

## Construction Notes by Malcolm Chisholm

### Fiberglass Boxes

#### MATERIALS ARE:

ONE: 1/4 INCH PLYWOOD, standard 4x8 foot sheets, construction as opposed to finish grade unless it is not planned to cover the sides in fabric, which is normal practice, and keeps all of the wood out of sight.

TWO: FABRIC, normally Jute Burlap, which is dimensionally stable, can be painted (water base) to any color, available at 60 (or more) inches wide, and inexpensive. In addition to its other good points, the thicker grades are a nearly perfect foil to Fiberglass, which gets a little reflective at very high frequencies. The combination of the two is as close to a perfect/practical absorber as possible. Open cell foam plastics can be as good or better, but are both expensive and delicate, and present a very serious fire hazard in terms of fumes even when fireproofed.

THREE: FIBERGLAS, Corning 703 (3 pound) semi-rigid board or equivalent. The Corning product is better at the low end than others, but also nearly double the cost of competitive products. Since low frequency absorption as such can be managed using polycylindrical diffusers in small numbers, a case can be made for using less costly fiberglass products, but they require that polys be used in the room.

CONSTRUCTION: Boxes are normally made at 4x8 feet to minimize cutting and 6 inches deep to provide adequate bass absorption. However: The actual size of glass boards varies a little between manufacturers, so the material in real use should be measured and boxes built to fit.

2x4 boards are usually 1/4 scant, so when inserted 2 wide and 2 high (8 ea 3" boards) will fit neatly in a 4x8 foot O.D. 1/4" box touching but not forced. Don't squeeze the boards!

Thickness is another matter as glass board won't compress, so it is usually necessary to build the boxes at 6-1/2 inches depth to allow for a 3 to 4 x 1/4" strip across the middle of the box front and back to capture the internal board seams. Alternately, the boards take silicon sealer/caulk very well and allow a 6" box. Either will prevent the board's bowing out in the middle.

Box sides, top, and bottom are screwed to 2x2s at the corners (1-5/8" wallboard screws), wrapped in chicken yard fencing or equivalent to support the glass board, and all visible surfaces covered in Jute Burlap cloth, both stapled to the 1/4 plywood. If the boxes are mounted separately from each other and the Jute won't reach the back, small trim on each side will conceal the problem, OR one can buy wider Jute.

Boxes can be hung with screen door hooks, picture hanging wire or what not anchored to the top 2x2s.

Trimming the glass to allow the 2x2s is easily done with a big, cheap scalloped edge bread knife. Long cuts, however, are not recommended unless really needed, and it is well to keep in mind that acoustical treatment is generally +/- 10% so filling the last few inches is a waste of time and energy.

Poly-Cylindrical Diffuser

MATERIALS ARE:

ONE: TEMPERED MASONITE, usually 1/8 inch as thicker is more difficult to handle and requires more strength in frame construction. Pegboard can be used but may fracture and has no advantages unless pegboard hooks are needed for hanging cables and so forth.

TWO: 2X4 AND 2X2 inch lumber for an open mount OR 6x1 inch finish and 2x2s for a shadowbox. The lumber needs be reasonably straight, otherwise select for appearance.

The purpose of the unit is to provide high end dispersion and low end absorption in one device.

These ends are accomplished by suspending a sheet of Masonite by it's vertical edges (only), bowed out about 6 inches between the vertical sides of the mount, and free to vibrate at all points except the vertical edges.

When Masonite is compressed between side boards at 46-1/2 inches, it takes the shape of an ellipse, reflecting medium to high frequency sound at all possible angles from 0 to 30 degrees, as an ellipse is made up of parts of an infinite number of circles, as with the edge of a football.

While 6" is not the only possible build-out, is a rational design as it is reasonably inconspicuous, forms a good ellipse, and exerts manageable side forces on the mount. These forces become excessive at lower figures, although they lessen as the Masonite warps to form, and at about one foot the panel starts to become a semi-circle, which yields poorer diffusion, and probably less bass absorption.

PLACEMENT, MOUNTING, APPEARANCE: Although polys will work as dispersers in any location and size, both are important to bass absorption.

Defining a corner as two walls at 90 degrees, bass collects in corners as it compresses into them, so polys in or across corners yields maximum absorption. Additionally, corners reflect multi phase comb filtered top end, which sounds bad, and polys cure that as well as killing excess bass.

Still further, polys in corners appear to work at lower frequencies than when wall mounted, provided only that the walls forming the corner be (at least) as long as the polys' maximum diagonal, which makes ceiling to wall installation attractive as short polys can be mounted over the length of a wall at the ceiling line. Known effective.

Mounting as such can be done by simply beveling 2x2s, nailing them onto a wall and squeezing Masonite between them, but it is usually better to make them removable by hanging them. It is very important to keep the Masonite clear bottom and top, and allow generous air flow behind it, as either done wrong will partially cripple bass absorption.

Masonite sheets in polys can be painted, wallpapered, cloth covered, and so forth, but don't add serious weight or thickness.

TRIVIA: A full 4x8 sheet, wall mounted, calculates to 63 Hz. Hum is 60 or 120, but rumble in big rooms goes much lower, so if it is present (as with being next to trains) they will require big units. 12x12 contiguous will absorb to 33 Hz, 12x14 to 21. Lowest frequency for a room can be calculated as  $1/2 \cdot 1130/\text{longest dimension}$ . 60 feet, 9.42 Hz.

Masonite hung top and bottom potbellies within a year. Ugly, and so not recommended.

If you want to see polys, look at bandshells and old stage theaters. They are not a new idea, just neglected.