

How to Make Throwing Bats

In order to make rigid bats from plywood, MDF (medium-density fiberboard), particle board, 1/4" Masonite, Plexiglas, or PVC, you need access to a skill-saw or table-saw, a bandsaw, and a drill-press, but with those tools you can make inexpensive bats that function as well as or better than any commercially-made units. The following instructions are for making bats from plywood or MDF. If you want to make bats from Plexiglas, Masonite, or PVC, be sure to use an appropriate fine-tooth blade on the bandsaw and the table-saw or skill-saw. The rest of the instructions are the same.

For wood bats, the choice of wood is critical. Never make bats from regular dimensional lumber, because it will warp in one direction and the bats will become useless. You can use any Masonite, particle board, MDF, or plywood, but if the material is not completely waterproof from the manufacturer, you will have to waterproof it yourself. I strongly recommend using **Medex** MDF far above any other material. It is a completely waterproof MDF board originally designed for road signs, reusable concrete forming, and other high-abuse outdoor situations. It does not warp, and is greatly superior to all other materials for throwing bats. If your local lumber yard doesn't stock **Medex**, they can usually order it. If for some reason you cannot get it, use high-quality birch plywood, MDF, or Masonite. For MDF or plywood, use 1/2" material for the smallest bats, 5/8" for bats up to 16", and 3/4" for enormous bats. We just use 5/8", and our bats are 12", 14" and 16". For all wood-based materials other than **Medex**, you must give the bats several coats of marine spar varnish on all surfaces **after** all cutting, drilling, and sanding is done. In that case, drill the bat-pin holes 1/64" oversize, since the varnish will slightly decrease the size of the holes.

These instructions are for bats that measure 11 3/4"-diameter. The reason they are not 12" is because you will lose a little material in the saw cuts when making 32 bats from one 4x8 sheet of plywood or particle board. You can adapt the following set-up and measurements for other sizes you wish to make. Cut the 4x8 sheets of plywood or particle board into 12" squares. It may be most expedient to pay the people at Lowe's or Home Depot or a cabinet shop to do those initial cuts very quickly and efficiently on a stationary inclined panel saw.

With a straight-edge, draw two pencil lines diagonally between corners of each piece so that they intersect in the exact center. With the drill-press, drill a 1/16"-diameter hole exactly on center. It is critical that this hole be drilled with a drill-press, because the point where it comes through on the bottom must line up perfectly with the crossed-lines on top. This hole is required for using the cutting and drilling jig described below and pictured in the accompanying images.

You need to make one multi-purpose jig that will allow you to cut perfect circles on the bandsaw and drill the precision-located bat-pin holes on the drill press. This jig should work on any bandsaw or drill press. Cut a piece of 3/4" plywood or particle board 12"x24". Draw a line down the center of the piece, 6" from each edge, heretofore referred to as **the center line**. At the mid-point along the 24"

length of the board, 12" from either end, make a single 6"-long bandsaw cut from one edge to the center line. Turn off the bandsaw and slide the board back off the bandsaw blade. Holding the board with this cut facing away from you, write "top" near the left-hand edge, measure exactly $5 \frac{7}{8}$ " to the right of the cut along the center line, and drill a $\frac{1}{16}$ " hole through the board at this point (6" from the front and back edges of the board). Cut the head off a 12-penny nail so that the remaining section including the sharp tip is barely longer than the thickness of the board. Drive this nail into the $\frac{1}{16}$ " hole from the bottom side so that the tip of the nail sticks up about $\frac{1}{8}$ " above the top surface of the board. Slide the saw-cut back over the bandsaw blade, and clamp the board onto the bandsaw table with the clamp located at least 4" to the left of the blade. If you don't have an appropriate C-clamp you can drill a hole in the board and bolt it to the bandsaw table. It won't matter if the head of the bolt sticks up, as long as it is at least 4" to the left of the blade (enough to clear the corners of the 12" squares as you cut them into circles).

Take one of your squares of plywood or MDF, and place it over this jig to the right of the blade so that the center hole drops over the nail-point, with one edge pressing against the bandsaw blade. Turn on the bandsaw and start rotating the board on the nail-head to feed the board into the blade, as shown in figures "B" and "C". Rotate the board on the center pivot until you cut a complete circle. Repeat the process with the rest of the squares. As you see, this technique can be adapted to cut any size of perfect circle.

Remove the jig from the bandsaw. With a few additional modifications, the same jig can work on the drill press to accurately drill the bat-pin holes, as shown in figures "D," "E" and "F". Almost all wheels have bat pins holes on 10" centers, but double-check yours and adapt the instructions if necessary. The following instructions are for pins on 10" centers. Along the center-line of the jig, measure exactly 5" to the left of the center of the nail point (towards the saw cut), and mark and center-punch that point. Measure, mark, and center-punch very carefully, because precision is everything at this step. Even slightly off and your bats will not fit over the bat pins. Place the jig on the drill press table in the same orientation it was on the bandsaw table, with the nail point on the right, and drill a $\frac{1}{8}$ " hole through the wood at the center-punched point. Before raising the drill-bit out of the work, clamp the board down to the drill-press table with the clamp located at least 4" to the left of the drill-chuck. Raise the drill bit back up.

Take one of your cut disks, and with the pencil lines facing up, place the center hole securely onto the nail-point on the jig. Along one of the pencil cross-lines, drill a $\frac{1}{8}$ "-diameter hole exactly centered on the line and exactly $\frac{3}{8}$ " deep, using the adjustable depth-stop on the drill-press or an accessory depth-stop fastened onto the drill bit. Rotate the bat 180 degrees on the nail point and drill another $\frac{1}{8}$ " hole along the same line. ***Make sure that these holes are exactly centered on the line.***

Bat pins these days are almost universally $\frac{1}{4}$ -28 (diameter and threads-per-inch) Allen socket-head cap screws held in place with a wing-nut on the underside of the wheelhead. The head of these screws is exactly $\frac{3}{8}$ " in diameter, and in order to have slight clearance to fit the bats in place easily, the holes should be $\frac{1}{64}$ " larger than the bat pins, or $\frac{1}{32}$ " larger if you are going to varnish the bat). That means a $\frac{25}{64}$ " drill bit for Medex, and $\frac{13}{32}$ " for any non-waterproof wood-product bat that is going to be sealed with spar varnish. When you change to this drill-bit, adjust the table height and the drill-stop accordingly, and using the $\frac{1}{8}$ " holes as pilot holes, drill them $\frac{3}{8}$ "-deep to the larger size. Take

the first drilled bat and try it on your wheelhead. If you measured carefully and laid out everything properly it and all subsequent ones will fit perfectly and rotate absolutely true. If not, figure out what you did wrong and make adjustments before proceeding with the rest of your bats.

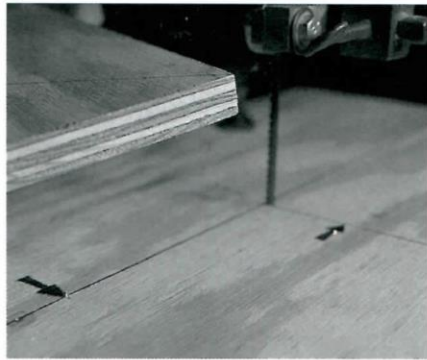
If the bat fits properly, put the 1/8" bit back into the drill-press, reset the table height and the drill-stop, and put your disks on the jig one at a time and drill the pilot holes. Change to the larger bit, reset the table height and depth-stop, and drill the holes to the larger size. Don't try to do this without the pilot hole, because it is far more difficult to start a larger hole in a precise location without a pilot hole. Try not to drill deeper than 3/8". It really will be worth it to use a proper depth-stop.

As a final step to make the bats easier to place over the bat pins, install a countersink bit in the drill-press chuck, and raise the drill-press table and adjust the depth-stop appropriately so that the countersink cuts just the slightest bevel at the opening of each hole. Only the slightest bevel is beneficial, and any more will decrease the efficiency of the bat pins in holding the bat.

When the bats are all finished to this stage, place a bat over the bat pins on the wheelhead, put on your dust mask, start the wheel, and with an electric sander or an angle grinder with sanding disk, put a slight bevel on the upper outer edge of the bat. With the wheel still turning, press a piece of sandpaper against the beveled edge and the side of the bat.

As mentioned, it is really worthwhile to use *Medex* or some other brand of truly waterproof MDF. Shortly after coming to the Appalachian Center for Craft we made a large supply of *Medex* bats, and over 20 years later they are still in excellent condition with no sealant applied. If you use any other wood-based material such as Masonite, plywood, or particle board, you must thoroughly seal all surfaces of the bats with marine spar varnish. For the first coat, thin some of the varnish slightly with an appropriate thinner – that helps it soak into the surface. Lay out the bats on strips of wood on newspaper, and paint one side with spar varnish, including the bat-pin holes, but use Q-tips or paper towel right way to blot any excess varnish out of the holes. When dry, reverse the bats and do the other side. When the varnish is completely dry sand lightly and give both sides a coat of un-thinned varnish. When dry, sand again and give a third coat. When dry, sand lightly with fine sandpaper. If you really take care to do all of this properly, the bats will last for decades. If you don't, they'll swell up and die in a year or less.

(See images on next page)



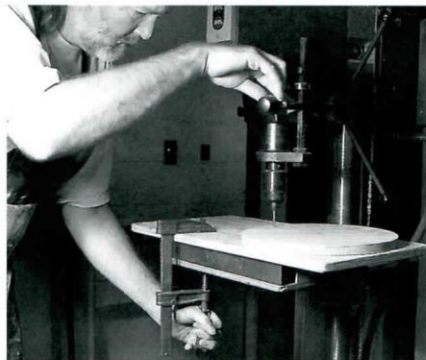
a. Making throwing bats: Jig in place on band-saw table, showing band-saw blade in slot, and nail point protruding from jig surface.



b. With gentle downwards pressure on the center point, rotate the square to cut a perfect circle.



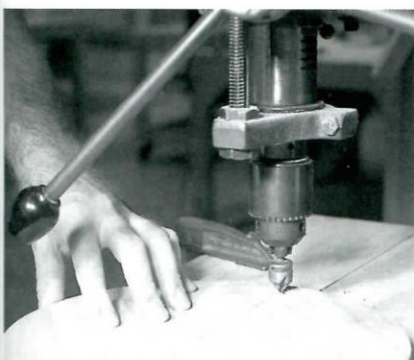
c. Finish cutting circle.



d. Measure for the bat-pin location, clamp the jig on the drill-press table, and drill the $\frac{1}{8}$ " pilot holes.



e. Drill appropriate bat-pin holes.



f. Slightly bevel the bat-pin holes with a countersink.



g. Sand a beveled outer edge on the bats with a sanding disk on an angle grinder.



h. Sand the vertical surface of the bats.