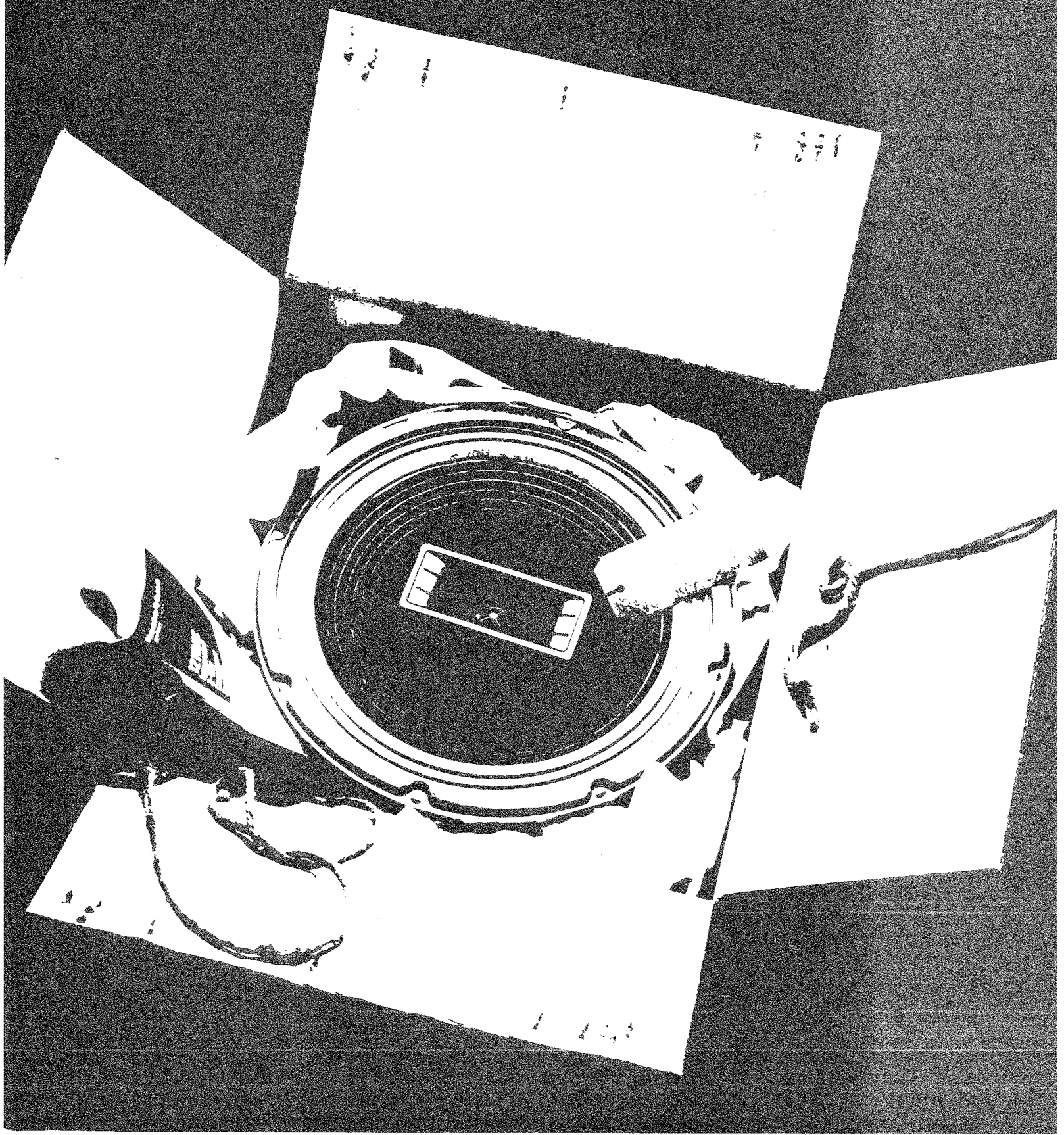
Electro-Voice® Guide To Speaker Enclosure Construction



INTRODUCTION

Electro-Voice offers the following information and guidelines for the construction of loudspeaker cabinets, as an aid to the inexperienced woodworker. This information is an extension of, and should be used in conjunction with, Electro-Voice brochure, "How to build an Electro-Voice Component Speaker System. From the ground up" (Form 1695-720).

First, read over the brochure and this guide to be certain that you understand all of the options available to you. The brochure's charts and other information will guide your selection of components and internal cabinet volume to achieve the desired performance. Specific plans are available for the recommended typical enclosures highlighted in the brochure's enclosure selection chart, as follows:

Plan Number	Speaker Model(s)	Net Internal Volume (Cubic Ft)
One	SP8C	1.17
Two	MC8A	2.33
Three	MC12A, SP12C, 12TRXC	5.85
Four	SP15A	7.36
Five	30W	46.5

Next, establish your own individual plan to guide you through the phases of (1) design, (2) material selection, (3) fabrication, (4) cabinet and grille assembly, (5) finishing, and (6) speaker installation. Also note that certain tools, accessories, and supplies will be required for successful results (see list on page 4).

DESIGN

If the specific plans for the recommended typical enclosures are not used, the enclosure builder should prepare outer dimensional drawings of the cabinet to his selected proportions. Include all styling details, such as flush or recessed grille. Typical examples are shown in Figures A and B. We suggest that you also prepare detail drawings from which sawing, drilling, and part placement can be accomplished more easily and accurately.

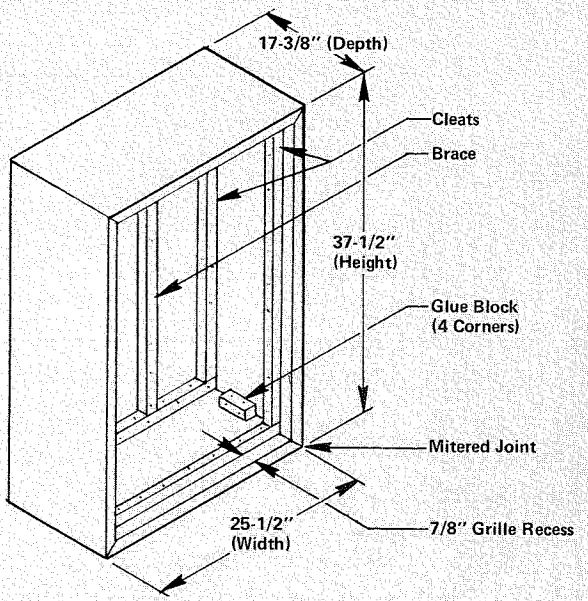


FIGURE A: Recommended Mitered-Joint Construction (7.36 Cubic Ft. Net Internal Volume)

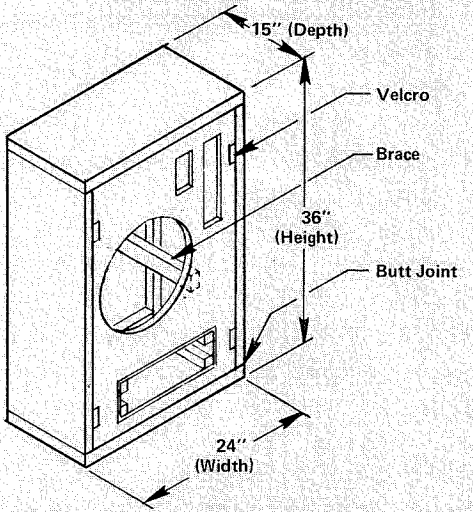


FIGURE B: Alternate Butt-Joint Construction (5.85 Cubic Ft. Net Internal Volume)

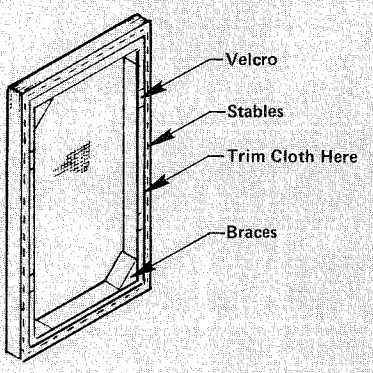


FIGURE C: Back View of Grille Assembly

The mitered-corner construction shown in Figure A is recommended; however, the simple butt joint shown in Figure B can be used. In any case, 1" square glue blocks should be a part of the cabinet design to assure rigidity and strength. The glue blocks should extend nearly the entire length of the inside corners they are reinforcing. These same blocks may be used for the cleats that will support both front and rear panels. If the speaker components selected are to be mounted on the back side of the front panel (from inside the cabinet), the front or rear panel must be removable in your design. Removable panels should be secured with wood screws and weather stripping tape. Notice that Figure A provides for a recessed grille that can be flush with the front of the cabinet, while Figure B provides for a grille that will project from the front of the cabinet.

The grille framework (see Figure C) may also be constructed of 1" square wood; however, this framework will require braces if it becomes very large.

It is not necessary to use the suggested cabinet dimensions if you desire a different height, width, or depth, provided that cabinet volume is not changed. It is important, however, that the proportions should not be extreme. Particularly to be avoided are long, narrow cabinets. We recommend that the width be approximately two-thirds the height and that the depth be approximately one-third the height. (The depth of the cabinet must allow the vent to operate freely, so it must have sufficient clearance. The length of the shortest side of the vent will do.) Although considerable variation can be tolerated, the shortest dimension of the cabinet should not be less than one-third that of the longest dimension.

Where you put the speakers on the front of the cabinet doesn't affect bass response, but close-to-ear-level mounting will provide the best mid- and high-frequency performance. Keep the speakers and the vent at least two inches away from the inside corners and edges of the enclosure. The vent is usually placed on the front of the cabinet, but it can be on any other side as long as its sound can reach the listener.

Figure B is one example of where to place the speakers and the vent.

CAUTION should be exercised when locating the speakers on the front panel to avoid interference with the front panel mounting cleats (see Figure A), or interference with the grille frame that will be placed over the front panel. Also, any braces on grille frame must not interfere with speakers.

The vent cross-sectional area is noted in the chart for various cabinet volumes. The width and height dimensional proportions of the vent are essentially non-critical (and can even be circular), as long as the vent cross sectional area and length are maintained. However, it is suggested that one dimension be no more than five times the other, as a narrow vent may cause excessive acoustic losses. The input terminals should be located near the center of the rear panel and crossovers should be mounted on the bottom panel.

MATERIAL SELECTION

It is recommended that 3/4" thick plywood or particle board, veneered if desired, be used for all six cabinet sides, although smaller enclosures (approximately 2 cubic feet and under) may be successfully constructed of 5/8" material. (Front and rear panels are usually painted, not veneered.) A 1" square pine or birch strip is recommended for corner reinforcing strips (glue blocks) and the strips that form a support to attach front and rear panels (cleats).

The grille cloth material can be any fabric or a material that is specifically designed for speaker grille use. The simplest way to determine whether or not your material is acoustically transparent is to hold it up to a light source. If you can readily see through the material, it will probably not restrict the performance of your speaker system. Fuzzy materials should be avoided.

FABRICATION

Lay out all cabinet sides on the sheets of plywood or particle board that will be used, per your dimensional drawings, to minimize material waste. Speaker components can be used as a template to locate their mounting holes in the front panel.

Cut all panels to size and perform the drilling and hole cutting operations that are required on front and back panels. At this point, the front and back panels may be painted if desired.

Cut the glue blocks and panel support cleats to length, making certain that the front and rear panel support cleats will meet at corners to assure a complete seal at those points.

CABINET ASSEMBLY

Cover your work surface with a clean non-abrasive cloth, such as a blanket.

All cabinet joints must be securely glued together to assure a strong construction. "Elmer's" type (polyvinyl) wood glues are satisfactory. All wood cleats must be securely glued and nailed or screwed down into position. The nails or screws through the cleats will retain all wood parts until the glue sets up. The non-removable front and rear panels must also be securely glued and nailed into position. The front and rear panels may be used to square up your cabinet during assembly.

Remove all excess glue from outside surfaces immediately with a clean damp cloth.

In the largest boxes – greater than about 6 cubic feet – bracing is usually required for the largest expanses of wood to prevent sympathetic vibrations from affecting overall system performance. Proper bracing technique splits a rectangular panel into two equal rectangles with the brace placed along the panel's longest dimension. Good bracing materials are 2" x 2" dimension lumber or 4-inch widths of 3/4-inch plywood, placed on edge. 3/4" x 3/4" or 1" x 1" material may also be used. See Figure A. Also, on larger cabinets it is recommended that a brace be glued between the front and rear panels, as near to the center of the panels as possible without interferring with the speakers. See Figure B.

After all glue has dried, apply a bead of sealer (such as G. E. or Dow Corning adhesive/sealant) to all internal joints to assure an airtight cabinet.

GRILLE ASSEMBLY

Securely glue and nail the wood grille frame together. If additional bracing is added, be certain that it does not interfere with speakers. Paint the wood frame with a color that will not show through the grille cloth.

The grille cloth should be gently but firmly stretched around the frame and stapled to the rear side (see Figure C). The stretching should be done in a uniform fashion to maintain a "straight line" appearance in the weave of the cloth. Care must also be taken to assure a neat appearance at the corners if they will be exposed when in use, such as in Figure B construction. Trim excess cloth from frame (a sharp knife or single edge razor blade works well). Velcro fasteners are handy for retaining your grille. Attach them to the back of the grille frame and to the corresponding location on the front panel of the cabinet. Use staples and glue for this.

FINISHING

Sand and fill outer surfaces to develop a smooth, clean surface. Paint front and rear panels if they were not painted prior to assembly. Apply external finish according to the finishing material supplier's specifications.

SPEAKER INSTALLATION

Install crossover (if one is to be used) and terminals. Any resultant holes through cabinet walls should be sealed.

Three mutually adjacent inside surfaces of the enclosure (top, one side, and rear) should be lined with a one- or two- inch thickness of glass wool or similar acoustic absorptive material to prevent internal reflections from affecting mid-frequency performance. No absorptive material should be placed over or within the port. Securely staple into place.

Securely screw the speakers into their proper positions on the front panel and hook up wires from crossover or terminals. Place a gasket material such as polyurethane foam tape between back panel and mounting cleats to provide an air seal, and secure back panel to cabinet with screws.

If speakers are mounted from the front, the back panel does not have to be removable, as the wires can be connected to the speakers before they are installed. It is recommended that the heavier speakers be held with T-nuts and machine screws as the speakers may pull wood screws out of plywood or particle board. The Electro-Voice SMH-1 mounting hardware kit offers an excellent method for holding the woofer, if it is to be front mounted (SP12C, 12TRXC, and SP15A only). All necessary nuts, bolts, and clamps are supplied.

You may wish to listen to your new speaker system before installing the grille. Thank you for letting us guide you. Let us know how it sounds.

TOOLS, ACCESSORIES, AND SUPPLIES REQUIRED

- ☆ Radial arm saw or table saw. If not available, the lumber supply mill will often cut pieces to supplied dimensions for a nominal charge.
- ☆ Hand-held jig saw, for cutting openings for speaker components. Can also be cut by lumber supply mill.
- ☆ Drill and bits for screw clearance and speaker mounting holes.
- ☆ Phillips head and slotted head screwdriver.
- ☆ Hammer.
- ☆ Stapler and 1/2" long staples.
- ☆ Hand saw.
- ☆ Paint brush. Good quality, approximately 2" wide.
- ☆ Sand paper. Coarse and fine grit.
- ☆ Nails. #4D, 1-1/2" long. Approximately 100 required to retain front panel, rear panel and internal wood strips. #8 x 1-1/2" long wood screws may be used instead of nails if desired. They require a 11/64" diameter hole for clearance and a 3/32" diameter pilot hole for threads.
- ☆ Glue. Approximately 16 oz. of polyvinyl wood glue (Elmer's, Tite Bond, etc.).
- ☆ Sealer. Approximately two tubes of silicone RTV for use around terminals, and to seal inside of cabinet. G. E. or Dow Corning adhesive/sealant is fine.
- ☆ Caulking gun. (If needed for sealer.)
- ☆ Paint. Spray or brush on front and back panels.
- ☆ Stain, oil, varnish, or paint for desired cabinet finish.
- ☆ Putty stick for touch-up. Color dependent on finish.
- ☆ 1-2" thickness of glass wool or similar acoustic absorptive material. Building insulation with its paper backing removed is a satisfactory material.
- ☆ Velcro tape, hook and loop. Approximately 1" wide by 6-12" long, used to retain grille frame to cabinet.
- ☆ Wax or soap. Apply to screws for easier installation.
- ☆ Wood veneer tape or other material to cover exposed edges of cabinet.
- ☆ Grille cloth.
- ☆ Component mounting hardware. Determine quantity and size to suit the components that you have selected for your design. SP12C, 12TRXC, and SP15A may be front-mounted with optional SMH-1 speaker mounting kit.
- ☆ Wood parts per your drawings.

Electro-Voice®
a gulton company
600 CECIL STREET, BUCHANAN, MICHIGAN 49107

Form No. 1788–824 Litho in U.S.A.