

Constructing a Three Position Target Stand for Air Rifle

by Leo R. Lujan

My high school rifle team practices air rifle in the school cafeteria. Janitors move the tables and chairs out of the way after lunch to make room for a ten-point air rifle range. For practice, we use Daisy 875 pellet traps sitting on milk crates to get the proper elevation. We do this four days a week for air rifle and we have a two hour block of time on the Vanderbilt University range one night a week for smallbore.

I have dreamed about turning the school's basketball gym into an air rifle range. Jack Duncan (from El Cajon, CA) has a set of target stands that he totes all over the country to turn any available space into a range. His stands hold a 10-bull target and use a vertical 14 gage steel plate to stop the pellets. The target holder is raised and lowered on a pipe as needed for different positions. Using Jack's vertical plate idea, I decided to design and build a target stand that would hold six targets (two for each position) allowing shooters to fire a three position match (half course) without a target change.

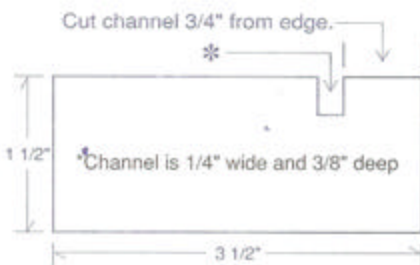
I calculated that I could build each target stand for about \$50 in materials. With a \$2,000 grant from the school Mother's Club, I set out to build 40 target stands. Having my range all but built (in my mind), I sent invitations to air rifle programs in five states for the Montgomery Bell Academy Fall Classic to be held the fourth weekend of October. With 120 shooters entered, I was still assembling target stands the day before the match but it all came together on time. With rifle team members and parents helping, it took two hours convert the school gym into a 32 point air rifle range. Knock-down time and cleanup after the match was less than an hour.

Along with the story or plan for building the target stands, I will relate my mistakes so that you won't have to make them.



Largest indoor air rifle range in Tennessee for 24 hours. Then it reverts to a basketball court.

Frame. The frame or side members of the stand consists of two spruce 2x4s cut 65" in length. When purchasing 2x4s, make sure they are not warped nor likely to warp. Each side will have a channel cut the full length of the side; when the stand is assembled, the channels will hold a sheet of cardboard on which targets are mounted. After the 2x4s are cut to length, use a stackable dado blade on a table saw to cut a channel in each 2x4 that is 1/4" wide and exactly 3/8" deep. The channel should be 3/4" in from the edge. Check the depth of the cut on scrap lumber until you get it right!



Side member cross section



Steel Plates. The target stand would be too heavy and more expensive if the entire back of the stand were covered with sheet steel so just the area where the targets are to be hung plus a few inches to catch a wild shot is covered. It is essential that you find a steel supply house which can cut and drill the steel sheet to your specifications. For each target stand you will need 14 gage galvanized steel sheet cut to the following dimensions:

- **26 3/4" X 16"** Four holes need to be punched in this piece, two each along the 16" sides, 3/4" in from the edge.

- **26 3/4" X 30"** Six holes need to be punched in this piece, three each along the 30" sides, 3/4" in from the edge.

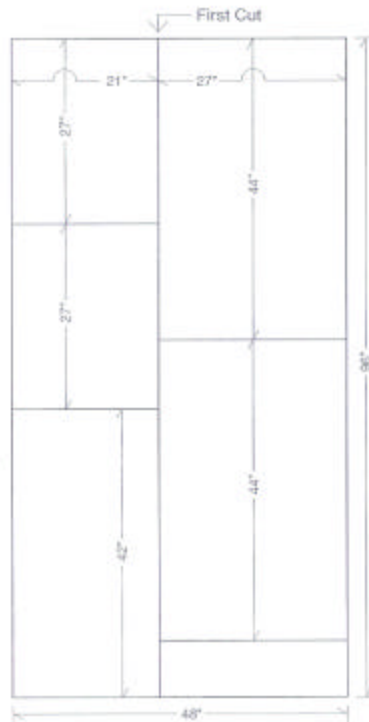
Holes should accept a 8 x 1 1/4" wood screw with a little slack.



Cut Plans for Steel Plate

Cardboard. A cardboard box manufacturer will cut cardboard to your exact needs for the target stands. Purchasing a larger quantity brings down the price per sheet dramatically so I purchased what I thought would be a two year supply at the outset. Actually it will last much longer. Exact size is important (too wide and it won't fit in the stand/too narrow and it will fall out). **NOTE:** Purchase cardboard after the stands are built so that if necessary, you may adjust the width of the sheets. For my stands, I purchased 100 sheets BC Plain (vendor description) cardboard cut 24 9/16" X 63".

Plywood back. The back should be made out of 3/8" BC Grade plywood. Using the cut plan illustrated below, you can get two stands out of one 4' X 8' sheet of plywood. Large building supply stores have special saws which make quick work of cutting plywood so I had all the cuts made at the store. It is essential that the first cut be made at the indicated location.



Plywood Cut Plan

Used for centering larger steel sheet.

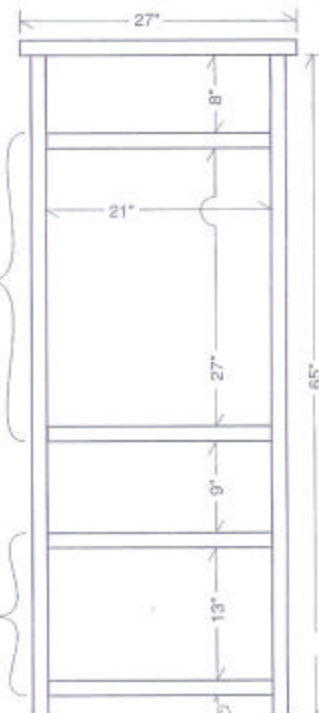
Used for centering smaller steel sheet.

Assembly Jig. An assembly jig can be made in less than an hour and it will cut the assembly time in half for each stand. For the parts of the jig, cut 2X4s to the lengths indicated as follows:

- 2 each 65" (sides)
- 1 each 27" (end cap)
- 4 each 21" (cross members)

Using a table saw, cut 1/2" off the side of each of pieces for the jig. The resulting cross sections will be 1 1/2" x 3". This will keep the jig from interfering with the assembly of the stand as you are screwing the parts together.

Assemble the jig using wood screws as shown below. The exact positioning of the cross pieces is important because they will be used as a quick reference for the placement of the steel plates.



Jig Plan



Completed Jig

Final assembly. I used 8 x 1 1/4" wood screws (flat head, Phillips) to fasten the steel plates to the side members and 1 1/4" drywall screws to fasten the plywood to the side members. You will need an electric screw driver or an amazingly strong arm.

Step 1: Lay the jig on a level surface (table or floor). Using four C-clamps (3 1/2" or larger), fasten the side members to the jig. Be sure that the channel slots face to the inside and are placed down.



Step 2: Place the large steel plate on the side members (the cross pieces of the jig allow you to quickly position the plate using the feel of your hands rather than sight). Screw the plate to the side members. Then mount the smaller steel plate.



Positioning steel plate

Step 3. Remove the C-clamps near the bottom of the stand. I used cardboard shims on the side members not covered with steel plate which allows the plywood to lie flatter over the plate. Using drywall screws, mount the large (27" X 44") plywood section. Then remove the remaining C-clamps and mount the small (27" X 21") plywood section. Separate the jig from the stand and you are done except for one final check.



Cardboard shims





Completed stands before installing cardboard.

Step 4. If you cut the channels in the sides carefully, the cardboard should fit perfectly in the channels. If, however, a portion of the channel is not quite the proper depth or is too deep, you will have problems with installing the cardboard. I took a yardstick and cut it down to the exact width (24 9/16") of the cardboard to be installed in the stand. Using the stick as a gage, I placed an end in each of the channels and ran it down the slots top to bottom. If it fell out, the channel was deeper than the plan called for and I would have to buy wider cardboard - this never happened. If it didn't slide freely down the channels, I had to take the stand apart and recut the channels - this happened in three of the 40 stands I built. When cutting the channels, I had allowed the side member to raise up slightly off the dado blade leaving a high spot.

Erecting the Target Stands. The target stands may be pushed flush against a wall and they will remain upright. If you set them up free standing in the middle of a room as we did in our gym, you will need a plywood support attached to one of the side members. We used pieces of plywood left over from the stand.

Pellet Adhesion. When the pellets strike the steel plate, they flatten out and kinetic energy is converted to heat. Most will fall to the floor, but a few will adhere to the plate. Dirt on the steel seems to encourage adhesion. When new, the dirt film on the steel can be removed by spraying the plates with WD-40 and wiping them clean with a rag. Spraying the plates with WD-40 before each use and wiping them clean when put away reduces adhesion. Pellets which adhere can be easily removed with a window scraper.

Comments and Questions about this plan should be directed to Leo Lujan, PO Box 3207, Brentwood, TN 37024-3207. Telephone and FAX 615/831-0485.



For a free standing stand, mount a plywood support to each side. Two dry wall screws make for quick installation and removal of the support panel.



Collapsed stands take up very little space. Twenty Three stands are shown here.

Corrections:

1. The channel groove in the 2" X 4" side rails needs to be 3/8" DEEP and 3/8" WIDE vice 1/4" wide and 3/8" deep.
2. Also, you can get by with lighter sheet metal than 14 Ga.