Building Your Own Wedges

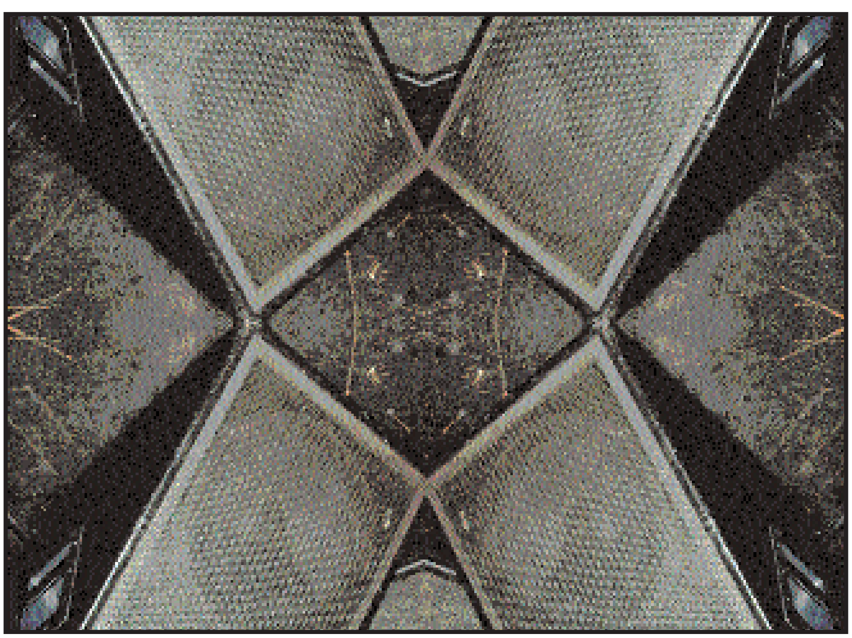
Follow the basics to insure roadworthiness

By Jeffrey A. Forsburg

Building a floor monitor wedge is something that many of us attempt (or at least want to attempt) at one time or another. There is great satisfaction in designing and building a wedge.

I design loudspeakers for G-Audio Corporation, but really enjoy taking other manufacturer's boxes apart to examine the inner construction and see how they actually put glue to wood to make the design work. Even though some wedges are surprisingly simple in design and work just fine, other cabinets are overbuilt and end up providing the same result.

For the most part, if you're successful at constructing a monitor wedge (which is a compound angle box using dado and rabbit joints), then you can build any loudspeaker enclosure. Rather than completely reinventing the wheel, it's more useful to follow some basic guidelines.



GETTING TO WORK

Let's look at building a wedge out of 13-ply Baltic Birch (18 mm thick) plywood, using industry standard manufacturing tools. The enclosure will house a single 12-inch cone driver with a 2-inch horn and a pair of ports. I'll leave the tuning to you after you have chosen your components, because each brand of loudspeaker component presents its own unique tuning requirements.

I chose this design for its versatility. It has three possible display angles: 30-, 45- and 90-degrees. Depending upon the horn you choose, not only does it make a great floor monitor, but you can also use it as a side-fill by standing it on end, another popular use for monitors.

I'm using a DDS (Design Direct Sound) CFD-251 with a tight 51-degree horizontal by 42-degree vertical. The connectors are positioned at either end of the cabinet, but you might run into some problems and may want to consider another location if you plan to use it for side-fill.

When designing a monitor, take a look at what's already been designed and available on the market. You'll find a plethora of sizes and angles, but most builders are seeking these common design goals: small, low profile, multi-angle, light weight, and extremely loud and clear output. Granted, the components you choose have an enormous effect on the quality, but for this article I'm going to focus on construction.

Keep in mind that while we're looking at how to build a wedge to withstand the abuse of the road and outlast all of us, it's still up to you to make your design sound good by choosing high-quality components and properly tuning the box.

First let's choose the type of joinery we plan to use. Following are three dif-

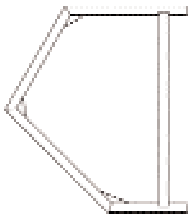


Figure 1

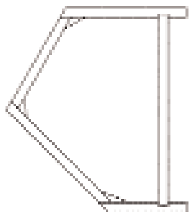


Figure 2

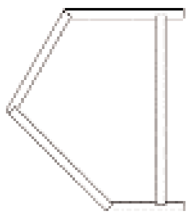


Figure 3

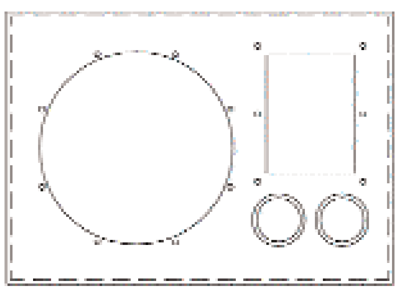


Figure 4

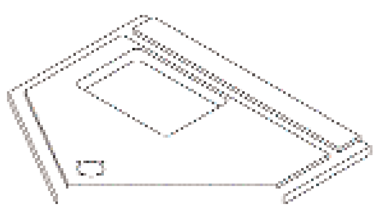


Figure 5

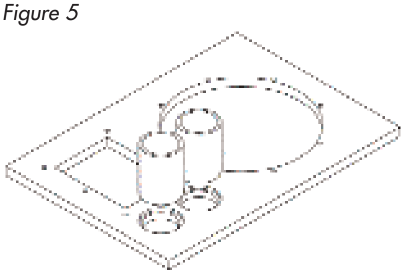


Figure 6

ferent styles used in monitors that are on the market today, and each has its own level of difficulty in construction.

Figure 1 shows a miter joint. To make it, simply determine the angle on the corner, divide by two, and that's the measurement for each edge angle cut. This type of joint is fine, even though it's not as strong as others. Many low-budget monitors are built using this method.

It's important to place a brace at each joint cut at the same angle for a tight fit, running the length of the joint to insure its strength. Two other things to remember: recalculate the enclosure volume to compensate for the loss of internal space from adding the bracing, and be careful where connectors are mounted, because there may not be room for them after bracing is added.

Figure 2 shows a butt joint, more commonly used because both pieces don't need to be cut perfectly to achieve a tight joint. The outer piece can be slightly oversized and sanded flush later. Again, this joint has strength inadequacies so additional internal bracing is advised.

Figure 3 demonstrates what we use at G-Audio, which is the dado joint. It's a very difficult joint to make, with a lot of time required to calibrate and adjust the cutting equipment to get every angle and depth of each cut exact. However, if done correctly, it makes the strongest joint of the three.

Each part interlocks with the other, and in most cases, makes additional internal bracing unnecessary. A note of caution: take care when you lay out your rabbit joints assembly.

A LOGICAL ORDER

Rabbit joints are the recessed outer edges of the end panel, and the side panels fit into them. Make sure they fit together in a logical order. Before gluing anything together, it's always a good idea to do a dry assembly to insure correct length and depth of cuts.

Figure 4 provides a look at the baffle. Notice the dashed line 0.25 of an inch from the edge. This is the area nested in the dado channel on the surrounding parts. You may consider building wedges with a butt joint on the baffle, but I don't recommend it.

Regardless of the joinery chosen for the rest of the box, it's always best to make the baffle the strongest supported area. Think of it this way: everything is built around the baffle, so dado it in.

Figure 5 is a sample of the side of our enclosure, and it has a cutout for the handle, connector, a dado channel for the baffle, and is rabbited to the top, bottom and sides. Using 13-ply Baltic Birch (approximately 0.75-inch) thick plywood, I like to leave 0.50 of an inch of remaining material in the rabbit joint. This provides strength and makes it easier to calculate the size of the cabinet when designing.

For instance, if you're building a 24-inch wide enclosure, your rabbits will be 0.50 of an inch thick. This means that all sides as well as the baffle will be cut to 23 inches in length, making it much easier to calculate your cuts and resulting in fewer mistakes.

After cutting all of the parts, but before cabinet assembly, some "prep" of a few parts is required. The tuning ports and t-nuts need to be installed, as shown in **Figure 6**. Recess the ports into the baffle for strength and a clean look.

You can make a baffle with the speaker on the left or right, but pay attention to the side you choose in which to recess the ports. This determines whether the wedge is oriented as a "lefty" or a "righty". You'll need to cut a channel about 0.25 of an inch deep, and large enough to fit the port pipe snuggly in the channel.

Keep in mind that if the port needs to be 4 inches long, don't forget to compensate for the baffle material in your calculations for its final length. If the baffle is 0.75 of an inch thick, the tube would be cut to 3.5 inches and recessed into the baffle at 0.25 of an inch, resulting in a port length of 4 inches.

The most common port material to use is PVC pipe, with 0.25-inch wall thickness to help eliminate vibration of the tube. To affix the ports, use waterproof epoxy and be sure to rough the sides of the PVC so the epoxy has a good surface to adhere to.

Let it dry and clean up the edges on the front with a straight router bit. If you plan to radius the front of the ports, do it at this step, because you can't get a router into the cabinet after it's assembled.

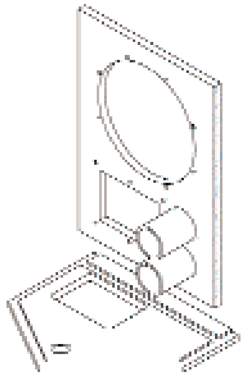


Figure 7

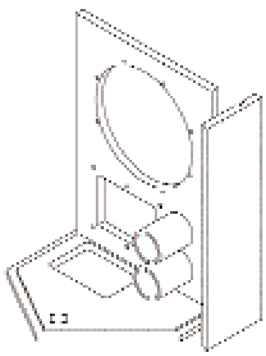


Figure 8

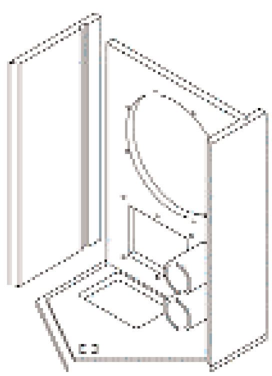


Figure 9

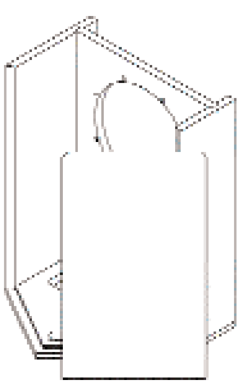


Figure 10

THE END GAME

All parts are now prepped and ready, so it's time to finish. In the following examples, note that I'm using miter joints, but for clarity the internal bracing is not shown. If employing either the miter or butt joint construction method, remember to add the internal bracing before placing the final side plate – it won't be possible to fit them through the baffle holes after it's assembled.

In **Figure 7**, note that I always start with the baffle first, and assemble around it. I keep a few small pieces with dado cuts using the same depth as the top and bottom to use as alignment guides to help center the baffle before stapling it in place. The sides can be used but they are un-steady, so I use small parts instead.

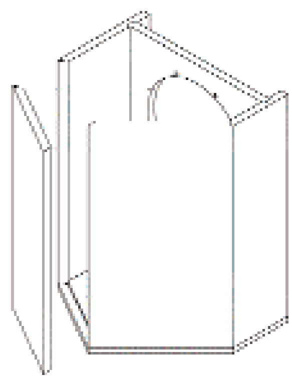


Figure 11

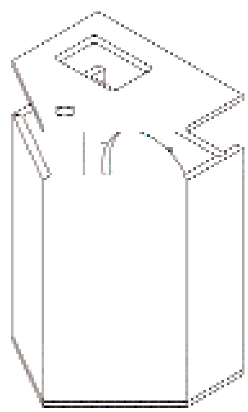


Figure 12

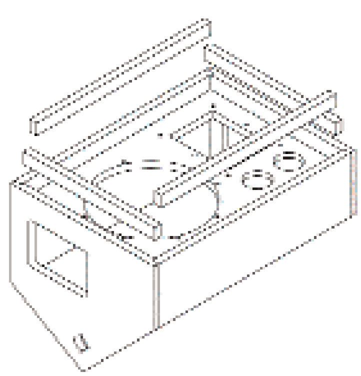


Figure 13

Employ a pneumatic staple gun for proper assembly, with 1.25-inch staples, the preferred method of all manufacturers. Don't use screws unless you want to drill pilot holes for each screw in order to avoid splitting the wood.

In **Figures 8** and **9**, the top and bottom are added, while in **Figures 10** and **11**, the sides are completed. To finish the main structure of the cabinet, add the other side, as shown in **Figure 12**.

In this design, I allow for a metal grill by adding a railing around the baffle as seen in **Figure 13**. It's a good idea to use a generous amount of glue when assembling, but don't be sloppy because when adding these final grill mounts, you don't want to be scraping out dried glue in order to make the mounts fit correctly. Once the assembly is completed, a belt sander can be used to clean up and level out the edges before adding a radius.

And there you have it – you should now be able to build your own wedges. Please keep in mind that this is a quick reference overview, and I glossed over notable aspects like size and measurement. To obtain this information in full, go to www.loudspeakerbuilder.com and download the project file in AutoCAD or Acrobat PDF format. For more details about the horn used, see www.ddshorns.com. Finally, for more in-depth information on projects, parts, machinery, and software, please reference my book, *Building Pro Audio Loudspeaker Enclosures*, available at www.grubsrof.com.

Remember, there are many ways to build enclosures. But based upon 20 years of work in this field, the techniques shown here guarantee strength, accuracy, and repeatability. So enjoy, and watch those fingers! ■

Jeffrey Forsburg *has been designing loudspeakers for nearly three decades and has been honored with several awards for his work. He is founder of Concept Music, Formula Audio, NUimage Labs and Grubsrof Imagination Studios, and can be reached at jforsburg@nc.rr.com.*