Dust Collector

Spend more time making sawdust and less time cleaning it up with this shop-built dust collection system. When you're finished building it, you'll have everything you need to rid your shop of sawdust.

There's nothing I like better than making sawdust. What I don't like is breathing it in and sweeping it up. So recently I decided to get serious about a project that's been on the back burner for some time now — a shop-built dust collection system.

What I had in mind was a scaled-down version of a large commercial system. One that would sit off to one side of the shop and use a vacuum unit and a system of pipes to pick up chips and dust at individual tools. Like commercial dust collectors, this system has two stages.

CYCLONE. The first stage is a metal separator that removes large chips from the air by starting a whirling motion like a cyclone (refer to *Fig. 1* on page 111).

Because the cyclone removes the chips before they pass through the vacuum, you don't get big chunks of material hitting the fan blades inside the vacuum. As a result, the vacuum runs quiet and the fan isn't as likely to get damaged.

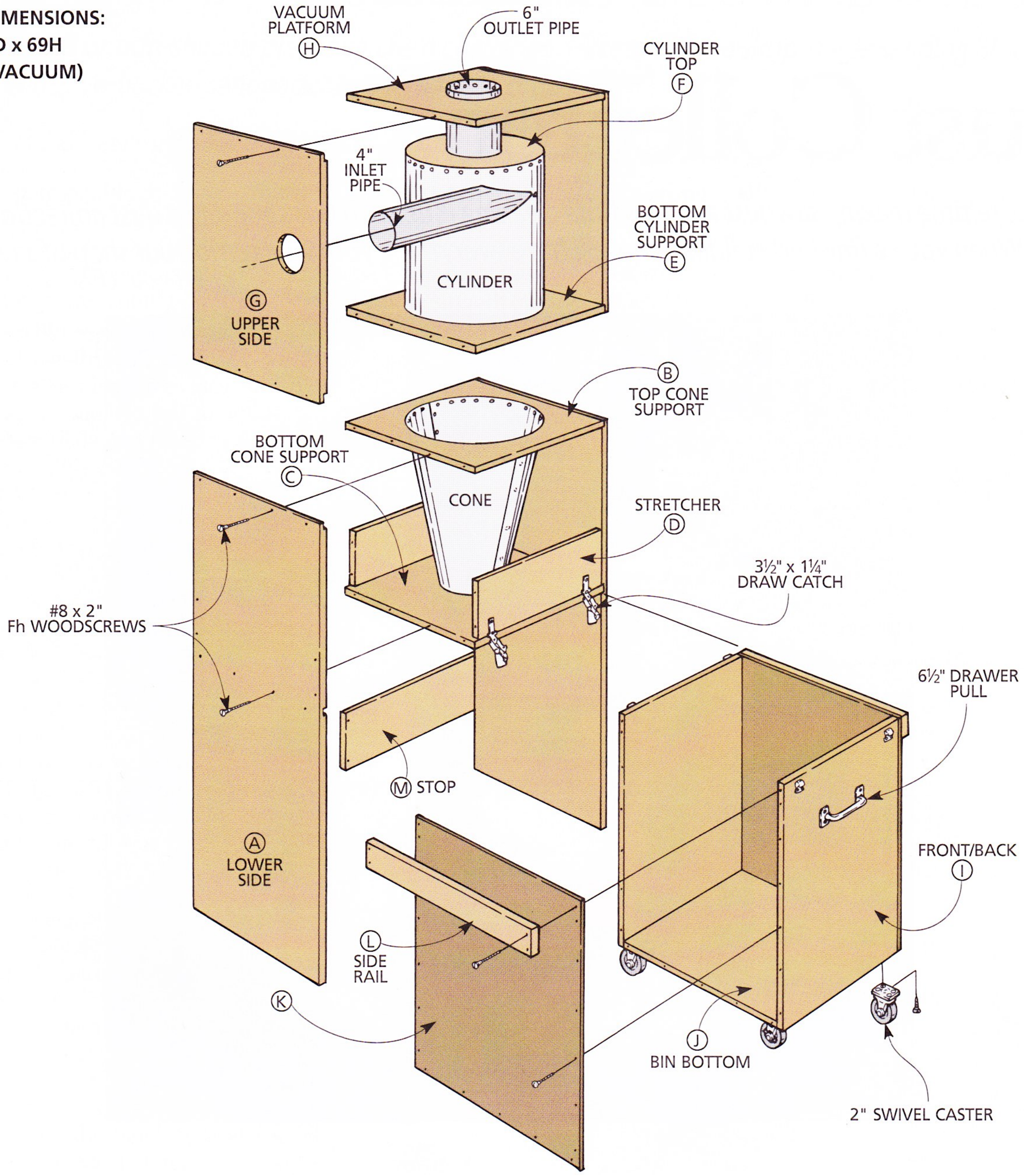
FILTER BOX. The second stage of this system is a filter box that screens out the fine dust particles. Since only fine dust gets blown into the box, it doesn't fill up very quickly. So there's more filter area to do what it's intended to do — clean the air before it recirculates in the shop.

EASY TO EMPTY. The design of this system also makes it easy to empty the chips and dust. A roll-around bin collects chips under the cyclone. And there's a dust drawer to catch the fine dust particles that settle to the bottom of the filter box.

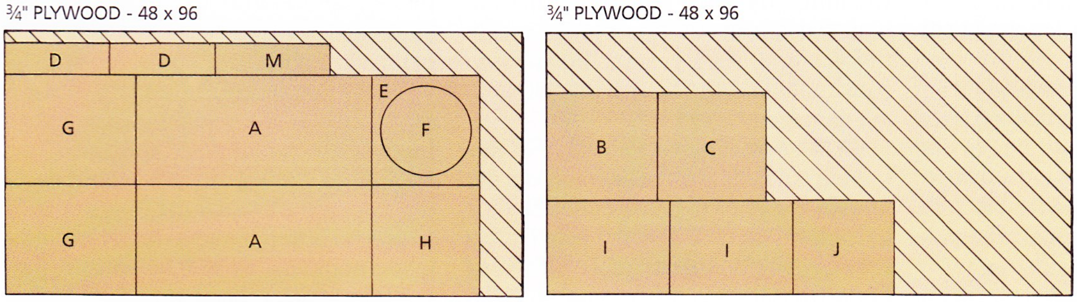
BLAST GATES AND HOOKUPS. But no dust collector is complete without a way to connect individual tools into the system. To control the flow of air at each tool and direct chips into the system, I'll show you how to build a variety of shop-made hookups, as well as an effective but inexpensive blast gate (see pages 122 through 125).

EXPLODED VIEW

OVERALL DIMENSIONS:
21W x 20¾D x 69H
(WITHOUT VACUUM)



CUTTING DIAGRAM



ALSO REQUIRED:
ONE 24" x 48" SHEET OF ⅛" HARDBOARD FOR SIDES AND TWO ¾"-THICK HARDWOOD PIECES (2" WIDE 20" LONG.)

MATERIALS LIST

CONE (Materials for cyclone only. Materials for Filter Box on page 118.)

A	Lower Sides (2)	¾ ply - 20 x 44
B	Top Cone Spprt. (1)	¾ ply - 20 x 20
C	Btm. Cone Spprt. (1)	¾ ply - 20 x 20
D	Stretchers (2)	¾ ply - 6 x 19½

CYLINDER

E	Btm. Cyl. Sppt. (1)	¾ ply - 20 x 20
F	Cylinder Top (1)	¾ ply - 20 x 20 rgh.
G	Upper Sides (2)	¾ ply - 20 x 24
H	Vacuum Platform (1)	¾ ply - 20 x 20

CHIP BIN

I	Front/Back (2)	¾ ply - 17½ x 22⅜
J	Bin Bottom (1)	¾ ply - 17½ x18½
K	Sides (2)	⅛ hdbd. - 20 x 22⅜
L	Side Rails (2)	¾ x 2 - 20
M	Stop (1)	¾ ply - 6 x 21

HARDWARE SUPPLIES

- (16) No. 8 x ¾" Fh woodscrews
- (6) No. 8 x 1¼" Fh woodscrews
- (68) No. 8 x 2" Fh woodscrews
- (30) No. 8 x 1" Rh woodscrews
- (1lb.) 1¼" ring-shank nails
- (13) Pop rivets
- (10') 20"-wide galvanized sheet metal
- (7') $^3/_{16}$" x 1¼" felt weatherstripping
- (1) 4" x 24" metal pipe
- (1) 6" x 24" metal pipe
- (2) 2" swivel casters
- (2) 2" fixed casters
- (2) 6½" drawer pulls
- (4) 3½" x 1¼" draw catches
- (1) Tube of silicone caulk
- (1) Roll of metal foil tape

CYCLONE

The heart of the Dust Collector is a shop-built cyclone that separates the large chips out of the incoming air. The cyclone is designed to work together with a vacuum that draws air into the system *(Fig. 1)*. With the cyclone removing the chips *before* they pass through the vacuum, you'll extend the life of some of the moving parts (like the fan blades) inside the vacuum. Another benefit is noise reduction — the vacuum will run a lot quieter.

VACUUM. There are a couple of options for the vacuum. You can hook an existing portable dust collector up to the cyclone (see the photo below). Or you can buy a stand-alone vacuum to mount on top *(Fig. 1)*. I bought a vacuum that draws 500 cubic feet of air per minute. See page 126 for sources.

CYCLONE. Regardless of the vacuum, what causes the chips to settle out is the shape of the cyclone. This cyclone is built up from two shapes — a cylinder and a cone. Both shapes are formed from sheet metal. I used 20"-wide galvanized steel flashing.

Safety Note: Just to be on the safe side, I always wear heavy-duty leather gloves when cutting metal pipe or sheet metal with tin snips. A sharp edge from the cut off pieces could easily cause serious injury.

The cylinder and cone are held in place by two plywood frames that are stacked on top of each other like building blocks *(Fig. 1)*. The bottom frame houses the cone and a bin for the chips; the top frame supports the cylinder and the vacuum.

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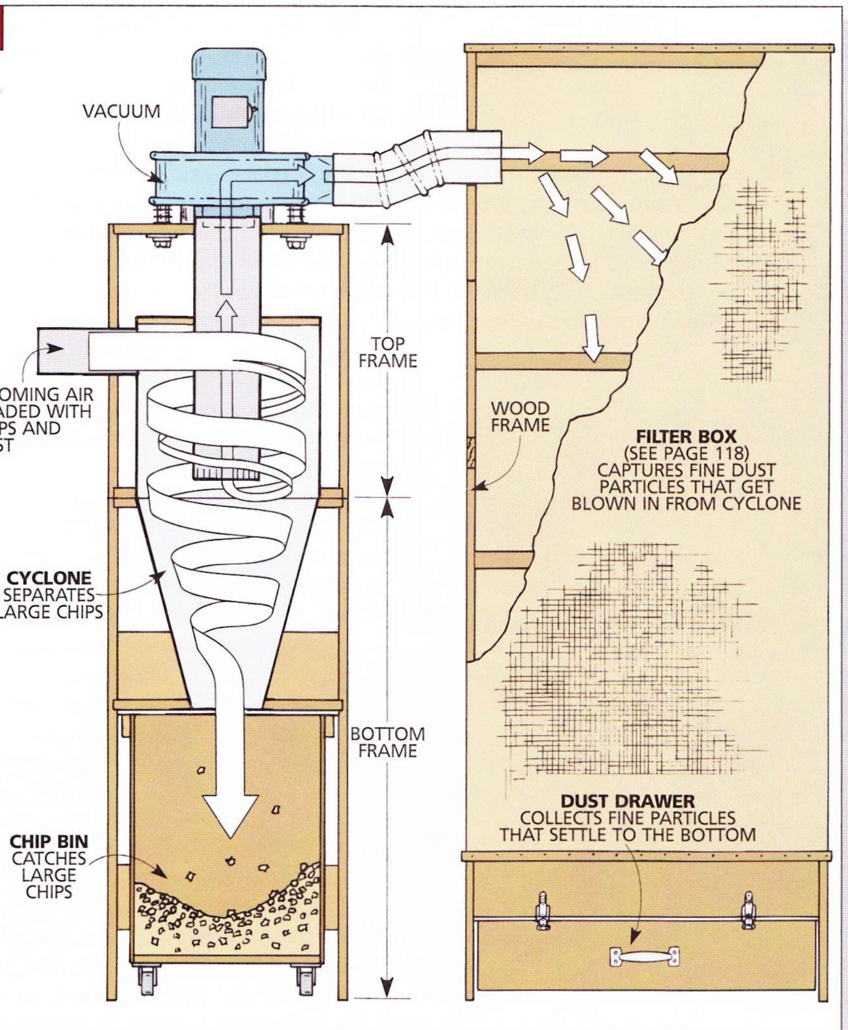
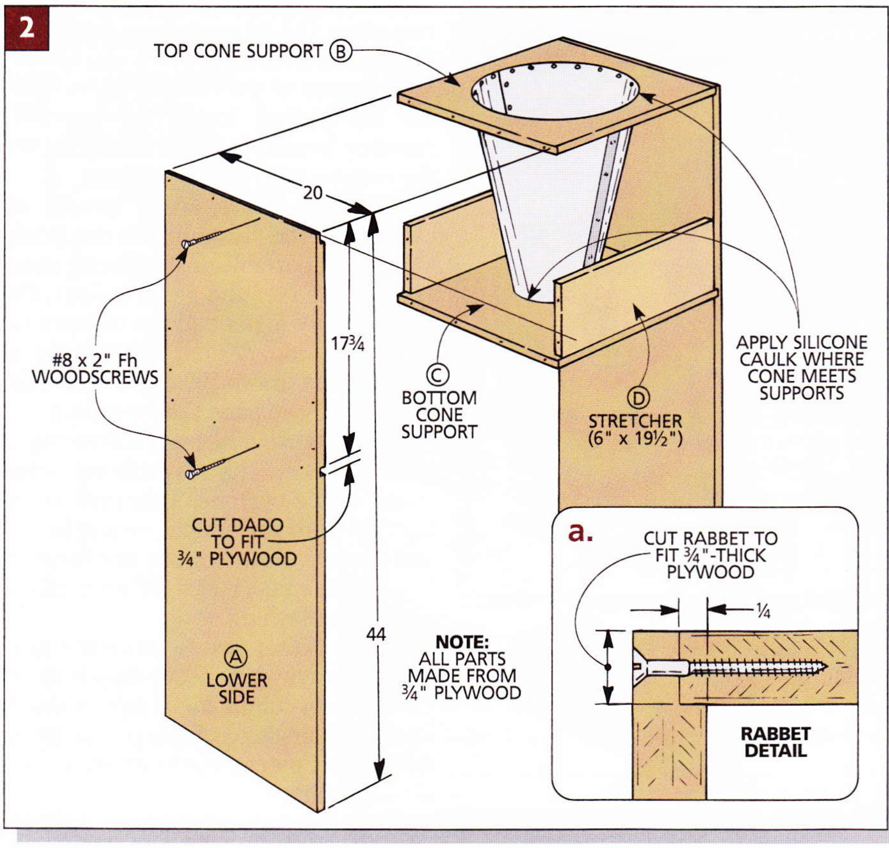
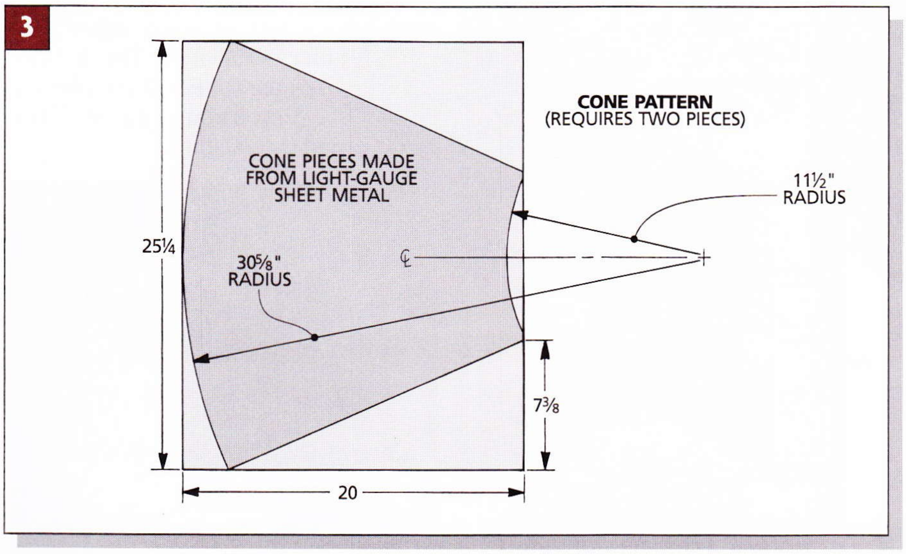


If you already have a dust collector, the cyclone can make it more efficient by removing the bulk of the sawdust before it gets to the vacuum.





CONE

I started work on the cyclone assembly by making a plywood frame for the lower half of the cyclone separator. To provide room for the chip bin, the lower sides (A) of this frame are 44" long (tall) *(Fig. 2)*. After cutting the lower sides to length, I cut a rabbet and a dado in each piece to accept two plywood support pieces *(Fig. 2a)*.

SUPPORTS. The supports are just square pieces of ¾"-thick plywood with holes cut in the center to serve as a form for the cone. Because the cone is quite a bit larger at the top than it is at the bottom, the holes have to be different sizes.

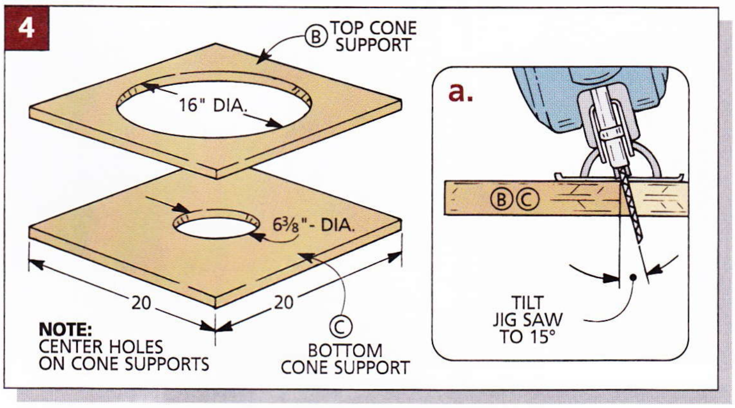
There's a 16"-diameter hole in the top cone support (B), and a 6⅜"-diameter hole in the bottom cone support (C) *(Fig. 4)*. Because the walls of the cone taper, the edges of these holes are cut at an angle. To do this, I cut both of the holes with a jig saw, tilting the blade to 15° *(Fig. 4a)*.

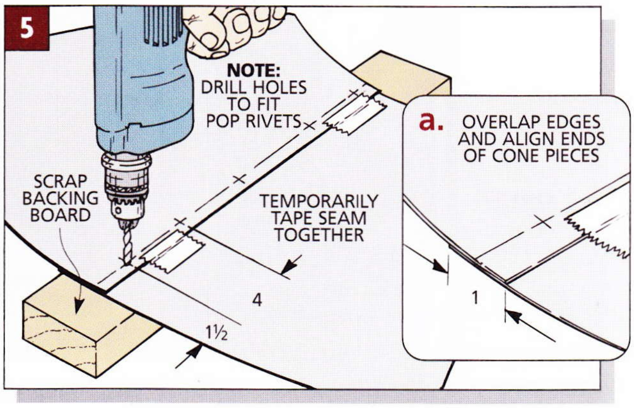
ASSEMBLY. After cutting the holes, the next step is to assemble the frame. This is just a matter of gluing and screwing the top and bottom cone supports to the sides *(Fig. 2)*.

CONE. Once you're finished assembling the frame, you can begin working on the cone. It's made from two wedge-shaped pieces of 20"-wide galvanized sheet metal *(Fig. 3)*.

To lay out each piece, you can make a full-size pattern based on the dimensions shown in *Fig. 3*. Since there is more than one piece, it might work best to make the pattern out of a thick piece of posterboard.

After cutting out the cone pieces with a pair of tin snips, they're fastened together along one edge. To hold these pieces together, I used pop rivets that I picked up at the local hardware store.





(For more information on how to use pop rivets, see the Shop Info below.)

DRILL HOLES. With the rivets in hand, the next step is to drill holes that match the diameter of the rivets. I found it easiest to lay the pieces out flat so there's a 1" overlap down the center seam *(Fig. 5a)*. The only problem is keeping the sheet metal pieces from moving while you drill the holes.

To solve this, I aligned the top and bottom edges so they're flush, and then used masking tape to temporarily hold the seams together *(Fig. 5)*. Then it's just a matter of drilling a series of holes and installing the rivets.

Note: I used a scrap 2x4 as a backing board when drilling the holes.

FORM CONE. Now you're ready to put the cone in place. At this point, it's no big deal if it's not a perfect cone. Just as long as it's rolled up tight enough to slip the metal down through the top and bottom cone supports.

The thing to keep in mind here is where the seam that's *not* riveted together is located. You'll want to ensure that it faces an open end of the frame (instead of the side). So I centered the riveted seam on an open end of the cone supports *(Fig. 6)*.

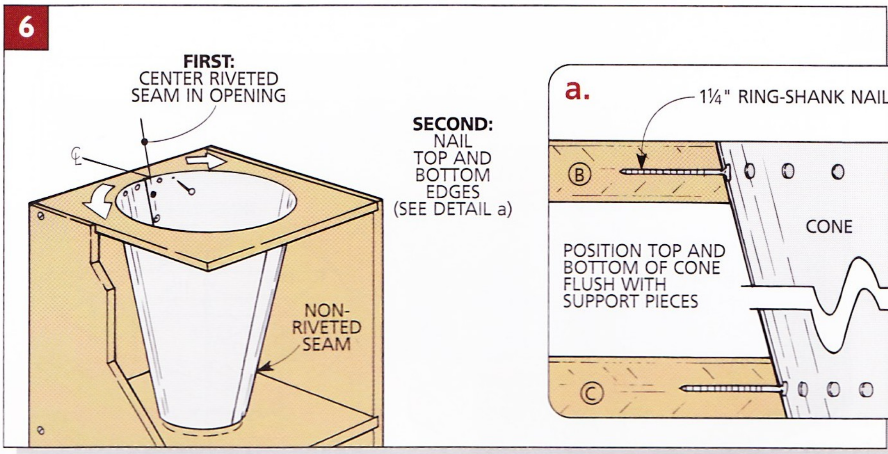
Although this roughly positions the sheet metal, you'll still need to slide it up or down a bit to get the top and bottom edges flush with the cone supports. The trick is to keep both edges aligned while you attach the sheet metal to the supports.

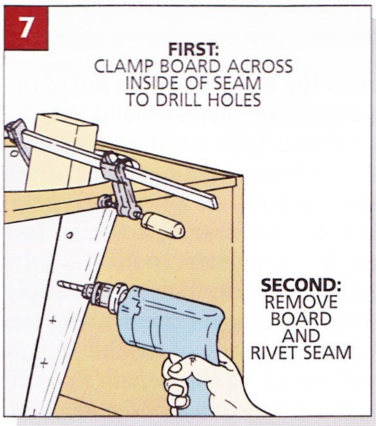
ATTACH METAL. What worked best for me was to tackle a small section at a time. So I started at the riveted seam and worked in both directions, nailing the top and bottom edges in place as I worked my way around *(Fig. 6a)*.

Note: I used hardened ring-shank nails to punch through the metal.

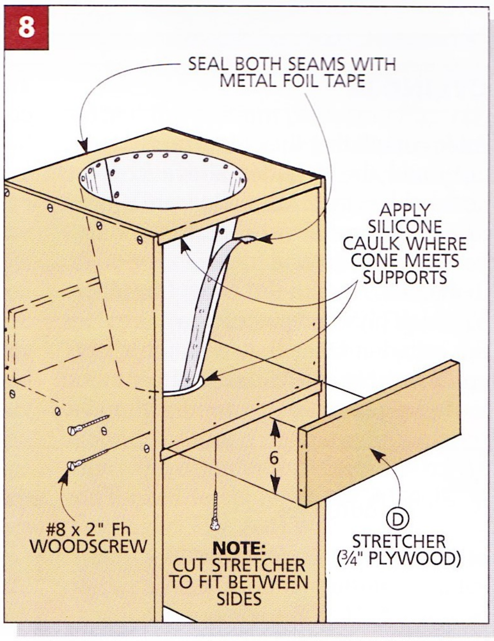
RIVET SEAM. After nailing the cone all the way around, the last seam can be riveted. To prevent the metal from crumpling when drilling the holes for these rivets, I clamped a short section of board (on edge) over the inside of the seam *(Fig. 7)*.

SEAL SEAMS. Now all that's needed to complete the cone is to seal the seams. To do this, I first covered each seam with a short strip of metal foil tape. (You could also use duct tape.) Then simply apply a thin bead of silicone caulk where the metal cone meets the plywood supports *(Fig. 8)*.





STRETCHERS. Finally, to keep the frame from racking, I added two stretchers (D). These stretchers are just pieces of $^3/_4$"-thick plywood that are cut to fit between the sides and screwed in place *(Fig. 8)*.

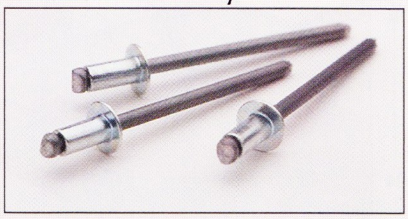


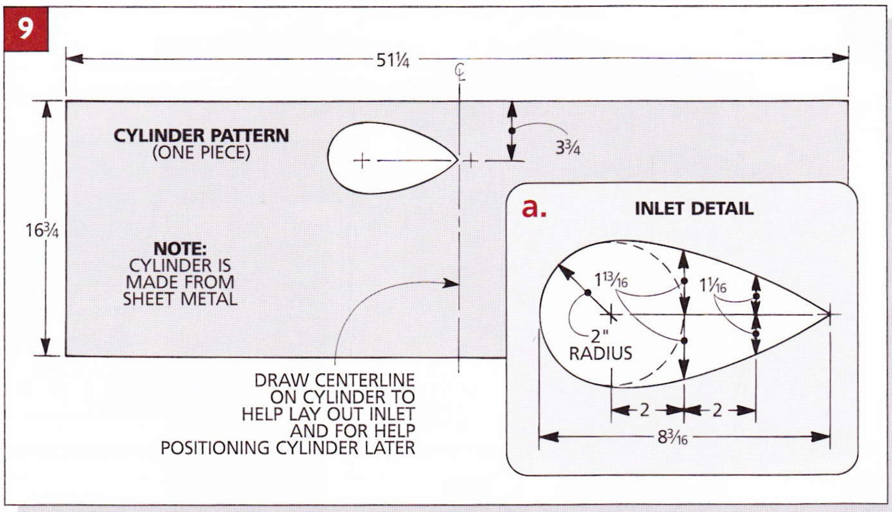
SHOP INFO .... *Pop Rivets*

Pop rivets are a quick and easy way to fasten two pieces of sheet metal together securely. After drilling a hole to fit the rivet, a special riveting tool is used to compress the rivet (bottom photo).

What makes this work is a pin that passes through a hole in the rivet (top photo). The long end of this pin is gripped tightly in the gun. The opposite end has a mushroom-like "ball" that's *larger* than the hole in the rivet.

By squeezing the gun handles, the pin pulls back and draws the ball against the end of the rivet. This flares the end of the rivet. Once the rivet is permanently set, the pin "pops" off.





CYLINDER

After completing the cone, the next step is to add the cylinder above it. Here again, the cylinder is made from a piece of light-gauge sheet metal that's supported by a plywood frame.

FORMS. As with the cone, I used two ³⁄₄"-thick plywood pieces as a "form" for the cylinder. Once they're cut to shape, you'll be able to attach the sheet metal to the edges of the plywood with nails.

To match the opening in the top of the cone, the bottom cylinder support (E) has a 16"-dia. hole cut in it *(Figs. 10 and 11)*. After you've cut the bottom cylinder support, be sure to save the round disk that's removed. It's the perfect size for the cylinder top (F).

To cut out the cylinder top, simply drill a series of small holes along the circle as an entry point for the jig saw blade *(Fig. 11a)*. While you're at it, you'll also want to cut a 6"-dia. opening for an outlet pipe into the vacuum *(Fig. 11)*. Once again, a jig saw makes quick work of this.

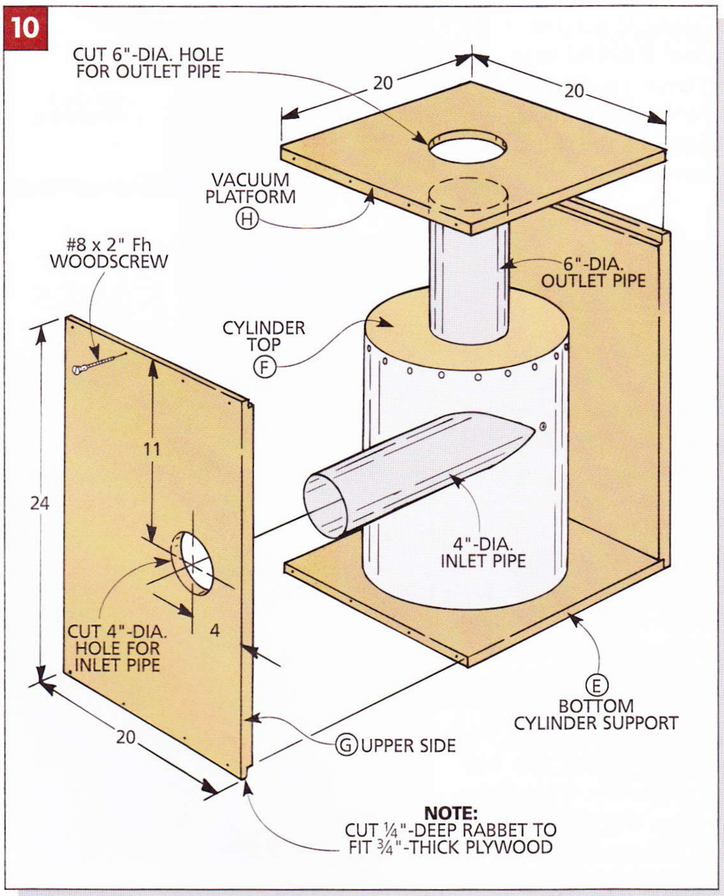
Note: Be sure to set your jig saw blade back to 90° before making either of these cuts.

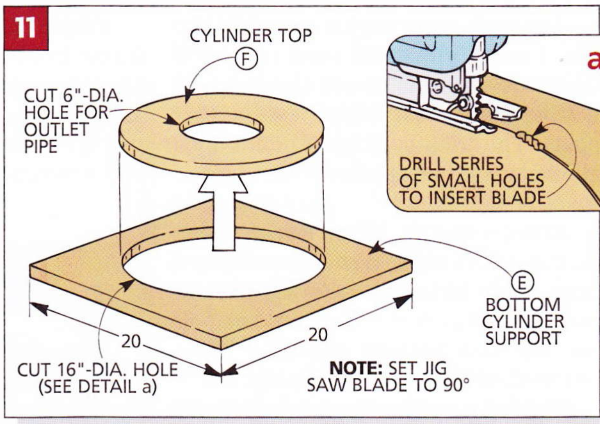
CYLINDER. Now work can begin on the cylinder. Basically, it's just a rectangular piece of sheet metal rolled up to form the cylinder. The only unusual thing is a teardrop-shaped opening that will be cut out near the top edge *(Fig. 9)*.

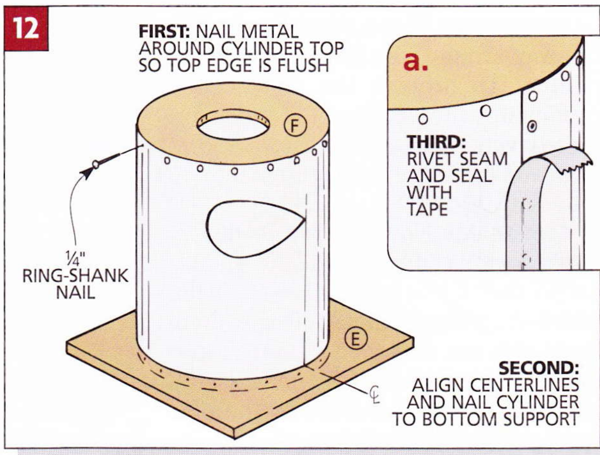
The reason for this opening is simple. Once the metal is formed into a cylinder, it allows an inlet pipe to fit tightly inside. The thing to be aware of is the tip of the opening is located on a line that's centered on the length of the metal. Later, this provides a reference for positioning the cylinder.

FORM CYLINDER. After cutting the metal to shape, you can form the cylinder. I started by wrapping the metal around the top (F). Then I nailed it in place as I worked my way around *(Fig. 12)*. Just be sure that the metal remains straight as you go.

Note: Once again, I used the same style of ring-shanked nails here that I used earlier on the cone assembly.







Now the sheet metal cylinder can be fit in the opening in the bottom support (E). This is just a matter of matching the centerline that was drawn earlier on the cylinder with a line centered on the support, then nailing everything in place *(Fig. 12)*.

RIVET SEAM. The next step is to rivet the seam. As with the cone, I used a scrap piece as a backing board to support the metal when drilling the holes. Then, after installing the rivets, seal the seam with a strip of metal foil tape *(Fig. 12a)*.

TOP FRAME. At this point, the top frame can be built around the cylinder. This frame consists of two upper sides (G) and a vacuum platform (H) *(Fig. 10)*. Each side is rabbeted at the top and bottom ends to accept the vacuum platform and the bottom cylinder support.

To allow the inlet pipe to pass through the frame, you'll need to cut a 4"-dia. hole in one side piece of the frame. Also, before screwing the frame together, go ahead and cut a 6"-dia. hole in the vacuum platform. This hole is for an outlet pipe that's added later *(Fig. 10)*.

INLET. After assembling the frame, I installed the inlet pipe. This is just a 4"-dia. metal pipe that passes through the hole in the side and into the cylinder. To reduce the amount of pipe that sticks inside, you'll want to trim the end off to match the opening in the cylinder *(Fig. 13)*. An easy way to do this is to trace the shape of the opening onto the pipe with a permanent marker

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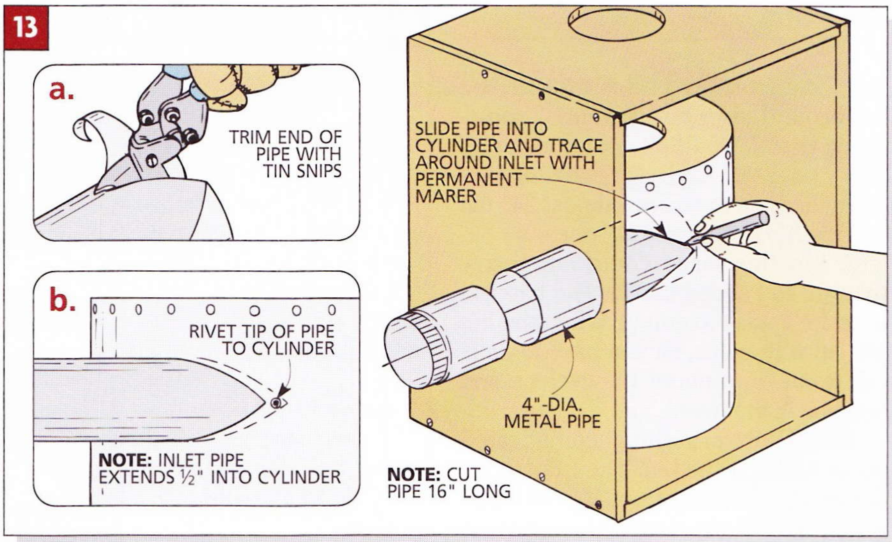

(Fig. 13). Then, after trimming the pipe with a pair of tin snips, sneak the end just past the cylinder wall and rivet the tip in place *(Figs. 13a and 13b)*.

Next, you'll need to cut off the crimped end of the inlet pipe *(Fig. 13)*. This way you'll end up with an uncrimped end for an adustable elbow added later. And it allows the air to flow smoothly through the pipe (refer to the photo on page 120 and *Fig. 24* on page 121).

OUTLET. In addition to the inlet, there's a 6"-dia. outlet pipe that helps direct the fine dust into the vacuum. The idea here is to locate the bottom end of this pipe so the vacuum won't suck up large wood chips that are coming into the cyclone.

To do this, I slipped a 24" length of pipe through the holes in the cylinder top and the vacuum platform *(Fig. 14)*. The top end of the pipe is nailed in place so it extends 1" above the vacuum platform. This way, the bottom end extends far enough into the cylinder so it carries off only the fine dust particles.

CAULK. Once the outlet is installed, the cylinder can be sealed *(Fig. 14a)*. Except for one place, I caulked on the *outside* of the metal (or pipe), including around the outlet and inlet pipes and around the base of the cylinder. But where the cylinder top meets the metal, you'll need to apply a bead of caulk on the *inside (Fig. 14a)*.

STACK FRAMES. Now all that's left is to screw the top and bottom frames together using No. 8 x $1^{1}/_{4}$" flathead woodscrews, so the frames are flush all the way around *(Fig. 15)*.

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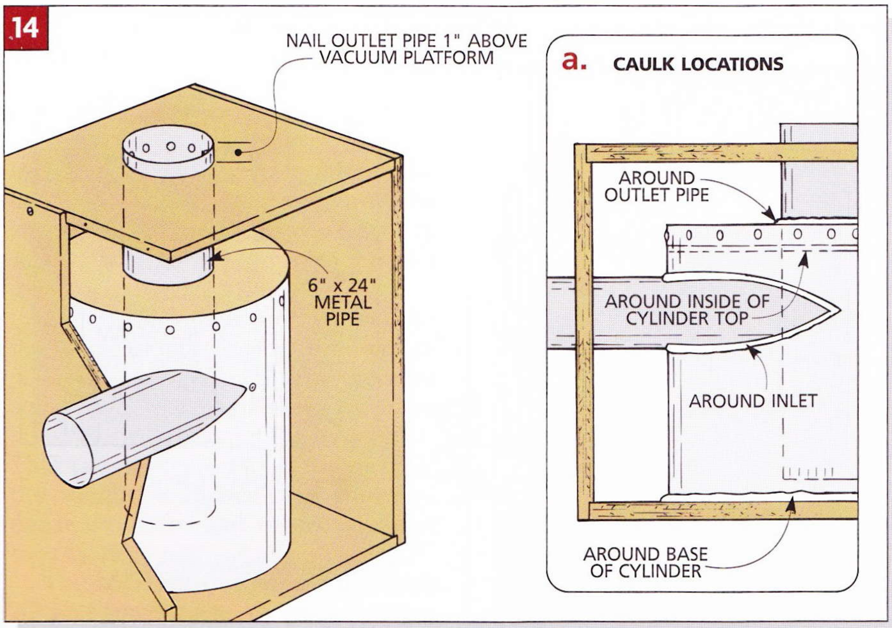

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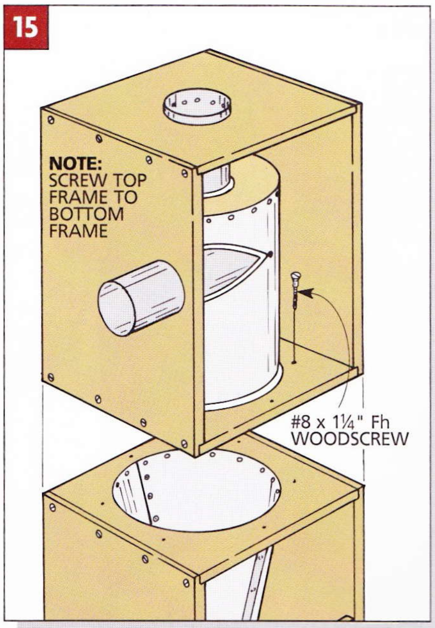


CHIP BIN

One handy feature of this cyclone is a roll-around chip bin. I wanted something that I wouldn't have to empty every day, so I made sure the bin was extra large. It measures almost 24" tall and it's $17^1/_2$" wide and 20" deep.

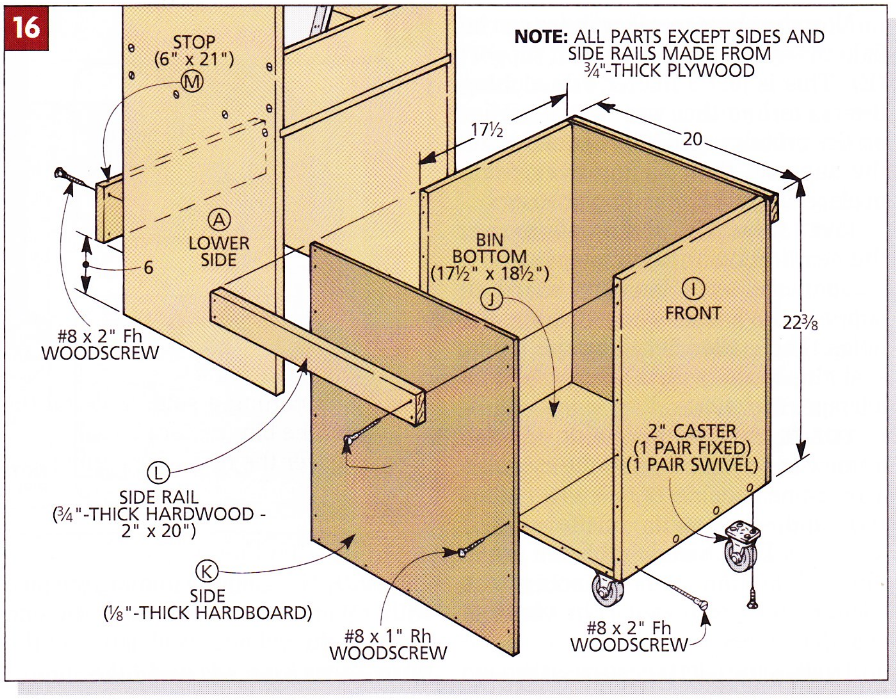
A bin this large could get heavy though, so I added casters and handles to make it easy to empty. When the bin fills up with chips, all you have to do is roll it out from under the cyclone and empty it in the trash.

BIN. There's nothing complicated about building the bin. The front/back pieces (I) are made from $^3/_4$"-thick plywood, and are glued and screwed to the bottom (J) using simple butt joints *(Fig. 16)*. And to make the chip bin as lightweight as possible, I decided to make the sides (K) from $^1/_8$"-thick hardboard. Here again, they're just glued and screwed in place.

Note: I used tempered hardboard for the sides. Tempered hardboard is smooth on both sides. This allows the sawdust and wood chips to slide off whenever the bin needs emptying.

SIDE RAILS. Next, to help stiffen the $^1/_8$"-thick sides, I attached a pair of hardwood side rails (L) with glue and screws. These rails also act as "bumpers," protecting the cart when you roll it in and out from underneath the cyclone.

CASTERS. After attaching the rails, I added a set of four 2" casters. To help steer the bin, two swivel casters are screwed in place along the front edge, and a pair of fixed casters along the back.



STOP. Now, to help keep the bin centered under the cyclone, I screwed a stop (M) to the back of the lower sides *(Fig. 16)*. The stop is made from plywood. With it in place, you just push the chip bin in until it hits against the stop.

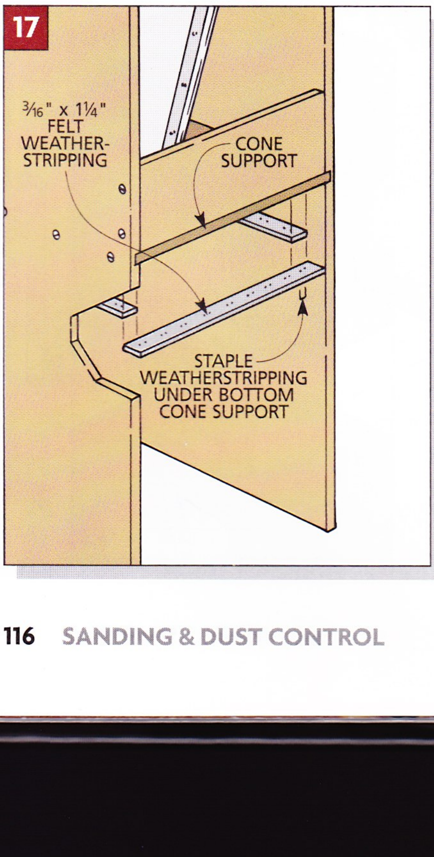
But just rolling the bin under the cyclone isn't enough. The key is to seal it so chips don't blow out. To do this, I used a two-part system.

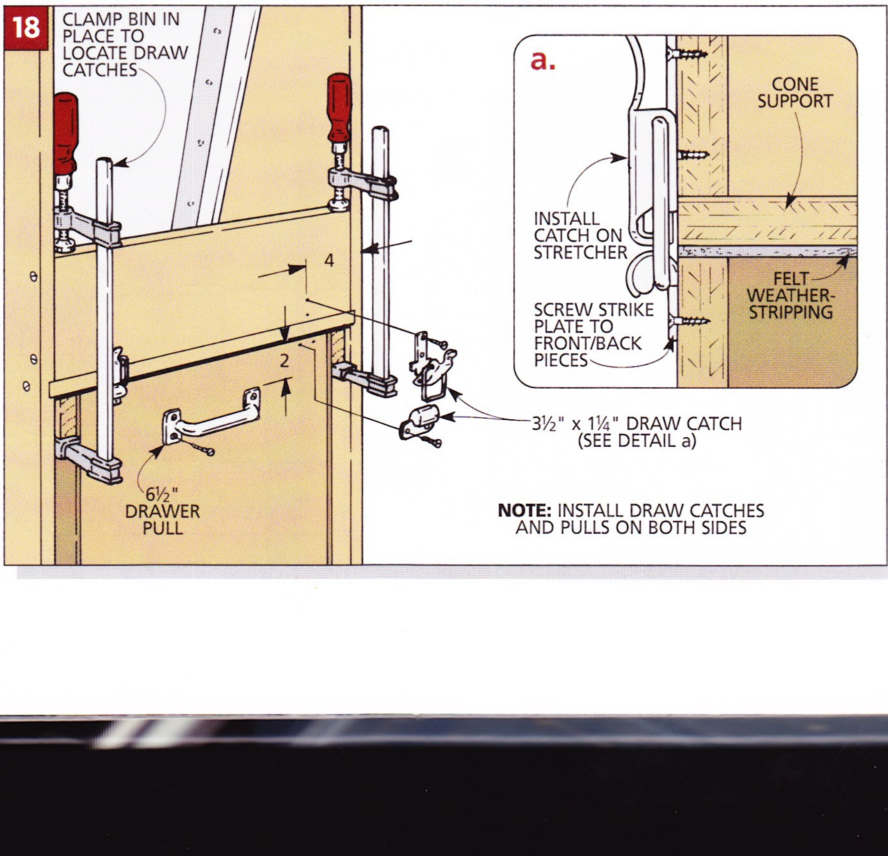
GASKET. The first part is a "gasket" made from pieces of felt weatherstripping *(Fig. 17)*. After cutting strips of this felt to fit under the bottom cone support, they're stapled in place.

But to produce a good seal, the bin needs to draw up tight against the felt. That's where the second part of the system comes in.

DRAW CATCHES. To raise the bin off the floor, there's a pair of draw catches on the front and back of the cyclone *(Fig. 18)*. When you snap the catches shut, the bin compresses the felt and creates an airtight seal. To locate the catches, I clamped the bin in the "closed" position and screwed a pair of catches to both the front and back pieces *(Figs. 18 and 18a)*.

DRAWER PULLS. Finally, to make it easy to lift and empty the bin, I screwed on a couple of heavy-duty drawer pulls, placing one on the front and another on the back of the bin.

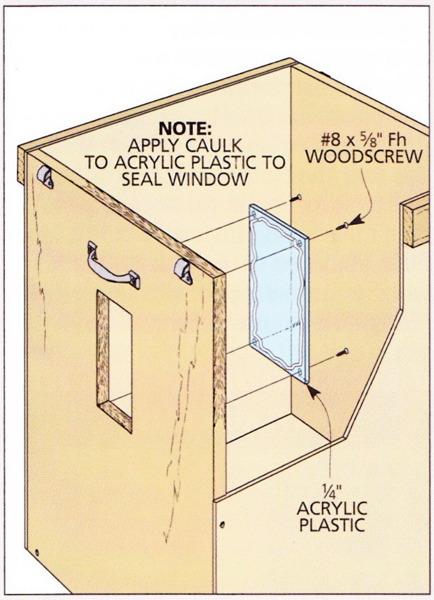




DESIGNER'S NOTEBOOK

To ensure the Dust Collector runs efficiently, you'll need to check it regularly. Adding a window will help.

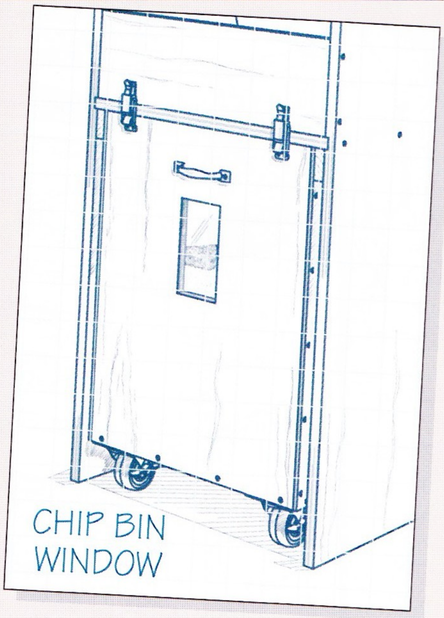
CONSTRUCTION NOTES:



- The Dust Collector won't work as well when the chip bin is over flowing with saw dust and chips. So to make it easy to check it, you can add a small "window." The window lets you peek into the bin without having to unlatch the draw catches and pull it out.
- Start by cutting a small hole on the outside of the bin (see drawing).
- Then cover the hole with a thin piece of clear acrylic plastic using some ⅝"-long woodscrews.

Note: Before screwing the clear acyrlic plastic in place, it's a good idea to apply a bead of caulk to stop any air leaks (see drawing).

- Now when you want to check the chip level inside the chip bin collector, all you have to do is look through the acrylic plastic window.



CONNECT THE VACUUM

At this point, all that's left to complete the cyclone is to connect the vacuum and the motor.

If you're using a portable dust collector, run a length of flexible hose from the inlet to the outlet pipe from the cyclone (refer to the photo on page 111).

Note: You may also need a reducer and a hose clamp to attach the hose.

PLATFORM MOUNT. But another, more compact setup is to mount a vacuum unit on top of the vacuum platform. Here, the inlet of the vacuum fits loosely inside the outlet pipe from the cyclone. Depending on how well the inlet fits, you may need to modify the connection to keep the vacuum from sucking in outside air. So you'll need to make an airtight seal between the inlet and the outlet *(Fig. 19)*.

DOUGHNUT. What worked well for me was to cut a "doughnut" from a piece of 1¾"-thick soft foam (like the kind available at most fabric stores). Cut the doughnut to fit around the outlet pipe. This way, when you mount the vacuum, the weight of the vacuum squeezes down the foam and forms a gasket around the outlet.

The trick is to compress the foam without having the vacuum "bottom out" on the pipe. This requires raising the vacuum off the platform. To do this, I used a stack of nylon spacers and some rubber washers at each mounting point *(Fig. 19a)*.

Depending on the vacuum you use, the location of these mounting points (and the fasteners) will vary. The vacuum I used had threaded holes in the housing, so I attached it with hex bolts. But you may need to drill holes and use self-tapping screws. Either way, slipping on a lock washer keeps the bolts (or screws) from vibrating loose *(Fig. 19)*.

ELECTRICAL HOOKUP. One final note. You can plug the vacuum into an outlet with a switch and receptable, and use the switch to turn it on and off. Or, simply plug and unplug the unit into a wall outlet to turn it on and off.

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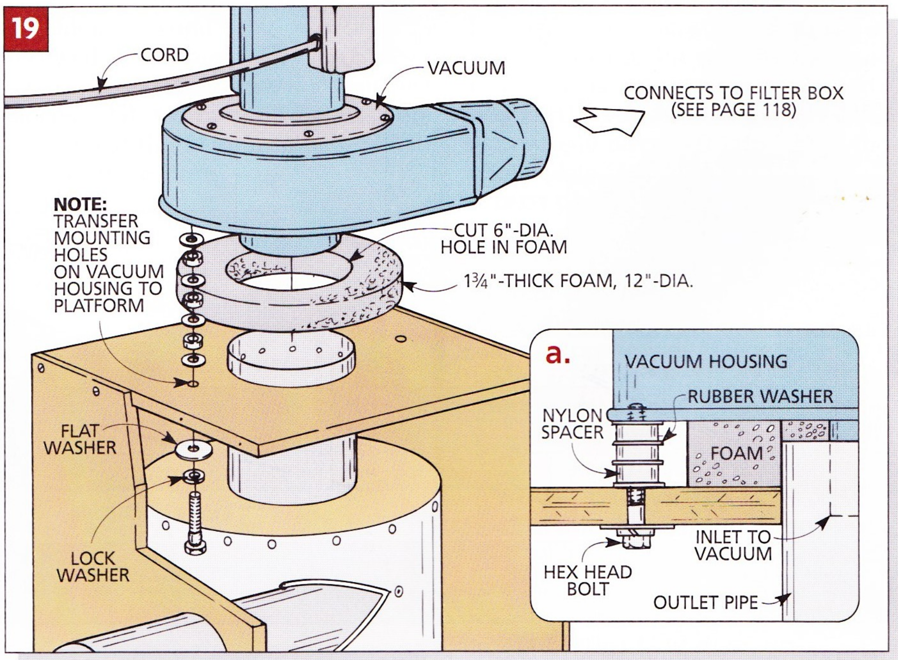
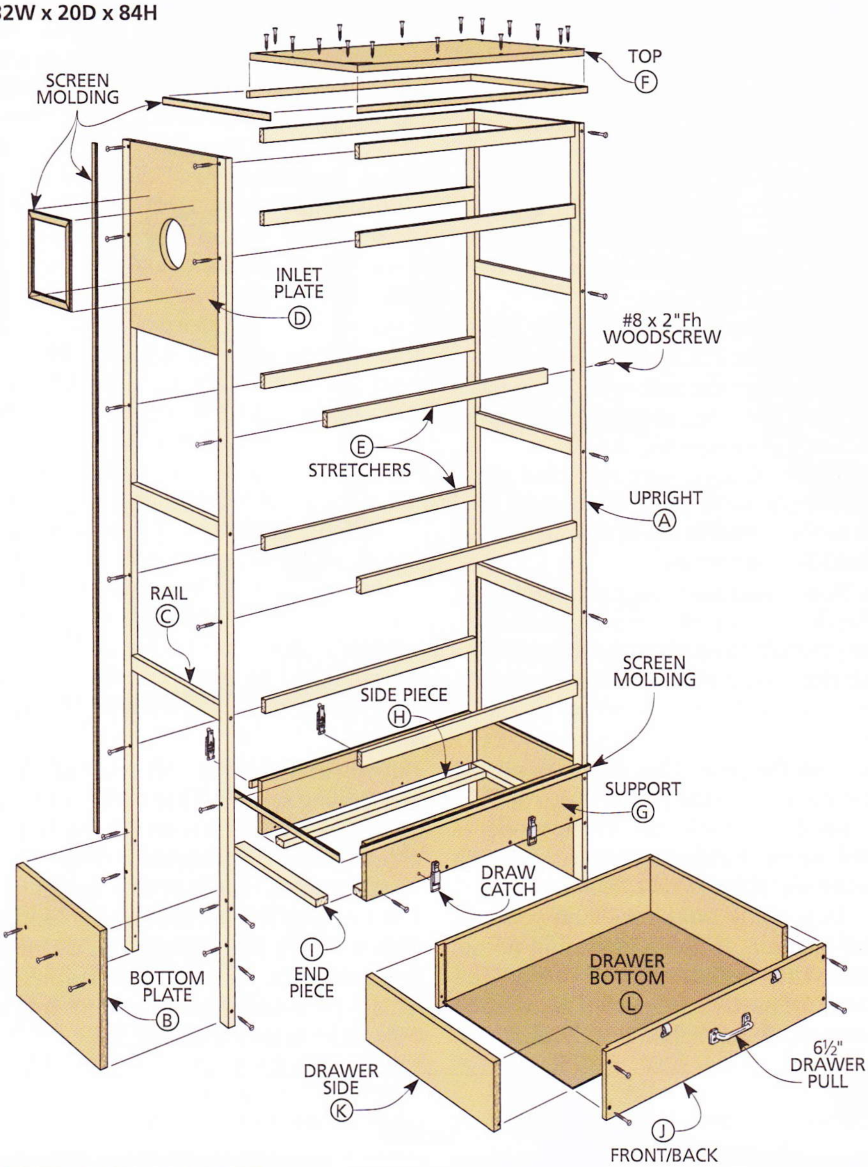
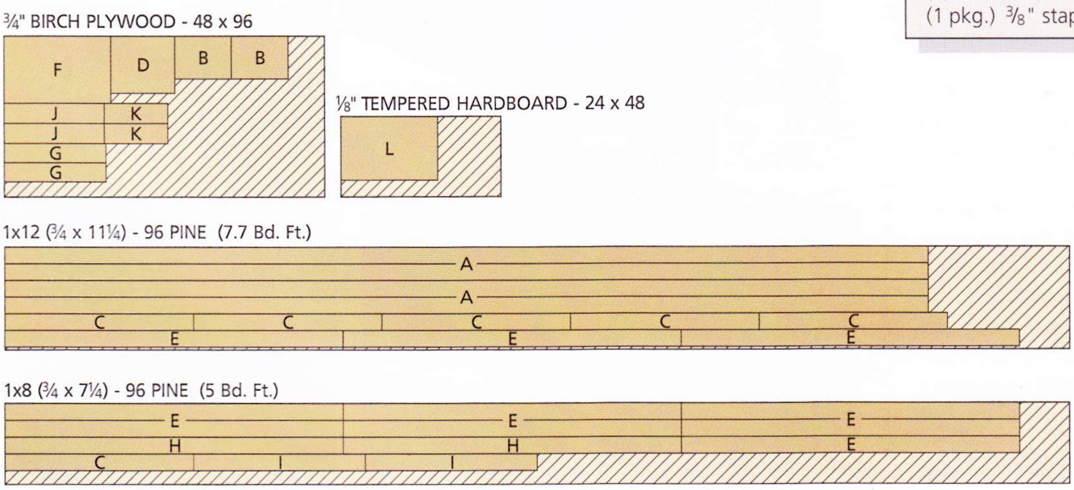


EXPLODED VIEW

OVERALL DIMENSIONS:
32W x 20D x 84H



CUTTING DIAGRAM



FILTER BOX

Most dust collection systems rely on fabric bags to filter out fine dust particles. But there are a couple of problems with these. First, they're expensive. And second, I've found that most bags are too small for the system. When it's turned on, the filter bag quickly inflates, producing a cloud of fine dust that settles over the entire shop.

To solve both these problems, I didn't use a bag. Instead, I built a large filter box (see photo at left). It's just a wood frame wrapped with inexpensive fabric. Since the fabric is stretched

MATERIALS LIST

FRAME

A	Uprights (4)	3/4 x 1 1/2 - 83 1/4
B	Bottom Plates (2)	3/4 ply - 12 3/4 x 17
C	Rails (6)	3/4 x 1 1/2 - 17
D	Inlet Plate (1)	3/4 ply - 19 1/8 x 17
E	Stretchers (10)	3/4 x 1 1/2 - 30 1/2
F	Top (1)	3/4 ply - 20 x 32
G	Supports (2)	3/4 ply - 5 3/4 x 30 1/2
H	Side Pieces (2)	3/4 x 1 1/2 - 30 1/2
I	End Pieces (2)	3/4 x 1 1/2 - 15 1/2

DUST DRAWER

J	Front/Back (2)	3/4 ply - 6 x 30
K	Drawer Sides (2)	3/4 ply - 6 x 19
L	Drawer Bottom (1)	1/8 hdbd. - 19 x 29

HARDWARE SUPPLIES

(26') Screen molding
(66) No. 8 x 2" Fh woodscrews
(28) No. 8 x 3" Fh woodscrews
(4) 3 1/2" x 1 1/4" draw catches w/ screws
(9') 3/16" x 1 1/4" felt weatherstripping (1lb.)
(2) 6 1/2" drawer pulls w/ screws
(3 yds) 10 oz. cotton duck fabric - 72" wide
(2 oz. pkg.) #18 x 1" wire brads
(1) 5"-dia. metal duct for inlet
(1 pkg.) 3/8" staples

around the frame, it can't collapse. So when the system is turned on — no more dust cloud.

FILTER MATERIAL. In designing the filter box, the first thing I had to figure out was what to use for fabric. I found just what I needed at a local fabric store — 10 oz. cotton duck fabric.

SIZE. The only other thing to decide was how big to make the frame. The height was easy. I sized the frame to fit the width of the fabric (72"). All that was left was to figure out how much filter area I needed.

If the filter area is too small, the dust gets forced right through the fabric like a clogged bag on a vacuum cleaner. So after taking into account the size of my vacuum (500 CFM), I came up with the design shown in the Exploded View on the previous page.

BOX FRAME

The filter box isn't really complicated. It's just a large ladder-shaped wood frame that I wrapped with fabric.

LADDERS. I started work on the box frame by building the two end units *(Fig. 20)*. Each end unit consists of two uprights (A), a bottom plate (B), and several rails (C) screwed in between.

But these two end units aren't identical. To provide support for the pipe that comes into the box from the vacuum, there will need to be an inlet plate (D) made from 3/4"-thick plywood *(Fig. 20)*. After cutting a hole in this plate to fit the diameter of the pipe (5") coming from the vacuum, the plate is screwed in place.

STRETCHERS. The next step is to connect the end units with stretchers (E) *(Fig. 20)*. They're attached to the inside edge of the frame uprights *(Fig. 20a)*.

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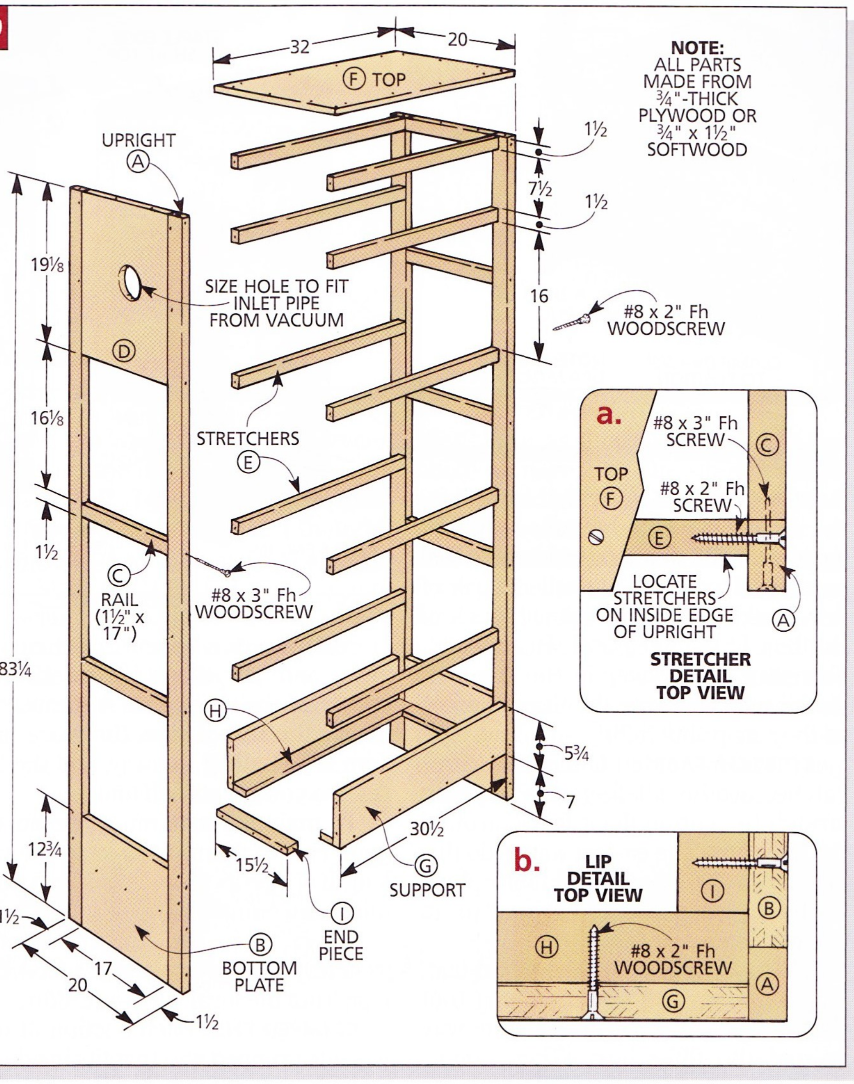

To add rigidity to the top of the box frame, I cut out a 20" x 32" piece of 3/4"-thick plywood for a top (F) and screwed it in place *(Fig. 20a)*. Also, there are two 3/4"-thick plywood support pieces (G) screwed between the uprights at the bottom to help stiffen the end of the frame.

LIP. All that's left to complete the basic frame is to add a lip around the bottom. Later, weatherstripping is attached to the lip to seal the dust drawer. This lip consists of two side pieces (H) screwed to the supports (G) and two end pieces (I) attached to the bottom plate *(Fig. 20b)*.

DUST DRAWER. With the basic frame complete, I made a shallow drawer to catch the remaining dust from the cyclone. The ends of the front/back (J) drawer pieces are rabbeted to accept a pair of drawer sides (K) *(Fig. 21)*. Before screwing the drawer assembly together though, a groove is cut in each piece for a 1/8"-thick hardboard drawer bottom (L) *(Fig. 21a)*.

WEATHERSTRIPPING. Next, to prevent sawdust from leaking out of the drawer, I added another seal made from strips of felt weatherstripping. These strips are stapled under the lip that was installed earlier *(Fig. 21)*.

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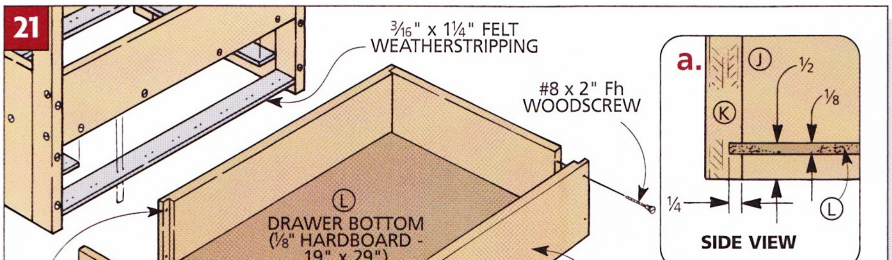
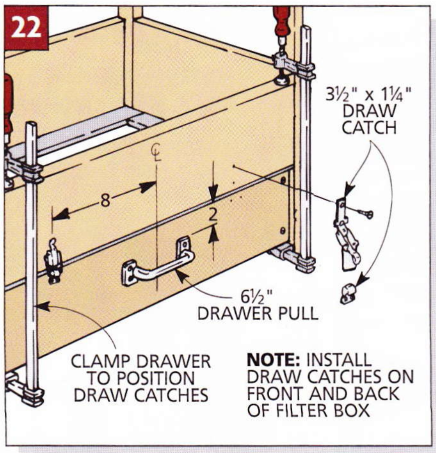
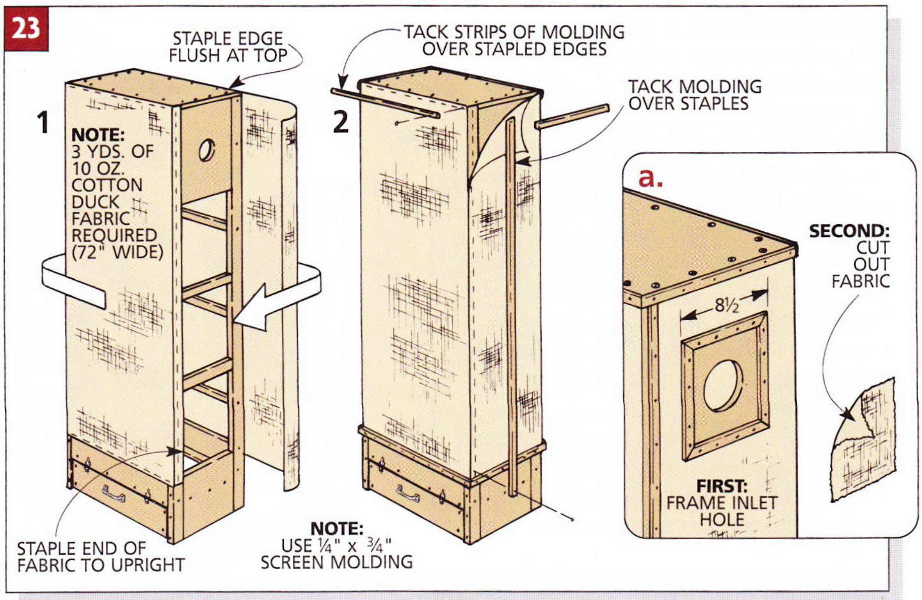






DRAW CATCHES. As with the chip bin, the drawer needs to be pulled up tight against the felt weatherstrip for it to seal properly. To do this, I installed a pair of draw catches on the front and back of the box frame *(Fig. 22)*. Here again, clamping the drawer in the "closed" position helps locate the draw catches so they snap shut tightly.

STRETCH FABRIC. Once the draw catches are installed, you're ready to stretch the cotton duck fabric around the filter box. The easiest way to do this is to align the edge of the fabric flush at the top, and staple one end to an upright *(Step 1 in Fig. 23)*.

Then, while keeping the fabric taut, staple the top and bottom edges (not the uprights) as you work your way around the filter box. When you've returned to the starting point, staple the remaining end of the fabric to the same upright *(Step 1 in Fig. 23)*.

MOLDING. To keep the staples from working loose, I attached strips of screen molding over the stapled edges and the upright *(Step 2 in Fig. 23)*.

Finally, after tacking strips of screen molding to make a frame around the inlet hole, cut out the small square of fabric inside the frame *(Fig. 23a)*.

PIPES & HOOKUP SYSTEM

No matter how efficient the dust collection system is, there's one thing for certain. To get chips from the tool to the cyclone, you'll need to add a system of pipes. This takes some some well-thought out planning to get it right.

LOCATION. One decision is where to locate the cyclone and filter box. To make it easy to empty the chip bin and dust drawer, the best bet is to find a place that's out of the way, yet still accessible.

Still, you don't want to get carried away and put them in the farthest corner of the shop. That's because the longer the run of pipe, the more pressure is lost along the way, and the less suction you get at each tool.

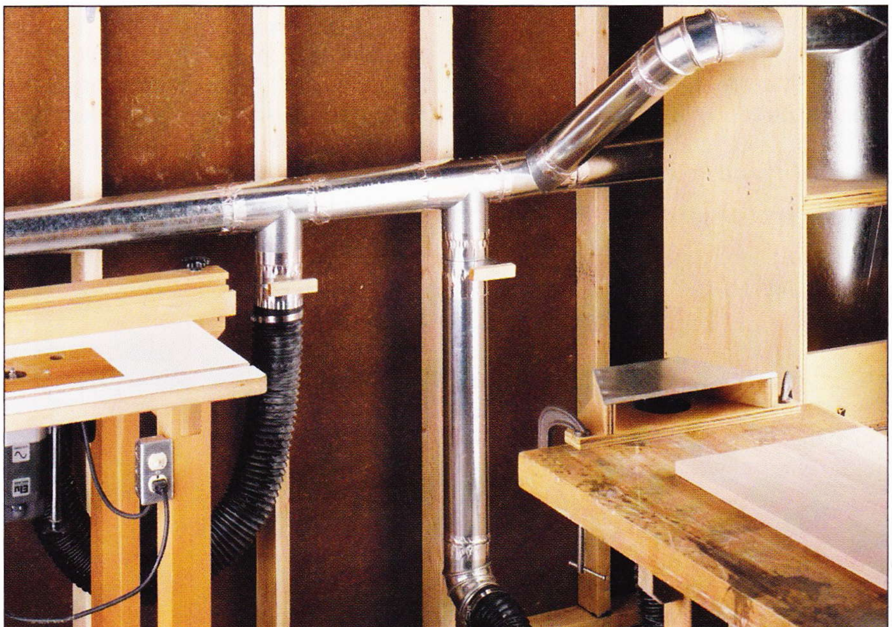
To maintain maximum pressure, a good rule of thumb is to keep the total length of pipe as short as possible with a minimum number of turns.

Note: For my dust collection system, I used 4"-diameter metal duct pipe from the local hardware store.

CRIMPED END. Each section of pipe has one crimped end that fits inside the smooth end of another *(Fig. 24)*. The only problem you're likely to run into will be when you cut a section of pipe and neither end is crimped on the piece you're working with. So to crimp one end of the pipe, I built a simple crimping tool. (See the Woodworker's Notebook on the facing page.)

When installing the pipe, the idea is to position the crimped end toward the cyclone (in the direction of the airflow) *(Fig. 24)*. This way, chips don't catch on the end, and the air flows smoothly through the pipe.

FITTINGS. In addition to the sections of duct pipe, you'll need a couple of different fittings to change the direction of the airflow. I used a 90° "tee" to branch off toward individual tools.



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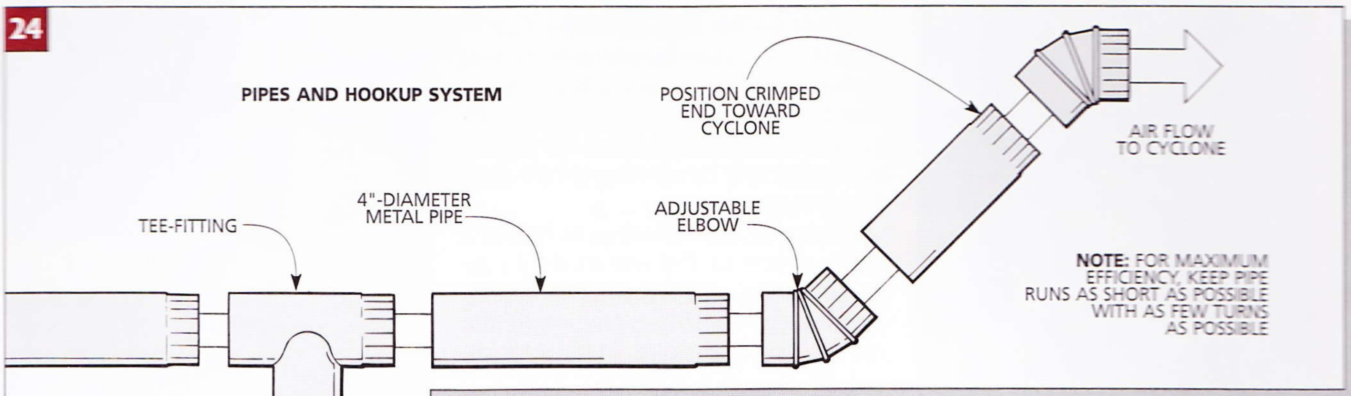

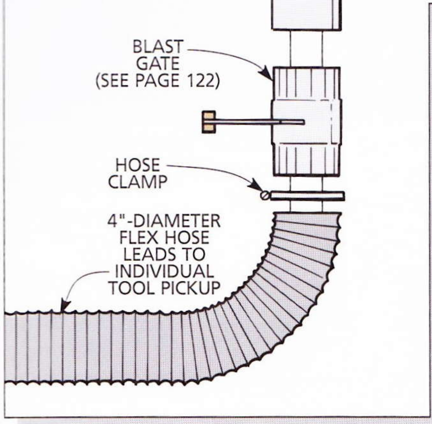

And I used an adjustable elbow to create gradual turns in the piping.

SEAL SEAMS. To ensure that the dust collection system is airtight, I thought it'd be a good idea to seal the system with a strip of metal foil tape around each seam. Also, applying a bead of silicone caulk around each tee-fitting keeps them from leaking.

FLEX HOSE. Another thing to consider is how to connect each individual tool into the system. What I've found works best is 4"-dia. rubber-coated "flex" hose, as shown in *Fig. 24* and the photo on page 120. The smooth inside surface of this hose makes it a good choice for smooth air flow.

Because this hose is flexible, it makes it easy to run a line around obstacles between the pipe and the tool. And once it's in place (as long as you include a little bit of extra hose), you can move the tool without having to cut new pipe or install different fittings. (Flex hose is available through several different woodworking catalogs. See page 126 for sources.)

WOODWORKER'S NOTEBOOK

Sometimes the right tool for the job, like this crimping tool, is one you can build in your own shop.

CRIMPING TOOL

- This shop-made crimping tool is just the ticket for crimping the end of the duct pipe (see photo).
- To make a crimping tool, start by cutting three strips of $1/8$"-thick steel to a length of about 10" each *(Fig. 1)*.
- Then cut a notch into one end of each strip *(Fig. 2)*. And cut a small radius on the opposite end of each strip to soften the sharp edges *(Fig. 1)*.
- To form a crimp in the metal, the notches on each strip need to be beveled. So I filed a bevel on both sides of the center piece, and the inside edge on each of the side pieces *(Fig. 3)*.
- Next, drill a hole in each piece near the notch *(Fig. 2)*. While you're at it, you can also drill the holes on the handle ends of two of the strips *(Fig. 1)*.
- Finally, assemble the crimping tool using the hex bolts, washers and locking nuts. The notches in the two side pieces face the *opposite* direction of the notch in the center piece *(Fig. 1)*. And the bevels need to face in *(Fig. 3)*.

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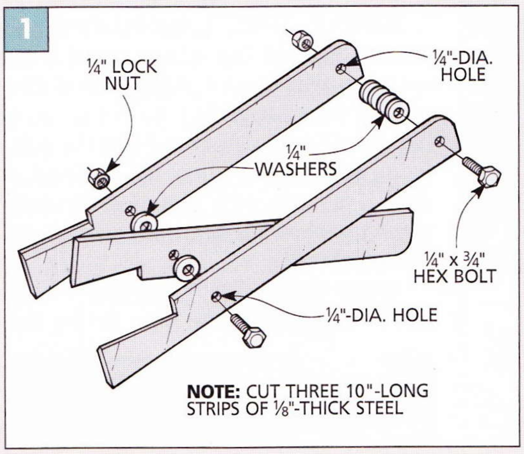

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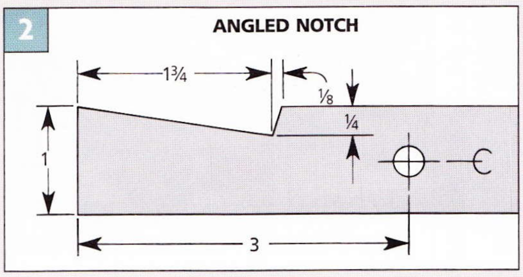

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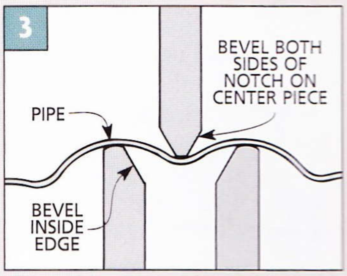


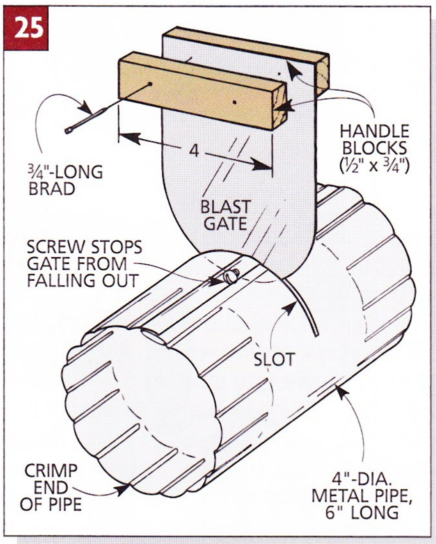
To avoid sharp turns, a pair of adjustable elbows connects the vacuum on the cyclone to the filter box.

BLAST GATES

There's more to getting the Dust Collector working than just setting up lengths of pipe. You still need a way to hook up individual tools to the system.

Although there are a number of manufactured hookups available, their cost can add up quickly (especially if you're connecting three or four tools). So I decided it would be just as easy to make my own.

Basically, I needed two types of hookups: blast gates and dust hoods. The blast gates turn the flow of air on and off at each tool. This makes the system more efficient, by preventing the vacuum from pulling air from more than one tool. And the dust hoods direct chips and dust into the system. (Several styles of tool and dust collection hookups are shown on the following pages.)



BLAST GATES. To control the flow of air in the system so there's only one tool on-line at a time, I added a blast gate at each tool (see photo at right). This way, I can easily turn the suction on (or off) at a tool simply by opening (or closing) the blast gate.

Basically, each blast gate is just a short section of 4"-diameter duct pipe with a slot cut in it. This slot creates an opening for the blast gate, allowing you to slide a piece of sheet metal in and out *(Fig. 25)*.

DISKS. To support the walls of the pipe when cutting the slot, I cut two plywood disks to size to fit inside the ends *(Fig. 26)*. Then just tighten the pipe (and the disks) in a vise and cut the slot halfway through.

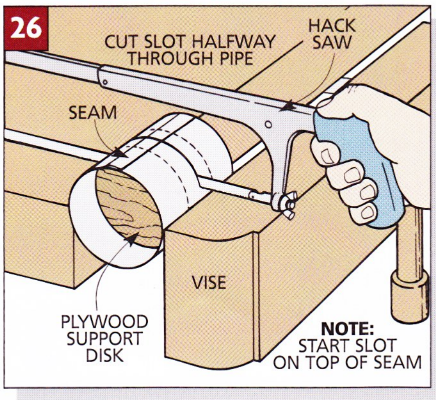
GATE. After removing the plywood disks, the gate can be cut to fit in the slot. The gate is just a strip of sheet metal that's cut to the same width as the diameter of the pipe *(Fig. 25)*.

To keep air from leaking through when the blast gate is closed, the end needs to fit tight against the curved inside wall of the pipe. To do this, scribe the shape of the pipe on the metal and trim the end to fit *(Fig. 27)*.

Note: I used a pair of tin snips to trim the gate, then I used a file to knock down any rough edges left over from cutting the sheet metal. The idea is to make sure the gate slides in and out smoothly without catching.

HANDLE. Next, I sandwiched the square end of the sheet metal gate between two blocks of hardwood and tacked them together to serve as a handle *(Fig. 25)*. Also, to keep the gate from falling out when it's opened, I drilled a hole and installed a small sheet-metal screw near the curved end of the gate *(Fig. 25)*.

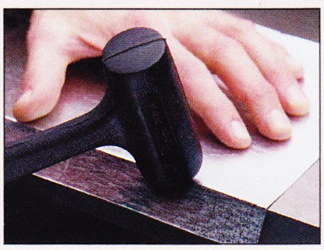
CRIMP ENDS. Finally, I crimped both ends of the blast gate pipe (using the shop-built crimping tool described on page 121) and installed it between the metal pipe and the flex hose leading to each tool hooked to the system.



Sliding a shop-made blast gate in and out of a pipe turns the suction off (or on) at each tool.

SHOP TIP
Sharp Corners

To create a sharp corner where needed on the sheet metal, bend the metal over the edge of your saw table with a dead-blow mallet.



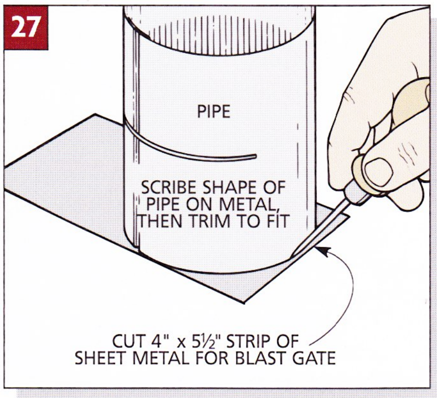


TABLE SAW DUST HOOD

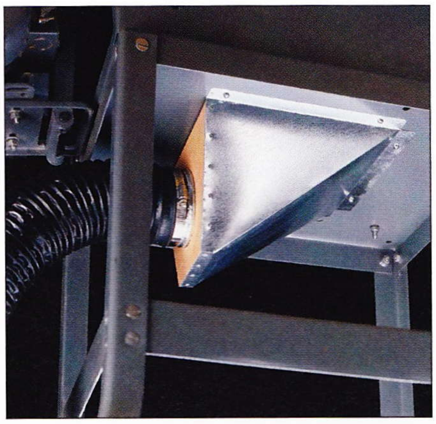
The dust created by the table saw presents one of the most difficult problems for effective dust collection. That's because the rotation of the blade carries the dust below the saw table.

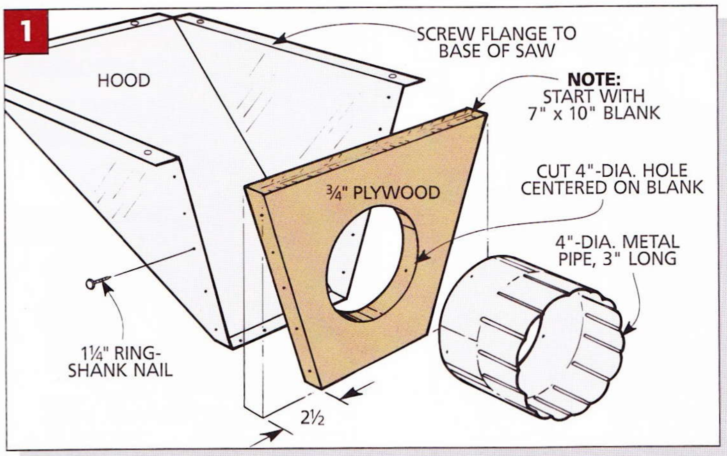
To direct this dust into the system, I added a dust hood that sits in the opening below the blade.

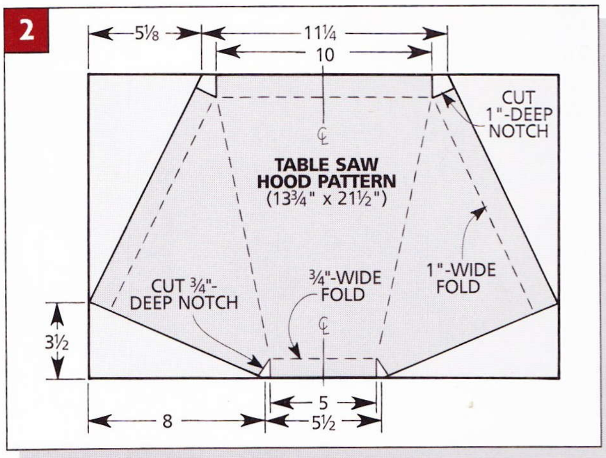
With the table saw dust hood, a piece of sheet metal is formed to fit around a piece of plywood and deflects dust into the pipe *(Fig. 1)*.

Note: To learn how to create a sharp corner at each of the fold lines for all of the dust collection accessories, see the Shop Tip on the opposite page.

The 3/4"-thick plywood starts out as a 7" x 10" blank. Then the sides are tapered from top to bottom *(Fig. 1)*. Then when the sheet metal is cut and formed around the plywood (using the pattern laid out in *Fig. 2*), it creates a funneling action, directing the dust downward. The dust hood is attached to the table saw by screwing the metal flanges to the base of the saw.







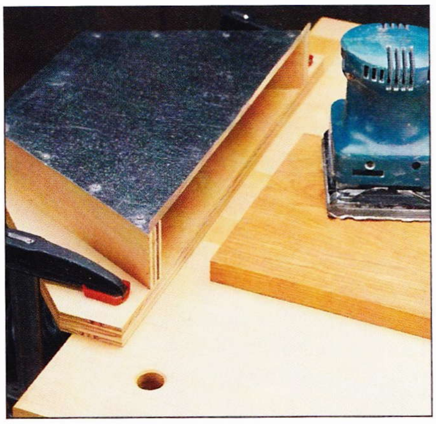
BENCH PICKUP

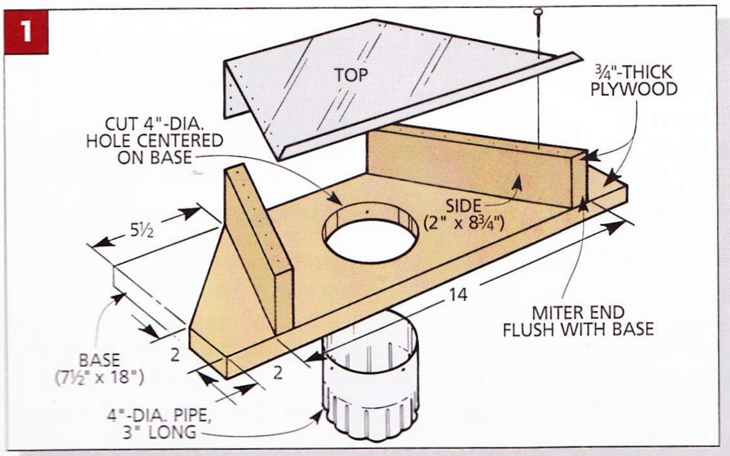
A hand-held power sander is one of the worst culprits when it comes to filling the air in the shop with fine dust. To capture this dust before it gets airborne, I made a pickup that clamps to the end of my bench (see photo at right).

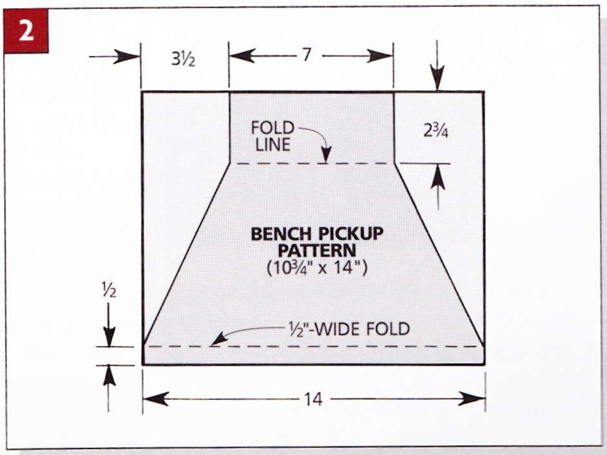
Basically, this pickup works just like a funnel. As you sand across a board, dust is drawn into the wide "mouth" at the front of the pickup. Then it's directed into the dust outlet by two converging sides *(Fig. 1)*.

Like the other hookups, this bench pickup is made by bending a piece of light-gauge sheet metal so it fits around pieces of plywood *(Figs. 1 and 2)*. And as before, a 4"-diameter pipe stub is nailed into the base which lets you connect it to the Dust Collector.

But in spite of these similarities, there are a couple of twists. First, to provide room to attach the clamps, there's an "ear" on each side of the base. Second, the ends of each of the side pieces are mitered so they're flush with the base *(Fig. 1)*.







ROUTER TABLE COLLECTION BOX

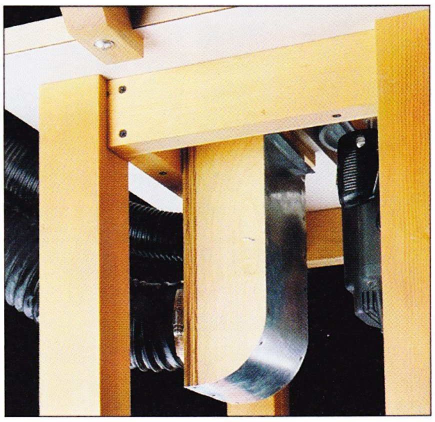
When using a router table, chips always get thrown above *and* below the table. To pull chips into the dust collection system at both places, I built a simple collection box for below the table and another one that's attached to the router table fence (see photo).

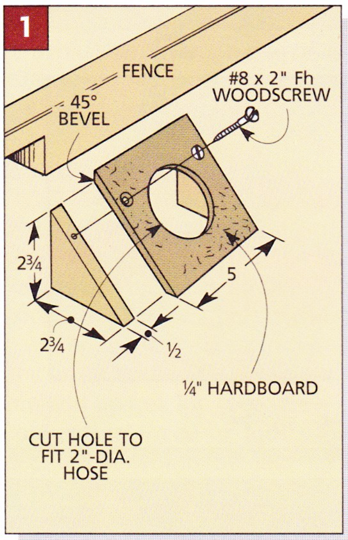
Note: Although it's designed to be screwed under an open-base router table (see photo), this box can also be easily adapted to other router tables.

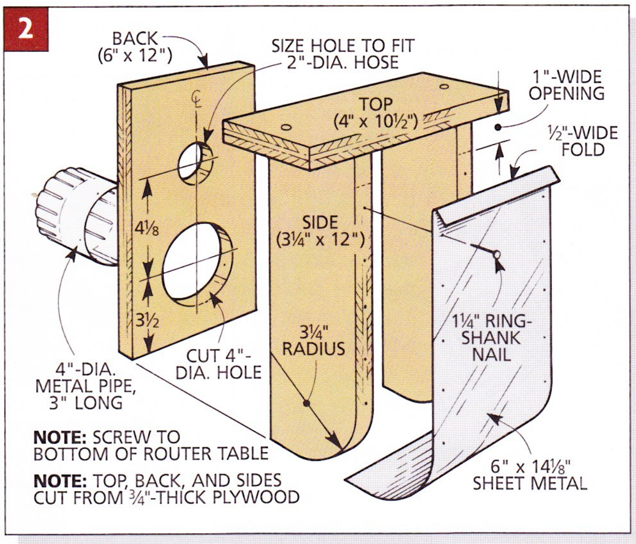
The chips that get kicked out below the table are drawn into a narrow opening in the top of the box *(Fig. 3)*.

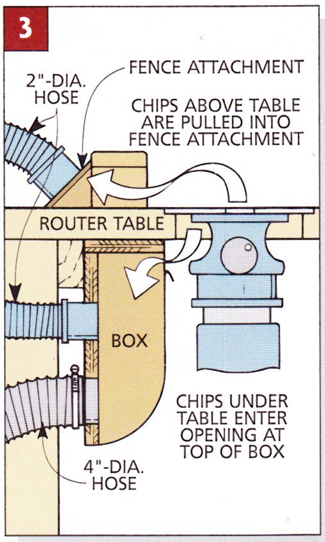
To collect chips above the table, I screwed a fence attachment to the back of the fence. It's made by gluing a hardboard plate with a hole for a 2" diameter hose cut in it to two triangular pieces of hardwood *(Fig. 1)*.

To hook up the collection box, run a 2"-dia. hose between the fence attachment and the box *(Fig. 3)*. Then fit a 4"-diameter hose over the pipe stub nailed into the box *(Fig. 2)*.







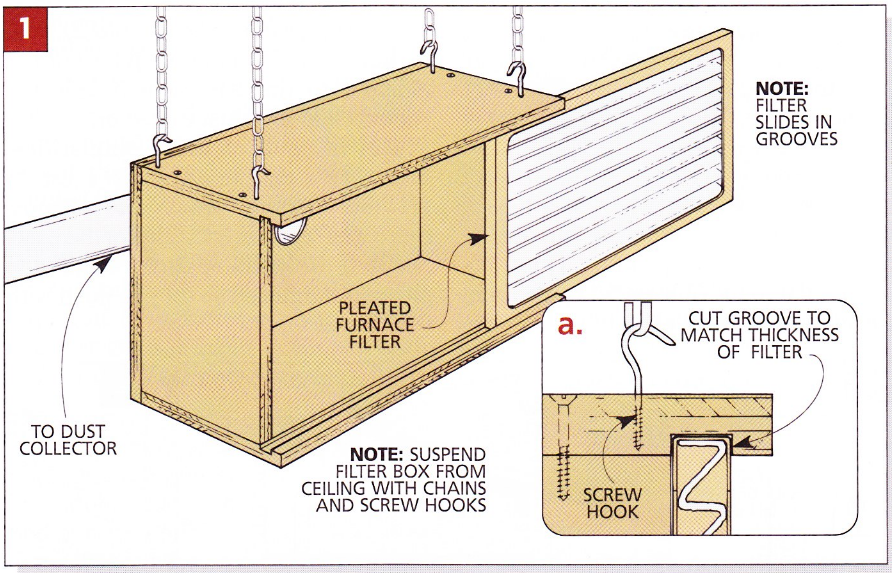


AIR FILTER BOX

Even though all the machines in my shop are hooked up to my Dust Collector, I've noticed there still seems to be a lot of fine dust left floating in the air after making a cut. To solve this, I made an air filter box. It hooks up to the Dust Collector system just like one of my machines *(Fig. 1)*.

This air filter is basically a large plywood box with a lip on the front. The lip is designed to hold an inexpensive pleated furnace filter. (See the Shop Info on page 92 for more about filters.)

Note: It's a good idea to purchase the furnace filter before you begin construction on the air filter box. Since filter sizes vary from one manufacturer to the next, you want to be sure of getting a snug fit.



A groove that matches the thickness of the furnace filter is cut near the front of the top and bottom pieces *(Figs. 1 and 1a)*. This groove will then create a slot for the furnace filter to slide in and out. And a 4"-diameter hole can be cut in the back of the box, which lets you hook up the flexible hose or ducting from the Dust Collector.

To keep construction of the box easy, I went ahead and used butt joints and simply assembled the box with glue and several woodscrews.

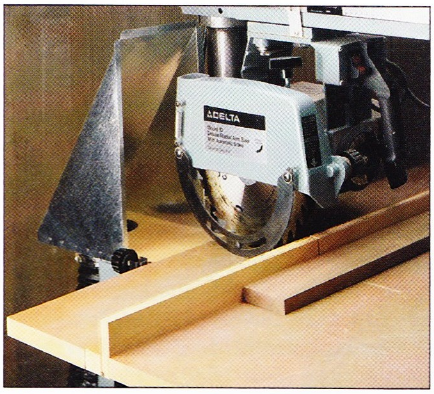
I've found that you'll experience the best results with the air filter box if you hang it from the ceiling in a central location. And I periodically check it to make sure that the filter isn't clogged — especially after I've completed a round of heavy sawing or sanding.

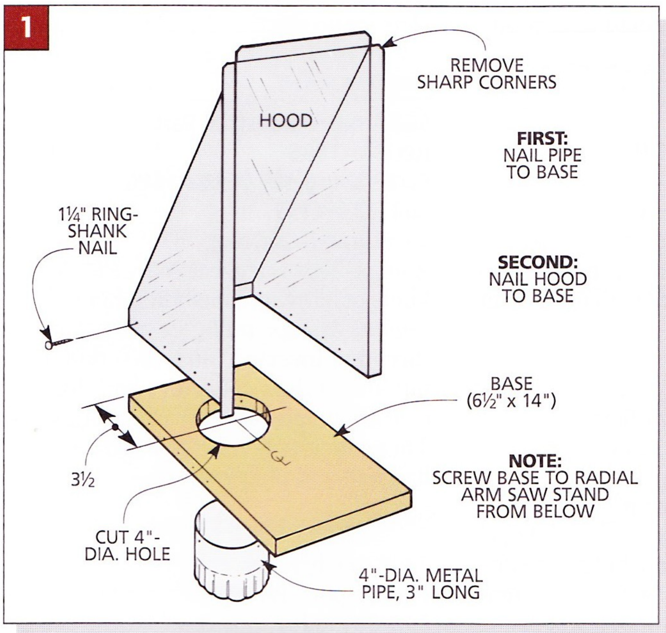
RADIAL ARM SAW DUST HOOD

Large stationary tools (like radial arm saws) are some of the worst dust producers. To make matters worse, cleaning out behind them usually means having to pull the tool away from the wall. To solve this problem, I built this dust hood to catch the dust that scatters behind the blade of my radial arm saw. I screwed the scoop-shaped dust hood to the tool's metal stand.

The base of this hood is a piece of ¾"-thick stock that has a hole cut in it for a short "stub" of 4"-diameter pipe *(Fig. 1)*. Fitting a 4"-diameter flex hose over this stub connects the hood to the dust collection system.

After nailing the stub into the base, a piece of sheet metal is cut and bent to fit around the plywood *(Fig. 2)*. The fold lines on the outside of the hood are for flanges that protect the user from getting cut on the sharp edges. Then nail the hood assembly onto the base.





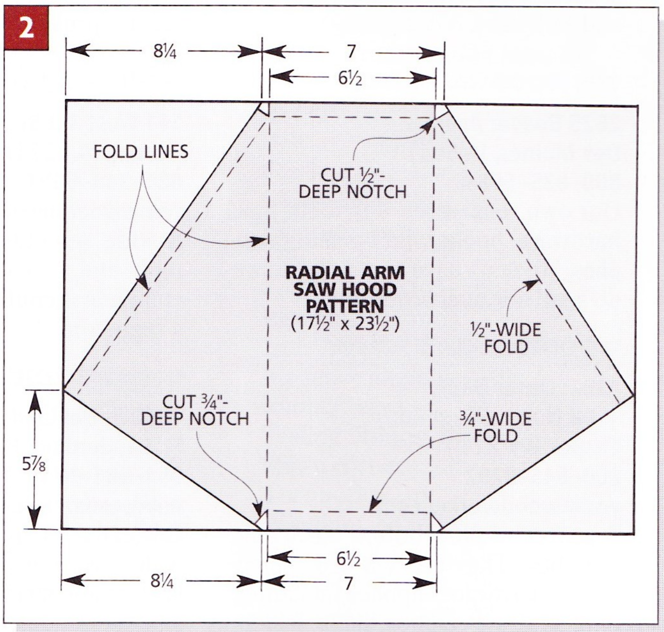
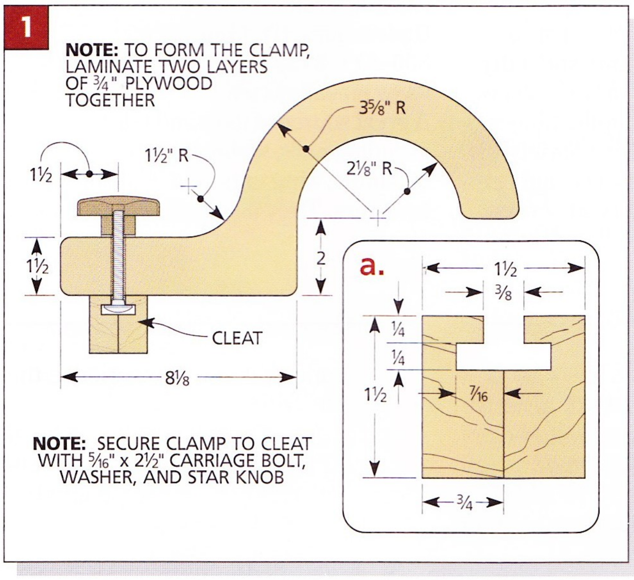


TABLE SAW HOSE CLAMP

Even with a dust hookup below the table, there's always some dust that escapes from the top of a table saw.



A good way to capture this dust is with a flex hose near the blade. But most methods of clamping the hose just flatten it. So I decided to build a simple hose clamp to solve this problem (see photo).

This P-shaped hose clamp is cut from two laminated pieces of ¾" plywood *(Fig. 1)*. In the "stem" of the "P" is a hole to accept a carriage bolt, a washer, and a star knob.

The carriage bolt secures the clamp in a T-slot that's cut in a cleat *(Fig. 1)*. The cleat is attached to a wing of the table saw. To make the cleat, cut a groove in one edge of two hardwood pieces. (I used hard maple.) After gluing the pieces together, cut a centered groove along the length of the cleat to open the T-slot *(Fig. 1a)*. Finally, attach the cleat to the edge of the saw by driving screws from the back of the wing into the cleat. ■