely clamp the beams in position and fasten with two ⅜ × 4" lag screws with washers per joint.

Install lateral beams. Cut four 2 × 8 lateral beams to size and lift each beam into position between the side beams. Make sure the top edges of the beams are flush with the top of the posts and clamp in place. Drill a pair of ½"-deep counterbore holes using a 1" spade bit, then drill 3½"-deep, ¼" pilot holes at each location. Fasten the lateral beams with ⅜ x 4" lag screws with washers.

Install corbels. Cut eight 4 × 4 diagonal supports (corbels) to size, beveling one end and notching the other. At each post, measure down from the side beam and mark at 26". Position the beveled end of the support against the post aligned with the mark, and the notched-out end against the bottom edge of the inner member of the side beam. Clamp the support to the side beam and attach with ⅜ × 4" lag screws with washers.

Install the first truss. Place a gable truss on the ends of the side beams. Extend a pair of long 2 × 4s to the ground and clamp them to the truss so the truss is held in place in vertical position. Align each truss with the reference marks on the side beams, and then measure the overhang of each rafter tail to ensure proper placement. Use wood shims at the braces to keep the truss plumb, if necessary. Toenail the truss in place using 10d galvanized common nails. Install the truss at the other end of the carport. *Tip: Tack a chalk line to the rafter tails at each carport end so it spans the length. Draw the lines taut and use them as references for installing the common rafters.*

Install common trusses. Lift each truss up so its ends rest on the side beams—it's easier to do this if the truss is upside down (with the peak facing downward). When you are ready to install it, flip the truss right-side up and position it on the beams. Trusses do not always need to follow conventional rafter spacing (16 or 24" O.C.). Here, the carport design has the trusses spaced 27¼" apart O.C. Toenail the trusses to the beams with 10d nails. Install the trusses in order, tacking a 1 × 4 brace to the top chord to maintain the correct spacing and alignment. If you will be installing purlins for a panel roof, install one now in lieu of a brace.

Install the purlins. Metal and fiberglass roof panels don't require a deck, but they normally need to have evenly spaced sets of wood strips beneath them for reinforcement. Called purlins, these strips are mounted perpendicular to the trusses or rafters. Often, they are used to secure a profiled filler strip that fits underneath the roofing panel to support the profiled shape and create a seal. Snap chalk lines for alignment, and then install the purlins.

(continued)

Close off the gable ends. Install 1 × 6 blocking to fur out the chords and struts of the gable-end trusses. Measure the triangular shape of the gable-end wall from the top edge of the end beam to the top edge of the blocking. Divide the area into two equal-size triangular areas, and cut ¾" plywood sheathing to fit. Attach the sheathing with 1½" deck screws.

Cut 1 × 6 fascia boards—two for each gable end—long enough to extend from the peak to several inches past the ends of the rafter tails. Use a rafter square to mark the peak ends of the boards for the roof pitch, and then cut the angles. Fasten the gable-end fascia boards to the gable sheathing using 6d galvanized casing nails. Cut 1 × 8s to size for the side fascia boards and fasten with 6d galvanized casing nails driven into the ends of the rafter tails. Make sure the top edge of the fascia boards do not protrude above the top of the last row of purlins. Trim the ends of the gable-end fascia flush with the side fascia using a handsaw.

Install roofing panels. Lay the first metal roofing panel across the purlins and position it so the finished edge of the panel extends approximately 1" beyond the gable-end fascia, and 1" past the side fascia. Drive 1" metal roofing screws with rubber washers through the roof panel into the purlins (these are sometimes called pole barn screws). Space the fasteners according to the manufacturer's directions. Install all panels, overlapping each preceding panel according to the manufacturer's directions. Work from one gable end to the other. Install the final panel so the finished edge overhangs the gable-end fascia by 1".

Ridge Caps ▸

A cutaway view of the ridge cap shows how the cap fits over the sealer strip. The caulk and the rubber sealer strip form a barrier to water and pests.

Install the ridge cap (left). To seal the roof ridge, a metal cap piece that matches the roof panels is screwed over the open seam. Mark the location for the rubber sealer strip on the starter purlin 6¼" from the peak of the roof. Run a bead of caulk along the reference line, and then install sealer strips on both sides of the peak. Apply a caulk bead to the tops of the sealer strips, and then center the preformed metal ridge cap over the peak so it overhangs the finished edges of the gable-end roof panels by 1". At each ridge of the metal roof panels, drive 2½" metal roofing screws with rubber washers through the ridge cap and sealer strip.

Install siding. Choose a style and color of siding that matches or blends with your house siding and install it in the gable area. Here, cedar lap siding is being installed. Use a framing square or rafter square to mark cutting lines on the ends of each piece to match the roof pitch. Install a 2"-wide starter strip at the bottom, and then work your way up toward the gable peak. Maintain a consistent reveal, and nail the siding in areas that will be covered by the next course. Stain or seal any exposed cedar, such as the gable ends, side fascia, and posts.

Garage Workshop

There is no better spot for your dream workshop than in the garage. Because things you do in a workshop tend to produce noise and mess, a garage workshop has the advantage of isolation from the rest of the household. Whether your interests tend toward woodworking, metalworking, small engine repair, or just plain tinkering away with the ballgame on the radio, you'll spend plenty of quality time in your garage workshop.

In more temperate climates, garages often make better shops than basements. Ventilating the shop is as easy as opening the garage door or rolling machinery outside for doing dusty work. Garages usually have high finished ceilings or open trusses, so you can maneuver larger building materials and make taller projects without overhead restrictions. Having a shop on ground level also saves your back from straining when you need to move machinery, supplies, and projects in and out of the workshop.

If you'd rather not dedicate your entire garage to a workshop, you can still keep one or more stalls available for parking a car, bicycles, or a lawn tractor by simply mounting your tools and workbench on wheels. Wheels make it possible for one person to easily move even the largest machinery.

One problem with most garages is they don't have enough electrical outlets. Those that are present are often fed with an inadequate electrical supply. Many garages, even on new homes, are wired with a single circuit. Some garages on older homes have no electricity at all, especially if they are detached from the house. When a garage serves only as parking and storage space, a single electric circuit is sufficient for servicing a garage door opener, an overhead light, and maybe a few light-duty outlets. But once your garage becomes a workshop, you're going to need more electricity to power tools with larger motors, such as table saws and planers.

Creative use of space in and around your garage lets you build a workshop that meets your needs without making your garage unusable for other functions.

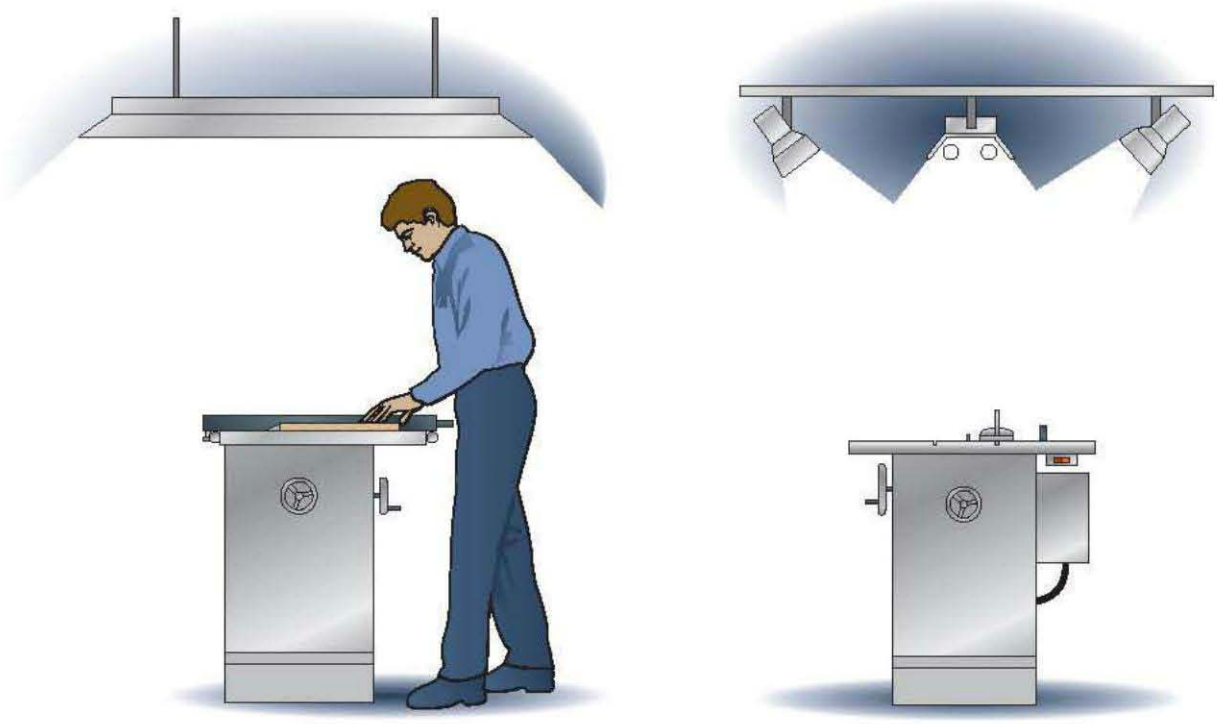
Bench-top power tools can be used on your workbench or you can build rolling bases to make them easy to transport from place to place. Either way, they offer excellent flexibility and efficiency.

With ample cross-ventilation, a garage shop is pleasant to work in during spring and fall months, especially if you work in the cool of the day. Winters and summers are a different story, depending on where you live. Garage walls are often uninsulated, so your workshop can become nearly intolerable to work in on bitterly cold days or during hot, humid summers. Uninsulated spaces will be difficult to heat or cool efficiently. Wood glues and finishes won't cure properly below 55°F, so you'll have to move gluing and finishing tasks indoors or save them until spring.

A couple of heating options can make winter shop time more tolerable and even pleasant. Standard "milk house" style electric heaters designed for heating a room simply won't generate enough heat to warm an entire garage. Kerosene or propane-fueled heaters, especially those with built-in blowers, will do the job more efficiently. A higher output, 240-volt heater will also work. Either choice is safe to use in a garage, provided you open a window or door or raise your garage door a few inches to exhaust carbon monoxide. You'll also need to turn off the heater when routing or sawing for long periods of time so the heater flame doesn't ignite the dust.

Cooling a garage shop during the summer can be equally challenging. Cross-ventilation will help draw breezes through the shop, especially if you use a fan to help move the air.

Unfinished garage walls make it easy to store supplies, lumber, and tools. Mount shelving, workbenches, lumber racks, and pegboard directly to the wall studs. You can even store lumber and other odds and ends overhead if the roof trusses are accessible.



A combination of light sources should include natural light, general overhead lighting—preferably from a fluorescent tube fixture (see pages 192 to 193)—and directed task lighting provided by a trouble light or other lamp fitted with a compact fluorescent or LED bulb.

Preparing the Garage

Getting your garage workshop up and running is one thing, but refining it to suit your specific working style will take years. Most DIYers enjoy the process of creating and recreating a workshop as their tools amass and their skills improve. For our purposes, we'll discuss the basics of turning a space into a workshop. Of course you'll need to adapt this general advice to fit your context, budget, and personal preferences. Depending on your space limitations and expectations, the job may be as easy as clearing out some clutter and putting up a workbench.

It's probably impossible to have too much light in a workshop. Try to have enough light so you won't be forced to work in the shadows. In addition to natural light from windows and skylights, workshops should be lit with a combination of overhead and task lighting. Overhead lights illuminate the general workspace, while task lighting directs focused light on the workbench and other machines where you need it most.

Ordinary ceiling-mounted incandescent light bulbs provide a reasonable amount of light in the immediate area under the fixture, but the light drops off quickly as you move away, creating shadows. If you're adding new fixtures, plan for one single-lamp fixture to illuminate about 16 square feet of floor space. Your garage shop should be equipped with fixtures that have protective covers over the lamps.

Make the most of natural light if your workspace has windows. Sunlight produces wonderful workshop lighting. A few windows, a skylight, or simply opening garage and service doors can largely replace artificial lighting during the daytime. Natural light makes even small shops more pleasant to work in while providing some radiant heat. Install skylights so they face north or east if you live in a hot climate. You'll get the benefit of indirect sunlight brightening your space without all the extra heat. For cooler climates, position skylights southward to capture more direct sunlight.

Fluorescent Lights ▸

Compact fluorescent lamps are better than incandescents because they provide the same light output with only a third of the wattage. Depending on the type, CLFs can be used with standard incandescent fixtures, fluorescent fixtures, and those with dimmer switches.

Fluorescent lights are well suited for your garage because they provide diffuse, even light. They are inexpensive to buy, and they operate on a fraction of the energy used by incandescent light bulbs, yet they produce about five times as much light and last about ten times as long. Fluorescent fixtures and bulbs come in a rapidly expanding range of sizes, shapes, and qualities. On the low end, you can buy 4-foot "shop lights" for less than $10 each. However, these budget-priced fixtures have low-quality ballasts that often make an annoying buzzing sound when the lights are on. In colder temperatures, the ballasts warm up slowly and make the bulbs flicker or light dimly. For about two or three times the price of economy fixtures, you can buy better quality 4-foot lights with "industrial" ballasts that start quickly in cold weather. The ballasts operate quietly and outlive their cheaper cousins.

For larger workspaces, consider installing 8-foot fluorescent lighting (see pages 192 to 193). Each fixture will cost $50 to $100 on average, which is usually still more economical than buying two premium 4-foot lights. Long fluorescent fixtures are made for commercial applications, so you'll be assured of good-quality ballasts designed for cold-weather use. Long fixtures also make for easier installation. You'll only need to hang and wire half as many lights.

Lighting & Electrical

Along with ample lighting, you'll need sufficient electricity in your shop. At a minimum, workshops require two circuits. One 15-amp circuit should be dedicated to shop lighting. Otherwise, you could be left in the dark if you trip a circuit breaker while using a machine. The other circuit supplies power for electrical outlets. Read the labels on your tools to identify how many amps they draw at peak loads, then use a circuit rated 20 to 30 percent over this number. For smaller corded power tools, a 15-amp circuit is usually sufficient. Full-size table saws, planers, jointers, and dust collectors should draw power from a 20-amp circuit. Large tools that produce 2 hp or more are generally wired for 220-volt operation, which requires at least a 30-amp circuit. If you don't have room to add two or more new circuits for the shop, a licensed electrician can install a smaller panel of additional circuit breakers, called a subpanel (pages 188 to 191). Subpanels are also useful when your shop is located in the garage far from the main service panel. Having a subpanel in the shop allows you to switch circuits on and off conveniently without having to walk all the way to the main panel.

Caution: Adding new circuits to the main service panel may exceed its amperage capacity, even if there are slots available for more circuits. An electrician can determine whether adding more circuits or a subpanel will be safe for your current main panel. See pages 178 to 191.

You'll likely need to use extension cords to deliver power where it's needed or move machines around the shop in order to plug them in. Extension cords can be used safely to power most tools, provided the cord's amperage rating is greater than the tool's peak amperage draw. In other words, if the tool draws 12 amps under maximum load, use an extension cord rated for 15 or more amps. Keep the length of the extension cords as short as possible without causing tripping hazards. Long extension cords can starve tools of optimal amperage to operate properly.

Use heavy-gauge extension cords in the shortest usable lengths to power your tools. This cord will be adequate for tools drawing 15 amps or less, provided it's not overly long.

Air Quality & Ventilation

Sawdust and fumes from stains, varnishes, and other finishing supplies can compromise the air quality in your shop. Contaminated air isn't just unpleasant to breathe, it's unhealthy. Use portable fans to move the air through windows and doors when you are sanding, sawing, or routing. Place the fan in a window or doorway opposite another open window or door to create a cross breeze. When your woodworking tool arsenal grows large enough to include those really dusty tools, especially table saws, stationary sanders, and planers, invest in a dust collector to capture dust, wood chips, and other debris right at the source.

Workbenches

Woodworking supply catalogs and home centers sell workbenches, but you can probably build a bench of equal or better quality yourself for less than what you'll pay for a ready-made bench. Project books often include plans for workbenches, and woodworking magazines publish workbench stories nearly every year.

Benches fall into three broad categories: traditional cabinetmaker's benches, utility workbenches, and metalworking benches. Traditional benches are those with thick hardwood tops and sturdy wooden leg bases. They're freestanding, so you can position them wherever you need to and work around all four sides.

Bench dimensions are typically 2 feet wide and 4 to 6 feet long. The top work surface tends to be a laminated blank of hard maple, beech, or other hardwood. The extra thickness helps absorb vibrations produced by heavy pounding, and the added weight keeps the bench stationary. Bench tops are often outfitted with a series of holes along one long edge or at the end. Wood or metal pegs, called bench dogs, fit into these holes and work in conjunction with a vise on the bench to hold long boards or large workpieces. If you buy a traditional bench, expect to pay more than $500 for a good one.

Utility workbenches are easy to build and a good value for woodworking and general home-improvement tasks. These benches may resemble cabinetmaker styles with a heavy top and a skeletal base, or they can be as simple as a sheet of plywood on top of a closed cabinet or two. A utility workbench can be freestanding, or you can fasten it to wall studs. Your bench will be more useful with a vise, but you can often forego the vise and use C-clamps or other short clamps to secure your work to the bench top. Or buy a clamp-on bench vise.

Woodworking bench

Utility bench

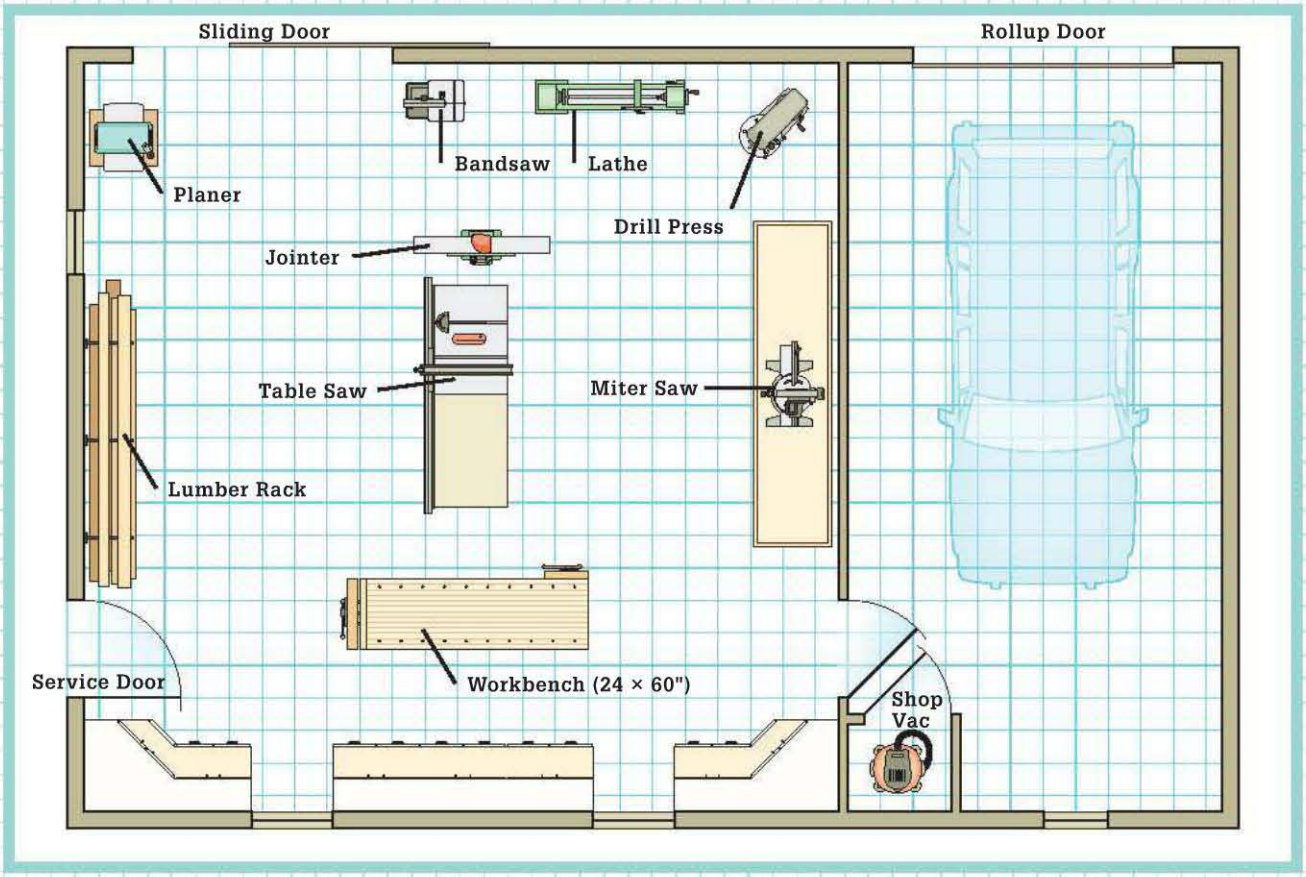
Metalworking bench

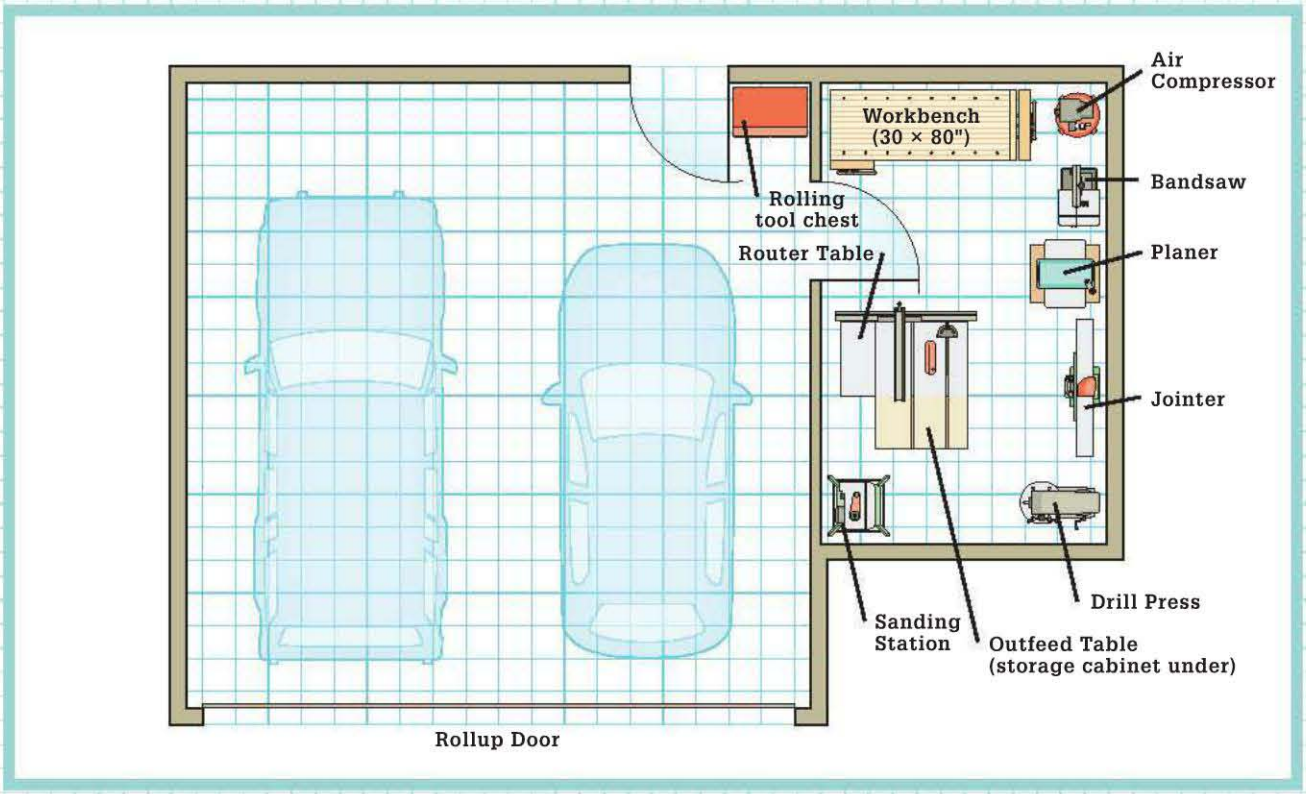
Shop Layout

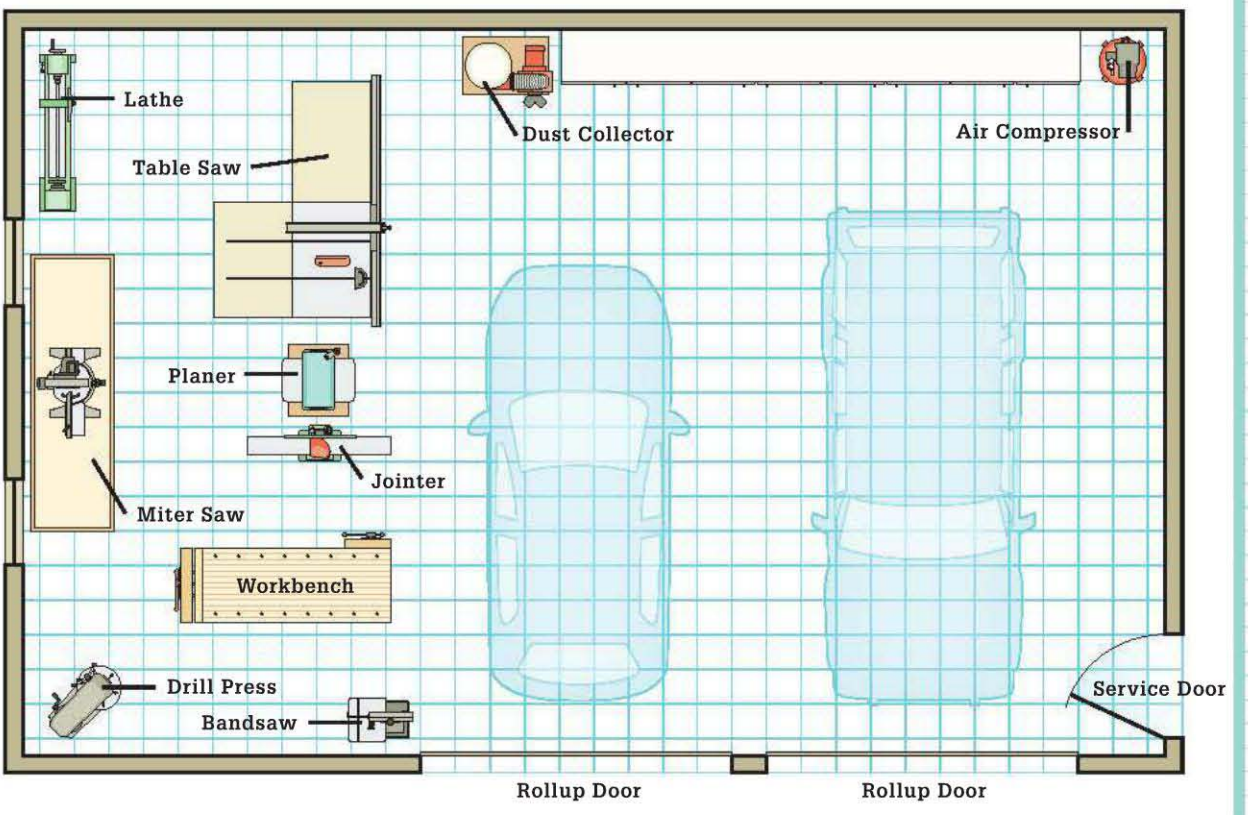
Arranging tools, materials, and fixtures in your shop will depend on the shape of the space you have; where doors, windows, and outlets are located; and the size and mobility of the machinery you own. Your vehicle parking and general storage needs will impact the shop too, of course. The following two pages include four sample floor plans. Here are some general guidelines to start with when laying out your shop:

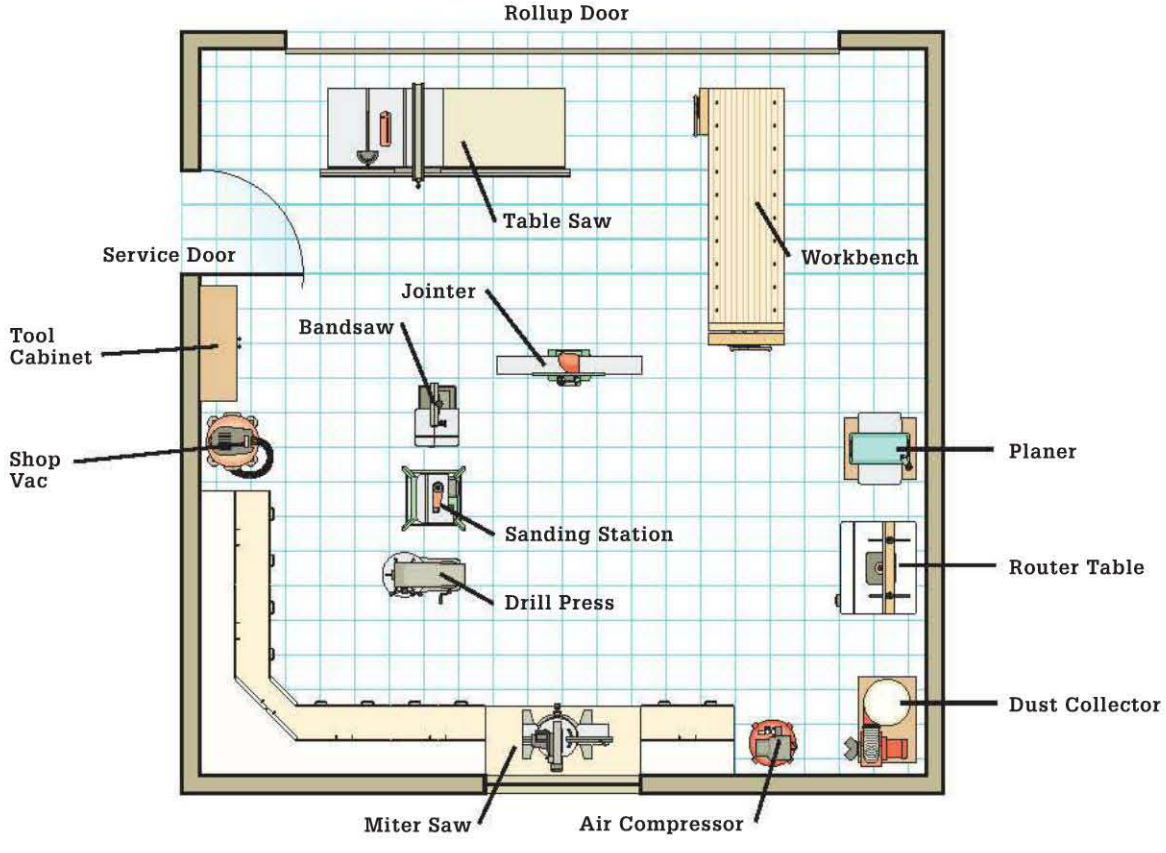
- Locate shelves or racks for storing lumber or sheet goods close to entry doors and stairwells.
- Table saws require at least 4 to 8 feet of clear space on all sides so there's room to work without hitting walls or other obstructions. Place the saw near the center of the shop.
- Keep your thickness planer and jointer near the table saw so you can move easily from jointer to planer to table saw for sizing and surfacing stock efficiently.
- Arrange other machines and shop fixtures where they are convenient for you.
- Have a bin near the miter saw for collecting short scraps. Place your stationary sanding station near a window to draw out the airborne dust.
- Router tables and band saws can be stored anywhere, provided they are on wheels.
- A drill press should stand against a wall where it's less likely to tip over.
- Keep measuring and marking tools, hand tools, containers of fasteners, and glue close to the workbench.

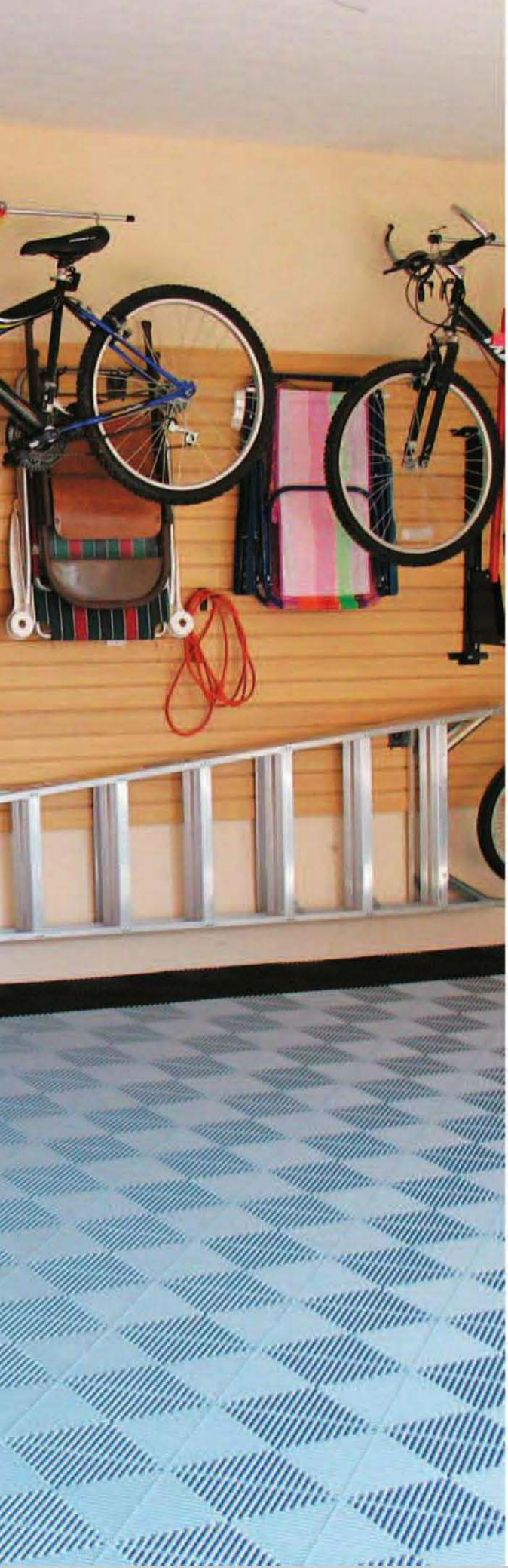
Sample Garage Workshop Floor Plans






Lathe
Table Saw
Dust Collector
Air Compressor
Planer
Jointer
Miter Saw
Workbench
Drill Press
Bandsaw
Service Door
Rollup Door
Rollup Door


Rollup Door
Table Saw
Workbench
Service Door
Jointer
Bandsaw
Tool Cabinet
Shop Vac
Planer
Sanding Station
Router Table
Drill Press
Dust Collector
Miter Saw
Air Compressor



Garage Improvements

Whether you use your garage primarily for parking and storage or you dream of converting it into a customized space for pursuing woodworking, auto restoration, or other hobbies, you'll only be able to use the space effectively if some basic organizational and infrastructure needs are met. This "Garage Improvements" chapter is filled with practical solutions to help you turn your garage into the space you've always wanted it to be. The first several projects focus on wall and ceiling storage options, and each could easily be completed in a weekend or less. The next six projects address electrical and lighting improvements. If you have moderate wiring skills already, you'll be able to handle each of these projects safely without hiring an electrician to do the work. The last few projects provide practical alternatives for either sprucing up your existing cement slab floor or installing a durable new covering over it.

In its present state your garage may be a dank and unusable cave, or it may simply be plain and uninspired. But once you set your mind to accomplishing even one of these projects, you'll start the ball rolling toward a much better workspace and storage area. It's not impossible, and the benefits will far outweigh the initial effort.

In this chapter:

Storage & Workspace Improvements

Garages tend to be catch-all spaces for anything and everything that doesn't quite fit in the house. Old boxes of mementos or bags of sporting equipment, collections of stuff intended for that next yard sale, a dorm room's contents home for summer, the broken-down lawn mower that never quite made it to the curb . . . the possibilities are virtually endless. We simply have stuff to spare, and once the basement or attic reaches its fill, the garage is the next logical spot for overflow. All that's really required to manage your mess is a bit of planning and organization. Even if you are among those rare folks who can keep the disorder down to a dull roar naturally, making storage and workspace improvements to your garage can help you free up space to use in other ways, such as pursuing a garage-based hobby.

Whatever your garage demands are, the first step in organizing it is evaluating exactly what you need to store. Do you have tools and equipment that should be hung up or can they lay flat? Maybe those boxes in the corner are light enough to store on a shelf or even place on a rack that hangs from the ceiling. Cans, odd-shaped containers, small power tools, and the like will stow well in cabinets, while the really small stuff might fit best in a series of drawers. Does your inventory of necessary chemicals and compounds include hazardous or flammable material with special storage needs? Take stock of your stuff, reducing or recycling what you really don't need, then you'll be ready to come up with a garage storage plan that works.

This section offers storage solutions for anything and everything in your garage. Most of these projects are relatively inexpensive, and you may even have the materials needed already. Generally, no single storage solution will do the whole job. So try to compartmentalize areas of your garage for certain kinds of storage, and keep your options open for how best to use the wall, floor, and ceiling space. Two or three different options could provide the ideal system for your garage.

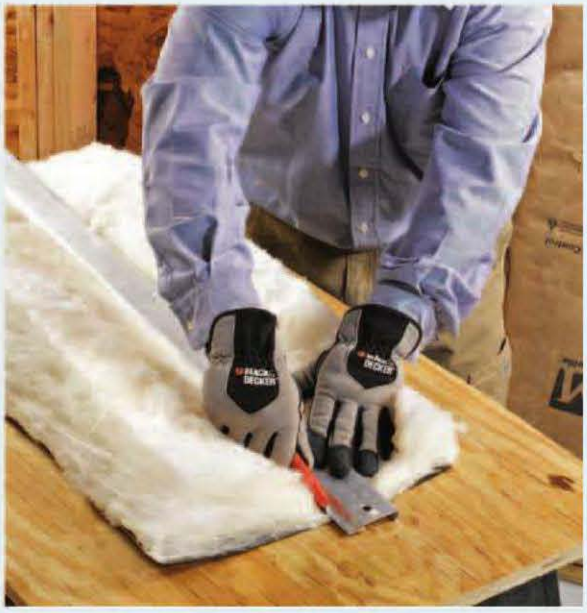
Your garage can be the picture of neatness and function with the right combination of storage systems. No matter what you need to organize your space, there's a project or product option that can help get the job done.

Insulating Your Garage Walls ▸

Use faced fiberglass insulation batts to insulate your garage walls. Staple the backing tabs to the wall studs, driving a staple every 8 to 10". The tabs should be perfectly flat against the studs to block air movement. Do not compress the insulation.

Work around obstacles in the wall cavities. For wiring cables and conduit, split the batts by separating them into two layers. Tuck the unfaced layer behind the cable or conduit and then install the faced layer over both.

Fit the batts around electrical boxes by cutting the insulation with scissors, not by stuffing it. Tuck a small piece of the insulation behind the box if there's room.



Cut around windows and doors. Lay a batt on a piece of scrap plywood with the facing down. Set a wide straightedge, such as a metal rule, across the batt at the cutting point. Press down on the straightedge to compress the insulation and then slice through with a sharp utility knife. Be sure to wear gloves and face protection (such as a respirator).

Finishing Interior Walls

Finishing your garage walls with drywall or other panel products improves the appearance of your garage and also can serve practical functions such as forming a fire block or concealing wiring or plumbing.

Whether or not to install finished interior walls on your garage is mostly a matter of preference. The only time wall surfaces are required is when your garage shares a wall with your house (an attached garage) or if one of the walls in your detached garage runs parallel to the house and is constructed within 3 feet of the house. In both cases only the shared or closest walls need to be finished to block the spreading of fire. Typically, a wall covering of ½"-thick (minimum) drywall with taped seams is required. Some circumstances may demand that you install fire-rated, Type X drywall or a double layer of drywall. The seams between drywall panels on fire-blocking walls must be finished with tape embedded in joint compound or with adhesive-backed fire-blocking tape.

If the area above the garage is occupied by a habitable room, the garage walls should be covered with ½" drywall to provide rigidity and structure, and the ceiling should be finished with ⅝"-thick Type X drywall. Ceiling seams should be covered with tape and compound. Fastener heads do not need to be covered with compound except for visual reasons.

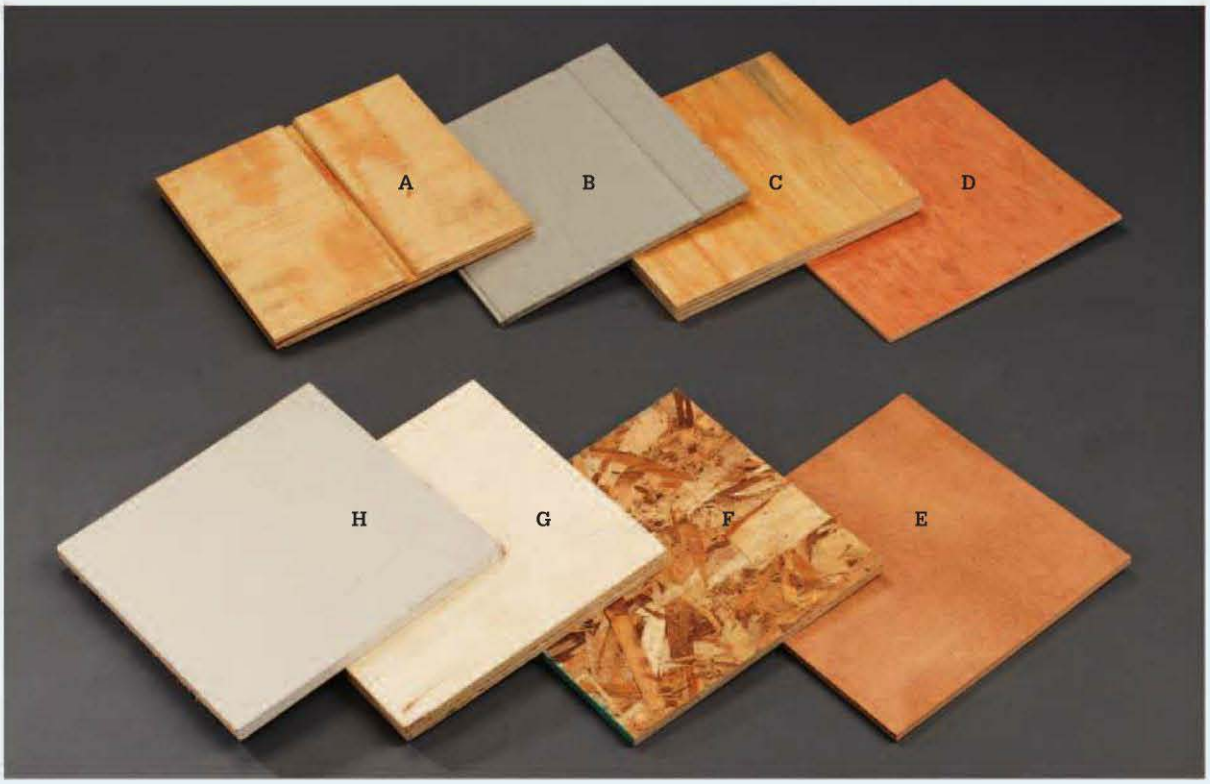
If your goal is to create a garage with walls that are finished to interior standards or serve to prevent fire spreading, then drywall is an excellent wall covering. Although the price and availability of diverse building materials fluctuates rather dramatically, drywall is typically one of the more economical choices. But because drywall is relatively susceptible to damage from impact (for example, from tools or bicycles) and doesn't withstand exposure to moisture well, many homeowners choose other wall coverings for their garage. Exterior siding panels are thick enough to hold fasteners and withstand moisture well but are relatively costly, and most have a rougher texture that some find bothersome on interior spaces. Interior paneling has only minimal structural value and some styles are fairly inexpensive, but it may be more visually pleasing to you.

Plywood and oriented strand board (OSB) are popular products for garage walls. Thicker panels (½ to ¾" thick) give excellent rigidity to the walls and are suitable for holding some fasteners. They can be left unfinished, clear-coated for protection with polyurethane finish (or comparable), or you may choose to paint them. A lighter colored wall paint in semigloss or gloss is a good choice. Sheet goods that have a pleasing color or woodgrain may be finished with either a clear coating or a protective deck/siding stain. Lauan plywood underlayment, for example, has a natural mahogany color that can be pleasing when treated with a reddish exterior stain or clear coat. It is also inexpensive but it is thin (¼" on average) and can only support very light-duty fasteners with little load, such as a stickpin holding a wall calendar.

Finishing Garage Walls ▸

Fire-rated drywall (Type X) is often required on walls that separate the garage and house, but more often it is installed on garage ceilings when a habitable space is located above the garage.

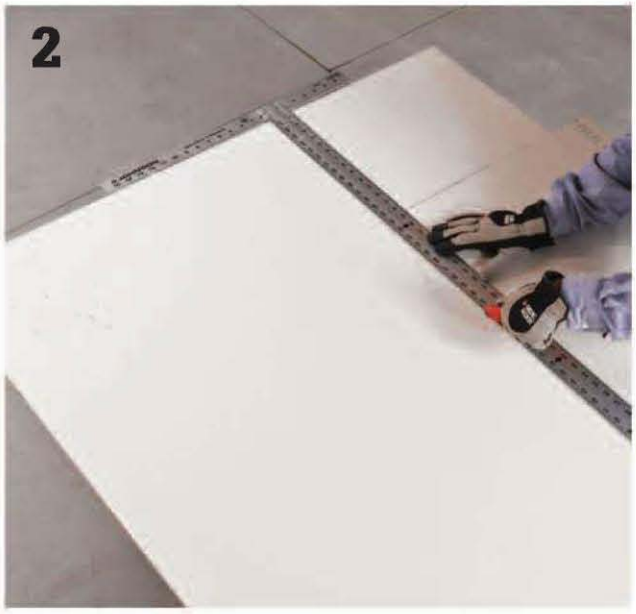
Tape the seams in fire-rated walls. If you are installing fire-rated drywall that won't be painted, you can save time and effort by using self-adhesive firewall tape (see Resources, page 235).



Sheet goods that may be used for interior garage walls include: (A) Siding panels (T1-11 shown); (B) fiber-cement siding panels; (C) ¾" interior grade plywood; (D) ¼"-thick underlayment (lauan shown); (E) cedar siding panels; (F) oriented strand board; (G) hardwood plywood (birch shown); (H) drywall (½" shown).

How to Hang Drywall in a Garage

Begin installing drywall panels in a corner. You can install the panels vertically or horizontally, depending on the wall height and how much cutting is involved. Garage walls are seldom a standard 8 ft., as are interior walls. If you are finishing a ceiling with drywall, cover the ceiling first so you can press the tops of the wall panels up against the ceiling panels. This helps support the ends of the ceiling panels. Drive coarse 1¼" drywall screws every 16".



Cut drywall pieces to fit around doors and windows. Take special care if you are covering a firewall since any gaps will need to be filled with joint compound and taped over. Make straight cuts that run full width or length by scoring through the face paper with a utility knife and then snapping along the scored line. Finish the cut by slicing through the paper of the back face.

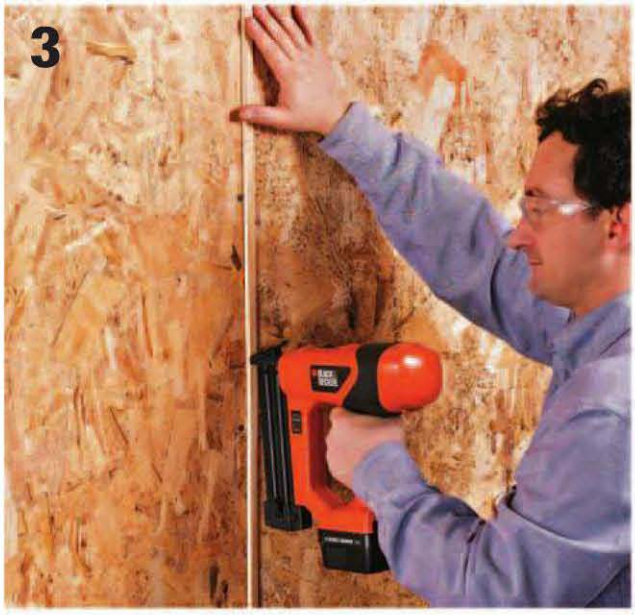
Mark and make cutouts for electrical and utility boxes. Use a drywall saw, key hole saw, or spiral-cutting saw to make the cutouts. Make sure the edges of the front boxes are flush with the face of the drywall (move the boxes, if necessary). Finish installing all panels.

Cover seams between drywall panels with joint compound; use drywall tape on walls that serve as firewalls. Cover tape with two layers of feathered-out joint compound, and then cover all fastener heads if you will be painting the walls. Give the panels a coat of drywall primer before painting.

How to Finish Walls with Sheathing

Begin installing full panels of sheathing at one corner. Apply a bead of construction adhesive to the faces of the wall studs before installing each panel. For best holding power, use drywall screws or deck screws instead of finish nails or pneumatic nails. Drive the screws so the heads are countersunk just below the wood surface.

Make cutouts for boxes with a jigsaw. Cut panels to fit using a circular saw for straight cuts and the jigsaw for any other interior cuts. Install all wall panels, making sure the seams fall at wall stud locations. Leave gaps of ⅛ to ¼" between panels.



Use screen retainer strips or T-molding to cover the seams between sheathing panels if you will be painting the walls. Attach the strips with panel adhesive and brad nails. Sand back any splinters around fastener heads, and then cover the heads with joint compound or wood putty.

Paint the sheathing with a semigloss or gloss paint that's easy to clean and will reflect light well. Use a paint roller or a high-volume low-pressure sprayer to apply the paint. Apply two or three thin coats.

Hanging Pegboard

Pegboard, also called perforated hardboard or perfboard, is one of the simplest and least expensive storage solutions for hanging tools and other lightweight objects. When mounted to the wall and outfitted with metal hooks, pegboard provides a convenient way to keep items from getting lost in the back of a drawer or the bottom of a tool chest. Pegboard also makes it easy to change the arrangement or collection of your wall-hung items, because you can reposition the metal hooks any way you like without measuring, drilling holes, or hammering nails into the wall. In fact, pegboard has served as a low-cost storage option for so long that there are a multitude of different hooks and brackets you can buy to accommodate nearly anything you want to hang. Any home center will carry both the pegboard and the hooks.

You need to install pegboard correctly to get the most value from it. If your garage walls have exposed studs, you can simply screw pegboard to the studs. The empty bays between the studs will provide the necessary clearance for inserting the hooks. On a finished wall, however, you'll need to install a framework of furring strips behind the pegboard to create the necessary clearance and provide some added stiffness. It's also a good idea to build a frame around your pegboard to give the project a neat, finished appearance.

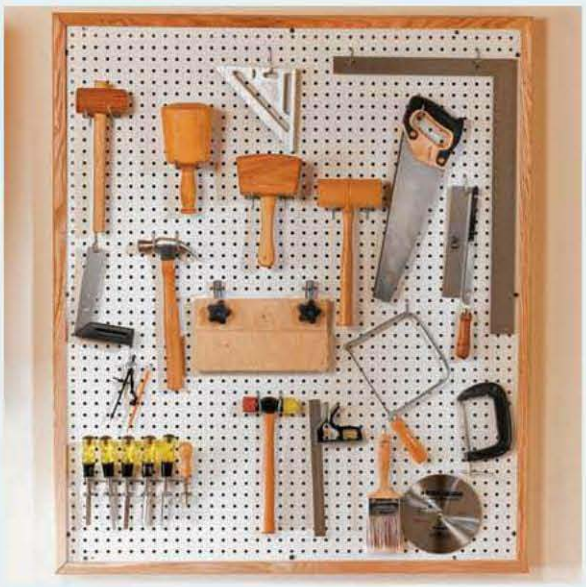
If your garage tends to be damp, seal both faces of the pegboard with several coats of varnish or primer and exterior paint; otherwise it will absorb moisture and swell up or even delaminate.

Tools & Materials ▸

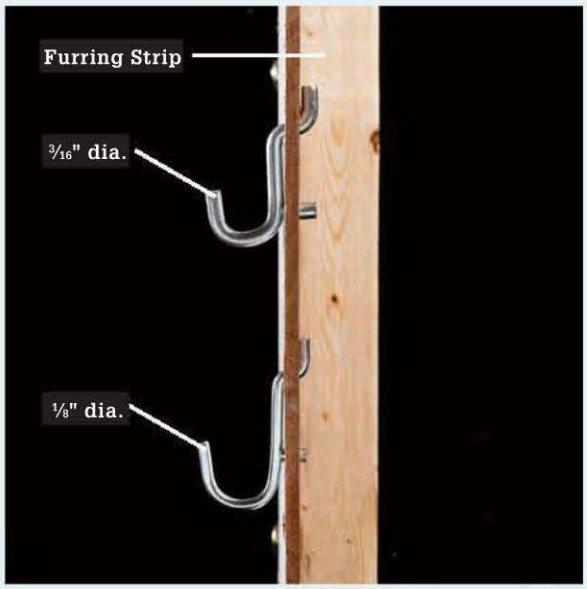
Eye protection	Stud finder
Marker	Level
Tape measure	Drill
Circular saw	Pegboard panels
Straightedge	1 × 2 lumber
Miter saw	1" drywall screws
Caulk gun	Panel adhesive
Paint roller	Paint or varnish

Pegboard systems are classic storage solutions for garages and other utility areas. Outfitted with a variety of hangers, they offer flexibility and convenience when used to store hand tools and other small shop items.

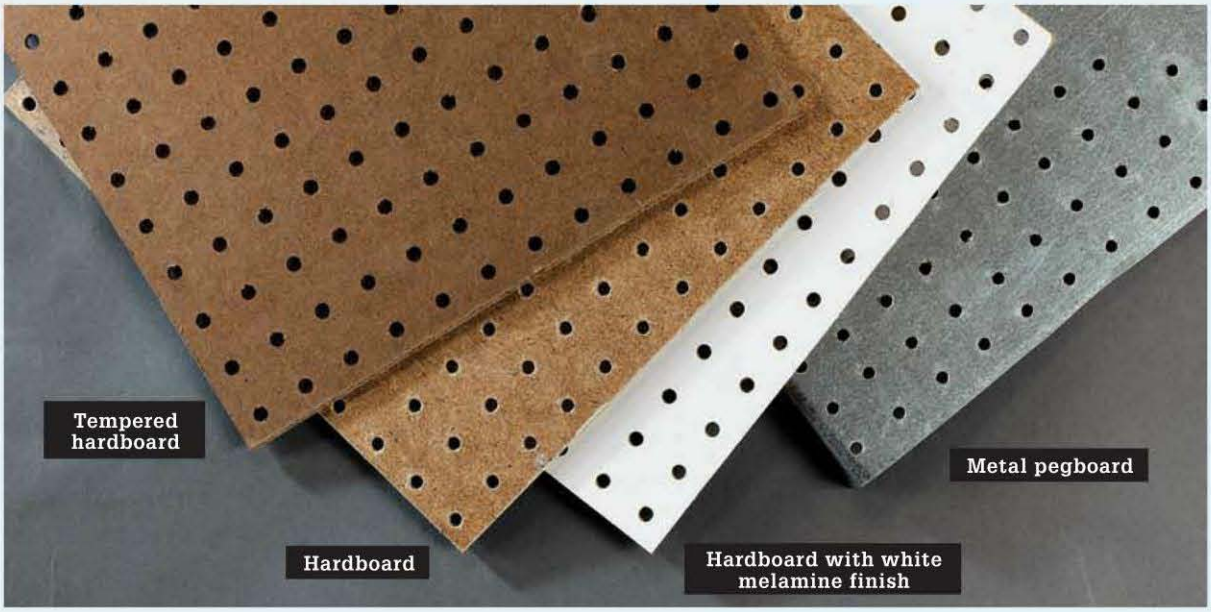
Pegboard & Hanger Hardware Styles ▸



Hanger hardware comes in many shapes and sizes, from the basic J for hanging a single tool to double-prong hangers for hammers and even shelf standards. You can buy assorted hangers in kits or stock up on the type you're likely to use the most.



Two common thicknesses for pegboard hangers are ⅛"-dia. and 3/16"-dia., both of which fit into standard pegboard hole configurations. The thicker the hanger, the more it can handle. Both types rely on the mechanical connection with the pegboard and can fail if the holes in the board become elongated. The pegboard must have furring strips on the back side to create a recess for the hangers.



Pegboard is a single-purpose sheetgood material. It is used to create a wall surface with storage function (occasionally it may be used as a cabinet back where ventilation is desired). Although it comes in ⅛"-thick panels, avoid them in favor of ¼"-thick material. Most larger home centers carry it unfinished and in pre-finished white. Woodgrain and other decorative panels can be found, and you can also buy metal pegboard panels. The standard size holes are ¼"-dia. and spaced in a 1"-on-center grid.

How to Install a Pegboard Storage System

Cut your pegboard panel to size if you are not installing a full sheet (most building centers sell 2 × 4-ft. and 4 × 4-ft. panels in addition to the standard 4 × 8 ft.) If you are cutting with a circular saw, orient the panel face-up to prevent tearout on the higher-grade face. If cutting with a jigsaw, the good face of the panel should be down. If possible, plan your cuts so there is an even amount of distance from the holes to all edges.

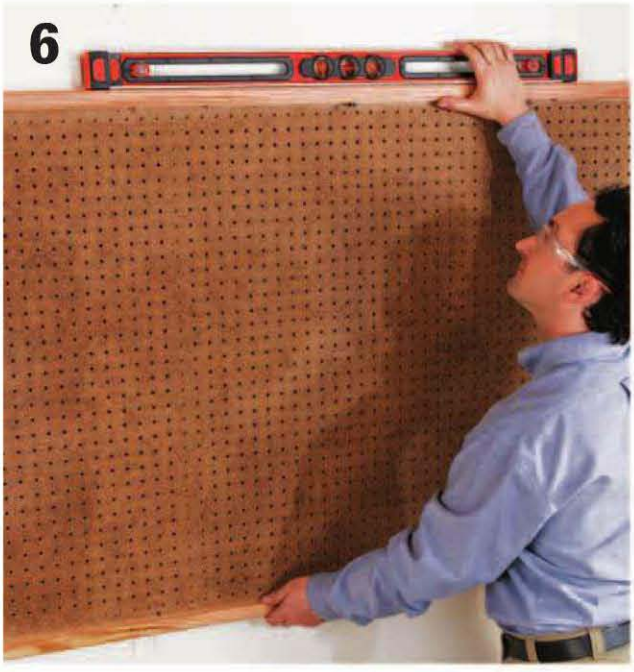
Cut 1 × 2 furring strips to make a frame that is attached to the back side of the pegboard panel. The outside edges of the furring strips should be flush with the edges of the pegboard. Because they will be visible, cut the frame parts so the two side edge strips run the full height of the panel (36" here). Cut a couple of filler strips to fill in between the top and bottom rails.

Attach the furring strips to the back of the panel using 1" drywall screws and panel adhesive. Drive the screws through countersunk pilot holes in the panel face. Do not drive screws through the predrilled pegboard holes. Use intermediate furring strips to fill in between the top and bottom. These may be fastened with panel adhesive alone.

Option: Make a frame from picture frame molding and wrap it around the pegboard to conceal the edge grain and the furring strips. If you can't find picture frame molding with the correct dimensions, mill your own molding by cutting a ⅜"-wide by 1"-deep rabbet into one face of 1 × 2 stock.

Paint or topcoat the pegboard. You can leave the pegboard unfinished, if you prefer, but a coat of paint or varnish protects the composite material from nicks and dings and hardens it around the hole openings so the holes are less likely to become elongated. A paint roller and short-nap sleeve make quick work of the job.

Locate and mark wall studs if your garage wall has a wall covering. Make sure the marks extend above and below the pegboard location so you can see them once the pegboard is positioned on the wall.



Tack the pegboard and frame to the wall in the desired location. Drive one 2½" screw partway through the top frame at the center of the pegboard. Place a long level on the top of the pegboard and adjust it to level using the screw as a pivot point.

Drive a drywall screw through the top and bottom frame rails at each wall stud location. Drill countersunk pilot holes first. Double-check for level after driving the first screw. Insert hangers as desired.

Installing Adjustable Shelving Systems

Some garage stuff is simply stored best on shelving, particularly if it's too large to fit into a cabinet but still relatively lightweight. Empty planters, gas cans, boxed supplies, and half-full cans of paint are ideal candidates for a sturdy shelving system. You could go to the effort and build your garage shelving from scratch, but going that route will require you to come up with a means of supporting shelf boards on the wall. It's doable, of course, but you'll have to make the standards and brackets yourself. Plus, most shop-made shelving is fixed in place, so you can't reposition the shelves easily if your storable items change.

A more convenient option is to buy metal shelf standards that fasten to the wall studs and shelf brackets that clip into a series of slots on the standards. Home centers carry these adjustable shelving systems in several colors and they come with shelf brackets in a range of lengths to suit various shelf widths. For garage applications, it's a good idea to buy heavy-duty standards and brackets. The components are made of thicker-gauge metal than regular-duty hardware, and the shelf brackets have two mounting lugs instead of one to reinforce the attachment points.

When you install your shelving, locate the top of the standards just high enough so you can reach the top shelf from the floor. If you plan to load your shelving with fairly heavy items, mount a standard to every wall stud in the shelf area. Use strong screws recommended by the manufacturer and fasten them to wall studs only—never to paneling, trim boards, or wallboard alone. Be sure to use sturdy shelf boards and firmly tap the brackets into mounting slots before loading up the shelves.

Tools & Materials ▸

- Eye protection & work gloves
- Level
- Drill
- Tape measure
- Circular saw
- Straightedge
- Stud finder
- Rubber mallet
- Shelf standards with brackets
- ¾" plywood

Sturdy, adjustable shelves are easy to install and offer a convenient place to safely store those larger, lightweight items off the floor.

How to Install Bracket Shelves

Install the first standard at one end of the installation area. The standards seen here (70" long) are centered on wall studs with the tops level. Align the top of the standard with the top level line and drive one screw through a mounting hole. Hold a level against the side of the standard and adjust it until it is plumb. Drive screws through the remaining mounting holes.

Install the remaining standards. For fail-proof results, install the two end standards first, and then establish a level line between them so you can butt the intermediate standards against the line. Use a level against each standard to make sure it is plumb. *Note: If you need to cut the standards for length, align all cut ends of the standards in the same locations (either at the top or bottom).*

Prepare your shelf stock. For excellent results, rip cut quality ¾" plywood to width (usually 11½") with a circular saw and a straightedge. Avoid particleboard or MDF shelving as it is prone to sagging and will degrade quickly if exposed to moisture. Most premilled shelving (usually coated with vinyl or melamine) is made from particleboard and is a bit too light-duty for garage storage.

Install shelf support brackets in the standards using light blows from a rubber mallet to make sure they're fully seated. Set the shelving onto the standards, adjusting as desired.

Installing Slatted Shelving Systems

Have you ever marveled at those floor-to-ceiling, slatted-track wall storage systems used for product display in many retail stores? You might not think of that approach as a viable option for your garage, but slatted wall systems are definitely available to consumers—and they're easy to install. The slatted panels are made of PVC or composite material in 4 or 8" pieces and in a variety of colors. Panels are packaged in cartons that cover between 30 to 40 square feet of wall space. The panel color is blended through the material, so slatted wall systems never need painting. Panels are washable and waterproof, making them perfect for a damp garage. Best of all, slatted wall systems can be outfitted with a variety of hooks, brackets, baskets, shelving, and even cabinetry to store just about anything. Aside from the hanging accessories, manufacturers also offer color-matched screw plugs, trim pieces for surrounding outlets, switch plates, and baseboard and moldings for accommodating room corners.

Installing a slatted wall system is a straightforward project. The installation methods do vary quite a bit, depending mostly on whether you select standard or heavy-duty products. Whatever the method, you need to locate and mark the wall studs in the project area and snap a plumb chalk line to establish the height of the bottom row of slatted panels. Depending on the system you choose, you can attach the panels by driving screws through them and into the wall studs or by attaching clips to the wall first and hanging the panels on the clips. Panels can be attached end-to-end with interlocking dowels and then hung as longer pieces. Then, each subsequent row clips to the row below it for an unbroken, seamless look. Slatted wall panels can be cut, drilled, and sanded with ordinary tools, so there's no special bits or blades to buy.

Tools & Materials ▸

- Tape measure
- Chalk line
- Level
- Circular saw
- Drill
- Wood glue
- Slatted wall panels
- Wall clips and connective dowels
- Screws

A slatted wall system combines easy installation, durability, and a range of hanging accessories to form an integrated solution for most any garage storage need. It can be customized for differing load demands, it's fairly easy to install, and it has a more finished appearance with greater durability than pegboard.

How to Install Slatted Walls

Lay out vertical and horizontal reference lines if you are installing the slatted wall system on a finished wall. The bottom reference line should be 16" above the floor in most installations. Also mark all wall stud locations. For bare stud wall applications, establish horizontal reference lines that are parallel to the floor.

Attach installation accessories to the wall if you'll be using them. Here, special hangers are attached at stud locations so the wall slat panels in this heavy-duty system can be positioned accurately. For maximum holding power you will also need to drive screws through the mounting slots in each panel.

Begin installing slatted panels, starting at the bottom. Make sure the panel is oriented correctly, with the dovetailed side of the slot facing up so it can slip over the angled edge of the installation accessory (inset photo).

Prepare butted joints between panels. In this system, dowel holes are drilled by enlarging predrilled pilot holes in the panel ends where the panels meet. Barbed dowels are inserted into the dowel holes and glued in place to reinforce the joint. If you do not intend the slatted wall to be permanent, do not use glue. The dowel reinforcement is unnecessary if the butt joint between panels falls at a wall stud location.

(continued)

Make butted joints at panel ends by sliding doweled panels together. If the ends do not fit together easily, try rapping the free end of the second panels with a wood block to seat it against the first panel.

Measure to find the required length of the last panel in the first row of panels (if you are doing a full-wall installation). Subtract ⅛" from the distance to allow for expansion of the PVC plastic or composite panels.

Cut the end panel to length using a circular saw with a straightedge cutting guide. Orient the panel with the good side facing down to minimize tearout from the saw blade. Any general-purpose blade with carbide-tipped teeth will work. *Tip: Set the workpiece on a backer of scrap plywood and set your saw cutting depth so it is slightly deeper than the panel thickness but not deep enough to cut through the backer.*

Install the second course of panels above the first course. Start with a half-length panel to create a staggered running-bond pattern (seams are not aligned between courses).

Measure for any cutouts in the panel, such as windows, receptacles, or switches. To find the edges of the cutout, hold the panel directly below the obstruction with the end aligned flush against the panel it will fit against.

Make cutouts for obstructions by following the cutting line with a jigsaw or handsaw. If you are making long, straight cuts, you will get a truer cut with a circular saw and straightedge guide, and then complete the cut at the corners with a jigsaw.

Install the top row. Most panels are sized so that they will fit onto an 8-ft. wall without cutting to width. But if you need to cut the panels to width, use a circular saw and straightedge cutting guide or a table saw for the job. Make sure to cut from the same side of all cut panels. Install hangers and brackets as desired.

Making Corners ▸

If your slatted wall plan calls for making a corner with the material, the easiest way to treat the panels is to butt one panel against another at inside corners or to miter cut the mating panel ends at outside corners. Most slatted wall system manufacturers also sell corner trim that may be installed on outside corners for a neater appearance.

Utility Shelves

You can build adjustable utility shelves in a single afternoon using 2 × 4s and plain ¾" plywood. Perfect for use in a garage, utility shelves can be modified by adding side panels and a face frame to create a finished look.

The quick-and-easy shelf project shown on the following pages creates two columns of shelves with a total width of 68". You can enlarge the project easily by adding more 2 × 4 risers and plywood shelves. Do not increase the individual shelf widths to more than 36". The sole plates for the utility shelves are installed perpendicular to the wall to improve access to the space under the bottom shelves.

Utility shelves built with ordinary 2 x 4s and plywood are an easy, inexpensive way to create flexible storage in a garage.

Tools & Materials & Cutting List ▸

Tools

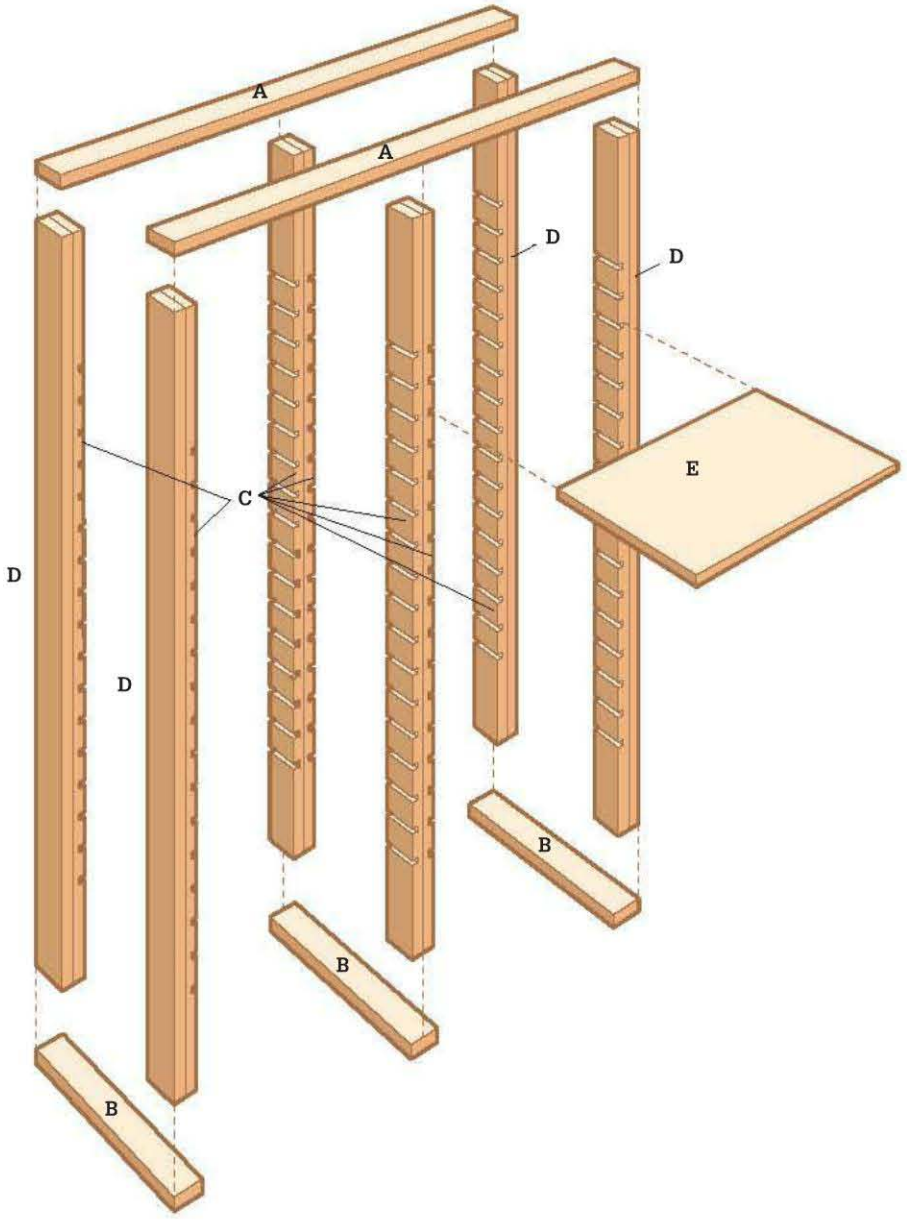
Tape measure
Level
Framing square
Drill/driver
Plumb bob
Powder-actuated nailer
Clamps
Router
Circular saw
Grease pencil
Straightedge guide

Materials

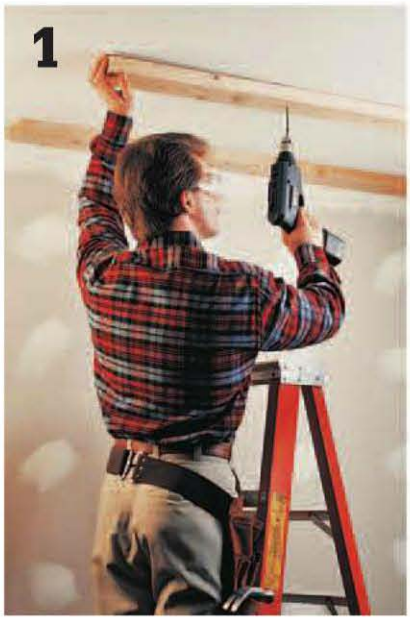
(15) 2 × 4 × 8 pine
(2) ¾ × 4 × 8 plywood
Wood glue
Shims
Drywall or deck screws (2½", 3")
Finishing materials
Shelf supports

Cutting List

Part	No.	Desc.	Size	Material
A	2	Top plates	68"	2 × 4s
B	3	Sole plates	24"	2 × 4s
C	8	Shelf risers	93"	2 × 4s
D	4	End risers	93"	2 × 4s
E	12	Shelves	30¾ × 24"	¾" plywood



How to Install Utility Walls



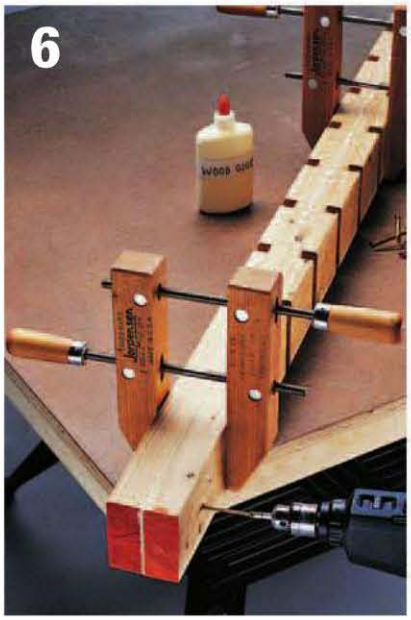
Mark the location of top plates on the ceiling. One plate should be flush against the wall, and the other should be parallel to the first plate, with the front edge 24" from the wall. Cut 2 × 4 top plates to full length of utility shelves, then attach to ceiling joists or blocking using 3" screws.

Mark points directly beneath the outside corners of the top plates to find the outer sole plate locations using a plumb bob as a guide (top). Mark the sole plate locations by drawing lines perpendicular to the wall, connecting each pair of points (bottom).

Cut the outer 2 × 4 sole plates and position them perpendicular to the wall, just inside the outlines. Shim plates to level if needed, then attach to the floor with a powder-actuated nailer or 3" screws. Attach a center sole plate midway between the outer sole plates.

Prepare the shelf risers by cutting ⅞"-wide, ¾"-deep dadoes with a router. Cut dadoes every 4" along the inside face of each 2 × 4 riser, with the top and bottom dadoes cut about 12" from the ends of the 2 × 4. *Tip: Gang cut the risers by laying them flat and clamping them together, then attaching an edge guide to align the dado cuts. For each cut, make several passes with the router, gradually extending the bit depth until dadoes are ¾" deep.*

Trim the shelf risers to uniform length before unclamping them. Use a circular saw and a straightedge guide.

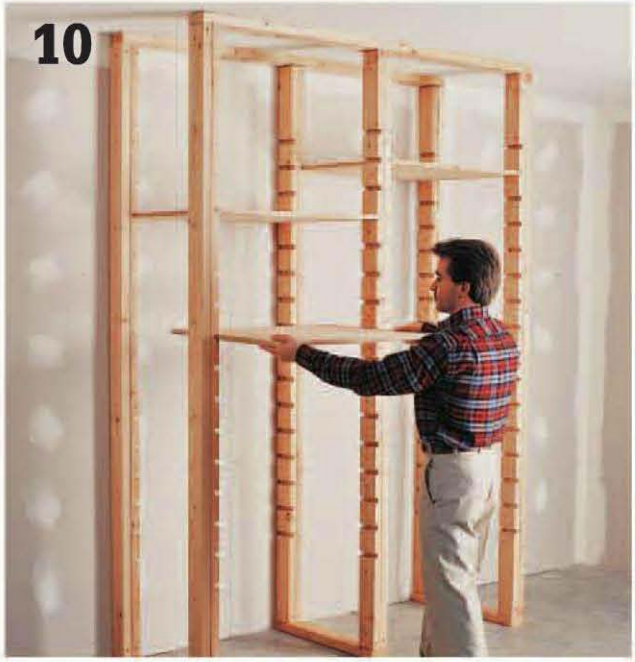


Build two center shelf supports by positioning pairs of shelf risers back-to-back and joining them with wood glue and 2½" screws.

Build four end shelf supports by positioning the back of a dadoed shelf riser against a 2 × 4 of the same length, then joining the 2 × 4 and the riser with glue and 2½" screws.

Position an end shelf support at each corner of the shelving unit between the top and the sole plates. Attach the supports by driving 3" screws toenail-style into the top plate and sole plates.

Position a center shelf support (both faces dadoed) at each end of the center sole plate, then anchor shelf supports to the sole plate using 3" screws driven toenail-style. Use a framing square to align the center shelf supports perpendicular to the top plates, then anchor to top plates.



Measure the distance between the facing dado grooves and subtract ¼". Cut the plywood shelves to fit and slide the shelves into the grooves.

Installing Garage Cabinets

If you'd prefer to keep your garage storables behind closed doors, a set of cabinets might be just the solution you're looking for. Any interior kitchen cabinets can be used in a garage, including both base and upper cabinets. Base cabinets really offer several benefits: deep inner storage for large items; drawers for fasteners, hardware, or other small tools; and, of course, a convenient flat work surface. If you're upgrading your garage storage on a budget, utility-grade melamine or unfinished cabinets are actually quite affordable. You could also shop at a second-hand building materials outlet or put to use cabinets removed during a kitchen remodel. If you have limited floor space in your garage, look for utility cabinets with a shallower base. Some manufacturers offer a 15"-deep model that's 9" shallower than standard base cabinet. As you plan, make sure there's still room to park the car, bikes, and other yard and garden equipment.

The process for installing cabinets in a garage is the same as in a kitchen. Cabinets must be firmly attached to wall studs, and they should be level and plumb. Using a level as a guide, draw reference lines along the project wall to indicate the locations of base and wall cabinets. If your garage floor is uneven, find the highest point of the floor along the wall and use this as your initial reference for drawing the other layout lines.

The best way to ensure an even, level installation of upper cabinets is to install a temporary ledger board to the wall, and rest the cabinets on it when fastening them to the wall studs. Many pros install upper cabinets first to take advantage of the full wall access, but you might want to begin with the base cabinets and use them to help support the uppers during their installation. If your garage cabinet system will include a corner cabinet, install it first and work outward to make sure the corner cabinet will fit the space properly. If your garage floor tends to be damp, it's a good idea to install leveler feet on the base cabinets beforehand.

Tools & Materials ▸

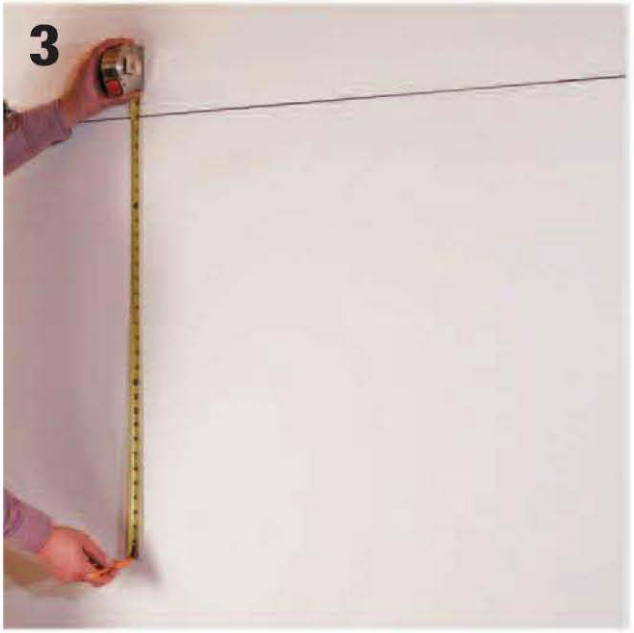
- Eye protection & work gloves
- Long level
- Grease pencil
- Tape measure
- Stud finder
- Combination square
- Drill
- Handscrew clamps
- Hammer
- Caulk gun
- 1 × 4 ledger boards
- 2½" drywall screws
- 1¼" panhead screws
- Base & wall cabinets
- Shims
- Toekick boards or side panel trim, as needed
- ¾" plywood
- Panel adhesive
- 1 × 2 lumber for edging strips
- Finish nails
- ¼" hardboard
- 1" brads
- L-brackets

Garage utility cabinets are inexpensive and because the base cabinets are not as deep as kitchen cabinets, they have a compact footprint that's well suited to a garage. A durable melamine surface is easy to clean, and a double plywood work top with a replaceable hardboard surface stands up well to hard use.

How to Install Garage Cabinets

Find the high point of the floor in the installation area by leveling a long, straight board and identifying the principal contact point with the floor. Mark the point on the floor with a grease pencil or tape.

Draw a level line along the wall to create a base cabinet top reference



Draw reference lines for the upper cabinets based on the base cabinet line. If your base cabinets are 34½" tall (standard height not including countertop) then the line for the tops of the upper cabinets should be 49½" above the base cabinet line and parallel to it. Measure down from the upper cabinet top line 30" and mark reference lines for the bottom of the upper cabinets (make sure your cabinets are 30" high first—this is a standard but there is occasional variation).

Mark wall stud locations clearly on the wall just above the base cabinet line and just below the bottom upper cabinets line. Also mark stud locations slightly above the top upper cabinet line. Use a stud finder to identify the locations of the studs.

(continued)

Attach ledgers to the wall or walls to provide temporary support for the upper cabinets while you install them. The ledgers (1 × 4 is being used here) should just touch the reference line for the bottom of the wall cabinet. Attach the ledger with a drywall screw driven at each stud location. Transfer stud location marks to the ledger.

Attach the first wall cabinet with 2½" drywall screws. If the cabinet has a mounting strip at the top of the back panel (most do), drive a pair of screws through the strip at each stud location. Attach all wall cabinets to the wall.

Join wall cabinets by driving 1¼" panhead screws through one cabinet side and into the adjoining cabinet side. Clamp the cabinets together first to make sure the fronts and tops stay flush.

Install the first base cabinet directly under the first wall cabinet. Position the cabinet and shim it as needed until it is level, plumb, and touches the reference line (see step 2). Secure it to the wall with 2½" drywall screws.

Install the remaining base cabinets by leveling the cabinet sides, screwing them to the wall studs, and then fastening them together. Attach toe-kick trim boards or side panel trim, if desired. Remove the upper cabinet wall ledger or ledgers.

Attach cabinet doors and drawers if you removed them during installation or if they were not preattached. Adjust the hinges according to the manufacturer's instructions so the gaps between doors are even and they all open and close smoothly.

Make the work top. While a piece of postform countertop makes a suitable and easy-to-install work top, you can create a heavier, more durable top with plywood. Simply cut two pieces of ¾" plywood so they overhang each side and the front of the cabinet base by 1". Secure them with panel adhesive and countersunk 1¼" screws. Use plenty of screws. Then cover the front and side edges with strips of 1 × 2. The front strip should overhang the front ends of the side strips. Attach the strips with adhesive and finish nails. Finally, cut a piece of ¼"-thick hardboard so all edges are flush with the base. Attach it with 1" brads driven through slightly countersunk pilots holes (the heads need to be recessed). When the hardboard top becomes worn, you can easily remove it and replace it.

Attach the work top. If your base cabinets do not have preattached mounting strips for a countertop, fasten L-brackets around the inside perimeter of each cabinet, and then drive screws up through the L-brackets and into the underside of the work top. Apply a bead of panel adhesive to all cabinet top surfaces for a better bond and to reduce clattering. Add a bench vise, if desired.

Installing a Ceiling Storage Unit

Some garage storables, such as empty coolers, luggage, and cartop carriers, tend to be bulky but lightweight. They take up an inordinate amount of shelf or floor space that could be better used for heavier items. One storage option for these items is right above your head—on your garage ceiling. Aside from a few lights and the track rails for your garage door, there isn't much on the ceiling of most garages. If your garage has roof trusses, you've got the perfect location for some lightweight shelf storage.

There are several ceiling-hung shelf kits available in a range of lengths and widths. The typical ceiling storage unit consists of four downrods that bolt to the bottom truss or joist members. A pair of crossbraces attaches to the downrods to form support frameworks for wire shelf grids. Other styles of ceiling storage are available for hoisting bicycles, truck toppers, or canoes up and out of the way.

Installing ceiling storage involves locating truss chords, joists, or rafter ties to support the four downrods, and then attaching the rods to the ceiling framing with lag bolts. The crossbraces and grids fit between the downrods and attach with nuts and bolts. It's possible to install the system by yourself, but a helper makes the job much easier. Once the parts are assembled, carefully double-check all connections before loading up the shelf.

Be careful to position your ceiling storage unit clear of the path of your sectional garage door and the moving parts of your garage door opener. Use a stud finder to help determine the thickness of the trusses so you can locate the attachment bolts as close as possible to their centers. Refer to the instructions that come with your kit to be clear about the maximum weight load your unit can hold.

Tools & Materials ▸

Stepladder	Screwdriver
Stud finder	Ratchet wrench & sockets
Tape measure	Overhead shelving kit
Drill	

A ceiling shelf unit takes advantage of underused space between the hood of your parked car and the ceiling. Most units are rated only for relatively light storage items.

How to Install a Ceiling Storage Unit

Attach the downrods for the first pair of horizontal support bars using the fasteners recommended by the manufacturer. The fasteners must be driven into structural members in the ceiling, be they truss chords, rafter ties, or ceiling joists. The outside edges of the two footplates should follow the spacing recommended in the instructions (69" apart for the model seen here). Install the second pair of downrod footplates on the next rafter or truss chord in 24" on-center framing. If the ceiling is 16" O.C., skip one member so the footplates are 32" apart.

Install the horizontal support bars. The bottom ends of the downrods are secured to the horizontal bars that support the shelving. This is often done with the use of L-shaped corner rods with female ends that accept the male ends of the downrod and the horizontal bars. How deeply the corner rods are inserted into the downrod determines the height of the storage platform. Set the height you want and then insert bolts through the aligned bolt holes in the downrods and corner rods. Align all parts and secure with bolts and nuts.

Install the shelving grids. Position the wire grid shelves so they span the support bars with even overhang (if possible). Thread bolts through the parallel wires and support framework as directed. Hand tighten nuts and washers onto bolts.

Join the grids together with the supplied fasteners. Load the storage items onto the shelves. Do not overload. Your instruction manual will inform you of the weight capacity. The model shown here is rated for up to 300 pounds provided the weight is distributed evenly.

Electrical & Lighting Improvements

If your garage has too few outlets or just a single light bulb that hangs starkly from the ceiling, that may be part of the reason why you don't use your garage more often. It's frustrating to work in a poorly lit room and inconvenient to have to plug everything into extension cords. Truth be told, many garages are built with just one or two outlets and a single overhead light—just enough service to operate a garage door opener and get you in and out of your car.

Adding more outlets, lights, or even a skylight will dramatically improve the working conditions in your garage. Suddenly, you'll be able to plug in all those electric tools, add an air conditioner or heater, and actually see what you're working on. These sorts of projects could be the keys to jump-starting that garage workshop you've always dreamed about.

This section will show you how to install electrical boxes, run wire, connect receptacles and switches, and install circuit breakers. These are all the steps you need to bring juice where you want it. Pages 180 to 205 provide practical instructions for extending service into your garage. If your garage suffers from poor lighting, you'll learn how to install new fluorescent light fixtures or add a new garage window or fixed skylight. We'll also show you how to hardwire an electric heater to make your garage more habitable during the winter months.

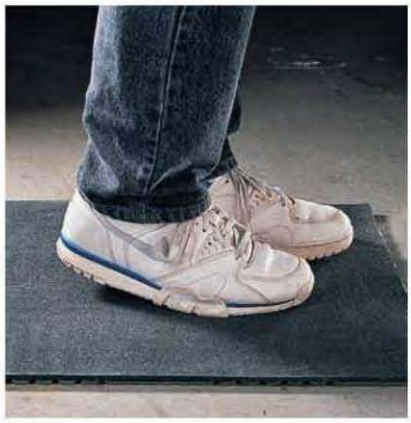
If you are inexperienced with wiring or uncomfortable working with electricity, by all means hire a professional licensed electrican to complete this work. Professionals can do the job quickly and safely, and they secure the proper permit inspections. Even if you have the work performed by someone else, review the included wiring diagrams to familiarize yourself with your options. Draw up a plan to determine where you'd like to have outlets and switches installed so you can share it with the electrician.

Upgrading to a full 8-ft.-long fluorescent light fixture is an efficient way to improve the quality of the light in your garage (see pages 192 to 193).

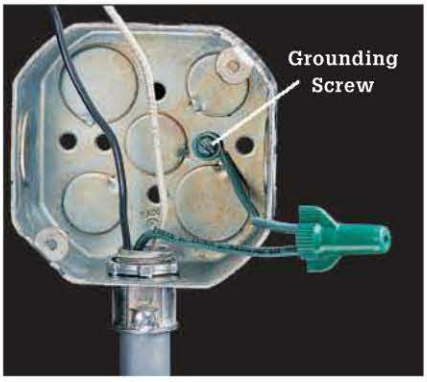
Wiring Safety

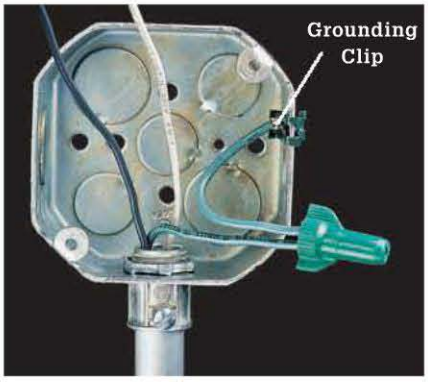
Shut power OFF at the main service panel or the main fuse box before beginning any work.

Confirm power is OFF by testing at the outlet, switch, or fixture with a current tester.



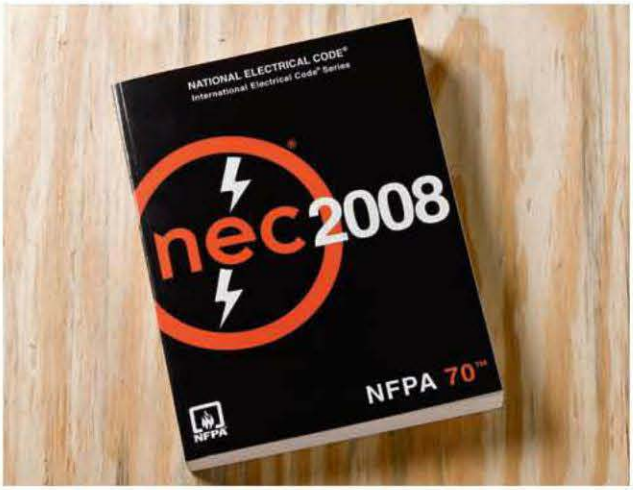
Wear rubber-soled shoes while working on electrical projects. On damp floors, stand on a rubber mat or dry wooden boards.





Install a green insulated grounding wire for any circuit that runs through metal conduit. Although code allows the metal conduit to serve as the grounding conductor, most electricians install a green insulated wire as a more dependable means of grounding the system. The grounding wires must be connected to metal boxes with a pigtail and grounding screw (left) or grounding clip (right).

The ground-fault circuit-interrupter, or GFCI receptacle, is a modern safety device. When it detects slight changes in current, it instantly shuts off power.



Learn about codes. The National Electrical Code (NEC), and local electrical and building codes, provide guidelines for determining how much power and how many circuits your home needs. Your local electrical inspector can tell you which regulations apply to your job.

Bringing Electrical Service to a Garage

Nothing improves the convenience and usefulness of a garage more than electrifying it. Running a new underground circuit from your house to the garage lets you add receptacles and light fixtures both inside the outbuilding and on its exterior.

Adding an outdoor circuit is not complicated, but every aspect of the project is strictly governed by local building codes. Therefore, once you've mapped out the job and have a good idea of what's involved, **visit your local building department to discuss your plans and obtain a permit for the work**.

This project demonstrates standard techniques for running a circuit cable from the house exterior to the garage, plus the wiring and installation of devices inside the building. The building department may recommend or require using a GFCI breaker to protect the entire circuit. Alternatively, you may be allowed to provide GFCI protection to the circuit devices via the receptacle inside the shed. GFCI protection is required on all outdoor circuits.

For basic electrical needs, such as powering a standard light fixture and small appliances or power tools, a 15-amp circuit should be sufficient. However, if you plan to run power-hungry equipment like stationary woodworking or welding tools, you may need one or more dedicated 20-amp circuits. Also, if the shed is more than 50 feet away from the house, you may need heavier-gauge cable to account for voltage drop.

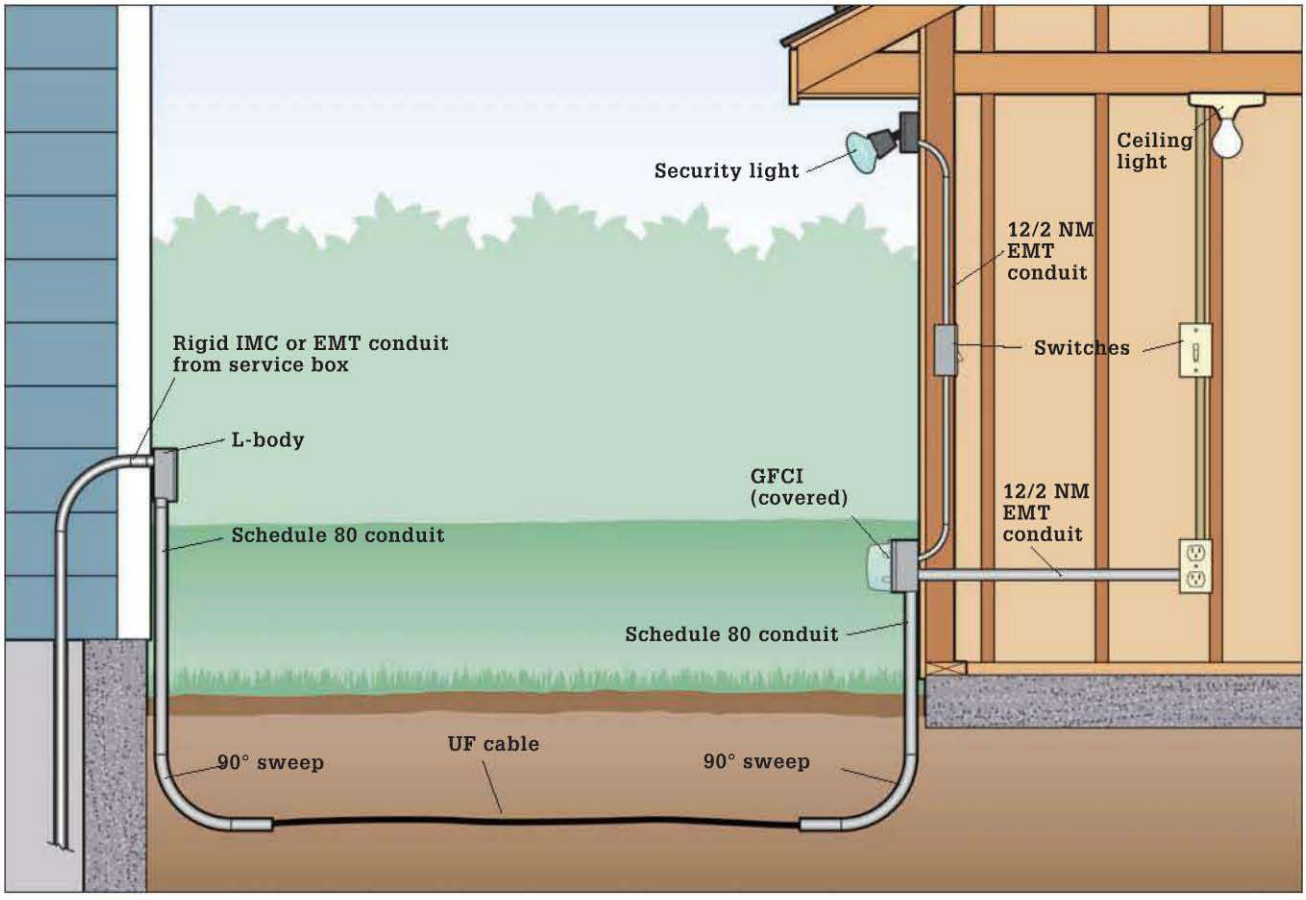
Most importantly, don't forget to call before you dig. Have all utility and service lines on your property marked even before you make serious project plans. This is critical for your safety, of course, and it may affect where you can run the circuit cable.

Warning: All electrical work must be reviewed and passed by a building inspector. Unless you have experience, electrical installations should be done by a licensed electrician.

Adding electrical service to a garage greatly expands the activities the building will support and is also beneficial for home security.

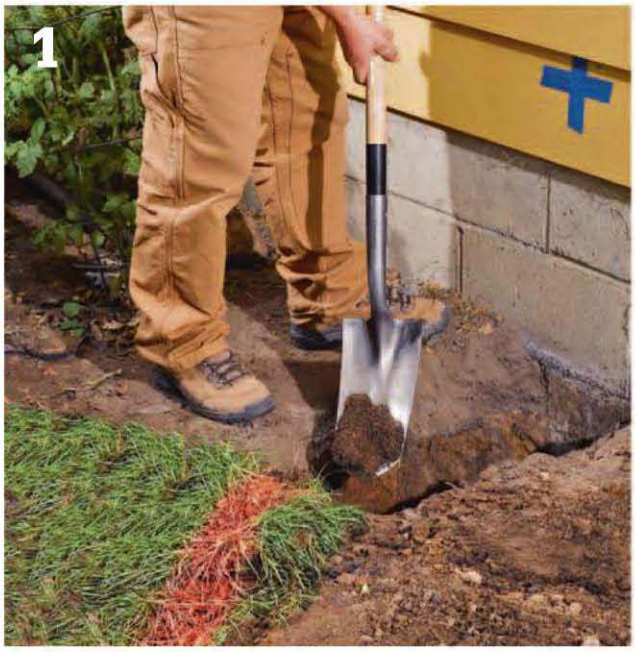
Tools & Materials

- Spray paint
- Trenching shovel (4" wide blade)
- 4" metal junction box
- Metal L-fittings (2) and conduit nipple for IMC conduit
- Wood screws
- IMC conduit with watertight threaded and compression fittings
- Wrenches
- Hacksaw
- 90° sweeps for IMC conduit
- Plastic conduit bushings
- Pipe straps
- Silicone caulk and caulk gun
- Double-gang boxes, metal
- One exterior receptacle box (with cover)
- Single-pole switches
- Interior ceiling light fixture and metal fixture box
- Exterior motion detector fixture and plastic fixture box
- EMT metal conduit and fittings for inside the shed
- Utility knife
- Wire stripper
- UF two-wire cable (12 gauge)
- NM two-wire cable (12 gauge)
- 15-amp GFI-protected circuit breaker
- Pliers
- Screwdrivers
- Wire connectors
- Hand tamper
- Masking tape
- Grease pencil
- Scraps of lumber

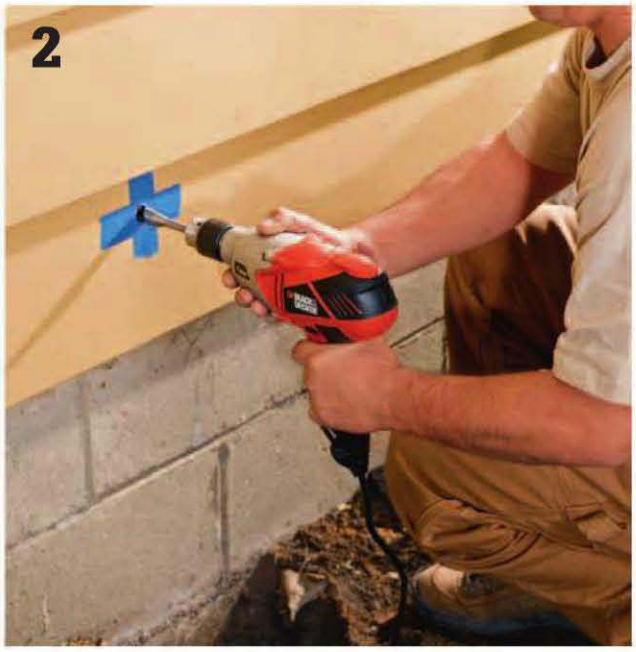


A basic outdoor circuit starts with a waterproof fitting at the house wall connected to a junction box inside. The underground circuit cable—rated UF (underground feeder)—runs in an 18"- to 24"- deep trench and is protected from exposure at both ends by metal or PVC conduit. Inside the garage, standard NM cable runs through metal conduit to protect it from damage (not necessary if you will be adding interior wall coverings). All receptacles and devices in the garage must be GFCI protected.

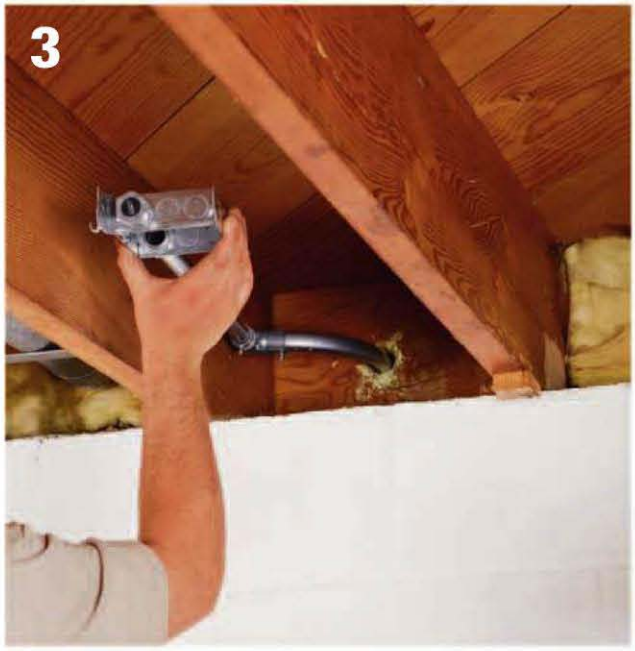
How to Supply Electrical Service to a Garage



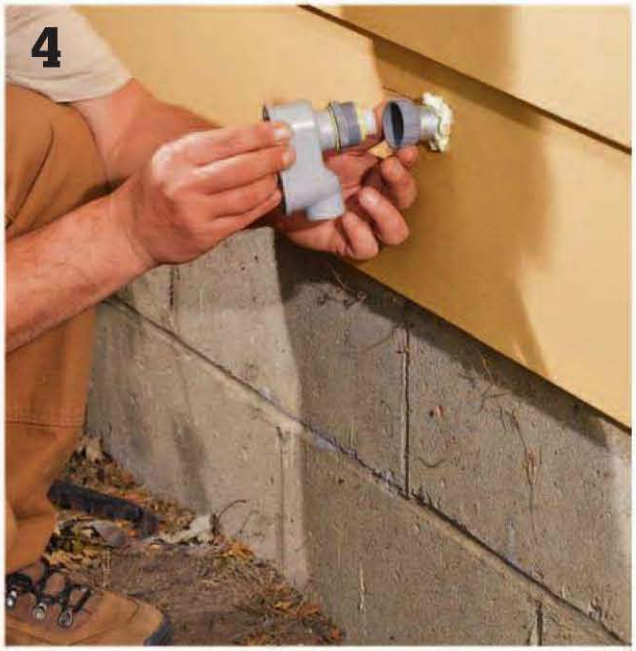
Identify the circuit's exit point at the house and entry point at the garage and mark them. Mark the path of the trench between the exit and entry points using spray paint. Make the route as direct as possible. Dig the trench to the depth required by local code using a narrow trenching shovel.



From outside, drill a hole through the exterior wall and the rim joist at the exit point for the cable (you'll probably need to install a bit extender or an extralong bit in your drill). Make the hole just large enough to accommodate the L-body conduit fitting and conduit nipple.



Assemble the conduit and junction box fittings that will penetrate the wall. Here, we attached a 12" piece of ¾" conduit and a sweep to a metal junction box with a compression fitting, and then inserted the conduit into the hole drilled in the rim joist. The junction box is attached to the floor joist.



From outside, seal the hole around the conduit with expandable spray foam or caulk, and then attach the free end of the conduit to the back of a waterproof L-body fitting. Mount the L-body fitting to the house exterior with the open end facing downward.

Cut a length of IMC to extend from the L-fitting down into the trench using a hacksaw. Deburr the cut edges of the conduit. Secure the conduit to the L-fitting, then attach a 90° sweep to the bottom end of the conduit using compression fittings. Add a bushing to the end of the sweep to protect the circuit cable. Anchor the conduit to the wall with a corrosion-resistant pipe strap.

Inside the shed, drill a ¾" dia. hole in the shed wall. On the interior of the garage, mount a junction box with an open back to allow the cable to enter through the hole. On the exterior side directly above the end of the UF trench, mount an exterior-rated receptacle box with cover. The plan is to bring power into the garage through the hole in the wall behind the exterior receptacle.

Run conduit from the exterior box down into the trench. Fasten the conduit to the building with a strap. Add a 90° sweep and bushing, as before. Secure the conduit to the box with an offset fitting. Anchor the conduit with pipe straps, and seal the entry hole with caulk.

Run underground feeder (UF) cable from the house to the outbuilding. Feed one end of the UF circuit cable up through the sweep and conduit and into the L-fitting at the house (the back or side of the fitting is removable to facilitate cabling). Run the cable through the wall and into the junction box, leaving at least 12" of extra cable at the end.

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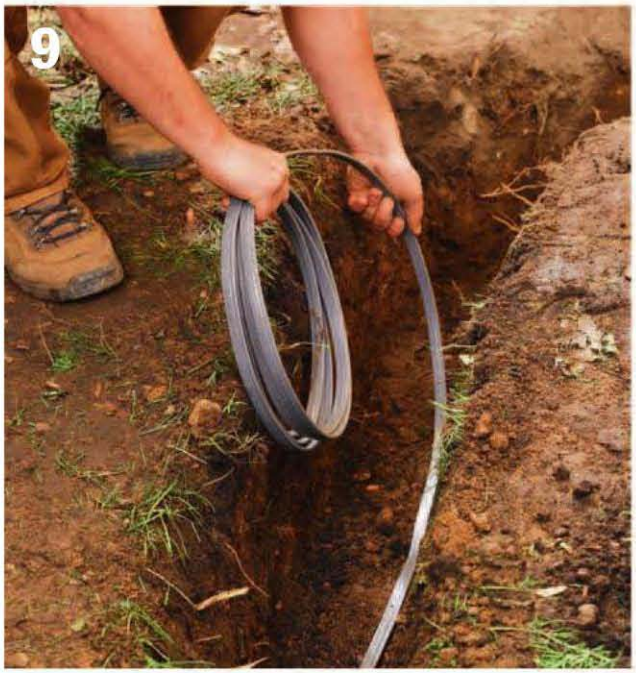
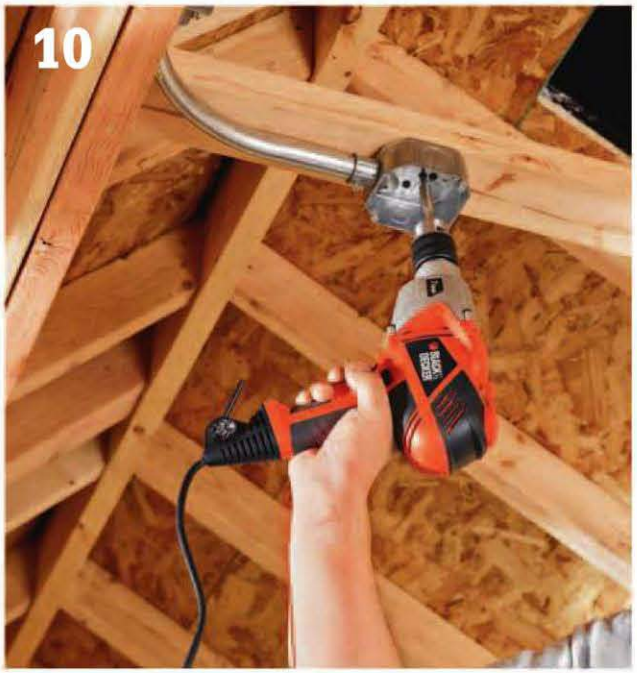
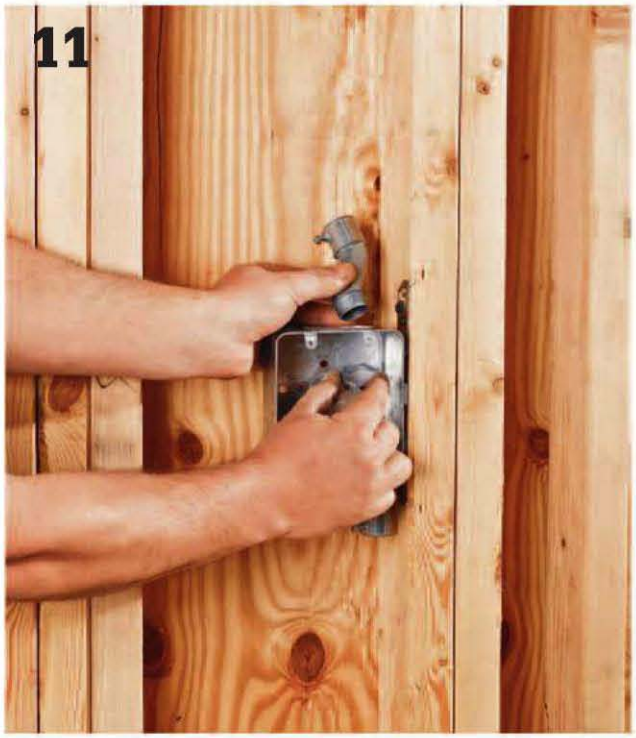


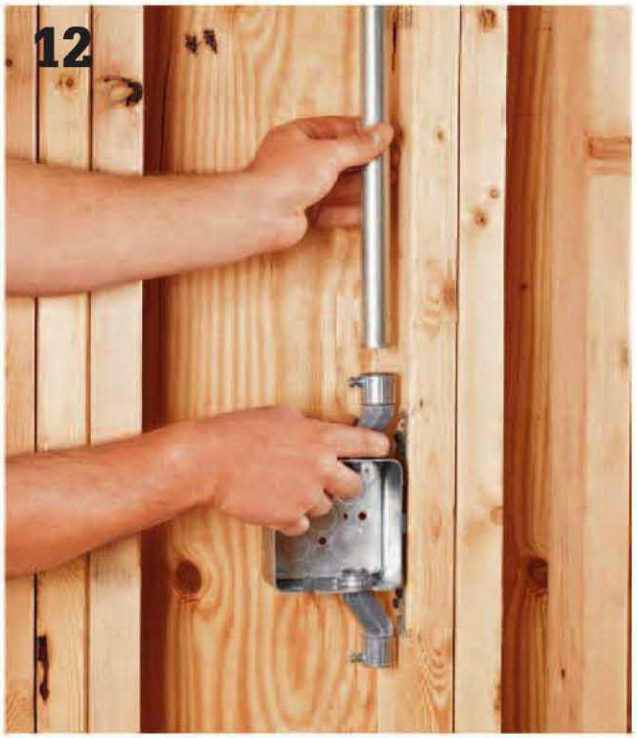
Lay the UF cable into the trench, making sure it is not twisted and will not contact any sharp objects. Roll out the cable and then feed the other end of the cable up through the conduit and into the receptacle box in the garage, leaving 12" of slack.



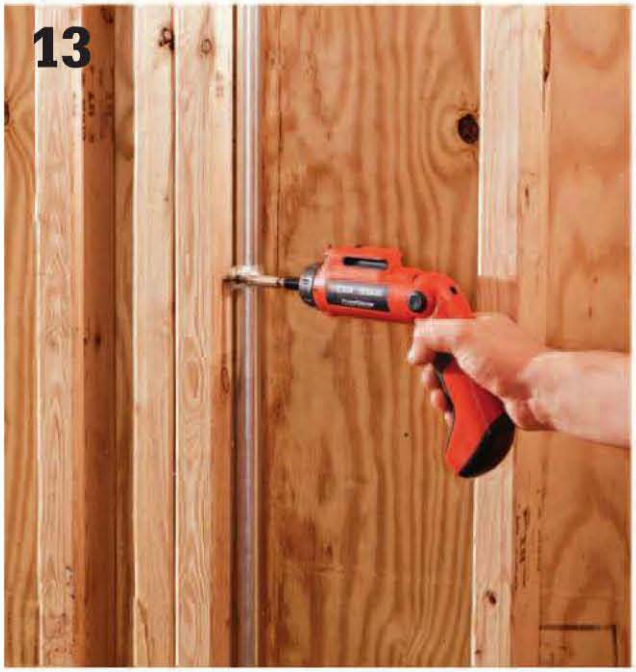
Inside the garage, install the remaining boxes for the other switches, receptacles, and lights. With the exception of plastic receptacle boxes for exterior exposure, use metal boxes if you will be connecting the boxes with metal conduit.



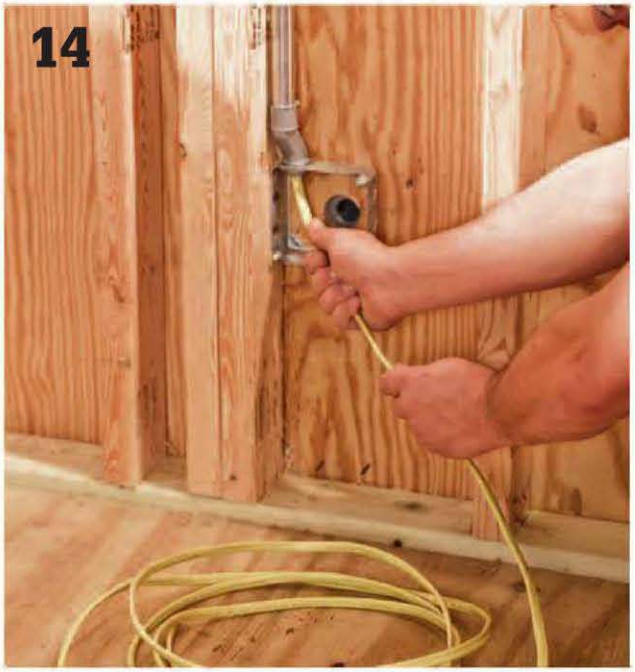
Connect the electrical boxes with conduit and fittings. Inside the garage, you may use inexpensive EMT to connect receptacle, switch, and fixture boxes. Once you've planned your circuit routes, start by attaching couplings to all of the boxes.



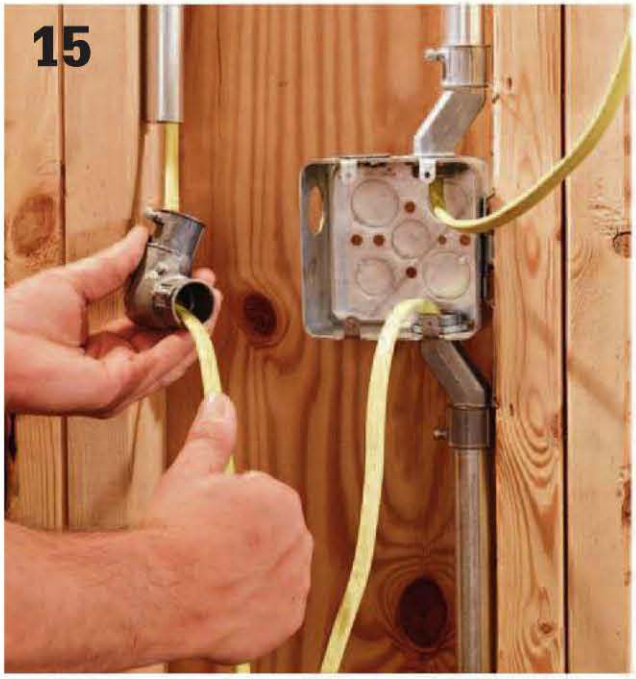
Cut a length of conduit to fit between the coupling and the next box or fitting in the run. If necessary, drill holes for the conduit through the centers of the wall studs. Attach the conduit to the fitting that you attached to the first box.



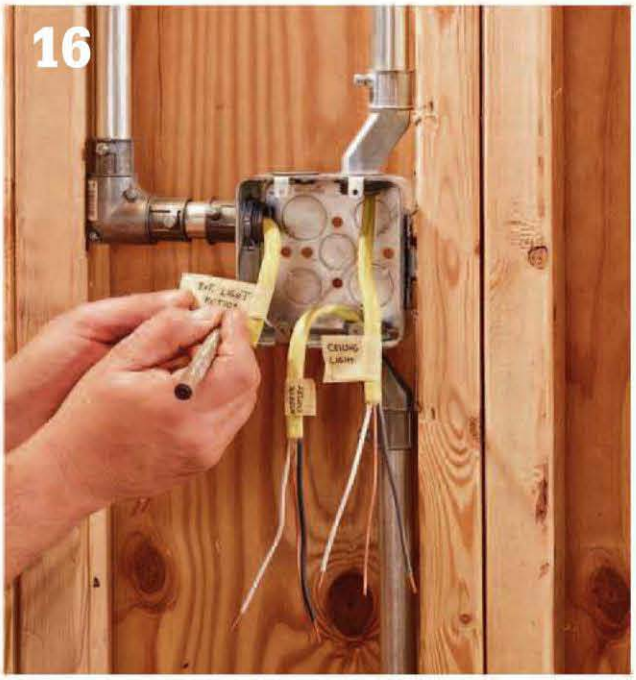
If you are surface mounting the conduit or running it up or down next to wall studs, secure it with straps no more than 3 ft. apart. Use elbow fittings for 90° turns and setscrew couplings for joining straight lengths as needed. Make holes through the wall studs only as large as necessary to feed the conduit through.



Measure to find how much NM cable you'll need for each run, and cut a piece that's a foot or two longer. Before making L-turns with the conduit, feed the cable through the first conduit run.



Feed the other end of the cable into the next box or fitting in line. It is much easier to feed cable into 45° and 90° elbows if they have not been attached to the conduit yet. Continue feeding cable into the conduit and fitting until you have reached the next box in line.



Once you've reached the next box in line, coil the end of the cable and repeat the process with new cable for the next run. Keep working until all of the cable is run and all of the conduit and fittings are installed and secured. If you are running multiple cables into a single box, write the origin or destination on a piece of masking tape and stick it to each cable end.

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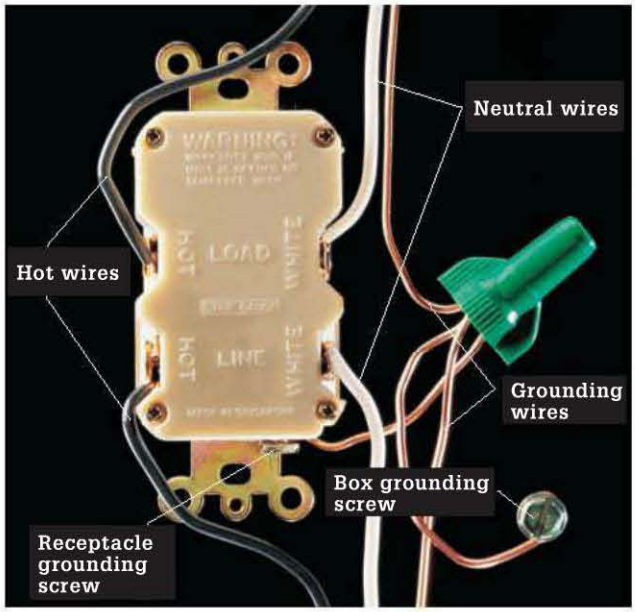
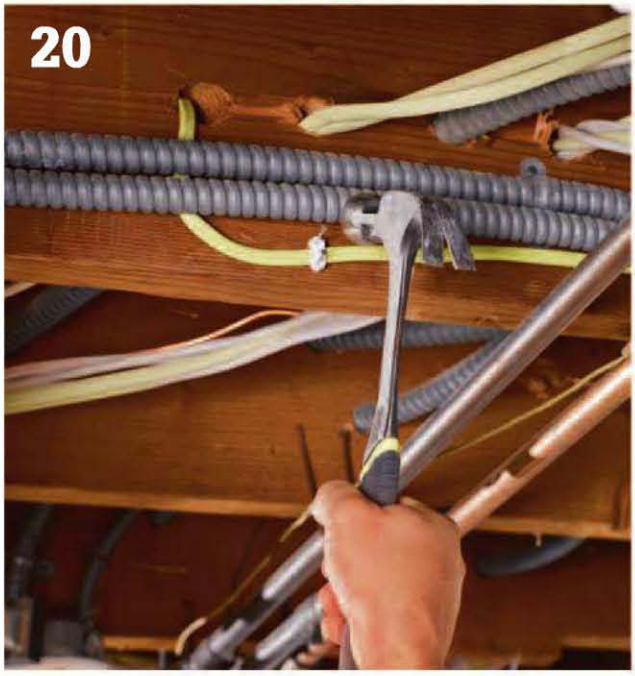


Make the wiring connections at the receptacles. Strip ¾" of insulation from the circuit wires using a wire stripper. Connect the white (neutral) wire and black (hot) wire of the UF cable to the LINE screw terminals on the receptacle. Connect the white (neutral) and black (hot) wires from the NM cable to the LOAD terminals. Pigtail the bare copper ground wires and connect them to the receptacle ground terminal and the metal box. Install the receptacle and cover plate.

Variation: Installing a GFCI-protected breaker for the new circuit at the main service panel is the best way to protect the circuit and allows you to use regular receptacles in the building. An alternative that is allowed in many areas is to run the service into a GFCI-protected receptacle, and then wire the other devices on the circuit in series. If you use this approach, only the initial receptacle needs to be GFCI protected.

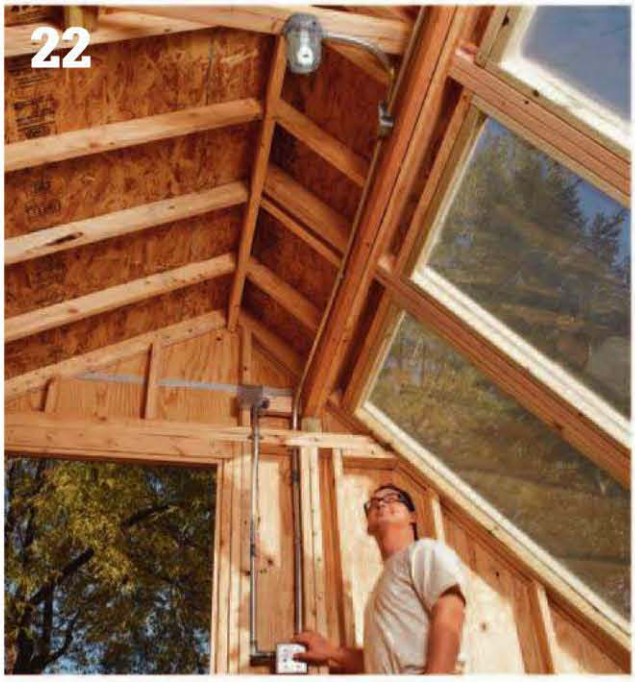
Continue installing receptacles in the circuit run, and then run service from the last receptacle to the switch box for the light fixture or fixtures. (If you anticipate a lot of load on the circuit, you should probably run a separate circuit for the lights.) Twist the white neutral leads and grounding leads together and cap them. Attach the black wires to the appropriate switches. Install the switches and cover plate.

Install the light fixtures. For this garage, we installed a caged ceiling light inside the garage and a motion-detector security light on the exterior side.

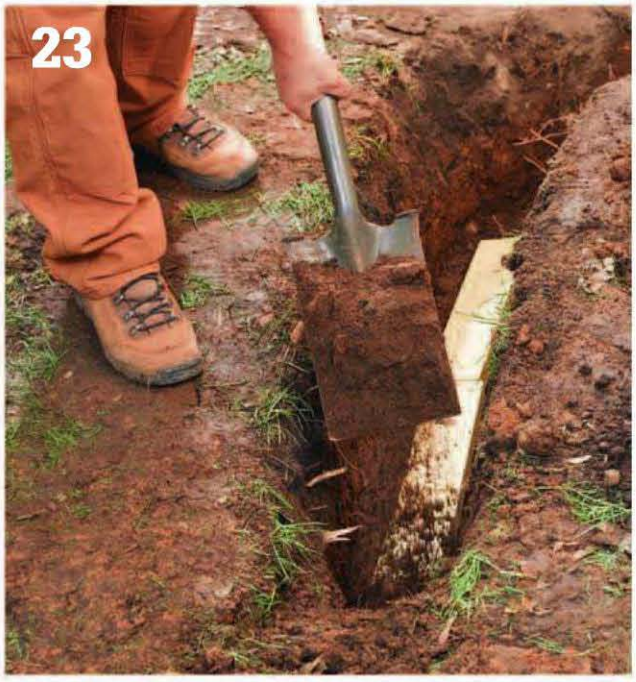


Run NM cable from the electrical box in the house at the start of the new circuit to the main service panel. Use cable staples if you are running the cable in floor joist cavities. If the cable is mounted to the bottom of the floor joists or will be exposed, run it through conduit.

At the service panel, feed the NM cable in through a cable clamp. Arrange for your final electrical inspection before you install the breaker. Then attach the wires to a new circuit breaker and install the breaker in an empty slot. Label the new circuit on the circuit map.



Turn on the new circuit and test all of the receptacles and fixtures. Depress the Test button and then the Reset button if you installed a GFCI receptacle. If any of the fixtures or receptacles is not getting power, check the connections first, and then test the receptacle or switch for continuity with a multimeter.



Lay narrow scraps of lumber over the cable in the trench as an extra layer of protection from digging, and then backfill with dirt to cover. Replace the sod in the trench if you saved it.

Motion-Sensing Floodlights

Most garages have floodlights on their exteriors. You can easily upgrade these fixtures so that they provide additional security by replacing them with motion-sensing floodlights. Motion-sensing floods can be set up to detect motion in a specific area—like a walkway or driveway—and then cast light into that area. And there are few things intruders like less than the spotlight. These lights typically have timers that allow you to control how long the light stays on and photosensors that prevent the light from coming on during the day.

A motion-sensing light fixture provides inexpensive and effective protection against intruders. It has an infrared eye that triggers the light fixture when a moving object crosses its path. Choose a light fixture with: a photo cell to prevent the light from turning on in daylight; an adjustable timer to control how long the light stays on; and range control to adjust the reach of the motion-sensor eye.

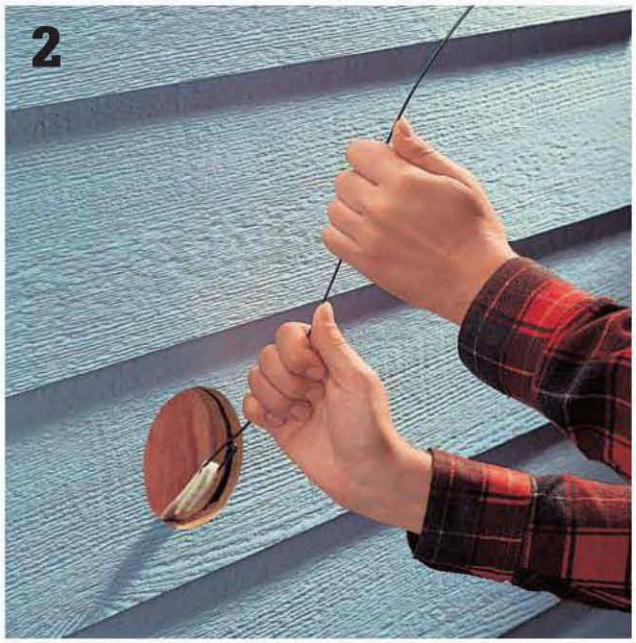
Tools & Materials ▸

- Marker
- Drill
- Jig saw
- Fish tape
- Cable ripper
- Combination tool
- Screwdriver
- Voltage sensor
- Light fixture box
- Motion sensor fixture
- Wire connectors

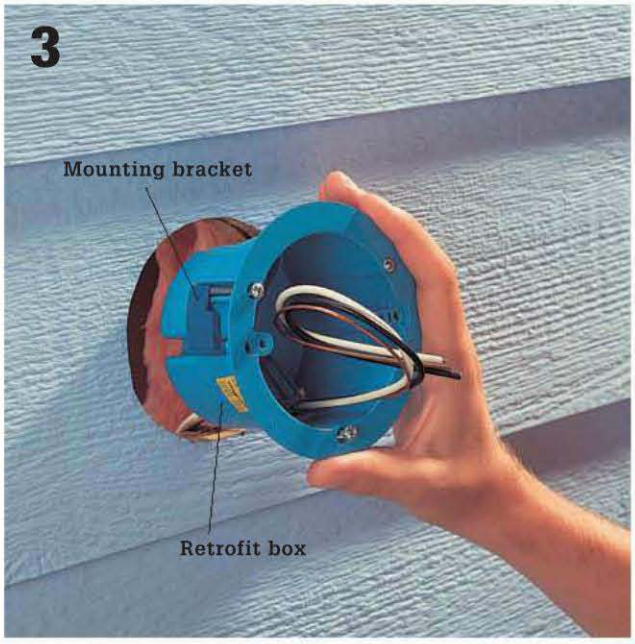
An exterior floodlight with a motion sensor is an effective security measure. Keep the motion sensor adjusted to cover only the area you wish to secure—if the coverage area is too large the light will turn on frequently.

How to Install a New Exterior Fixture Box

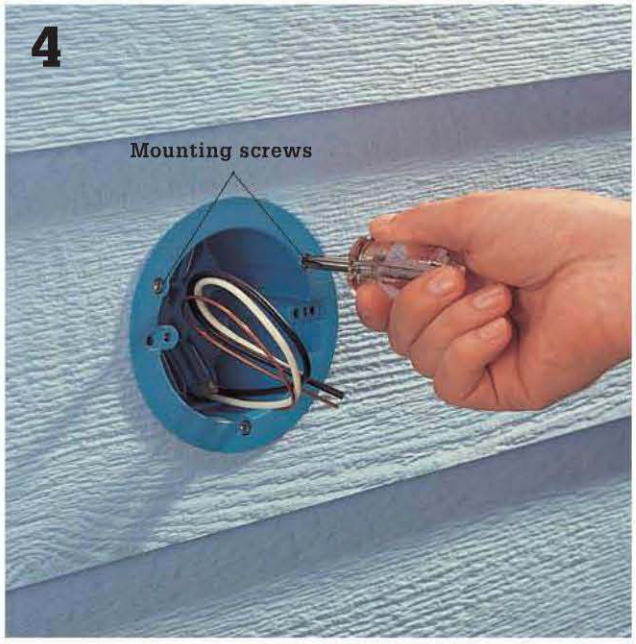
On the outside of the house, make the cutout for the motion-sensor light fixture in the same stud cavity with the GFCI cutout. Outline the light fixture box on the wall, then drill a pilot hole and complete the cutout with a wallboard saw or jigsaw.



Estimate the distance between the indoor switch box and the outdoor motion-sensor box, and cut a length of NM cable about 2 ft. longer than this distance. Use a fish tape to pull the cable from the switch box to the motion-sensor box.



Strip about 10" of outer insulation from the end of the cable using a cable ripper. Open a knockout in the retrofit light fixture box with a screwdriver. Insert the cable into the box so that at least ¼" of outer sheathing reaches into the box.



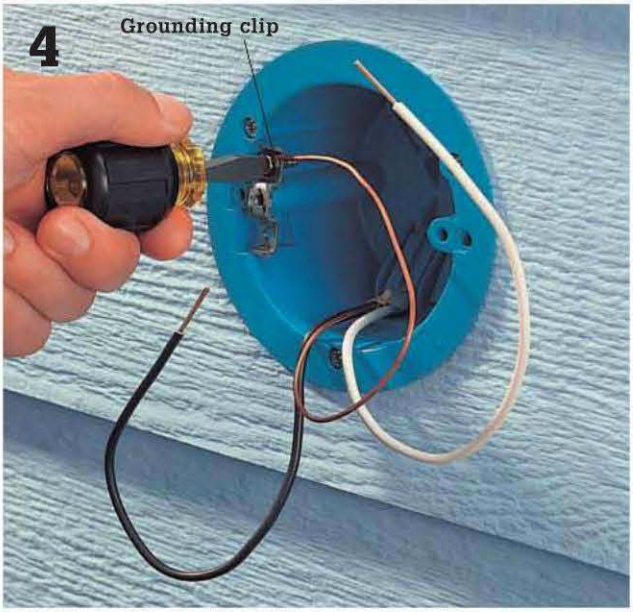
Insert the box into the cutout opening, and tighten the mounting screws until the brackets draw the outside flange firmly against the siding.

How to Replace a Floodlight with a Motion-Sensor Light

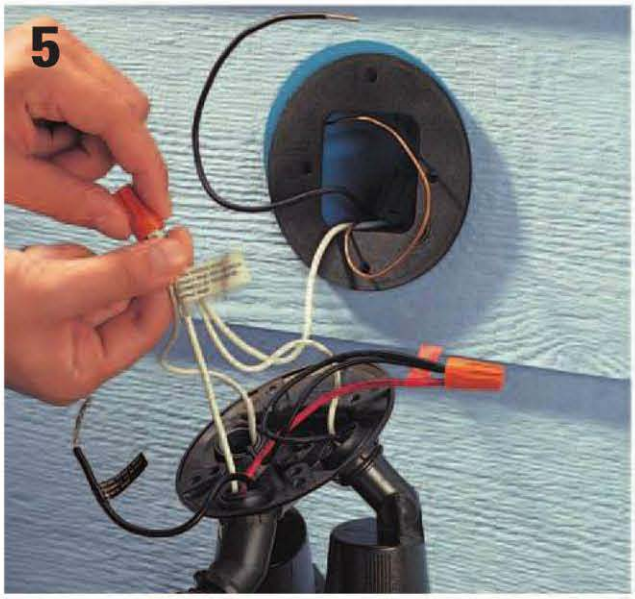
Turn off power to the old fixture. To remove it, unscrew the mounting screws on the part of the fixture attached to the wall. There will probably be four of them. Carefully pull the fixture away from the wall, exposing the wires. Don't touch the wires yet.

Before you touch any wires, use a voltage sensor to verify that the circuit is dead. With the light switch turned on, insert the sensor's probe into the electrical box and hold the probe within ½" of the wires inside to confirm that there is no voltage flow. Disconnect the wire connectors and remove the old fixture.

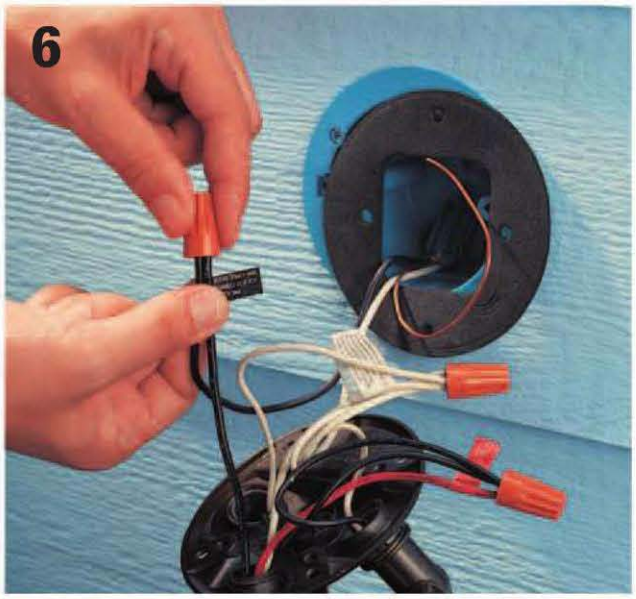
Examine the ends of the three wires coming from the box (one white, one black, and one bare copper). They should be clean and free of corrosion. If the ends are in poor condition, clip them off and then strip ¾" of wire insulation with a combination tool.



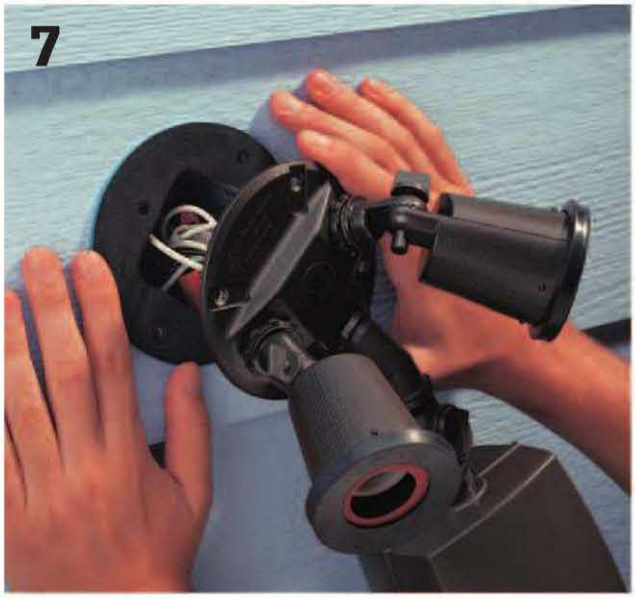
If the electrical box is nonmetallic and does not have a metal grounding clip install a grounding clip or replace the box with one that does have a clip, and make sure the ground wire is attached to it securely. Some light fixtures have a grounding terminal on the base. If yours has one, attach the grounding wire from the house directly to the terminal.



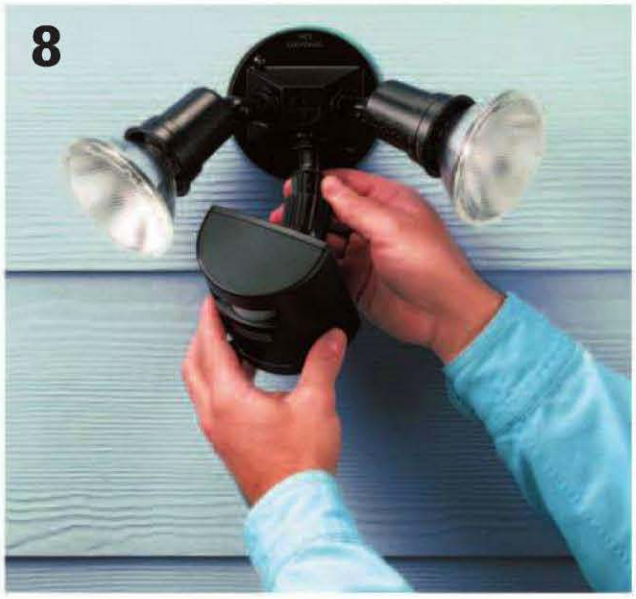
Now you can attach the new fixture. Begin by sliding a rubber or foam gasket (usually provided with the fixture) over the wires and onto the flange of the electrical box. Set the new fixture on top of a ladder or have a helper hold it while you make the wiring connections. There may be as many as three white wires coming from the fixture. Join all white wires, including the feed wire from the house using a wire connector.



Next, join the black wire from the box and the single black wire from the fixture with a wire connector. You may see a couple of black wires and a red wire already joined on the fixture. You can ignore these in your installation.



Neatly tuck all the wires into the box so they are behind the gasket. Align the holes in the gasket with the holes in the box, and then position the fixture over the gasket so its mounting holes are also aligned with the gasket. Press the fixture against the gasket and drive the four mounting screws into the box. Install floodlights (exterior rated) and restore power.



Test the fixture. You will still be able to turn it on and off with the light switch inside. Flip the switch on and pass your hand in front of the motion sensor. The light should come on. Adjust the motion sensor to cover the traffic areas and pivot the light head to illuminate the intended area.

Installing Fluorescent Light Fixtures

Aside from natural lighting, fluorescent lights are the most economical way to brighten up your garage. The fixtures are relatively inexpensive, the bulbs burn for thousands of hours before they need replacement, and fluorescent lights use a fraction of the energy of incandescent bulbs. If you buy bulbs rated as daylight in the 3,000 kelvin range, you'll have bright, white light that will make excellent ambient or task lighting for a garage.

In this project, we show you how to install an 8-foot fluorescent ceiling fixture, but you can follow the same procedure for mounting shorter fixed 4-foot lamps. Either way, once you disassemble the fixture to hang it, you'll want to work with a helper. The fixtures are bulky and fairly delicate. If your only option is to work alone, consider renting a wallboard lift to hold the fixture against the ceiling while you fasten it in place.

You might wonder how to determine the number of fixtures you need for your garage. The rule of thumb is one overhead fixture will illuminate an area that extends about 4 feet out from the fixture in all directions. So, a single 4-foot light will illuminate approximately 96 square feet of floor space below it. You'll want to have at least two 4-foot fixtures for a single-car garage and four 4-foot or two 8-foot fixtures for a two-car garage. Of course, adding more fixtures only helps, particularly if you want to eliminate most or all of the shadows in your garage workspace. If you install the minimum number of ceiling fixtures, supplement the overhead lighting with windows and additional task lights where you need them.

Although it might be tempting to buy economy fixtures, you get better value and performance in the long run if you invest in industrial-grade fluorescents. These fixtures have cold-weather ballasts that start immediately in the winter, and they won't flicker or buzz as loudly as economy lights. The ballasts also last much longer than those in bargain-priced lights.

Tools & Materials ▸

- Stepladder
- Tape measure
- Stud finder
- Drill
- Screwdriver
- Combination tool
- Fluorescent fixture
- Cable clamp
- Wire connectors

An 8-ft.-long fluorescent light fixture can illuminate your entire garage. This model has a heavy-duty ballast that withstands cold weather, making it a good choice for a garage setting.

How to Install a Hard-wired Light Fixture

Prepare the fixture box for installation by removing the knockout in the box that will align with the electrical box in the ceiling. Raise the fixture to the ceiling. Although fluorescent fixtures are not especially heavy, once you've removed the diffuser there is a danger they will buckle. Have a helper support the other end of the fixture. Position it against the ceiling, threading the end of the cable through the cable clamp installed in the light fixture knockout. *Note: The light fixture must be supplied with 120-volt power from a ceiling box with 12- or 14-gauge NM cable. The cable should be routed through finished walls or through conduit, and it should originate from a switch next to the service door. If you do not have wiring experience, hire a professional to provide power to the fixture box. Shut power OFF at the service panel.*

Attach the fixture box to the ceiling by driving screws through mounting holes in the box and into ceiling framing members. If the mounting holes do not align with rafters or trusses, mark the holes, remove the fixture, and then install toggle bolts. Or drill new mounting holes in the metal box at the framing member locations.

Make wiring connections. Connect the bare copper ground in the NM cable to the grounding terminal on the fixture box. (This may require a short pigtail wire.) Connect the black power wire from the switch to the black fixture wire with a wire connector. Connect the white neutral from the switch box to the white fixture wire.

Install the bulb and test the fixture. If everything works, remove the bulb and install the deflector shield over the wiring connections. Reinstall the bulb, and then attach the diffuser.

Installing an Electric Heater

A plug-in portable electric heater is one option for warming your garage, but most of these small room units won't deliver adequate heat. A better solution is to install a thermostatically controlled, hard-wired heater such as the one shown in this project. It has a built-in fan to circulate heat quickly and evenly, and you can mount it to the ceiling where it's out of your way. Louvers on the front of the heater enable you to direct the airflow where it's needed most. The unit has a thermal cutout that automatically shuts it off in the event of overheating.

A hard-wired heater generally requires 220-volt electric service, and it should be wired to a dedicated circuit breaker. If you are experienced with advanced wiring projects, you could wire this project yourself. However, in the interest of personal safety and in order to meet local building codes, it may make more sense to hire a professional electrician for this job.

The heater shown here hangs from a bracket that fastens to a ceiling joist or roof truss. Installing the bracket and mounting the heater isn't difficult. Be sure to follow the manufacturer's recommendations regarding important wall and ceiling clearances before proceeding with the installation. If your garage hobbies create a lot of dust, remember to inspect and clean the heater on a regular basis to keep it working safely and efficiently. If you do not have experience with home wiring, hire a professional to install a new circuit and run the cable to the device.

Tools & Materials ▸

- Drill
- Studfinder
- Stepladder
- Screwdrivers
- 240-volt heater with mounting bracket
- Flexible metal conduit with 10/2 wire
- Lag screws (⅜" × 4")
- Cable clamp

A high-output electric heater can improve the working conditions in your garage dramatically, extending your working-in-the-garage season by weeks or months.

How to Install an Electric Heater

Turn off power to the circuit at the main service panel. Mount the heater hanger bracket to the ceiling at a joist location. So you can pivot the heater from side to side, use a single ⅜ x 4" lag screw with a washer on each side of the bracket strap to hang the unit. Don't overtighten the screws.

Hang the heater unit in the mounting bracket. Position it at the desired height and align the bracket screws with the screw slots in the hanger straps. Tighten screws to secure the unit. If you want to be able to point the heater downward, make sure to use the keyhole-shaped screw slots.

Run electrical cable to the heater. For finished garages, the easiest way to run cable is to encase it in metal conduit that's surface mounted to the walls and ceiling. The unit seen here requires 240-volt service delivered by 10/2 sheathed cable with a ground. Connections at the circuit breaker box should be made by an electrician. The cable is routed through an electrical box located within 2 ft. of the heater.

Run flexible metal conduit containing 10/2 cable from the electrical box to the heater unit. Use cable clamps to secure the conduit and leave 8 to 10" of free wire extending into the electrical box. Connect the other end of the conduit to the cable entry opening in the heater unit.

Make wiring connections inside the heater unit at the power block and inside the electrical box. A 240-volt heater will have two connection terminals. Connect the black wire from the box to one terminal and connect the white wire to the other terminal. The white wire should be tagged black with electrical tape. Connect the ground wire to the grounding screw terminal.

Set the thermostat once you have restored power and tested to make sure the heater is operating properly. On the model shown here, you set the thermostat to high and then dial it back once the garage reaches your desired temperature. Adjust the heater to the desired position.

Adding a Garage Window

Artificial lighting is only one option for illuminating your garage. Another sensible approach is to add a window or two. No matter which direction your garage faces, a window increases the ambient lighting during daylight hours. Any window size and style can work in a garage, but smaller windows are less vulnerable to break-ins. If you want your garage window to serve as a source of ventilation as well as light, a double-hung style will allow breezes from all directions and it won't project out from the garage when it's open. Be sure to buy insect screens for your new window.

This project shows you how to install a flange-style window in a finished garage wall. The process involves locating the window on the inside wall, removing wallboard and existing framing, and then framing a new rough opening for the window. Once the exterior wall is opened up and the window is mounted, you patch the siding and interior wall surfaces to complete the job. Correct flashing and caulking techniques are critical to keep moisture out, so follow those steps carefully.

Be sure to defer to the installation manual that comes with your new window if the instructions differ from those you see here. Failing to do that and installing the window incorrectly could void the product warranty and lead to leaks or a shorter service life.

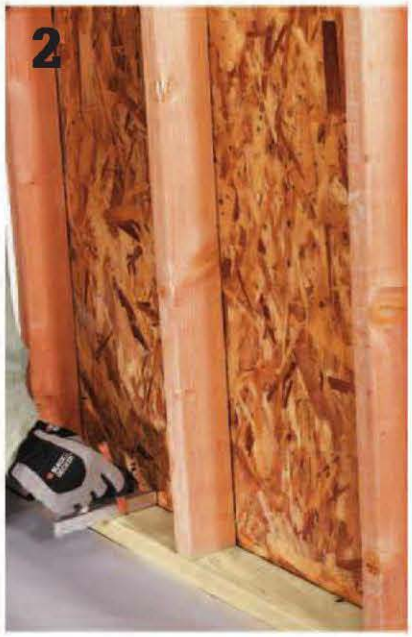
Tools & Materials ▸

- Work gloves & eye protection
- Utility knife
- Straightedge
- Tape measure
- Marker
- Level
- Combination square
- Hammer
- Stepladder
- Circular saw
- Reciprocating saw
- Flat pry bar
- Caulk gun
- Chalkline
- Aviation snips
- Common nails (10d, 16d)
- Panel adhesive
- ½" plywood
- 2× framing lumber
- Self-adhesive flashing
- Window
- Shims
- Silicone caulk
- 1½" roofing nails
- Metal drip edge
- Brickmold
- Case moldings

Add a window to a dark garage to increase natural light. Although hopper-style windows and fixed windows are common in garages, a double-hung such as this offers better ventilation.

How to Add a Garage Window

Remove wall coverings in the installation area. Lay out the location for the new window on the wall first, according to the rough opening requirements for the window unit you purchased. Extend the opening to the next wall stud on each side, and mark the centers of the studs to outline the removal area. Remove the wall covering material all the way from the ceiling to the floor in the removal area. This will create access for framing the window opening.



Mark the rough opening width on the sole plate of the garage wall. Mark locations for jack studs and king studs just outside the rough opening marks.

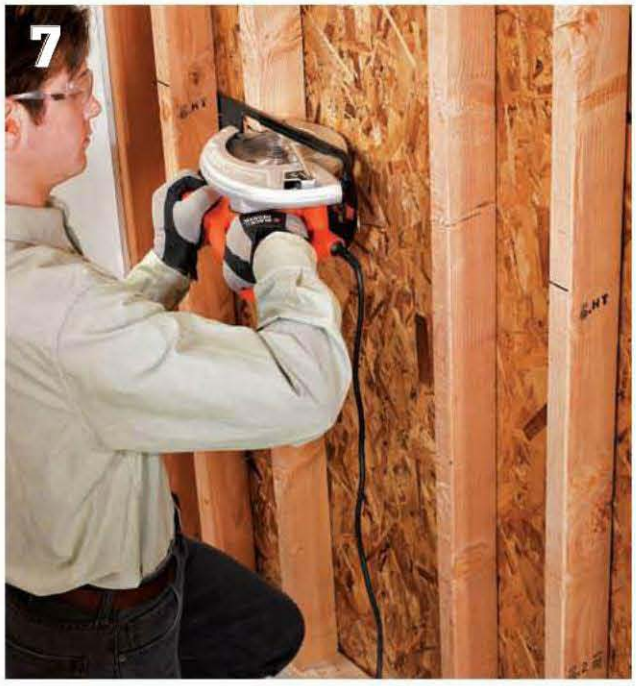
Cut and attach the king studs to the sole plate using 10d common nails driven toenail-style.

Plumb the tops of the king studs with a level, and then mark the edges onto the cap plate. Toenail the king studs to the cap plate.

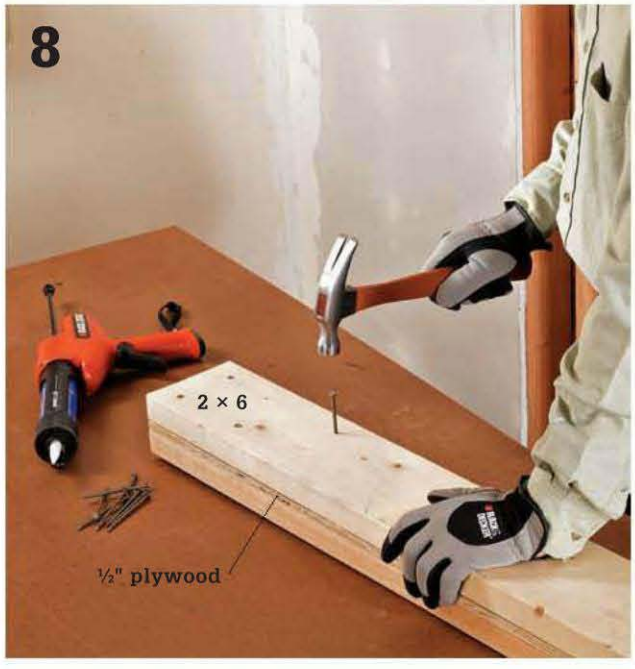
Mark the top of the rough opening onto the king studs, measuring up from the floor. Cut the jack studs to this length.

(continued)

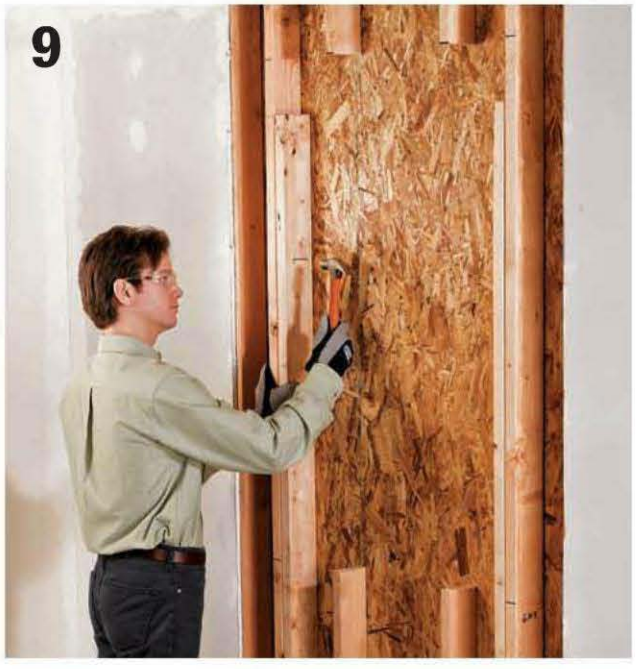
Measure and mark the top of the header and sill locations on the king studs, and then transfer the lines across the old studs in the rough opening area by positioning a straightedge between the header marks on the king studs. This creates a pair of cutting lines on each old stud.



Cut the old studs along the top and bottom cutting lines using a circular saw set to full cutting depth. Finish the cuts with a reciprocating saw or handsaw. Pry out the cut studs with a flat pry bar.

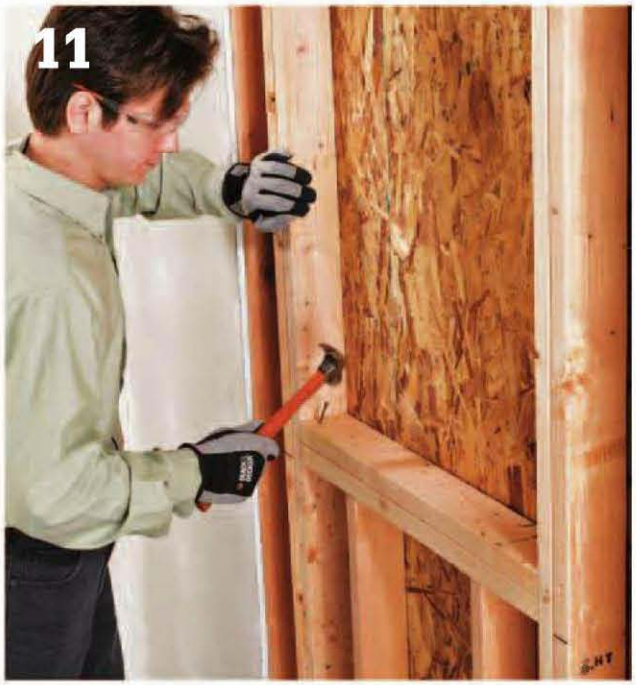


Make the header. For most garages, a window or door header made from a pair of 2 × 6s sandwiched around a strip of ½" plywood meets code requirements, but be sure to check with your local building department. Apply panel adhesive between all the parts, and drive 16d nails through both faces at regular intervals to secure the header parts.



Facenail the jack studs to the king studs, making sure the tops align with the layout lines for the bottom of the header (the header will rest on the tops of the jack studs).

Install the header. Set the header (step 8) onto the tops of the jack studs. Attach it to the king studs by facenailing through the king studs and into the header with 10d common nails. Also toenail through the cut studs (called cripple studs) above the header.



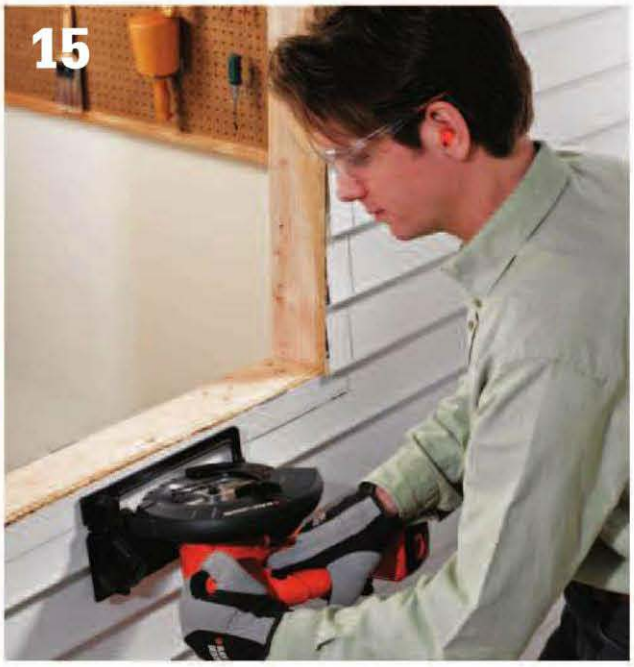
Install a doubled sill. Attach one sill member by facenailing down and into the tops of the cripple studs. Then, facenail the second sill plate to the first. Also toenail the top sill to the jack studs. Finally, cut two cripple studs and install them beneath the ends of the sill.

Mark the rough opening on the exterior wall. First, drive a 10d casing nail through the siding at each corner of the opening, nailing from inside the garage. Then on the exterior side, snap a chalk line between the nails to outline the opening.

Cut through the wall with a reciprocating saw, following the cutting lines for the rough opening. Make your cutting lines as straight as you can.

(continued)

Mark the siding around the opening for trimming to create a recess for the window nailing flange and also the brickmold trim that will be installed (it is preinstalled on some windows). You need to temporarily set the window into the opening to trace the cutting lines.



Remove the siding along the cutting lines. Vinyl, wood, or steel lap siding can be cut with a trim saw or circular saw. Other siding types, such as stucco or brick, require more complicated techniques. Check with a contractor or refer to other resources for more information. Remove all wall coverings down to the wall sheathing.

Flash the rough opening by installing self-adhesive flashing or strips of building paper around the opening. Tuck the flashing beneath the siding next to the window opening. Flash the sill first, then the side, and then the top so the strips overlap from above.

Set the window in the opening. Insert wood shims beneath the window and the sill and between the sides of the unit and rough opening. Adjust the shims until the unit is level in the opening and the side gaps are even. *Tip: For an extra seal, apply a bead of silicone caulk to the back of the nailing flange before installing the window.*

Nail the window nailing flange to the framing members with 1½" roofing nails. Unless the manufacturer's instructions direct otherwise, drive nails at corners and every 6" along the flanges. Most flanges are predrilled with guide holes for nails. For an extra seal, cut thin strips of self-adhesive flashing and cover the flanges once the nails are driven.

Cut a piece of metal drip edge molding (also called drip cap or window cap) and insert it behind the siding above the window. Use only caulk (no metal fasteners) to secure the drip edge.

Install brickmold if your window doesn't have preinstalled trim. Start with the top strip, miter cutting the ends at 45° to create miter joints with the side pieces. Then install the sides. Install the bottom last. Attach brickmold with 8 galvanized casing nails driven through pilot holes (brickmold is prone to splitting). Caulk between the brickmold and the siding.

Finish the interior side. Patch in with new drywall (see pages 154 to 157) or reuse the old drywall if possible. Then trim the window sill and jambs with mitered case molding.

Installing a Skylight

A skylight will brighten any room in your house, including the garage. Skylights are reasonably priced, and today's new high-quality models have improved flashing that makes them as dependable and weather-tight as other windows. Any standard garage roof can accept a skylight, provided it has a reasonable pitch (at least 3-in-12) and good drainage. If your garage has an unfinished ceiling, you can simply mount the skylight and let it provide general ambient light. On finished ceilings, a skylight shaft is needed to direct the light down into the garage, which will create a more focused area of light.

A skylight frame has a header and sill, similar to a standard window frame. However, instead of king studs, it has king rafters as well as trimmers that define the sides of the rough opening. Follow the manufacturer's instructions for determining the proper rough opening size for your new skylight.

With standard rafter-frame roof construction, you can safely cut into one or two rafters as long as you permanently support the cut rafters. If your garage has a truss roof, the skylight needs to fit between two trusses. Never alter your roof trusses to accommodate a wider skylight by cutting or removing parts of their framework. If your garage has a heavy slate or clay tile roof, talk with an architect or building engineer regarding how to reinforce the new framing.

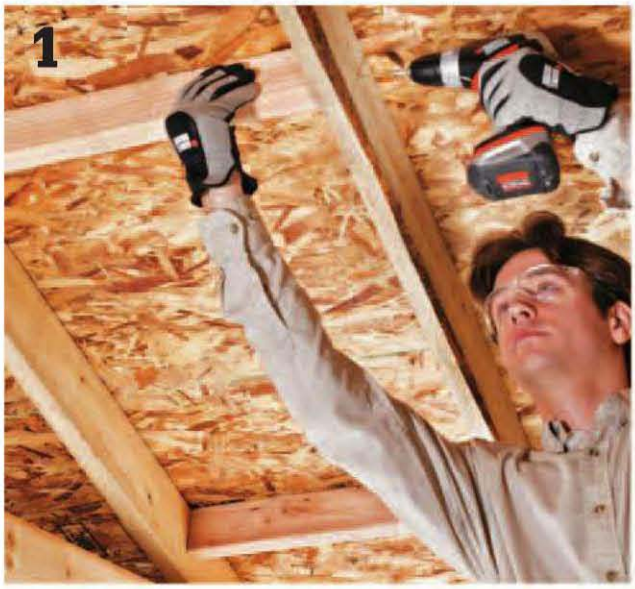
If you install your garage skylight facing west or south it will receive the greatest amount of direct sunlight, but the flip side is that the intensity of the light could overheat your space. For that reason, you may want to position it facing east or north for cooler general room lighting. Since installing a skylight requires working on the roof, carefully set up stepladders and wear fall-arresting gear. The job will go much more smoothly and safely with a helper.

Tools & Materials ▸

- Work gloves & eye protection
- Tape measure
- Miter saw
- Hammer
- Drill
- Ladders
- Chalkline
- Circular saw
- Jigsaw
- Aviation snips
- 2× Framing lumber
- Utility screws
- 1 × 4 board
- Self-adhesive flashing
- Skylight with flashings

A skylight introduces natural light into a garage without posing the security risk that makes some homeowners reluctant to install an eye-level window in the garage (inset). A rafter-style garage roof provides clearspans that are impossible with trusses. Here's an attic space you can really use! If you're planning to build a new garage, give traditional rafters some serious thought.

How to Install a Skylight



Frame the rough opening for the skylight according to the size specifications provided with the unit. Skylights are sized so they fit between 24 or 16" on-center roof members, so if you have chosen a model wisely, you only need to install a header and a sill to complete the rough framing. In most areas, single 2 × 4s may be used for the rough frame. For aesthetic purposes or if you will build a skylight shaft, however, you may prefer to use the same width dimensional lumber as the rafters.

Mark the cutout area for the roof sheathing by driving a long deck screw or a casing nail at each corner of the framed opening on the interior side.

Outline the roof cutout by snapping chalk lines between the points of the deck screws driven at the corners of the opening. Be sure to follow good safety practices for working on roofs: wear shoes, such as tennis shoes, with nonskid soles; and use roof jacks and fall-arresting gear on roofs with a pitch greater than 4-in-12. Also be aware of weather conditions.

Cut out the roof opening. Mount an old blade in a circular saw or cordless trim saw and plunge cut along the top and bottom cutting lines. Stop short of the corners so you don't overcut. Before making the side cuts, tack a long 1 × 4 across the opening, perpendicular to the top and bottom cuts, driving a couple of screws through the 1 × 4 and into the cutout area. The 1 × 4 will keep the waste from falling into the garage through the hole. Make the side cuts, and then finish the cuts at the corners with a jigsaw or reciprocating saw. Remove the waste.

(continued)

Remove the shingles surrounding the opening, but try and maintain the integrity of the building paper beneath. Try to salvage the shingles if you can so they can be reinstalled (they'll match better than new shingles). Start with the row of shingles above the opening. Once these are removed you'll have access to the roofing nails on lower courses.

Seal the bottom of the rough frame opening. Apply a strip of self-adhesive flashing at the bottom of the roof opening to create a seal on the curb and to cover the seam between the underlayment and the roof deck. This is for extra protection.

Position the skylight in the opening. Different models use different fastening and centering devices. The one seen here is installed using pairs of adjustable brackets that are fastened to the roof deck and to the sides of the skylight frame.

Fasten the skylight unit. Many models employ adjustable brackets like the ones seen here so the skylight can be raised or lowered and centered in the opening. The brackets seen here have a slot and several nail holes in the horizontal flange. Drive a ring shank nail in all four slots and then shift the unit side to side as necessary until it is centered in the opening. The brackets also allow the unit to be raised or lowered so the bottom edges of the cladding are the recommended distance above the finished roof surface (see manufacturer's recommendations).

Install self-adhesive flashing strips around the skylight curb. Start with the base strip, cutting slits in the corners so the flashing extends all the way up the curb (you'll need to remove metal cladding strips first). Install the head flashing last so all strips overlap from above.

Install the metal flashing beginning with the sill. Some skylights have a 4-piece flashing kit where the side flashing is simply shingled over. Others, like the one seen here, include solid base and head flashing components and step flashing that is woven in with the shingles as the roof coverings are installed.

Replace shingles up to the skylight curb. Install shingles in complete rows, notching them to fit around the curb. Stop once the granular surfaces of the top row of shingles meet the curb.

Install side flashing. Here, metal step flashing is interwoven with the shingles during the shingling process. Whether it's the shingle layer or the step flashing layer, make sure that all components always overlap from above and the horizontal tabs on the step flashing are all covered with shingles. Do not nail through flashing.

Install the head flashing piece so it overlaps the last course of shingle and step flashing. Finish shingling in the installation area, again taking care not to nail through any metal flashing. Replace the metal cladding and caulk if recommended by the manufacturer.

Floor Improvements

Three flooring solutions allow you to paint your floor or cover it up for a fresh, clean appearance, and all are manageable DIY projects. You won't have to put up with a dull, dirty, or damp garage floor.

If you plan to use your garage for anything more than parking or storage, you're going to spend a lot of time standing and walking on the floor, so it makes sense to improve its appearance, condition, and cleanliness. Garage slabs tend to be the most marginal floor areas of our homes. They can be damp, especially when the slab doesn't drain properly. If you've got an older garage, the slab may be cracked or show signs of deterioration from weathering and hard use. The good news is there are a number of ways to improve your garage floor economically as a do-it-yourselfer, without renting a jackhammer or sand blaster. This chapter will highlight several options.

For a garage floor that is dry and in sound condition the most cost-effective approach is to paint it. Garage floor paint is generally a two-part epoxy product that you can apply with a roller and brush. It comes in a range of colors, and you can add quartz crystals or sand to the paint to help improve traction. Paint will brighten dull concrete, and when applied correctly, it will stand up to both foot traffic and car tires. The first project of this section will show you how to apply garage floor paint properly.

The next two projects provide floor-covering options. If your garage floor has some minor cosmetic problems, such as tiny cracks or spalling, paint probably won't hide them adequately. One alternative is to install flexible rolled flooring. It's thick enough to hide surface imperfections in the slab, and it offers a bit of cushioning for your feet and legs. A third option—interlocking floor tiles—simply snap together to form a grid over the concrete. These tiles stand slightly off the floor to promote drainage underneath, so they're a good solution for damp concrete.

Because no flooring project should be conducted on a floor that is in disrepair, the following pages include a brief sequence showing how to patch your concrete garage floor.

Patching Garage Floors ▸

Use a concrete chisel (called a cold chisel) and a heavy hammer or mallet to deepen the edges of the damaged area until the outer edges are at least ⅛" thick. Most cracks and depressions in concrete floors are deeper in the center and are tapered at the edges; the feather-thin material around the perimeter of the hole is liable to peel or flake off.

Clean out the area to be patched using a wire brush or portable drill with a wire wheel attachment. Be sure to remove all dirt and loose material from the area to be patched. This step will also roughen the edges a bit, creating a better bond.

A bonding agent (also called a bonding adhesive) helps to chemically bond the patch material to the existing concrete, making the repair material less likely to loosen or dislodge. Apply a thin layer of bonding adhesive to the entire repair area with a paintbrush. Some bonding agents need to be applied to a wet surface, others should not. Follow the directions carefully.

Mix your concrete patching compound with clean water until all of the material is thoroughly wet and all of the lumps are worked out. Most mixing compounds start to set within 10 to 20 minutes. (Inset) Use a trowel to compact the material into the area being repaired until it is slightly raised above the surface of the surrounding concrete. If the hole is deeper than ¼", allow each layer to dry before applying the next layer.

Use the edge of the trowel to smooth the surface, removing any excess material. Slide the trowel back and forth on its edge, while also pulling the excess material toward you, until it is past the edge of the area you're working on. Scoop it up with the trowel and discard.

Finishing work. Slightly raise the flat face of the steel finishing trowel and smooth the patching material until it is even with the adjoining surfaces, creating a seamless repair. Keep the trowel clean and damp to prevent the mix from gumming up the trowel. Finishing is an art and takes practice, so keep trying.

Garage Floor Treatments

If your garage floor is not perfectly dry, smooth, and in good repair, you have several options for improving it. A simple cleaning is the easiest and most obvious solution. For concrete floors, a process called etching is done in conjunction with basic cleaning with detergent. Etching uses mild acid to remove oil, grime, and other stains plain detergent won't take care of. Etching is recommended as a preparatory treatment for applying paint or acid-based stain. Prior to etching, any preexisting paint must be completely removed and any minor cracks or imperfections should be repaired (see following pages).

Once the garage floor is repaired, cleaned, and etched, you may choose simply to seal it. There is some debate about the advisability of sealing concrete because the sealing products remove the concrete's natural ability to breathe which can lead to problems related to moisture entrapment. But because garage floors receive so much traffic and filth, it is generally agreed that a seal coat is a definite aid in ongoing maintenance.

After etching, but before sealing, is the time to paint (or you can use an acid-based stain if you wish). To paint an etched concrete floor, use a two-part, epoxy-based product that you mix together before application. The paint can be applied with ordinary brushes and rollers. Each gallon provides approximately 250 square feet of floor coverage and dries in about 48 hours. When fully cured, the paint will resist oil and brake fluids and other automotive chemicals.

Tools & Materials ▸

- Stiff-bristle push broom
- Leaf blower
- Pressure washer
- Power buffer
- Garden hose
- Long-handled paint roller or squeegee
- Paintbrush
- Baking soda
- Protective glasses
- Boots
- Painter's tape
- Plastic sheeting and tape
- Drill
- Mixing paddle attachment
- Cleaning and finishing products
- Shop vacuum
- Large plastic bucket
- Respirator

Specially formulated epoxy-based paint will give your concrete garage floor a low-cost facelift and comes in a variety of colors from which you can choose.

Tools & Materials for Painting Garage Floors

Preparation and finishing materials include: (A) ammonia-base detergent for general cleaning of concrete surface; (B) muriatic acid for final cleaning immediately before paint application; (C) two-part epoxy floor paint Part A; (D) two-part epoxy floor paint Part B; (E) antiskid granular additive (optional).

A power washer does a fast and thorough job of cleaning dirty garage floors prior to painting. Use these tools with caution. If handled carelessly, they are powerful enough to create more mess than they remove.

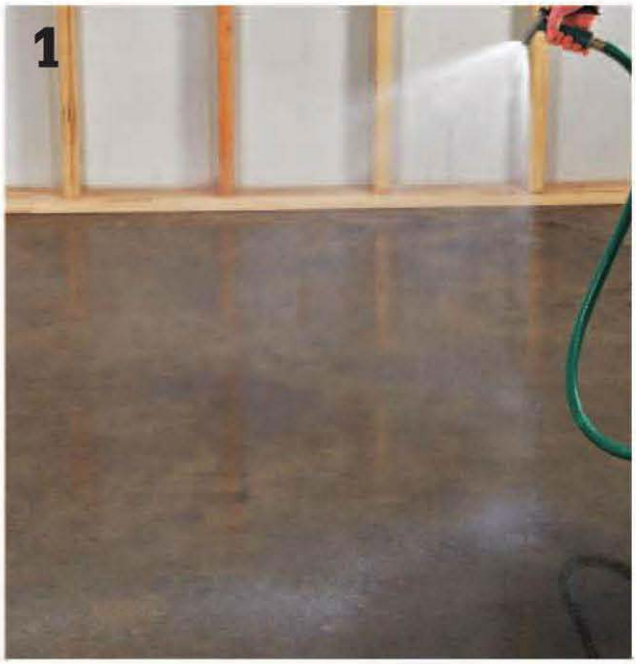
A power scrubber/buffer can be rented to clean dirty, oily floors and to help work floor treatment products into the concrete surface. These can be tricky to handle at first, so it's a good idea to practice with plain water before you use the scrubber with chemicals.

General purpose tools that are useful in a floor maintenance and painting project include: (A) a plastic watering can for broadcasting cleaning and finishing chemicals; (B) a push broom; (C) a long-handled squeegee; (D) a long-handled paint roller; (E) a drill outfitted with a paddle-type mixing attachment; (F) a plastic-body garden sprayer for applying chemical treatments.

How to Clean & Etch a Garage Floor

Testing Tip ▸

Test the floor to make sure moisture is not migrating up from below. Tape a large piece of plastic to the floor and let it rest overnight. If condensation forms on the underside of the plastic it means that transpiration is occurring and the paint will likely fail. Test the floor more than once and in multiple spots to be sure of its suitability for paint.



Rinse the floor thoroughly after sweeping or vacuuming. A simple garden hose can be used for this process, or you can employ a pressure washer for deep cleaning. Use grease-cutting detergent and also scrub with a stiff-bristle brush as necessary to remove oily stains.

Prepare the acid-based etching solution by pouring one cup of muriatic acid into a pump sprayer or a plastic watering can containing clean water for the recommended dilution ratio (see acid container label). **Always add acid to water: never add water to acid.** *Caution: Follow the safety precautions on the acid product container at all times.*

Broadcast the acid etching solution with a sprayer or a watering can. Apply it evenly in areas small enough that they will not dry before you can work the acid into the concrete surface (100 sq. ft. at a time is a good guideline).

Work the acid solution into the floor surface with a stiff-bristle push broom or a power scrubber/buffer. Let the acid solution rest for 5 to 10 minutes. A mild foaming action indicates that the product is working.

Neutralize the acid by brushing the floor with a solution of baking soda dissolved in water (1 cup per gallon of water) only after all of the floor surface has been etched. Rinse with a power washer and then vacuum with a wet/dry shop vacuum. Let the floor dry overnight before applying paint.

Rinse the garage floor thoroughly with a hose and clean water, or with a pressure washer. Multiple rinsing is advised.

Vacuum the wet floor thoroughly with a wet/dry shop vacuum after you have finished rinsing it. Vacuuming will help prevent any residue from forming on the floor when it dries.

How to Seal a Garage Floor

Once etched, clean, and dry, your concrete is ready for clear sealer or liquid repellent. Mix the sealer in a bucket with a stir stick. Lay painter's tape down for a testing patch. Apply sealer to this area and allow to dry to ensure desired appearance. Concrete sealers tend to make the surface slick when wet. Add an antiskid additive to aid with traction, especially on stairs.

Use wide painter's tape to protect walls, and then use a good-quality 4"-wide synthetic-bristle paintbrush to coat the perimeter with sealer.

Use a long-handled paint roller with at least ½" nap to apply an even coat to the rest of the surface. Do small sections at a time (about 2 × 3 ft.). Work in one orientation (e.g., north to south). Avoid lap marks by always maintaining a wet edge. Do not work the area once the coating has partially dried; this could cause it to lift from the surface.

Allow the surface to dry according to the manufacturer's instructions, usually 8 to 12 hours minimum. Then apply a second coat in the opposite direction of the first coat. If the first coat was north to south, the second coat should be east to west.

How to Paint a Garage Floor

Mix the first part (Part A) of the two-part epoxy paint. Following the instructions on the can label precisely, add the Part B liquid to the Part A and blend with a mixing paddle attachment mounted in an electric drill. If you plan to add antiskid granules, add them at this point and mix them in well.

Paint the perimeter of the room with a large brush, making sure to get paint all the way into the corners and up against the bottom of the walls. Feather the paint out on the room side so you do not leave any ridges that will show.

Paint the floor with a long-handled roller extension and a short-nap sleeve. Work from one corner opposite the garage door and make your way to the overhead door. Don't make the coat too thick; a couple of thin coats is much better than one thick one. Once you have completed the first coat, close all doors and do not open them until the paint has dried. Sweep or vacuum the floor after the first coat (the primer coat) dries. Wear clean shoes and try and get up as much debris as you can.

Apply the second coat of paint in the same manner as you applied the first. Instructions may vary, but in general it isn't a good idea to apply more than two coats. Reserve any leftover paint for occasional touch-ups in high-wear areas.

Installing Roll-out Floor Covering

A quick, simple alternative to painting your garage floor is to cover it with rolled PVC flooring. Rolled flooring is manufactured in several colors and surface textures, including rib, coin, and tread patterns. This is the soft floor covering you often see in airports, shopping malls, gyms, and other high-traffic areas. The material is impervious to most automotive chemicals as well as road salt and water. Patterns help to hide minor concrete blemishes and improve traction. Rolled garage flooring is manufactured in 7½- to 10-foot-wide rolls and in various lengths up to 60 feet.

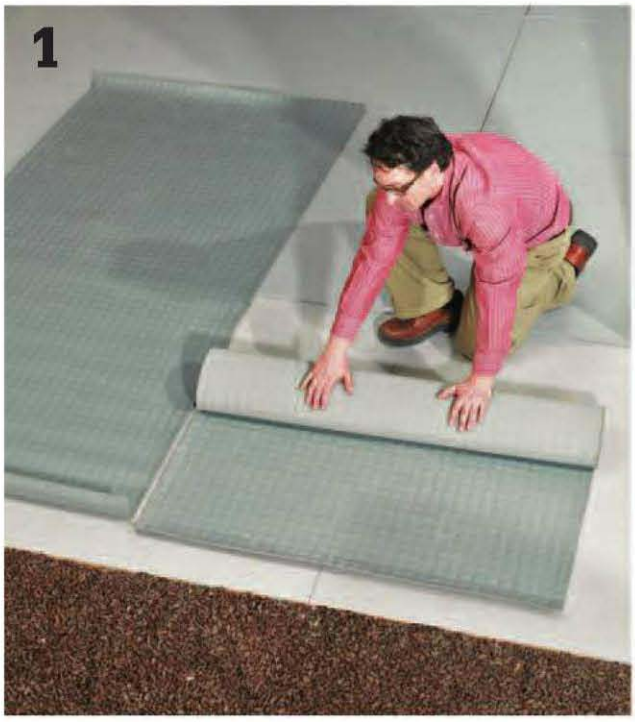
Installing roll-out covering requires much less preparation than garage floor paint, and the material is thick enough to lay flat and stay in place without bonding it to the concrete. To prepare for installation, sweep and clean your garage floor. Use cleaning chemicals, and then rinse thoroughly to remove stubborn oil and chemical stains. Plan to install the flooring on a warm, sunny day.

Tools & Materials ▸

- Stiff-bristle push broom
- Tape measure
- Straightedge
- Utility knife
- Roll-out floor covering
- Double-sided carpet tape

Roll-out flooring is a durable floating-floor solution that requires no special adhesives to install. In fact, you can lift up and pull the sheets outside for easy cleaning. It's an excellent option for concealing aged, stained, or damp concrete slabs.

How to Install Roll-out Flooring



Unroll the flooring material, preferably in a clean driveway on a sunny day. Let the material rest for a few hours to flatten.

Lay the material on the garage floor in rough position and use a push broom to sweep out any air bubbles.

Trim the material to fit around door openings and any obstructions using a sharp utility knife. For larger garages, roll out additional rolls of floor covering as needed.

Tape seams between rolls by curling the edge over and applying double-sided carpet tape to one roll. Lay the edges back down so the edge of the other roll is pressed into the tape.

Installing Interlocking Floor Tiles

Interlocking floor tiles are another quick, DIY-friendly solution that can give your garage floor a custom checkerboard look. These 1 × 1–ft. tiles are molded in a range of colors and are made of recycled PVC or other composites. You have several surface pattern styles to choose from, depending on the manufacturer. Some types are ventilated to promote drying, which makes them a good option for installing over damp concrete. The tiles will resist gasoline, oil, and most other solvents, so they're well suited for parking spaces or other garage workspace applications.

Interlocking tiles create a floating floor system similar to roll-out flooring (see pages 214 to 215). The four edges have locking tabs that clip together like a jigsaw puzzle. Once installed, the tile grid holds itself in place, so there's no need to fasten or glue the tiles permanently to the concrete. You can cut them with standard woodworking saws and tap them together with a mallet. Most tile brands offer beveled transition pieces to border the garage door edge.

The process for installing locking floor tiles is quite similar to laying permanent floor tile. Clean the floor thoroughly, then measure it and snap chalk lines to determine the exact center. Start by laying a row of tiles along the lengthwise chalk line from the garage door to the intersecting chalk line. Adjust the row as needed to allow for full tiles along the front edge of the garage. It's fine to have partial tiles along the back wall. Now, build out the tile grid left and right of the center row to fill in the rest of the floor. Measure and cut partial tiles as needed to fit against the side and back walls. Finish up by adding beveled transition pieces along the garage door, and cover the edges of the floor at the walls with sanitary base or other base moldings. With a helper, you should be able to complete your new tiled floor in an afternoon.

Tools & Materials ▸

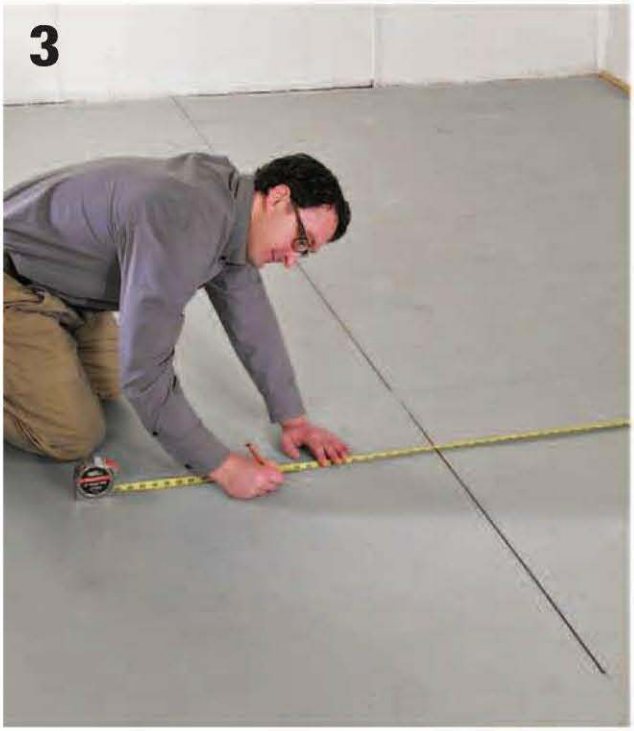
- Push broom or leaf blower
- Tape measure
- Chalk line
- Stiff-bristle brush
- Cleaning detergent
- Backer board
- Plastic bucket
- Straightedge guide
- Rubber mallet
- Jigsaw or circular saw
- Grease pencil
- Surface sealer
- Floor tiles

Interlocking floor tiles snap together for a virtually foolproof installation, and you'll have all the conveniences that a floating floor can offer.

How to Install Interlocking Floor Tiles

Clean the floor by sweeping, vacuuming, or blowing off any debris with a leaf blower.

Remove any oily stains by scrubbing with detergent and a stiff-bristle brush.



Measure the floor in both directions, and mark the locations of the centerlines.

Snap chalk lines to connect the center points in both directions, forming a point of intersection in the middle of the garage and dividing the floor into four quadrants.

(continued)

Lay tiles along one leg of the layout reference line, stopping just short of the wall. Snap the tiles together as you work. Use a rubber mallet to gently tap and set the tiles, if necessary.

Adjust the position of the first row of tiles so the last tile will fit just short of the overhead door opening without cutting. It is best to have the cut tiles against the far wall. If you plan to install a beveled transition strip (some, but not all, manufacturers carry them), be sure to allow room for it when repositioning the row. Snap new chalk lines parallel to the originals.

Add tiles along the adjusted reference lines to establish the layout. If you find that one row of tiles will need to terminate with tiles that are cut to a couple of inches or less, adjust the layout side to side so the cut tiles will be evenly balanced at both ends of the line. Fill in the tiles in the field area of all quadrants.

Measure the gaps at the ends of the rows requiring cut tiles and subtract ¼" for expansion.

Cut the tiles that need cutting with a jigsaw. Be sure to place a backer board underneath the tile. Use a straightedge guide for a clean cut.

Install transition strips at doorways. Not all brands of interlocking tiles have transition strips available.

Option: Seal the tiles to protect against tire marks and other discoloration by applying a surface sealer. (Check with the tile manufacturer for its recommendations.)

Add base trim. Conceal the expansion gaps around the perimeter of the installation with molding, such as vinyl-cove base molding.

Garage Maintenance

Most of the chores required when taking care of your garage are not much different from those you'd perform on your house: some fresh paint, a little caulk around windows and doors, a new roof every 10 or 20 years, and some basic dusting up and washing. But there are some maintenance activities that are unique to the garage. Concrete garage floors get more abuse than most floor surfaces and need regular cleaning as well as the occasional touching up of cracks or pop-outs. If your garage is home to a car or other gas-powered vehicle equipment, you will almost certainly face an occasional stain from engine oil or other fluid. In colder climates, road salt tracked in by your vehicles can cause the floor to discolor and degrade.

The garage door is another hot spot for garage maintenance. Anything that's as big as a garage door and moves regularly will undoubtedly need occasional lubrication and adjusting. If you have a garage door opener, you can plan on some regular maintenance, as well as eventual replacement.

The trick to garage maintenance is really no trick at all: don't procrastinate. Fix problems as soon as you spot them so they don't get worse, and stick to a regular cleaning and maintenance schedule.

In this chapter

Renewing a Garage Floor

Over time, exposed concrete surfaces can start to show a lot of wear. Weather, hard use, and problems with the initial pour and finishing are among the most common causes of surface blemishes. But despite a shabby appearance, old concrete is often structurally sound and can last for many more years. So instead of breaking up and replacing an old garage floor, you can easily renew its surface with concrete resurfacer. With this simple application, your concrete will have a freshly poured look and a protective surface layer that's typically stronger than the garage floor itself.

Concrete resurfacer is suitable for any size of garage floor, outdoors or indoors. You can also apply it to vertical surfaces to put a fresh face on steps, curbs, and exposed patio edges. Depending on the condition of the old surface, the new layer can range in thickness from 1/16 to 1/4". For a smooth finish, spread the resurfacer with a squeegee or trowel. For a textured or nonslip surface, you can broom the surface before it dries or use a masonry brush for smaller applications.

Tools & Materials ▸

- Protective gloves & eyewear
- Scrub brush
- Pressure washer
- Trowel
- 5-gal. bucket
- Drill with mixing paddle
- Squeegee
- Concrete cleaner
- Concrete resurfacer
- Duct tape

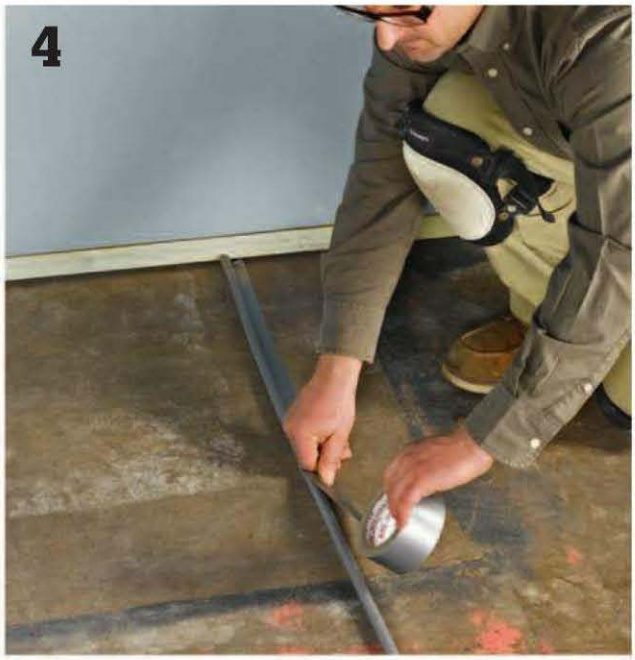
Concrete resurfacer offers an easy, inexpensive solution for renewing garage floors that have become chipped and flaked with age.

How to Resurface a Garage Floor

Thoroughly clean the entire project area. If necessary, remove all oil and greasy or waxy residue using a concrete cleaner and scrub brush. Water beading on the surface indicates residue that could prevent proper adhesion with the resurfacer; clean these areas again as needed.

Wash the concrete with a pressure washer. Set the washer at 3,500 psi and hold the fan-spray tip about 3" from the surface or as recommended by the washer manufacturer. Remove standing water.

Fill sizeable pits and spalled areas using a small batch of concrete resurfacer. Mix about 5 pt. of water per 40-lb. bag of resurfacer for a trowelable consistency. Repair cracks or broken slab edges as shown on page 207. Smooth the repairs level with the surrounding surface and let them harden.



On a large project, section off the slab into areas no larger than 100 sq. ft. It's easiest to delineate sections along existing control joints. On all projects, cover or seal off all control joints with duct tape, foam backer rod, or weather stripping to prevent resurfacer from spilling into the joints.

(continued)

Mix the desired quantity of concrete resurfacer with water following the mixing instructions. Work the mix with a ½" drill and a mixing paddle for 5 minutes to achieve a smooth, pourable consistency. If necessary, add water sparingly until the mix will pour easily and spread well with a squeegee.

Saturate the work area with water, then use a squeegee to remove any standing water. Pour the mix of concrete resurfacer onto the center of the repair area or first repair section.

Spread the resurfacer with the squeegee using a scrubbing motion to make sure all depressions are filled. Then spread it into a smooth, consistent layer. If desired, broom the surface for a nonslip finish (opposite page). You can also tool the slab edges with a concrete edger within 20 minutes of application. Let the resurfacer cure.

Options for Finishes

For thicker resurfacing, simply add more layers of resurfacer as needed. Wait until the surface can support foot traffic—typically 2 to 6 hours—before applying the next coat.

Nonslip broomed finish: Within 5 minutes of applying the resurfacer, drag a clean fine-bristle push broom across the surface. Pull the broom backward in a straight line, moving across the entire area without stopping. Repeat in parallel rows until the entire surface is textured.

Trowel application: A trowel is handy for resurfacing small areas. Use a stiffer mix for troweling—approximately 5 pt. of water per 40-lb. bag of dry mix. Spread and smooth the resurfacer with a steel concrete finishing trowel.

Tuning Up Garage Doors

Imagine this: You're driving home late at night, it's pouring outside, and you're shivering because you've got the flu. Then you turn into your driveway, punch a little button, and your garage door opens, a light comes on, you pull in, and you're HOME. You didn't have to get drenched, or lift a door that felt like heavy metal, or scream at the heavens for making you so miserable. Thanks to a well-maintained garage door and opener, you escaped all of this, and that is a good thing.

Unfortunately, over time, many good things become bad things, especially if they aren't well maintained. An overhead garage door is no exception. To keep everything running smoothly requires effort on three fronts: the door, the opener, and the opener's electronic safety sensors. Here's what you need to know to keep all three in tiptop shape.

Tools & Materials ▸

- Mineral spirits
- Graphite spray lubricant
- Garage door weather-stripping
- Level
- Soft-faced mallet
- Galvanized roofing nails
- Penetrating lubricant
- Toweling
- Socket wrenches
- Lightweight oil
- Pliers
- Open-end wrenches
- Old paintbrush or toothbrush
- Hammer

A bit of routine maintenance now and again will help keep your garage door working exactly as it should, rain or shine.

How to Tune Up a Garage Door

Begin the tune-up by lubricating the door tracks, pulleys, and rollers. Use a lightweight oil, not grease, for this job. The grease catches too much dust and dirt.

Remove clogged or damaged rollers from the door by loosening the nuts that hold the roller brackets. The roller will come with the bracket when the bracket is pulled free.

Mineral spirits and kerosene are good solvents for cleaning roller bearings. Let the bearing sit for a half-hour in the solvent. Then brush away the grime buildup with an old paintbrush or toothbrush.

(continued)

If the rollers are making a lot of noise as they move over the tracks, the tracks are probably out of alignment. To fix this, check the tracks for plumb. If they are out of plumb, the track mounting brackets must be adjusted.

To adjust out-of-plumb tracks, loosen all the track mounting brackets (usually 3 or 4 per track) and push the brackets into alignment.

It's often easier to adjust the brackets by partially loosening the bolts and tapping the track with a soft-faced mallet. Once the track is plumb, tighten all the bolts.

Sometimes the door lock bar opens sluggishly because the return spring has lost its tension. The only way to fix this is to replace the spring. One end is attached to the body of the lock; the other end hooks onto the lock bar.

If a latch needs lubrication, use graphite in powder or liquid form. Don't use oil because it attracts dust that will clog the lock even more.

Alternative: Sometimes the lock bar won't lock the door because it won't slide into its opening on the door track. To fix this, loosen the guide bracket that holds the lock bar and move it up or down until the bar hits the opening.

(continued)

Worn or broken weather stripping on the bottom edge of the door can let in a lot of cold air and stiff breezes. Check to see if this strip is cracked, broken, or has holes along its edges. If so, remove the old strip and pull out any nails left behind.

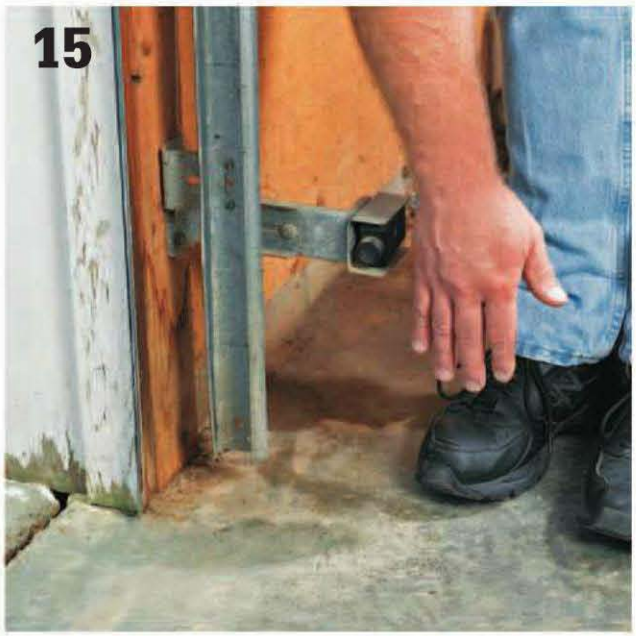
Measure the width of your garage door, then buy a piece of weather stripping to match. These strips are standard lumber yard and home center items. Sometimes they are sold in kit form, with fasteners included. If not, just nail the stripping in place with galvanized roofing nails.

If the chain on your garage door opener is sagging more than ½" below the bottom rail, it can make a lot of noise and cause drive sprocket wear. Tighten the chain according to the directions in the owner's manual.

On openers with a chain, lubricate the entire length of the chain with lightweight oil. Do not use grease. Use the same lubricant if your opener has a drive screw instead.

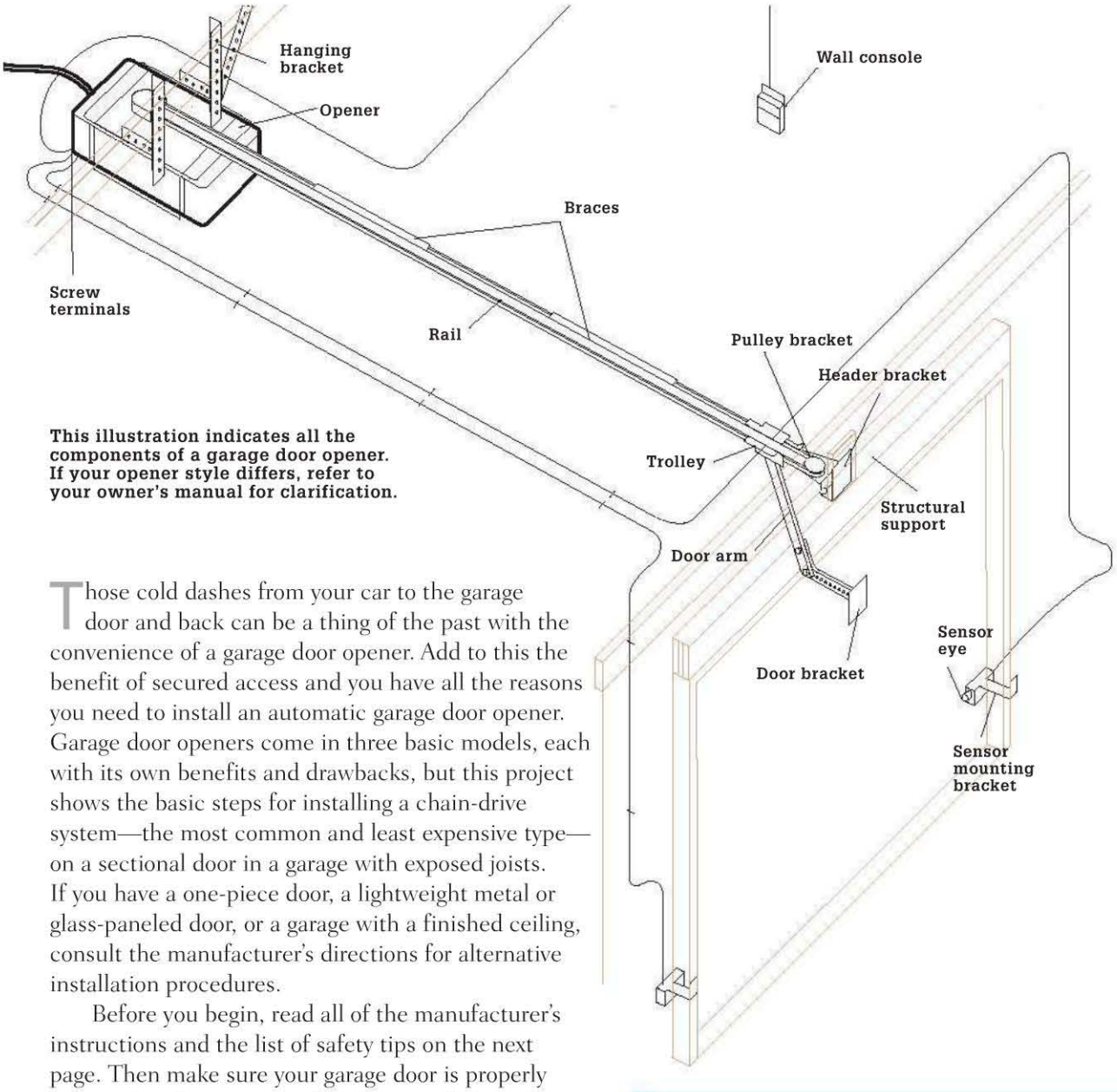
Test the door's closing force sensitivity and make adjustments at the opener's motor case if needed. Because both the sensitivity and the adjustment mechanism vary greatly between opener models, you'll have to rely on your owner's manual for guidance. If you don't have the owner's manual, you can usually download one from the manufacturer's website.

Check for proper alignment on the safety sensors near the floor. They should be pointing directly at one another and their lenses should be clean of any dirt and grease.



Make sure that the sensors are "talking" to the opener properly. Start to close the door, then put your hand down between the two sensors. If the door stops immediately and reverses direction, it's working properly. If it doesn't, make the adjustment recommended in the owner's manual. If that doesn't do the trick, call a professional door installer and don't use the door until it passes this test.

Garage Door Openers



This illustration indicates all the components of a garage door opener. If your opener style differs, refer to your owner's manual for clarification.

Those cold dashes from your car to the garage door and back can be a thing of the past with the convenience of a garage door opener. Add to this the benefit of secured access and you have all the reasons you need to install an automatic garage door opener. Garage door openers come in three basic models, each with its own benefits and drawbacks, but this project shows the basic steps for installing a chain-drive system—the most common and least expensive type—on a sectional door in a garage with exposed joists. If you have a one-piece door, a lightweight metal or glass-paneled door, or a garage with a finished ceiling, consult the manufacturer's directions for alternative installation procedures.

Before you begin, read all of the manufacturer's instructions and the list of safety tips on the next page. Then make sure your garage door is properly balanced and moves smoothly. Open and close the door to see if it sticks or binds at any point. Release the door in the half-open position. It should stay in place supported by its own springs. If your door is not balanced or sticks at any point, call a garage door service professional before installing the opener.

Most garage door openers plug into a standard grounded receptacle located near the unit. Some local codes may require openers to be hard-wired into circuits. Consult the manufacturer's directions for hard-wiring procedures.

Tools & Materials ▸

Stepladder	½ and 7/16" sockets and ratchet wrench
Tape measure	Drill and bits
Screwdriver	Garage door opener kit
Pliers	2× lumber
Wire cutters	Grease pencil
Pencil	Staple gun
Hammer	Insulated staples
Adjustable wrench	

How to Install a Garage Door Opener

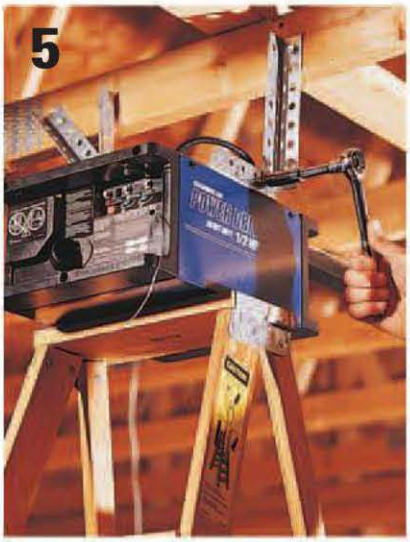
Start by aligning the rail pieces in proper order and securing them with the included braces and bolts. Screw the pulley bracket to the door end of the rail and slide the trolley onto the rail. Make sure the pulley and all rail pieces are properly aligned and that the trolley runs smoothly without hitting any hardware along the rail. Remove the two screws from the top of the opener, then attach the rail to the opener using these screws (inset).

The drive chain/cable should be packaged in its own dispensing carton. Attach the cable loop to the front of the trolley using the included linking hardware. Wrap the cable around the pulley, then wrap the remaining chain around the drive sprocket on the opener. Finally, attach it to the other side of the trolley with linking hardware. Make sure the chain is not twisted, then attach the cover over the drive sprocket. Tighten the chain by adjusting the nuts on the trolley until the chain is ½" above the base of the rail.

To locate the header bracket, first extend a vertical line from the center of the door onto the wall above. Raise the door and note the highest point the door reaches. Measure from the floor to this point. Add 2" to this distance and mark a horizontal line on the front wall where it intersects the centerline. If there is no structural support behind the cross point, fasten 2 × lumber across the framing. Then fasten the header bracket to the structural support with the included screws.

Support the opener on the floor with a board or box to prevent stress and twisting to the rail. Attach the rail pulley bracket to the header bracket above the door with the included clevis pin. Then place the opener on a stepladder so it is above the door tracks. Open the door and shim beneath the opener until the rail is 2" above the door.

(continued)



Hang the opener from the ceiling joists with the included hanging brackets and screws. Angle at least one of the hanging brackets to increase the stability of the unit while in operation. Attach the manual release cord and handle to the release arm of the trolley.

Strip ¼" of sheathing from the wall-console bell wire. Connect the wire to the screw terminals on the console, then attach it to the inside wall of the garage with the included screws. Run the wires up the wall and connect them to the proper terminals on the opener. Secure the wire to the wall with insulated staples, being careful not to pierce the wire. Install the light bulbs and lenses.

Install the sensor-eye mounting brackets at each side of the garage door, parallel to each other, about 4 to 6" from the floor. The sensor brackets can be attached to the door track, the wall, or the floor, depending upon your garage layout. See the manufacturer's directions for the best configuration for your garage.

Attach the sensor eyes to the brackets with the included wing nuts, but do not tighten the nuts completely. Make sure the path of the eyes is unobstructed by the door tracks. Run wires from both sensors to the opener unit and connect the wires to the proper terminals. Plug the opener into a grounded receptacle and adjust the sensors until the indicator light shows the correct eye alignment (inset), then tighten the wing nuts. Unplug the unit and attach the sensor wires to the walls with insulated staples.

Center the door bracket 2 to 4" below the top of the door. Drill holes and attach the bracket with the included carriage bolts. Connect the straight and curved arm sections with the included bolts. Attach the arm to the trolley and door bracket with the included latch pins. Plug the opener into a grounded receptacle and test the unit. See the manufacturer's directions for adjustment procedures.

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Swisstrax Corp.
866 748 7940
www.swissfloors.com

VAULT (Vault Brands, Inc.)
866 828 5810
www.vaultgarage.com

Resources

American Garage Floor
Garage floorcoverings, pages 214 to 217
800-401-4537
www.americangaragefloor.com

Black & Decker Corp.
Power tools, utility cabinets
800-544-6986
www.blackanddecker.com

HDA Inc.
Garage plans, pages 92 to 101
800-373-2646/ plan sales
314-770-2228/ technical assistance
www.projectplans.com

Quikrete Cos.
Concrete sealer p. 33
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Conversion Charts

Metric Equivalent

Inches (in.)	1/64	1/32	1/25	1/16	1/8	1/4	3/8	2/5	1/2	5/8	3/4	7/8	1	2	3	4	5	6	7	8	9	10	11	12	36	39.4
Feet (ft.)																								1	3	3 1/12
Yards (yd.)																									1	1 1/12
Millimeters (mm)	0.40	0.79	1	1.59	3.18	6.35	9.53	10	12.7	15.9	19.1	22.2	25.4	50.8	76.2	101.6	127	152	178	203	229	254	279	305	914	1,000
Centimeters (cm)							0.95	1	1.27	1.59	1.91	2.22	2.54	5.08	7.62	10.16	12.7	15.2	17.8	20.3	22.9	25.4	27.9	30.5	91.4	100
Meters (m)																								.30	.91	1.00

Converting Measurements

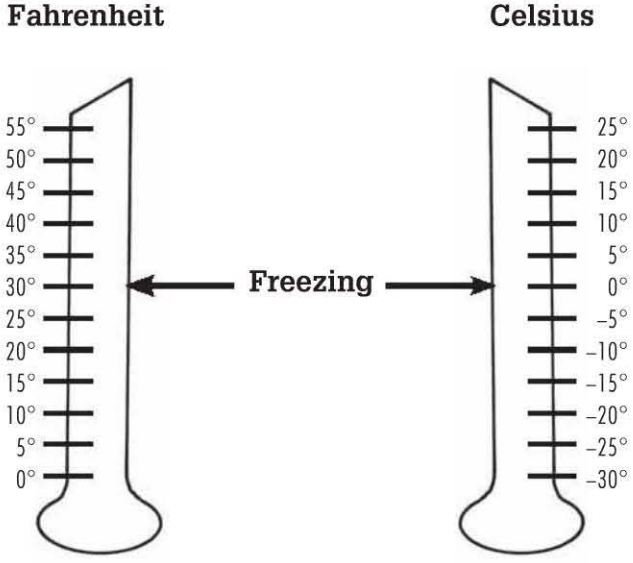
To Convert:	To:	Multiply by:
Inches	Millimeters	25.4
Inches	Centimeters	2.54
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square inches	Square centimeters	6.45
Square feet	Square meters	0.093
Square yards	Square meters	0.836
Cubic inches	Cubic centimeters	16.4
Cubic feet	Cubic meters	0.0283
Cubic yards	Cubic meters	0.765
Pints (U.S.)	Liters	0.473 (Imp. 0.568)
Quarts (U.S.)	Liters	0.946 (Imp. 1.136)
Gallons (U.S.)	Liters	3.785 (Imp. 4.546)
Ounces	Grams	28.4
Pounds	Kilograms	0.454
Tons	Metric tons	0.907

To Convert:	To:	Multiply by:
Millimeters	Inches	0.039
Centimeters	Inches	0.394
Meters	Feet	3.28
Meters	Yards	1.09
Kilometers	Miles	0.621
Square centimeters	Square inches	0.155
Square meters	Square feet	10.8
Square meters	Square yards	1.2
Cubic centimeters	Cubic inches	0.061
Cubic meters	Cubic feet	35.3
Cubic meters	Cubic yards	1.31
Liters	Pints (U.S.)	2.114 (Imp. 1.76)
Liters	Quarts (U.S.)	1.057 (Imp. 0.88)
Liters	Gallons (U.S.)	0.264 (Imp. 0.22)
Grams	Ounces	0.035
Kilograms	Pounds	2.2
Metric tons	Tons	1.1

Converting Temperatures

Convert degrees Fahrenheit (F) to degrees Celsius (C) by following this simple formula: Subtract 32 from the Fahrenheit temperature reading. Then mulitply that number by 5/9. For example, 77°F - 32 = 45. 45 × 5/9 = 25°C.

To convert degrees Celsius to degrees Fahrenheit, multiply the Celsius temperature reading by 9/5, then add 32. For example, 25°C × 9/5 = 45. 45 + 32 = 77°F.



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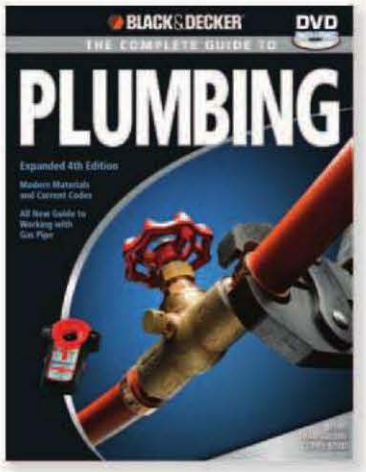

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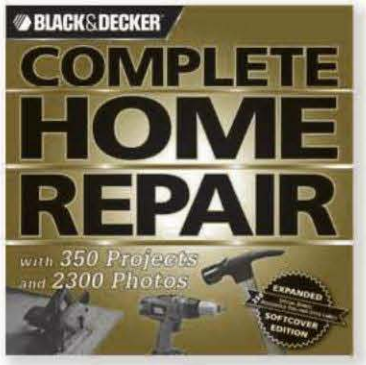

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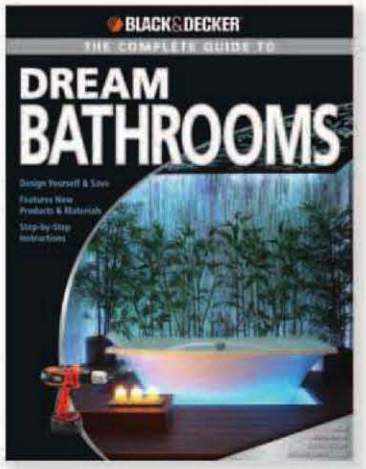

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