Subject: Re: Sure, why not!
Posted by bmar on Sun, 16 Mar 2003 14:19:39 GMT
View Forum Message <> Reply to Message

A few thoughts on MDF and laminated plywood. Baltic Birch and Apple Ply are some of the best in the business. They can have up to 13 or 15 layers in a 3/4" thickness. This is far denser than a standard 5 or 7 layer ply. It offers improved strength and stability. These plywoods are the best choice for speaker cabinets that will have to be moved around, cabinets that are very large and have to be moved at all, or the need for durability is an issue. Good quality birch plys can also be used as a final product where MDF should never be the final product.MDF is "The" premier substrate for veneer work. The material is ultra stable except in the presence of water. It has very high compression strength. It is cost efficient and easy to machine. Some of the reasons I truly dislike MDF are. It has no structural integrity. It produces huge amounts of dust when worked. Full sheets can be difficult to work with because of the weight. As Till mentioned there is not a difference in sound between MDF and plywood but how the material is excited to resonate at different frequencies. This is true to all woods and can be seen when using different wood for sound boards in acoustical instrument construction. In loudspeaker construction the overtones from box resonation varies significantly from where bracing is used through out the internal structure. MDF and plywood need to be braced differently or the overtones from resonation will not be the same. I call this "box affect" and it is similar to room mode. To briefly summate these characteristics. Unless you move your worldly possessions into an anechoic chamber and build loudspeaker boxes from 10" concrete on six sides. You will always have box affect and room modes. It is possible to use room treatments or open baffle speakers. I submit that this does not remove or "fix" these sound effects but merely changes them to an artifact which is unfamiliar and we can now assume a change for the better. Where does this leave us with our construction? We have already decided on the material to use based on cost, ease of use, strength, weight and other properties. This is a "rule of thumb" I use for building cabinets with these two materials. Braces for MDF are used every 275 square inches of panel.Braces for Baltic or Apple ply are used every 200 square inches of panel.Braces for common 5 and 7 ply are used every 150 square inches of panel.With the use of an Accelerometer and a FFT Spectrum Analyzer, you could dial these figures into a lot more usable data. For common practice and practicality I have come up with those figures because they work best. Each box will always react differently as its shape changes using the same volume, and the shape of the panel itself and where it will be divided play an equal part as well. Wayne has pointed out that with bracing your main intention is to divide the panel into a small panel that will not be excited to resonation at a lower frequency. At higher frequencies the resonation can then be absorbed by the damping material inside the box. I used the same damping material in both plywood and MDF boxes. 3 1/2" fiberglass is suitable and easy to obtain. 3 1/2" fiberglass insulation has an approximate NRC (noise reduction coefficient) of .75 I prefer to use higher density fiberglass such as duct liner or commercial insulations. These have an NRC of .70 at only 1" thickness. The material now becomes more manageable for both use, and storage. It should also be mentioned that fiberglass has a typical NRC of .10 @ 125hz and 1.00 @ 4000hz. This is true to form that the damping material is doing virtually nothing from 20hz to 150hz. This is why the bracing is most important to aid in the control of panel resonations. Construction with MDF can be challenging at times. It WILL split from a edge driven screw and can split or at least expand from edge driven nails. So you might think this is not a problem because "all quality craftsmanship" is constructed with out the use of fasteners. There is some truth to that statement but the problem is MDF does not lend itself to being a part of that phrase! So you have to use fasteners. MDF does not soak up the glue. Yes it absorbs water like a

sponge, but the material is so hard and does not have open pores like hard wood and plywood. The glue you use if left to only adhear to the surface of the MDF. At this point your glue joint is as expected, stronger than the material itself. Remember now, MDF has no strength. The glue joint tears of from the rest of the panel taking with it only the very surface to which it was bonded. For all intents and purpose you are gluing together paper. Screws are best and should have two holes drilled. A body hole through the top board that the screw will fall straight through. A pilot hole into the edge of the fastened panel that is of the same diameter as the "core" of the screw. Hold a drill bit along the screw and the threads of the screw should be all that projects beyond the diameter of the drill. Stay at least 2" away from corners with fasteners. Nails can be used and a 2" nail is good for 3/4" MDF. Coated nails are better and Nail guns are best.Dados, Rabbets and variations of good joinery all have added strength for solid wood and quality plywood. Using these joinery techniques for MDF for anything other than alignment is not worth the time you spend. For MDF a butt joint is fine. When putting the pieces together. It is best assemble with the edge board slightly proud of its corresponding face board. This will accomplish two things. The first being MDF is subject to swell and expansion when the fastener is installed. By having the face recessed 1/32" you have compensated for this and the swell will now become flush after fastened. The second thing is that you will be covering the MDF with veneer or some form of shell. All the sides will need to be perfectly flat and having a 3/4" recess or drop off at the edge means that you have to take down the whole face to meet the edge which is lower. It is MUCH easier to take down the 3/4" edge a tiny amount than the whole face. Bracing material can be almost anything. Plywood, MDF, hardwood or large dowel rod can all be used with success. Hardwood is tops on the list because it will be easiest to fasten to in the small cross sectional area of the end of the bracing. I use MDF quite frequently because of availability from waste material from the sheets. It has no strength but remember we are only dividing panels to reduced low frequency resonance and excitement. I like to make a brace into a L shape using a 2" strip and a 3" strip. Glue and nail these together in long sections 3, 4, or 5 foot long. Then cut to length the braces you need. Tie a side to side brace to a front to back brace. The world is into uni-body construction so why not loudspeaker boxes. Space your bracing accordingly and always space the bracing unevenly. As an example, if you are building a tall tower type speaker. You would typically have two braces dividing the cabinet's height. This will give you 3 areas. If you tap your knuckle in the 3 areas you want the Bottom, Middle and Top to all have a different tone. A different tone is spreading the easily excitable resonances out into three different frequency groups. If the divisions are all the same, you will end up with that one resonance times 3! This is much like adding multiple speaker motors to gain efficiency.Have fun BuildingBill