ShealdPLENUM BARRIERS AND CEILING BLANKETS

In the design of a noise control system for office and other buildings, there are several important areas that should be considered: ceilings; partitions; doors; perimeter joints; glazing; and common ducting, fixtures, etc.

This brochure deals specifically with ceiling treatments - plenum barriers and ceiling blankets using Sheald', the new continuously cast (con-cast) thin lead sheet. Brochures dealing with the use of Sheald in other noise control problem areas are available.

The value of lead as an acoustical barrier has been recognized for many years, but its use was restricted due to the high cost of rolling the sheet to the thin gauges generally required. The development of a machine to continuously cast thin lead sheet has significantly reduced its cost and made its use economically attractive.

SOUND ABSORPTION AND SOUND INSULATION

It is important to understand the difference between sound absorption and sound insulation when preparing specifications related to the reduction of noise transmission in various buildings:

Sound Absorption ... is the prevention of sound reflection. Materials suitable for sound absorption are usually lightweight and of open cellular nature. However, the porosity which allows a material to absorb sound also allows the sound to pass through the material at only a slightly reduced intensity.

Sound Insulation ... is the prevention of sound transmission. Materials suitable for sound insulation are preferably both dense and limp. Their function is to suppress sound transmission from one area to another. The key to the popularity of Sheald in noise control systems is found in the material's unique properties. High density, natural limpness, good damping capacity and non-permeability make Sheald the one material which most closely approaches the ideal sound barrier.

DESIGNING FOR NOISE CONTROL

Many installed barriers frequently fall short of their design ratings due to inadequate planning or careless installation. Small openings will create major flanking paths permitting the sound to circumvent the barrier wall. For example, failure to eliminate sound leaks around doors and perimeter joints will affect the performance of an acoustical barrier in partitions. Proper design and installation of acoustical barriers are of prime importance; and particular attention should be paid to all components of the system, which must be compatible with each other for effective noise control.

WHY INSTALL A PLENUM BARRIER?

Lightweight hung ceilings are generally made of conventional sound absorbent materials, such as "acoustic the", which reduce sound reverberations within a room. These are ineffective as barriers and allow the sound to pass through the plenum above and into adjoining areas. Perforations in the tiles and holes around lighting fixtures, sprinkler heads and air diffusers or returns are all flanking paths for sound waves which are free to bypass partitions and enter adjoining offices. To obtain sound privacy in an office, these transmissions must be stopped. One of the most effective methods to do this is to hang a plenum barrier from the concrete slab above to the top of the partitions. Alternatively, a sound insulation blanket laid over the top of the ceiling tiles will serve the same purpose.

WHY USE SHEALD FOR THE BARRIERS?

Sheald is a more effective sound barrier than any other conventional building material because, being lead, it is the only construction material which possesses the ideal combination of properties of that metal. The costly process of painstakingly fitting rigid materials around obstacles in plenum spaces is no longer necessary. Sheald conforms easily to irregular surfaces, substantially reducing installation costs.

EASE OF INSTALLATION

Sheald has good malleability. In plenum spaces cluttered with pipes, wires and ducting, it is readily cut, folded and formed. No special tools are required. It is easily cut with a knife or shears, and joints can be hand folded and crimped. Sheald can be fastened to flat surfaces by stapling, or nailed to battens with broad head nails. It accepts adhesive readily and can be taped, cemented or caulked without degreasing.

INSTALLATION PROCEDURES

The Basic Joints

The basic joints between adjacent sheets of Sheald are simple to make by hand and apply to most jointing situations. A standing seam (single fold), Fig. 1, is probably the easiest to form between two hanging sheets of one-pound lead. It is not important that the seam be straight, so long as it is crimped tight. The lock seam, Fig. 2, is preferred for two-pound and heavier lead sheet.

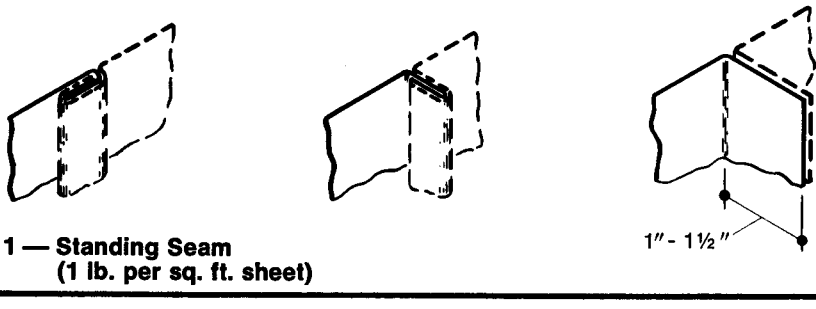


Fig. 1 — Standing Seam (1 lb. per sq. ft. sheet)

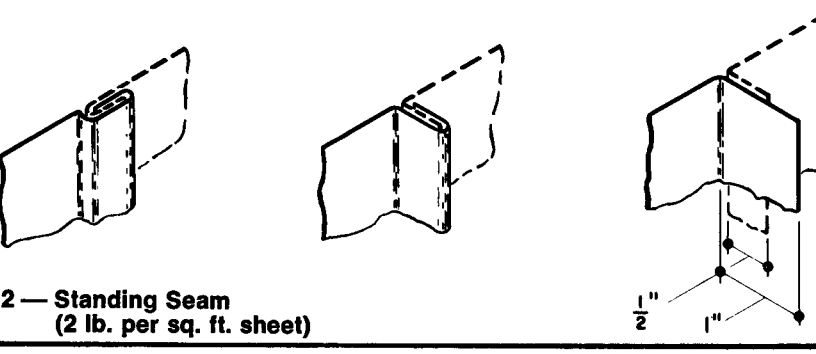


Fig. 2 — Standing Seam (2 lb. per sq. ft. sheet)

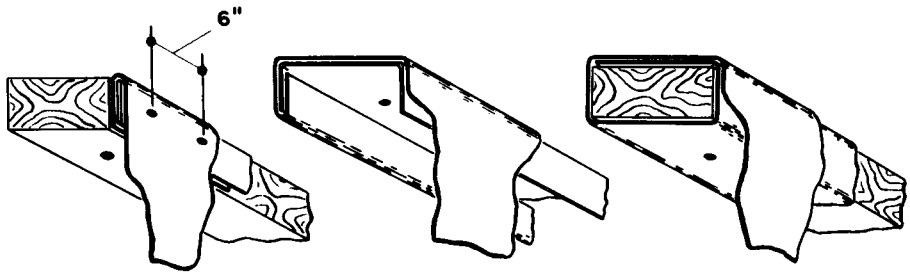


Fig. 3 — Block and Batten Attachment to Floor Slab

Attachment to Floor Slab

Straight uninterrupted runs are made by using nailing strips to hang Sheald from the slab. Caulking between nailing strips and slab may be necessary if slab is uneven. Cut Sheald sufficiently longer than the plenum height so as to be able to turn it 1 ½ times over a wood or metal batten as shown in Fig. 3, and to provide for bottom drape. In addition, cut a notch 1 ½" deep for joining sheets. Drape the bottom edge of the Sheald 2-3 inches over the ceiling surface. Use concrete fasteners at 8" to 12" centres to fasten assembly to underside of slab.

Where the plenum barrier joins a masonry wall, it should be fastened with clips or a batten strip and sealed with caulking.

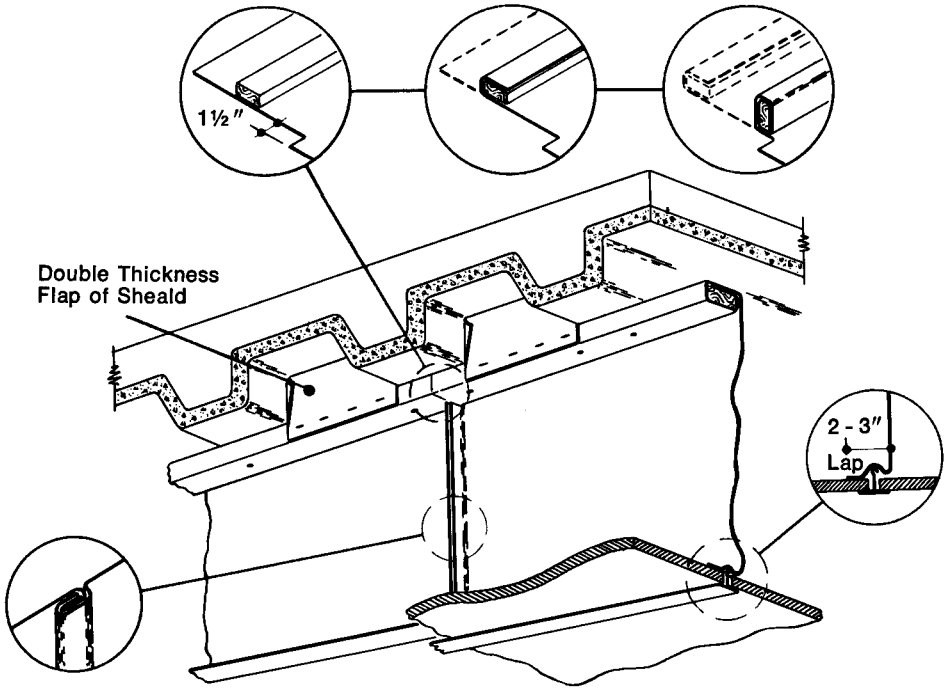


Fig. 4 — Attachment to Under-pan Type Floor Slab

Under-pan Type Slabs

Under-pan or "waffle" type slabs, fasten battens with folded over sheet in the normal way. Then cut flaps of one-pound Sheald, folded double; dress to fit the dimensions of the floor cavities. Staple flaps to previously fastened batten at the bottom and mold upstanding flap snugly into cavity, Fig. 4.

INSTALLATION PROCEDURES

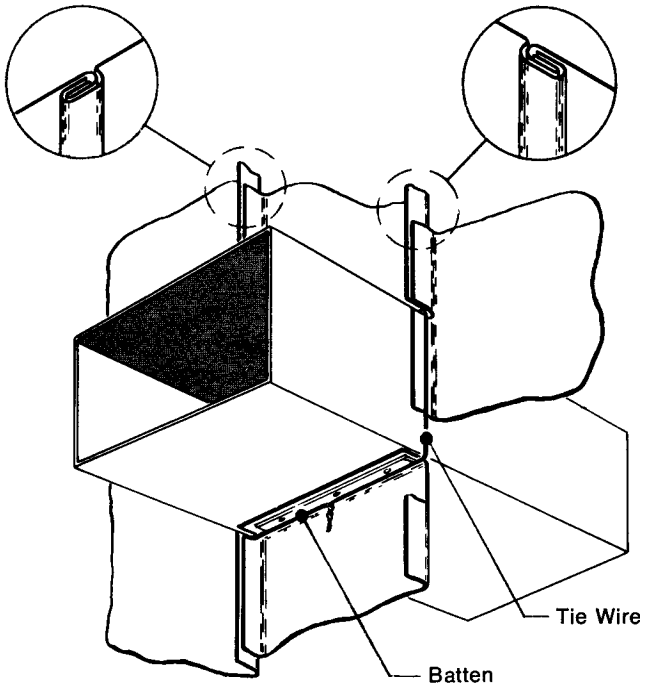


Fig. 5 — Large Rectangular Ducts

Large Rectangular Ducts

For large rectangular ducts, form standing seams at the vertical sides of the duct, Fig. 5, and drape a barrier sheet from the slab above onto the top of the duct. Fold the top edge of another sheet over a batten strip and fasten to the bottom of the duct with sheet metal screws and washers. Make the usual standing seam joints at the vertical sides of the duct and lay a few feet of Sheald on top of the duct in each direction to reduce drumming noise. Use tie wires to attach all Sheald flaps firmly to the duct.

Small Rectangular Ducts

For small rectangular ducts, make standing seams in the centre of adjoining sheets as in Fig. 6. Slit barrier sheets diagonally as shown; turn out flaps to accommodate duct and wire tie in place. Fold and crimp the vertical joint above and below the duct. Lay a few feet of Sheald on top of the duct in both directions to reduce drumming noise.

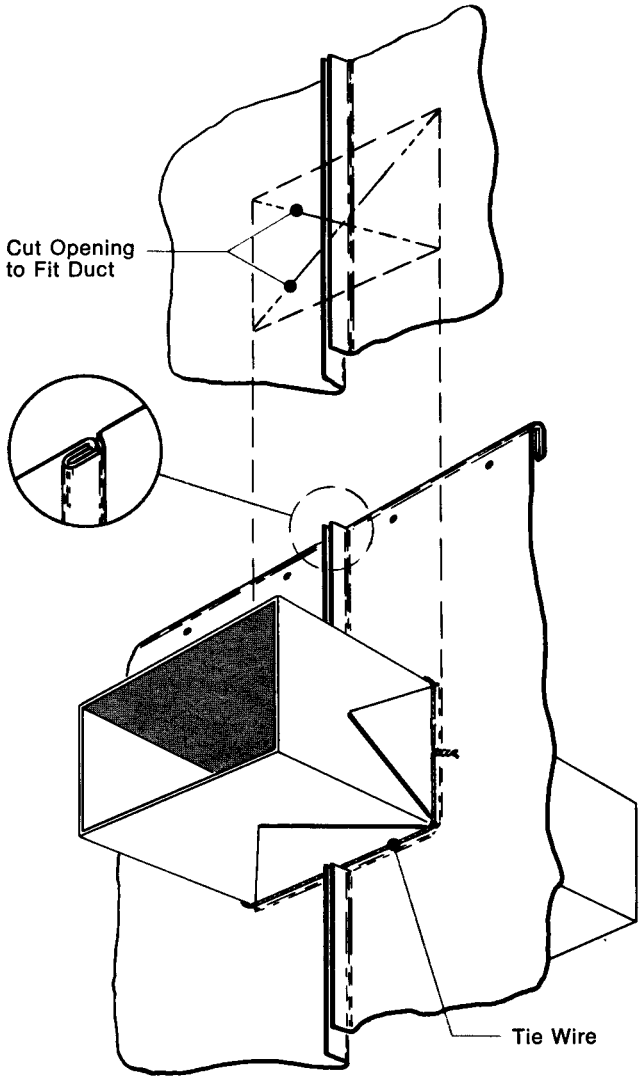


Fig. 6 — Small Rectangular Ducts

INSTALLATION PROCEDURES

Large Circular Pipes and Ducts

For large circular pipes and ducts, use the same procedure as for smaller rectangular ducts, but cut more slits to obtain an orange peel effect, Fig. 7. Fold out flaps to accommodate the pipe and wire tie in place. Fold and crimp vertical joints above and below the pipe in the usual manner.

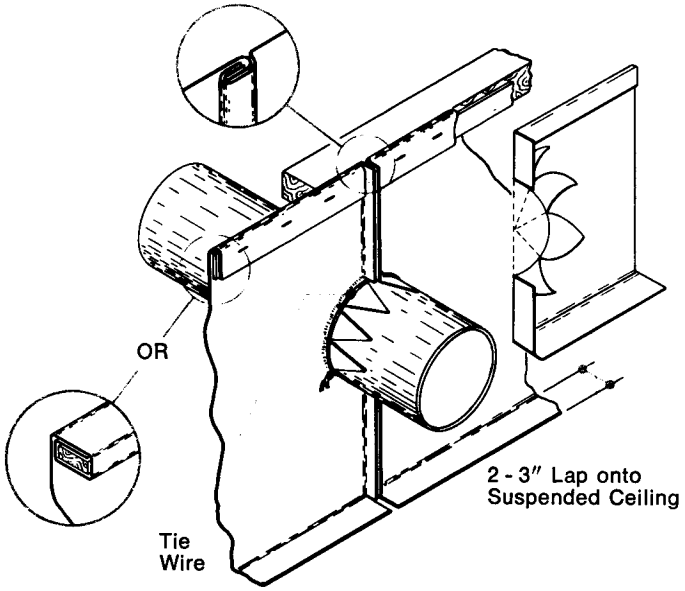


Fig. 7 — Large Circular Pipes and Ducts

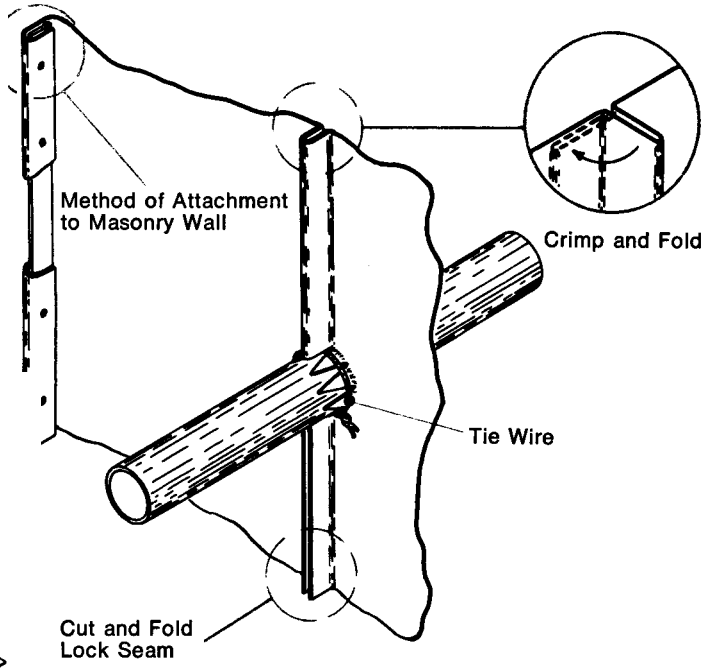


Fig. 8 - Small Pipes, Wires and Mechanical Equipment

Fitting Around Mechanical Equipment, Raceways or Wires

To fit around pipes of less than 2" diam., fold a 1" vertical tuck and slit from the bottom up to the point of penetration as shown in Fig. 8. Make slits large enough to accommodate the pipe and mold the Sheald snugly against it. Wire tie in place, then fold and crimp the vertical joint below.

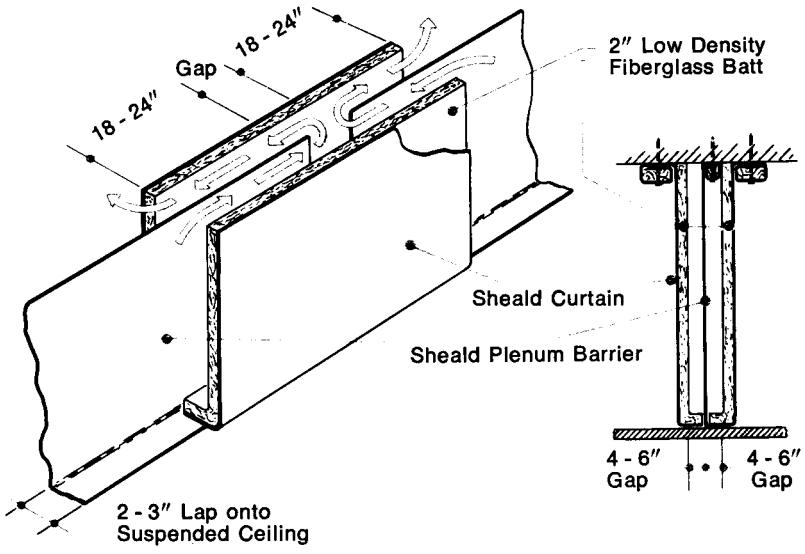


Fig. 9 — Plenum Sound Trap in Open Air Return System

Open Plenum Air Returns

When the return air from a soundproofed office is not ducted, a simple and effective sound trap, Fig. 9, can be made in the plenum barrier. Leave a gap, with an area at least twice as large as the total area of the return air grilles, between two adjoining sheets of Sheald plenum barrier. Cut two more sheets of Sheald each wide enough to extend 18"-24" on each side of gap and attach low density fiberglass batts, cut to size, to one side of each. Hang these flanking curtains about six inches from the gap on either side of the plenum barrier with fiberglass facing the gap. Drape the bottom of the flanking curtains along the top of the ceiling so as to touch the bottom of the plenum barrier. The baffle will allow free circulation of air while absorbing sound emanating from the room. As an alternate to this assembly, acoustical stub ducts may be used.

WHERE AND HOW TO USE CEILING BLANKETS

In cases where plenum spaces are shallow or congested, it is sometimes more convenient and more economical to lay a blanket of Sheald over the entire ceiling, including light fixtures. The blanket should extend from four to six feet beyond the perimeter of the room for maximum privacy, Fig. 10.

Sheald ceiling blankets can be installed over all forms of suspended ceiling systems, and are most easily handled by laying a barrier sheet following the placement of one or two rows of tiles. The work can be handled by one man working below the ceiling. Sheald, 3 feet wide by 7 - 9 feet long, affords a convenient working weight. All joints should be lapped by extending the sheet being laid about 2 inches over the edge of the adjoining sheet and "dressing" the joint by hand. Holes for suspension wires can be cut with a knife and Sheald is easily formed over lighting fixtures, Fig. 11. Close contact between the fixtures and the Sheald improves heat radiation and helps cool the fixtures. At a ceiling/wall juncture, the lead blanket should be carried up or down the wall, as convenient, for four to six inches and caulked to masonry, Fig. 11.

For high security areas, Sheald weighing 2 or 3 lbs. per sq. ft. is available, but a detailed investigation of conditions should be made for these special cases. For example, if the return air is not ducted, silencing hoods may be necessary.

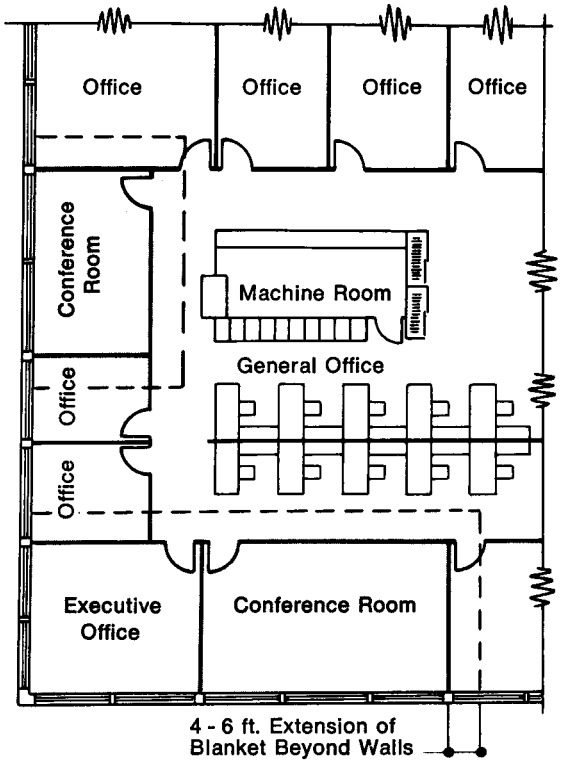


Fig. 10 — Ceiling Blanket Installations (tinted areas)

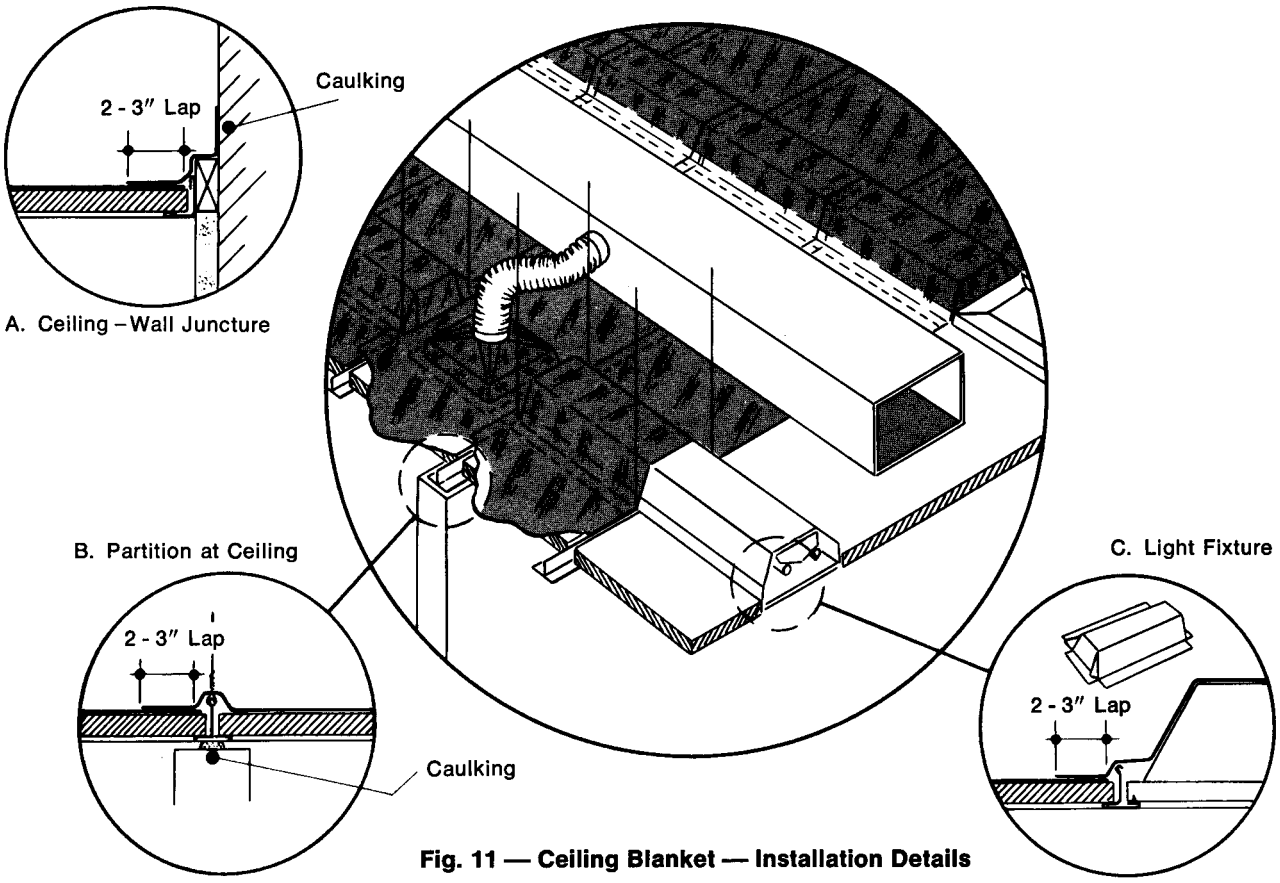


Fig. 11 — Ceiling Blanket — Installation Details

WHAT THE TESTS SHOW

Plenum barriers and ceiling blankets as described in this bulletin have been tested under laboratory conditions, Fig. 12". The tests were made with a 30-inch deep plenum between two 10 x 14 foot rooms. Hung ceilings on either side were texture finished glass fiber board weighing 0.59 lbs. per sq. ft. As shown in the plotted results, the normalized attenuation between rooms was improved from 19 dB (as an eleven frequency average) to 45 dB. Reported as STC, the improvement was from 18 to 46.

Ceiling blanket overlays effect similar improvements.

Since there are many different weights of ceiling tile systems on the market, a wide variety of STC ratings can be obtained with the use of Sheald lead sheet.

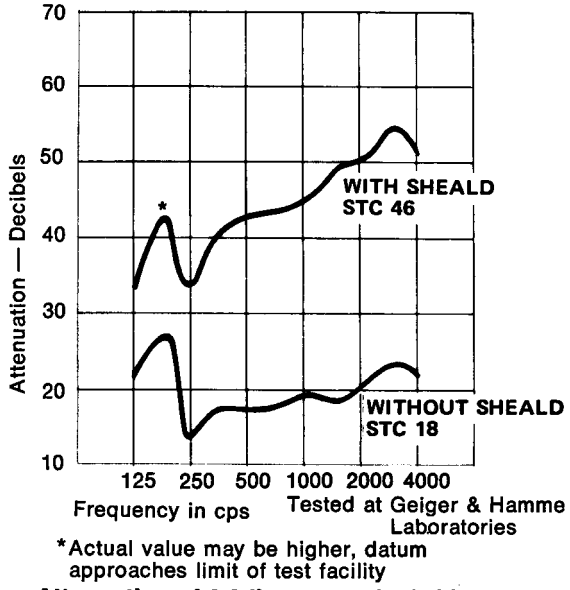


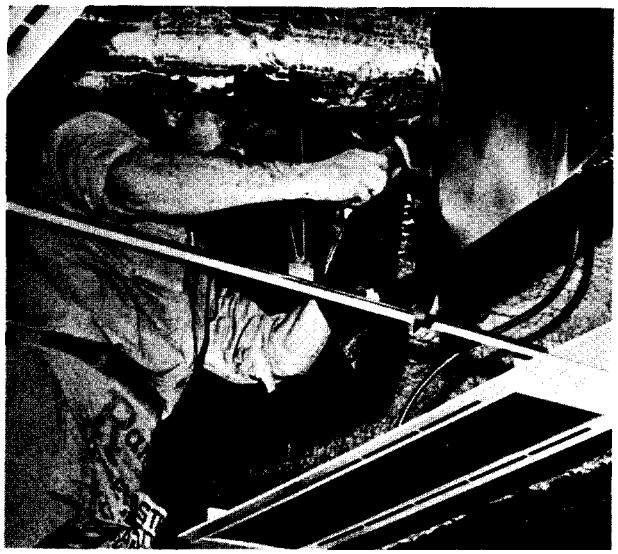
Fig. 12 — Attenuation of 0.6 lb. per sq. ft. Ceiling Board. With and Without Sheald Plenum Barrier.

Sheald

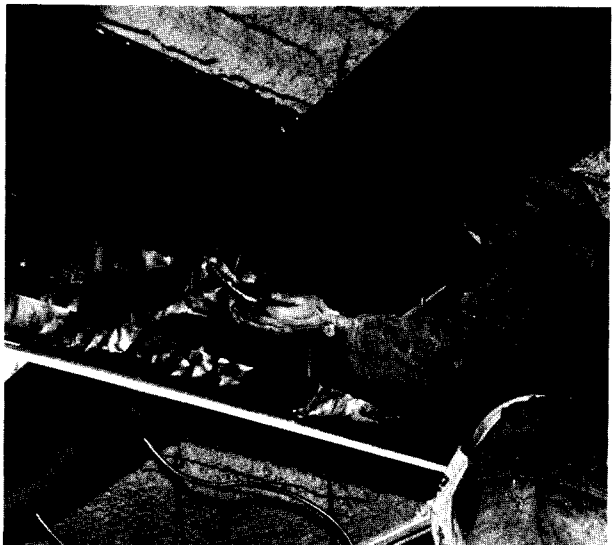
DIMENSIONS AND WEIGHTS

Sheald for plenum barriers and sound insulation blankets weighs 1 lb. per sq. ft. and is %" thick. It is normally supplied in 3 ft. wide rolls, 36 feet long. Sheald in weights of 2 lbs. and 3 lbs. per sq. ft. is available in rolls measuring 3 ft. by 18 ft. and 3 ft. by 12 ft. respectively.

SHEALD IS EASY TO INSTALL



Extremely easy to work and install, Sheald can be cut to shape with scissors or knife.



Sheald can be molded, folded, creased or crimped to provide a sound-tight seal around any shape, or to fit any enclosure system.

SPECIFICATION

The following specification clauses are for insertion in the applicable section of the Architect's or Engineer's Specification. Only those clauses relating to the application of lead sheet for sound control are included and these should be collated with the erection instructions for the specific wall or ceiling system.

MATERIALS

Sheald: Con-cast soft lead sheet weighing 1 lb.; 2 lbs.; 3 lbs.; per square foot. Sheet shall conform to CSA Specification HP2-1957 and ASTM Specification B29-55.

Fiberglass: 1 lb. density (per cu. ft.) 2 inch thick fiberglass batts.

Acoustical Caulking: Non-hardening, non-skinning, synthetic rubber caulking.

Adhesive: Elastomeric type contact adhesives.

PLENUM BARRIERS

Provide Sheald plenum barriers above partitions where shown on drawings (or in specifications). Fasten continuous nailing strips to slab, positioned so sheet will drape onto ceiling directly over the partition. If slab is uneven, apply acoustic caulking between nailing strips and slab.

Cut sheet sufficiently long to drape at least 2 inches onto the ceiling surface. Fold upper edge over batten and attach to slab. If ceiling is uneven, tape or dress lower edge to ceiling surface. When vertical joints are necessary, join adjacent sheets with folded, lock seams. Make cutouts to accommodate ducts, conduits, pipes or beams passing through the plenum barriers, in accordance with the brochure, "Sheald Plenum Barriers and Ceiling Blankets".

Tape flaps tight to object passing through. Where battens are fastened transversely to one-way concrete joist construction, channel slabs, etc., cut flaps of sheet folded double to fit dimensions of cavities and staple to battens. Fit upstanding flaps tightly into cavities. Caulk as required for complete seal.

Note: Sheet metal specifications should include a clause stating that penetrations made after the plenum barriers are installed should be adequately sealed according to the plenum barrier specification.

CEILING BLANKET

Provide Sheald ceiling blanket over rooms where shown on drawings (or in specifications). Lay sheet, without adhesive, progressively as the ceiling is erected. Lap joints 2 inches and dress by hand. Carry sheet up diffusers and over any obstacles such as ceiling runners, etc.

Sheet can be bonded to light fixtures before installation. Leave 2 inch lap on all edges. Lap ceiling blanket over laps of light fixtures.

Extend the sheet 4 to 6 feet beyond area to be treated; carry the sheet a minimum of 6 inches up the walls and secure in place. Caulk as required for effective seal.