Introduction:

When it comes to heavy industrial operations—such as stamping, forging and fabricating—silence truly is golden. Unchecked industrial noise can cost a company dearly in terms of both regulatory fines and low worker productivity. Ironically, one of the most effective ways to grab golden silence in the workplace is to use one of the least expensive metals available—lead—**the quiet material.**

"Industrial Noise Control with Lead: Using the Quiet Material" is designed to help contractors, architects and others who must deal with acoustical problems to obtain a cost-effective solution with lead. This section provides a brief overview of lead's sound-blocking capabilities to acquaint you with how this malleable metal does the job.

The section that follows is a hands-on practical guide. It contains over twenty typical wall, enclosure and door constructions—complete with architectural drawings and installation instructions, which can be used to build lead's quiet capabilities into potentially noisy situations.

Included with each example are test results, measured by an independent laboratory, which illustrate the kind of sound reduction you might expect from some typical wall constructions using lead.

The tests were performed according to specifications established by the American Society for Testing and Materials. ASTM E-90-81 was used to measure the "airborne sound transmission loss" (STL) over a range of frequencies for each partition. Plus, ASTM E-413-73 was employed to establish a single-number Sound Transmission Class (STC) for every assembly.

TABLE OF CONTENTS

Lead: Why It's Used

Why use lead in this age of polymer insulation materials and acoustical tiles? The answer is lead's unique properties complement the sound-absorbing capabilities of such space-age products. While polyurethane foams, fiberglass batting and acoustical ceiling tiles are superior at absorbing sound, they do very little to block, or damp, the waves that constitute noise. As a result, their usefulness is limited, particularly in industrial settings where the high-volume clamor and deep-throated roar of heavy-duty machinery can be especially dangerous. Such situations require more than mere sound absorption; they require the barrier properties of lead across a wide spectrum of frequencies.

In such situations, lead is a virtual necessity because its specialty is blocking the transmission of noise, literally reflecting the sound energy without allowing it to pass through the wall, enclosure or door on which the lead is installed. In that manner, lead works in conjunction with sound absorbing materials to quiet down a noisy situation more efficiently. This special synergy saves space, materials and construction costs whenever lead is used.

When working as a barrier material, lead blocks sound paths two ways:

- **First:** Its dense mass effectively cuts off the high end of the frequency spectrum.

- **Second:** Lead's inherent limpness effectively clips the bottom from low frequency noises.

Furthermore, both properties—mass and limpness—team up to produce the damping effect, isolating unwanted vibrations.

To get the best of all worlds—lead's sound blocking and damping with the absorbent qualities of porous materials such as foam or fiberglass—lead is generally used in conjunction with other substances to construct truly cost-effective sound abatement installations.

In fact, off-the-shelf products exist which combine lead with other construction elements in ways that enhance the metal's sound-reduction capabilities, plus provide ease of installation. The most common forms are listed in the table on this page.

Typical Lead-Based Noise Control Materials

Material	Description	Uses
Sheet lead	Weight ranges between 1 lb to 4 lbs per square foot (psf)	Alone or laminated with various substrates
Lead/Foam Composites	One or more ¾ lb. Laminated to sound sandwiched betw. layers of poly urethane foam	to 1 lb. lead sheets. control enclosures.
Leaded Plastic Sheets	Lead-loaded sheet vinyl or neoprene, with or without fabric reinforcement	As a curtain barrier or to line enclosures
Damping Tile	Lead-loaded epoxy or urethane tiles	Damping heavy machinery
Casting Compounds	Lead-loaded epoxy complex voids	Potting, filling
Troweling & Damping	Lead loaded epoxy and urethane	Damping enclosures, surfaces, resonating

Tricks of the Trade...

Lead works best as a noise control material when its inherent mass, limpness and internal damping properties are maximized via proper installation. Also, your lead-based noise barrier will be most effective if air passages are sealed as much as possible. Reason: sound will go wherever air will flow.

(To understand the concept better, think of sound as water. Then, picture a full swimming pool with a minor problem. Even a pinhole leak will allow a massive loss of water.)

Following are several rules of thumb that will help you ensure that the above parameters are met:

- When building a "sandwich" or composite barrier, keep the weight of the lead sheet nearly equal to or greater than that of the laminating material. This preserves lead's mass advantages.
- Avoid rigid fastening of lead to stiffer surface panels to maximize lead's limpness. Use visco-elastic adhesives when bonding lead sheet to other laminating materials.
- Employ fasteners intermittently rather than continuously when mechanically attaching lead sheet to other materials.
- Use leaded panel skins in double walls rather than single, even when the total weight is the same for both. For instance, two single sheets, separated, are more effective barriers than one sheet of the same weight.
- Eliminate sound leaks in seams, doors and perimeter joints by caulking or gasketing. A few pinholes in a wall will allow 30% of the sound to pass!
- Make sure paths through which sound can flank or circumvent the barrier wall are thoroughly blocked.

Applications, Installations

You can read volumes about the theory behind lead's unsurpassed noise control combination of mass, limpness and high internal damping. However, the readings that will matter most to you are the ones measured in Sound Transmission Loss (STL) and Sound Transmission Class (STC) ratings. These are measured after a lead-based noise-control barrier is installed. Those numbers, along with instructions on how to achieve them in typical applications, can be found in this section.

The decibel (dB) ratings which constitute Sound Transmission Loss are presented in graphic form over a range of frequencies. When comparing the various lines on each graph, remember that the higher the dB level, the better the noise abatement that particular construction is providing.

The STC number, also given in dBs, is provided for various configurations, both with and without lead installed. Check the ratings and you'll find that when lead is deployed as an integral part of the sound abatement scheme, the STC rating usually improves dramatically. For an additional perspective of what the STC ratings mean in terms of "real world" performance, check the table on this page.

Both the Sound Transmission Loss (STL) and Sound Transmission Class (STC) ratings provided here were derived from tests performed at the Manville R&D Center Acoustical Laboratories for the International lead Zinc Research Organization and the Lead Industries Association. The tests conformed completely to the appropriate standards of the American Society for Testing and Materials. (ASTM E-90-81 & ASTM E-413-73).

Sound Transmission Class (STC) Rankings

STC Range	Audibility of Speech Through Barrier	Barrier Ranking
≤	Normal speech clearly understood.	Poor
26-35	Loud speech easily understood. Normal speech 50% understood.	Fair
36-45	Loud speech 50% understood. Normal speech faintly heard but not understood.	Good
46-55	Loud speech faintly heard but not understood. Normal speech inaudible.	Very Good
≥55	Loud speech or music inaudible	Exceptionally Good

Four-inch Solid Masonry Block Wall

This masonry wall is typical of those found in modern factory settings (Specimen A). It consists of 4″ × 8″ × 16″ expanded aggregate blocks with reinforcing wire placed every two rows. The blocks were set in a mortar bed composed of four parts sand, one part cement and one part lime. Joints were struck flush with the block surface on both sides of the wall. In this standard uncoated configuration, the wall achieved an STC of 27.

The first retrofit option (Specimen B) begins with 1″ × 2″ furring strips (actually ¾″ × 1 ½″) spaced 16″ on center They are attached to the wall with 2″ long power-driven fasteners spaced approximately 24″ on center. Fiberglass batts—¾″ thick and weighing 1.5 lbs./cubic foot (lb. pcf)—are fitted between the furring strips and against the wall.

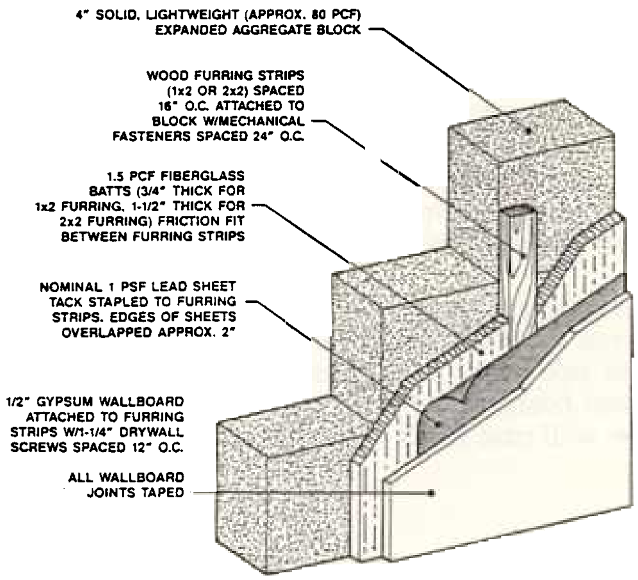
Next, a single layer of 1 lb. per square foot (psf) lead sheet (.0156″ thick) is rolled out over the furring strips and attached to them with ¼″ staples spaced 24″ on center. Supplied in 50″ wide rolls, the 1 lb. sheet lead is applied vertically, with a ½″ minimum overlap at the furring strips and a sheet-to-sheet overlap of 2″.

Finally, a single layer of ½″ gypsum wallboard is applied vertically over the lead sheet with the vertical edges of the material falling over the furring strips. Attached 12″ on center with 1¼″ type-W screws, the drywall was taped and sealed with acrylic latex caulking. Caulk is also applied to the top and bottom of the wallboard. The result was an overall panel thickness of about 5″, producing an STC of 46.

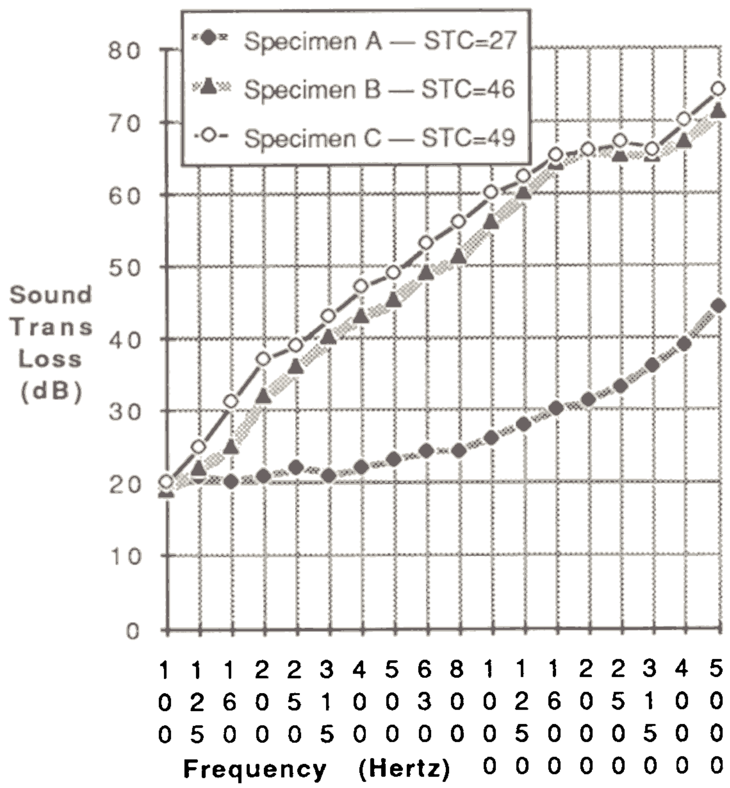
The second retrofit configuration (Specimen C) was essentially identical to the above except:

- 2″ × 2″ (actually ½″ × 1½″) furring strips were used.
- 1½″ of 1.5 lb. pcf fiberglass batts were used instead of the ¾″ insulation.
- The resulting overall panel thickness was 5¾″, producing an STC of 49.

FIGURE 1
SPECIMENS A, B & C



NOTES: 1. SPECIMEN A DID NOT INCLUDE SUPPLEMENTARY FURRED WALL.
2. SPECIMEN B UTILIZED 1″ X 2″ FURRING STRIPS AND 3/4″ INSULATION
3. SPECIMEN C UTILIZED 2″ X 2″ FURRING STRIPS AND 1-1/2″ INSULATION

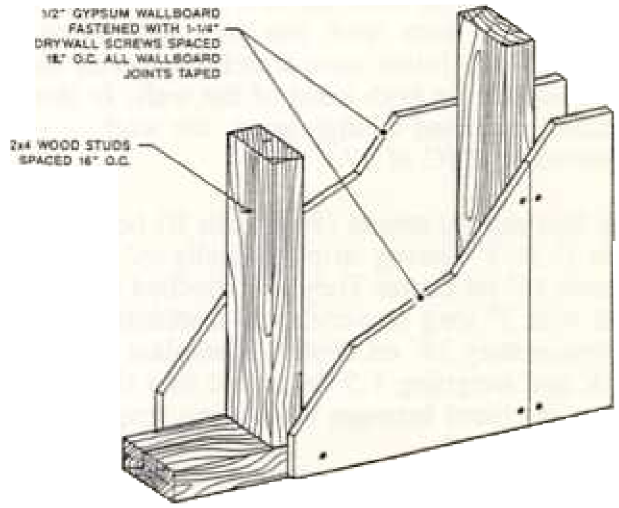


2 × 4 Wood Stud, ½″ Gypsum Board Wall

A typical non-bearing wall in a factory, office or home setting, this installation involved use of construction grade two-by-four wood studs, (actually 1½″ × 3½″) spaced 16″ on center and nailed to two-by-four top and bottom plates. A single layer of ½ gypsum board was attached with 1¼″ type-W drywall screws to each side of the studs, to complete the wall. This non-noise-control partition (Specimen D) was a 4½″ thick overall and was rated at 35 on the STC scale.

By installing 4″ thick 0.6 lb. pcf fiberglass bans between the studs and attaching 1 lb. lead sheet to one side of the studs prior to screwing the gypsum board to the structure, the STC rating of the wall rose to 43 (Specimen E).

FIGURE 2
SPECIMEN D



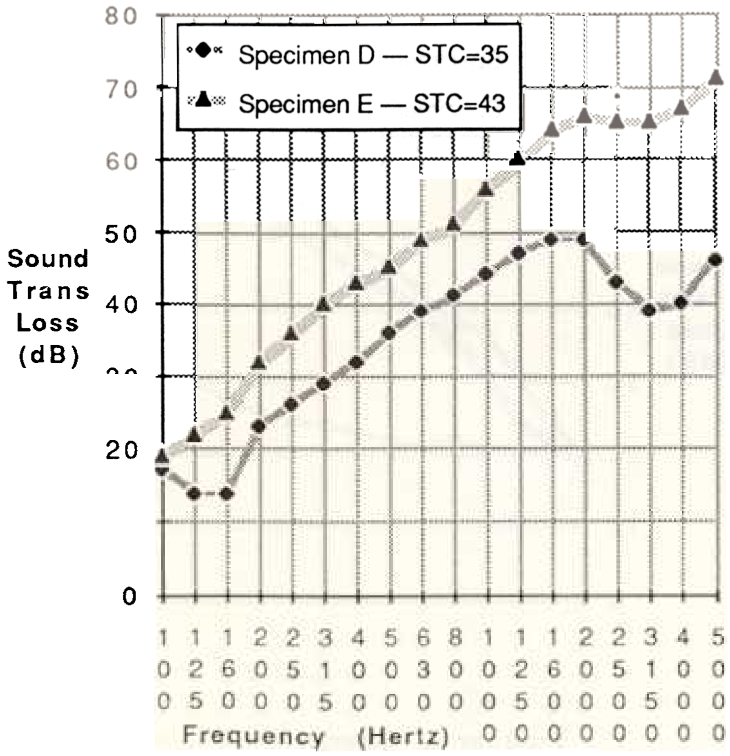
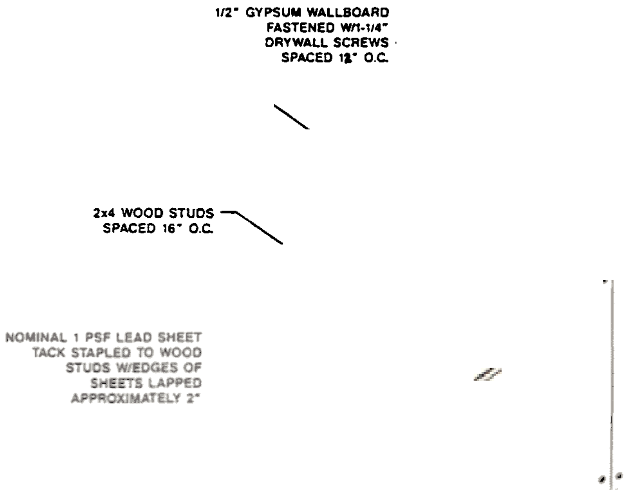


FIGURE 3
SPECIMEN E

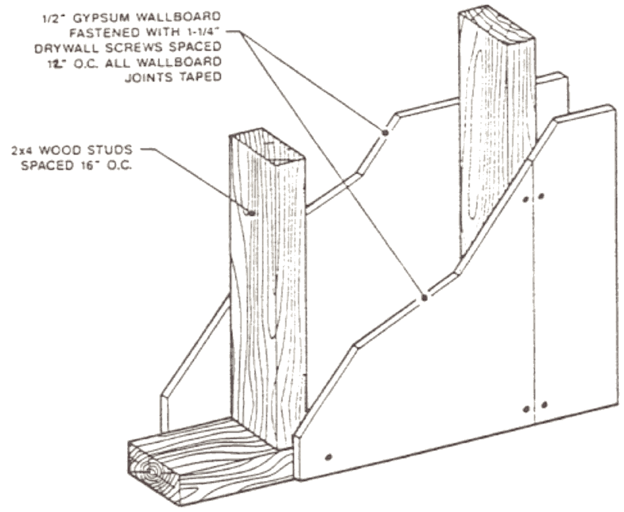


2 × 4 Wood Stud, ½″ Gypsum Board Wall

While the previous example shows a simple way to build sound control into a new partition wall, it is not practical in most retrofit situations. One remodeling option (Specimen F) is to screw 1″ × 2″ furring strips to the existing wallboard with 1⅞″ S-type screws, spaced 16″ on center. Then, friction fit ¾″ 1.5 lb. pcf fiberglass bans between the strips and staple 1 lb. psf lead sheet over the assembly. As described in the first example, the 1 lb. sheet lead is applied vertically, with a ½″ minimum overlap at the furring strips and a sheet-to-sheet overlap of 2″. Finish the job with ½″ gypsum board and you can achieve an STC of 40.

A second option (Specimen G) is to use 2″ × 2″ furring strips and 1½″ fiberglass insulation, netting an STC of 41, according to the test results.

FIGURE 4
SPECIMEN D



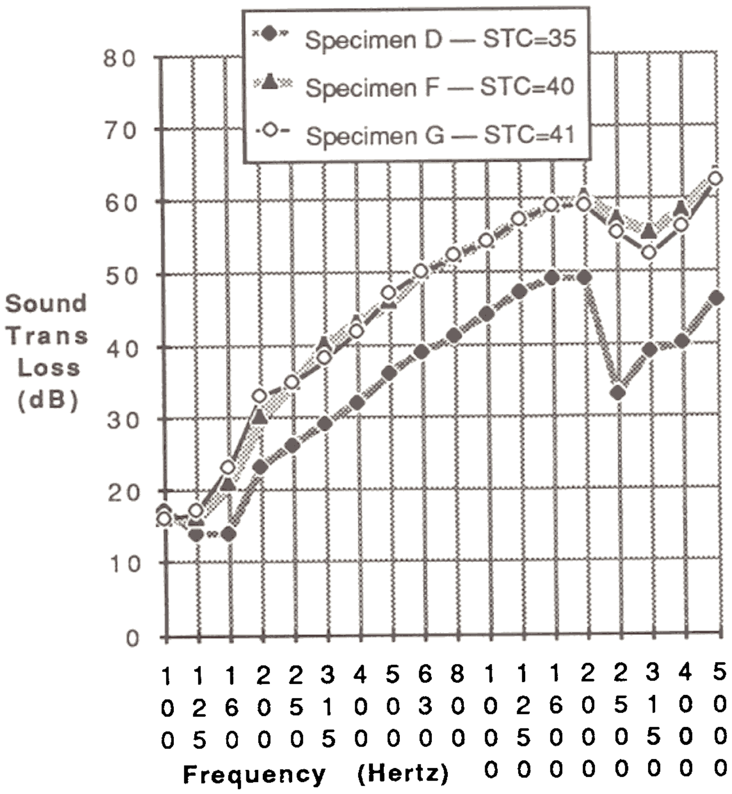
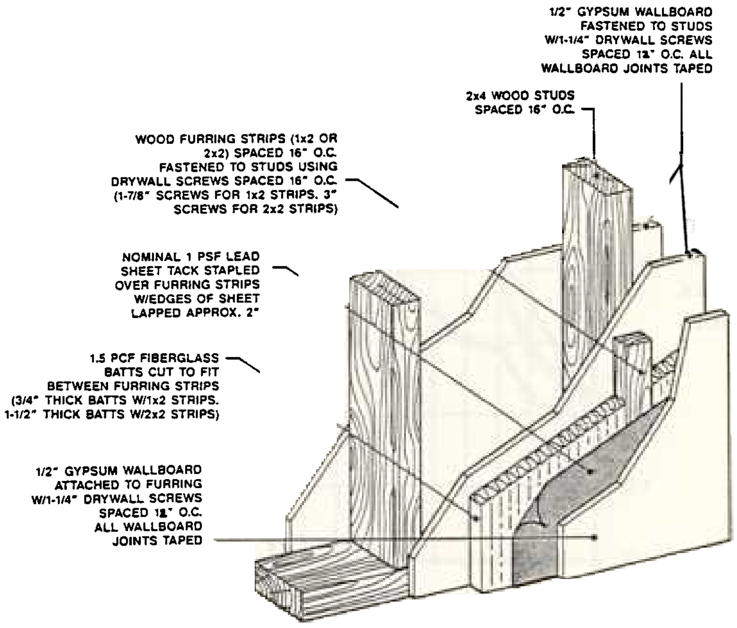


FIGURE 5
SPECIMENS F & G



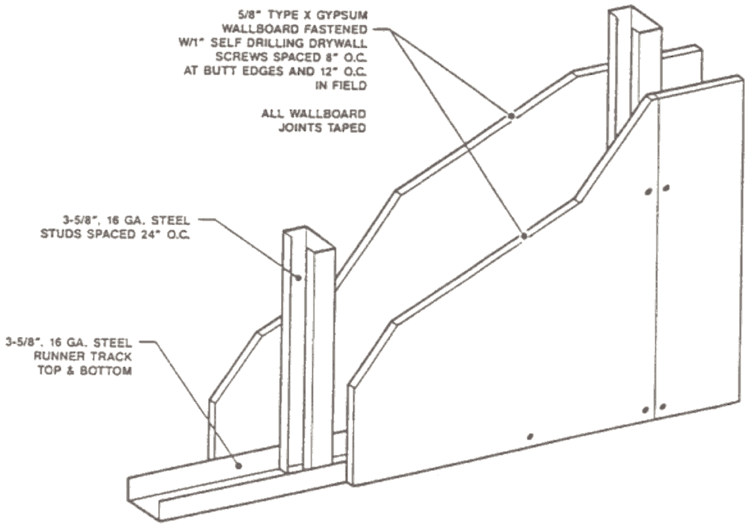
NOTES: 1. SPECIMEN F UTILIZED 1" X 2" FURRING STRIPS AND 3/4" INSULATION
2. SPECIMEN G UTILIZED 2" X 2" FURRING STRIPS AND 1-1/2" INSULATION

3 ⅝″ Steel Stud, ⅝″ Gypsum Board Wall

This load-bearing wall (Specimen H) was constructed of 3⅝″, 16-gauge steel studs which were set into steel runner tracks of similar dimensions, spaced 24″ on center. Type S-12, 1″ self-drilling screws were used to attach ⅝″ wallboard on either side of the studs. Even with its edges sealed with latex acrylic caulking, this wall could attain an STC of only 39.

Retrofitted sound attenuation on such a partition can be obtained as in the previous example using wood furring strips, fiberglass batts and 1 lb. sheet lead. With 1″ × 2″ furring strips and ¾″ insulation deployed with the lead (Specimen I), an STC of 49 was achieved. When 2″ × 2″ and 1½″ fiberglass were used with lead (Specimen J), the STC inched up to 52.

FIGURE 6
SPECIMEN H



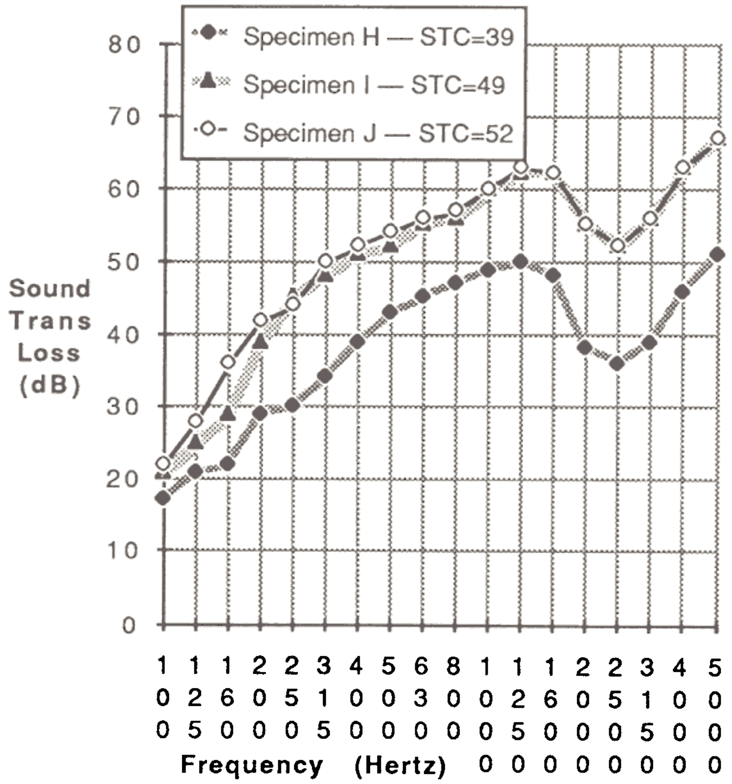
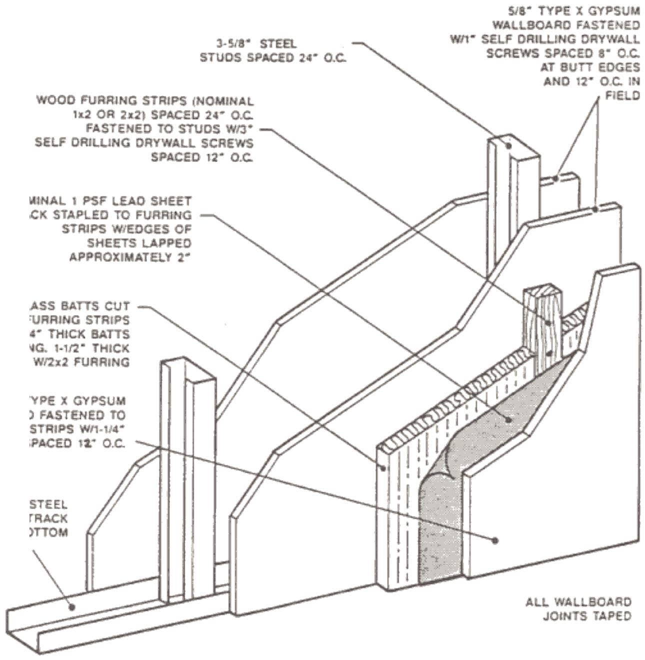


FIGURE 7
SPECIMENS I & J



NOTES: 1. SPECIMEN I UTILIZED 1" X 2" FURRING STRIPS AND 3/4" INSULATION
2. SPECIMEN J UTILIZED 2" X 2" FURRING STRIPS AND 1-1/2" INSULATION

3 ⅝″ Steel Stud, ⅝″ Gypsum Board Wall

As might be expected from the findings in our opening examples, a more cost-effective way to noise-protect a load-bearing steel studded wall is to build-in lead sheet and complementary materials from the beginning. In this case, the framing is constructed as before (Specimen H). But this time, the first side of gypsum wallboard is backed by 1 lb. sheet lead.

The composite panels are fabricated by rolling out the lead from 50″ by 8′ rolls onto 4′ × 8′ sheets of wallboard, then tacking the metal onto the gypsum with ¼″ staples. A 2″ overlap is allowed along the long edge of each board to form a lead sheet tongue.

The lead rolls are applied lengthwise with the long edges 24″ on center so that the fastening points would be in line with the steel studs. When the panels are installed, they were positioned with the 2″ tongues protruding. In that manner, a lead-on-lead overlap of 2″ at the vertical butt edges of each panel was created. Further sound abatement is supplied by a 4″, 0.6 lb. pcf fiberglass batts, friction fit between the studs. As before, the wall was finished on the second side with ⅝″ gypsum wallboard, which was installed with type S-12 self-drilling screws. The result was an STC rating of 49 (Specimen K) compared to a 39 rating for a similar wall (Specimen H) constructed without the lead and fiberglass.

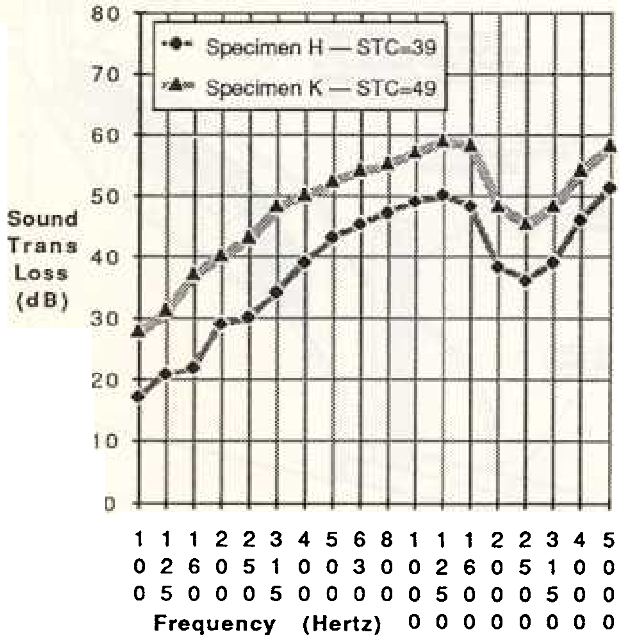


FIGURE 8
SPECIMEN H

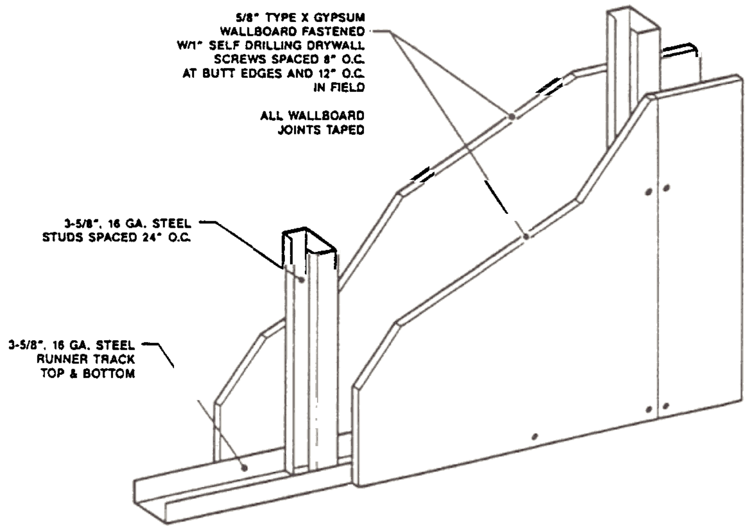
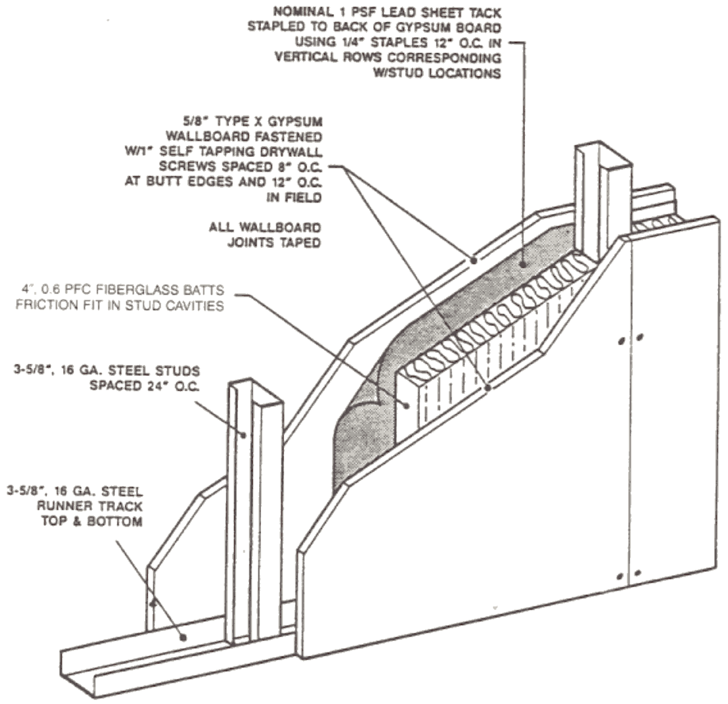


FIGURE 9
SPECIMEN K

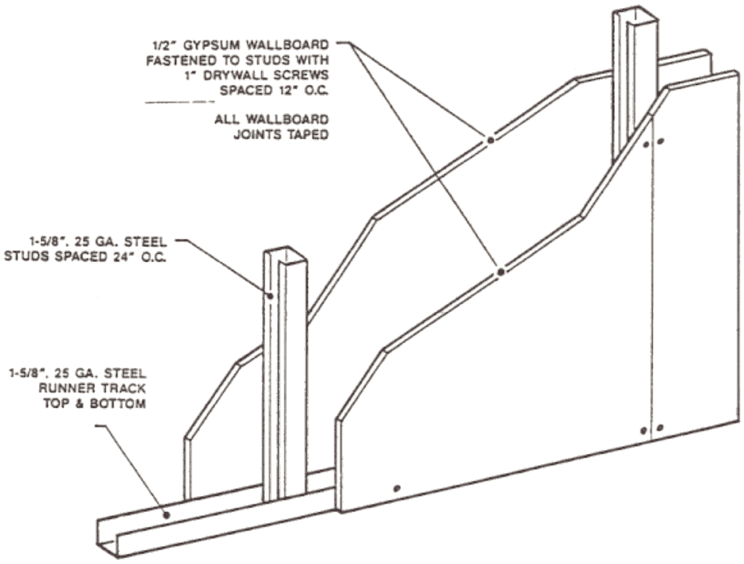


1 ⅝″ Steel Stud, ½″ Gypsum Board Wall

Non-load-bearing steel-studded walls can also benefit from lead-based noise control treatment. The unleaded partition in this case was constructed like Specimen H, except smaller 1⅝″ studs were used and thinner ½″ gypsum wallboard was employed. The result is an STC of 34 (Specimen L).

There was a major improvement, however, when 1 lb. lead sheet was built into the wall using the techniques specified in the description of Specimen K. The lead's performance was complemented with 1½″, 1.5 lb. pcf fiberglass batting, friction fit between the studs. Once completed this fabrication achieved an STC of 45.

FIGURE 10
SPECIMEN L



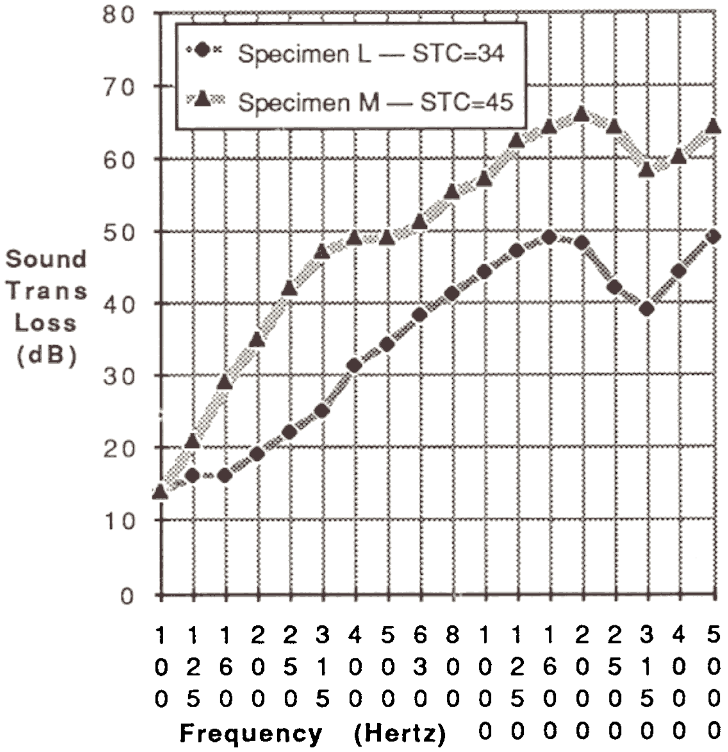
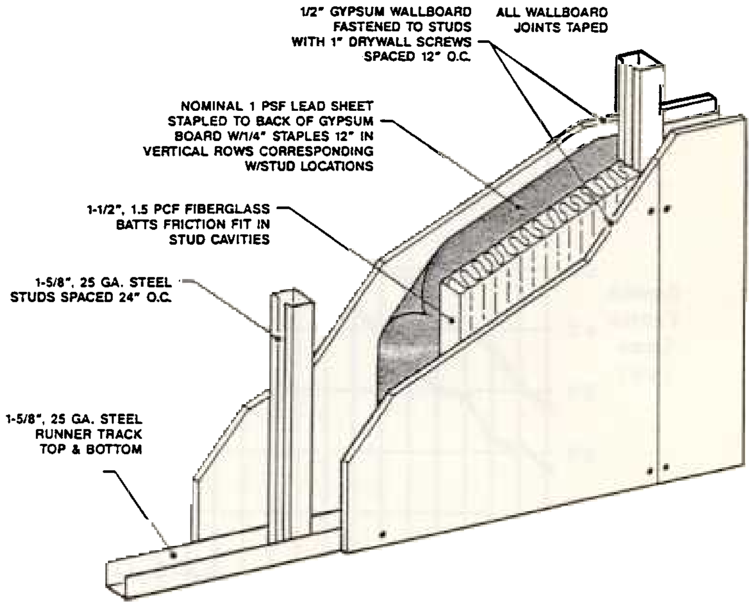


FIGURE 11
SPECIMEN M



¾″ Plywood over Two-by-Four Wood

Building a sound-blocking enclosure for excessively noisy equipment can be as simple as framing a box with two-by-fours then covering the frame with ¾″ plywood, attached with type-W drywall screws. Such is the case of Specimen N, which attained a relatively poor STC of 22.

That score can be increased to STC 30 by attaching a foam/lead sheet composite to the plywood surface (Specimen O). In this case the product consisted of a 1″ thick open cell, 2 lb. pcf flexible urethane foam bonded to 1 lb. lead sheet. It was glued to the enclosure using a pressure sensitive acrylic adhesive over the non-stud side of the plywood.

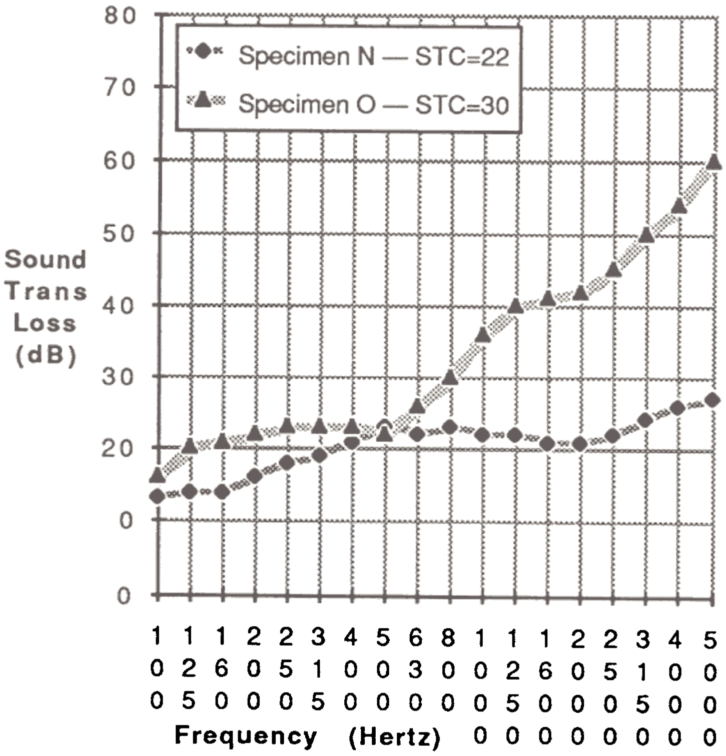
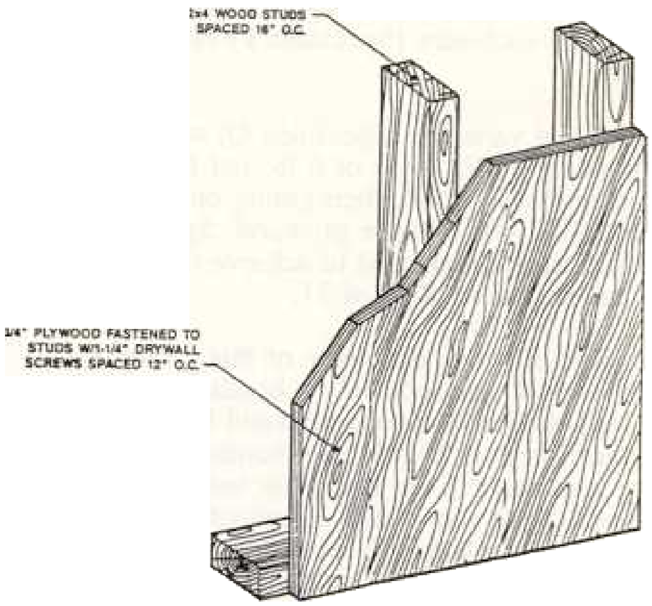
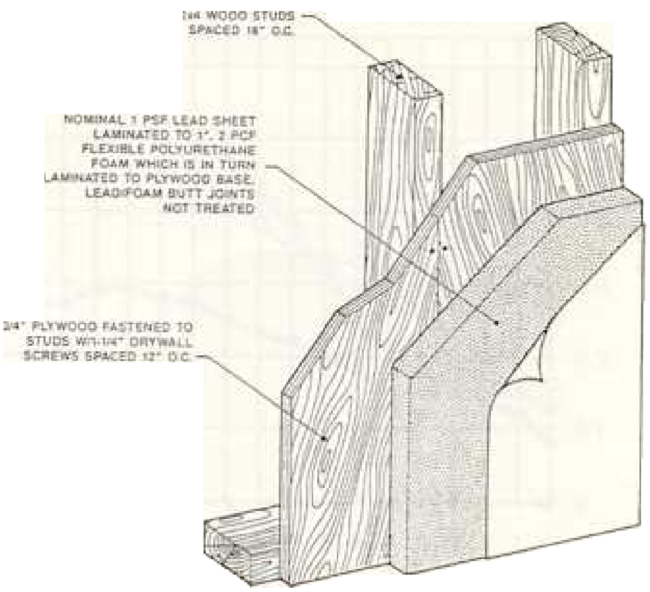


FIGURE 12
SPECIMEN N



NOTE: FOAM/LEAD SHEET COMPOSITE USED FOR SPECIMEN O ONLY.

FIGURE 13
SPECIMEN O



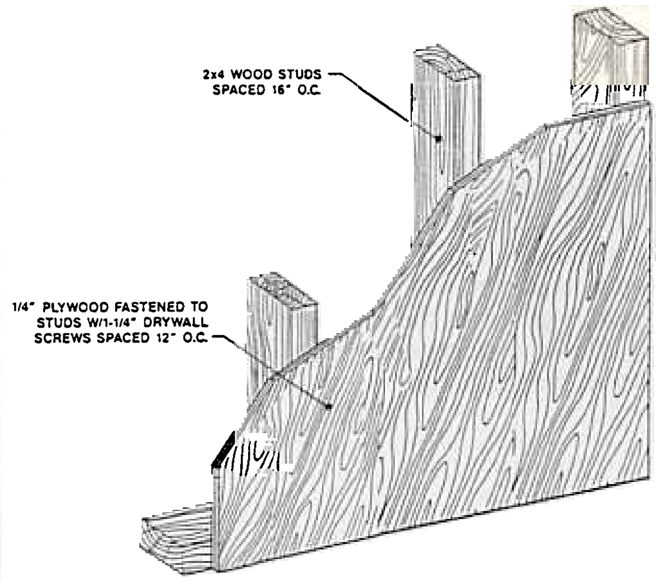
¼″ Plywood over 2 × 4 Wood Studs with

Three variations on this theme are presented here. The base unit is constructed of plywood basewalls attached to two-by-four framing. This unadorned enclosure (Specimen P) rates an STC of 24.

The second variation (Specimen Q) was created by bonding a 1½″ layer of 6 lb. pcf fiberglass board to the plywood, then gluing on a second layer of ¼″ A/C exterior plywood. Sprayed-on contact cement was used to achieve the unions. The result was an STC of 31.

The most effective enclosure of this group (Specimen R) was created by bonding a 1 lb. psf lead sheet to the base plywood before applying the fiberglass board, then bonding a second 1 lb. lead sheet to the fiberglass before the final plywood layer was added. Edges of the lead sheet were overlapped 3″ to ensure continuity. The resulting composite netted an STC of 36.

FIGURE 14
SPECIMEN P



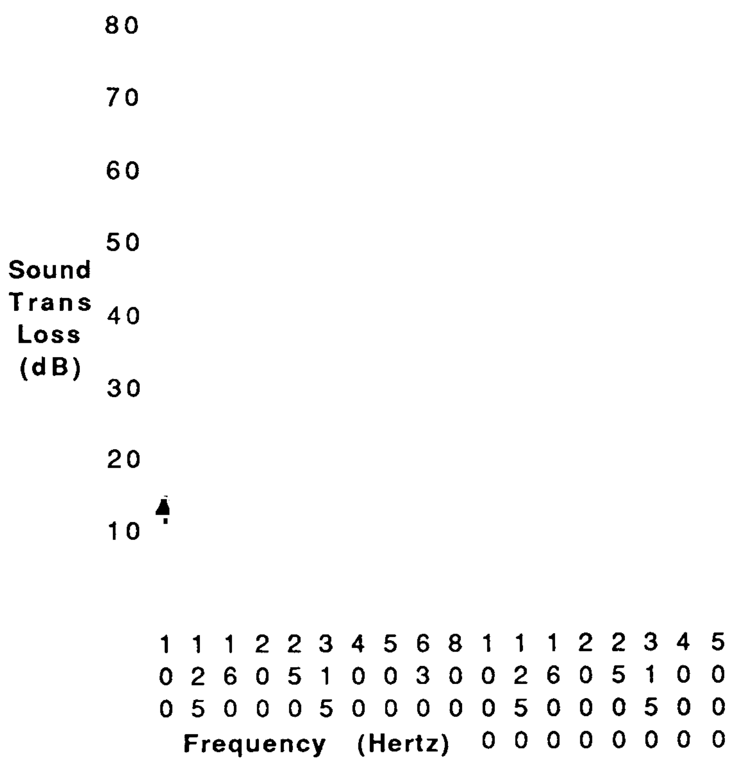
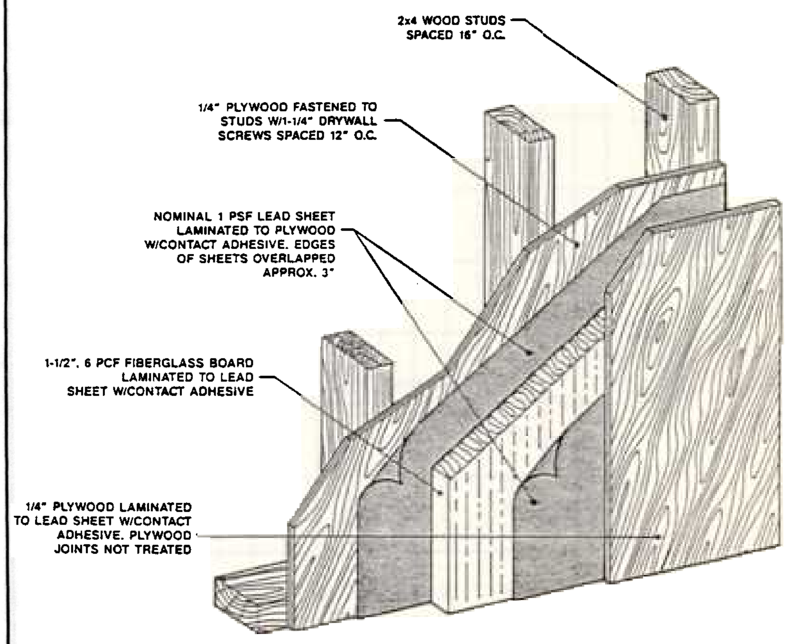


FIGURE 15
SPECIMENS Q & R



NOTES: 1. SPECIMEN P CONSISTED OF 1/4" PLYWOOD OVER STUDS W/O SUPPLEMENTARY LAYERS
2. SPECIMEN Q DID NOT INCLUDE LEAD SHEETS
3. SPECIMEN R INCLUDED ALL ITEMS ILLUSTRATED

5/8″ Gypsum Wallboard & Gypsum/Lead/

The non-treated version of this enclosure (Specimen S) is framed with 3⅝″, 16-gauge steel studs spaced 24″ on center on appropriate runner tracks. A single layer of ⅝″ gypsum wallboard attached with 1″ S-type screws completes the assembly. The fasteners were spaced 12″ on center in the field and 8″ on center at the edges, connecting an enclosure which rated an STC of 29.

To beef-up the fabrication for effective sound blocking (Specimen T), our by-now-familiar sandwich approach was used, joining various layers to each other with sprayed-on contact cement. The first extra slice was a 1 lb. psf lead sheet. Next, a 1½″ thick, 6 lb. pcf fiberglass board was added, to be followed by a second 1 lb. psf lead sheet. Edges of the lead sheet were overlapped 3″ to ensure continuity throughout. Finally, a second ⅝″ gypsum wallboard was bonded onto the top layer of lead. The result: an STC of 42.

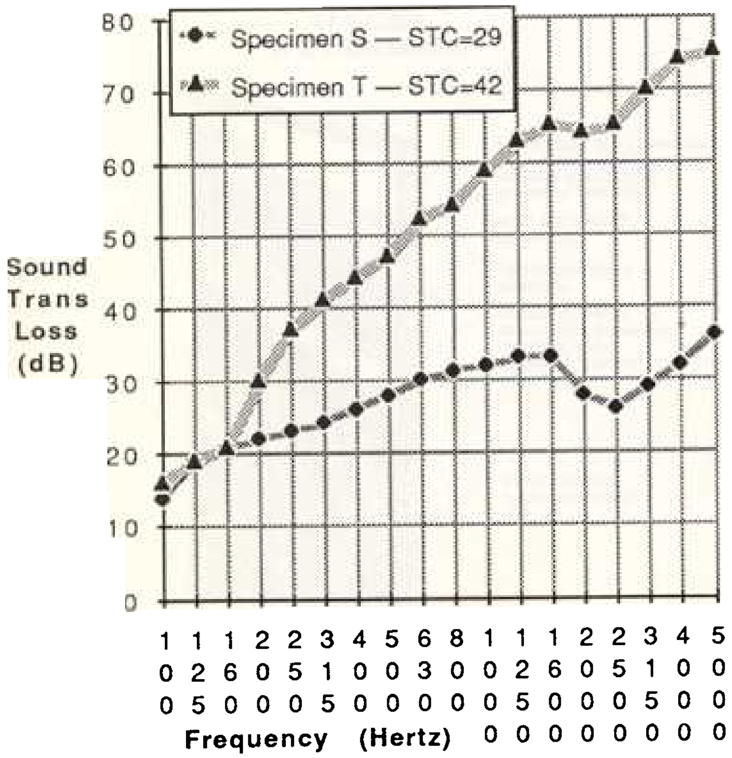


FIGURE 16
SPECIMEN S

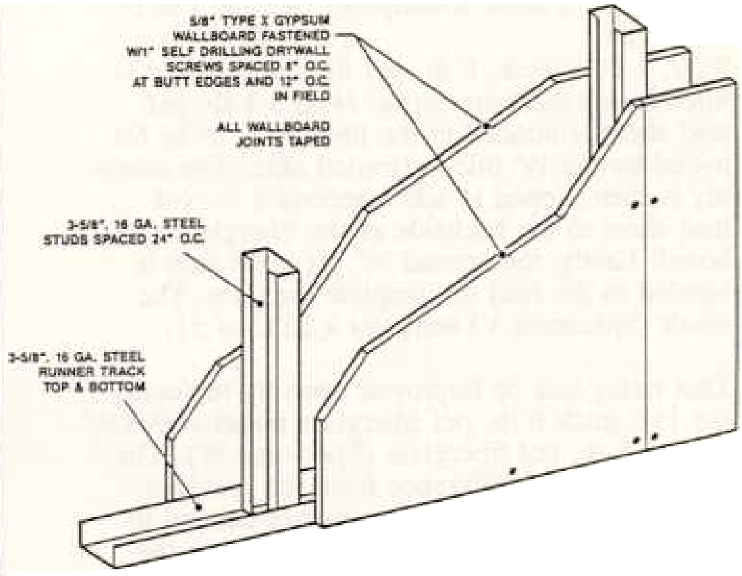
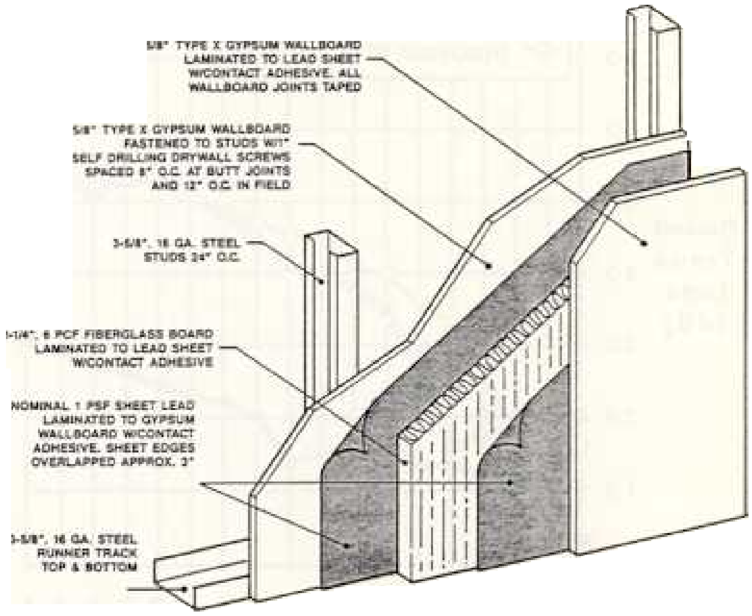


FIGURE 17
SPECIMEN T



NOTES: 1. SPECIMEN S CONSISTED OF SINGLE LAYER OF GYPSUM BOARD OVER STUDS AND DID NOT INCLUDE SUPPLEMENTARY LAYERS
2. SPECIMEN T INCLUDED ALL ITEMS ILLUSTRATED

Hollow Core Vs. Lead Sheet Lined Wood Doors

A conventional honeycomb core door (Specimen U) achieved an STC of 20, direct from the factory. Utilizing the same wood rails, stiles and door skins from the manufacturer of the conventional door, a more soundproof opening can be fabricated.
First, a 1⅛″ thick, 6 lb. pcf fiberglass board is fitted inside the framework. Next a 1 lb. psf lead sheet is bonded to the fiberglass, to be followed by the ⅛″ thick plywood skin. The assembly is then flipped to add a second 1 lb. psf lead sheet to the backside of the fiberglass board. Lastly, the second ⅛″ plywood skin is bonded to the lead to complete the door. The result (Specimen V) achieves a STC of 31.

That rating can be improved upon by replacing the 1⅛″ thick 6 lb. pcf fiberglass board with 1½″ thick 1.5 lb. pcf fiberglass (Specimen W). The only fabrication difference from the previous specimen was that the lead was not bonded to the fiberglass in any way. But by packing the less dense fiberglass into the door, the STC jumped to 38.

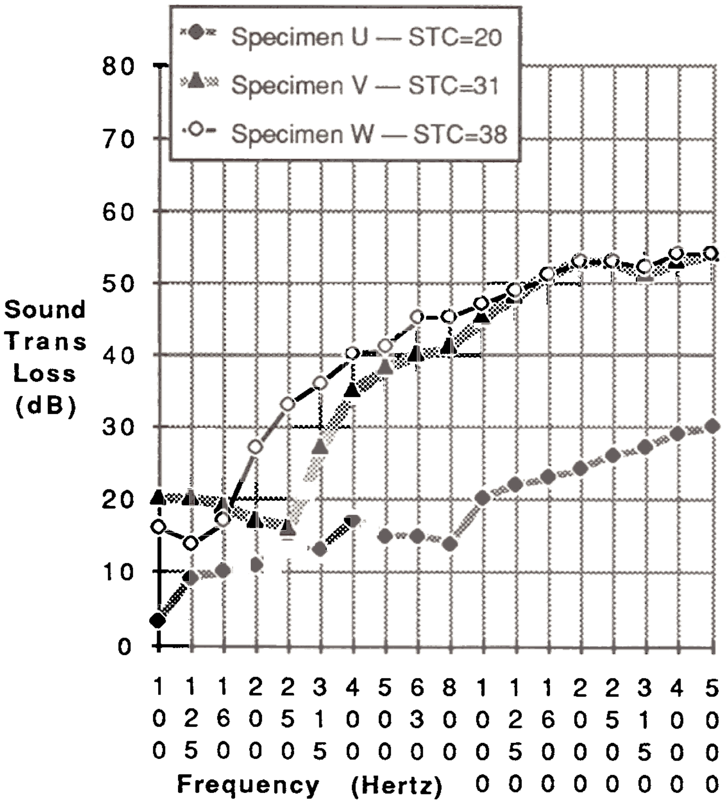


FIGURE 18
SPECIMEN U

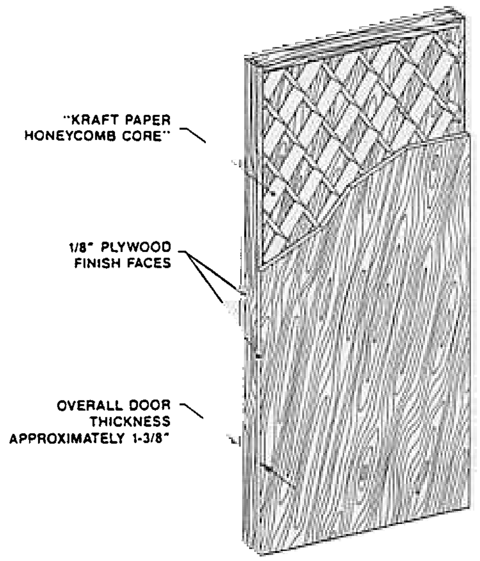
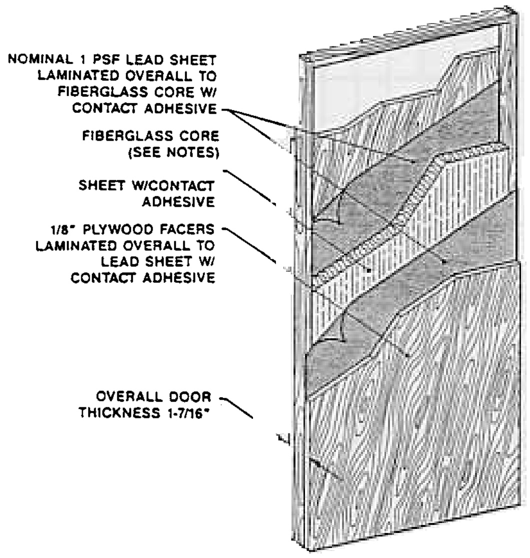


FIGURE 19
SPECIMENS V & W



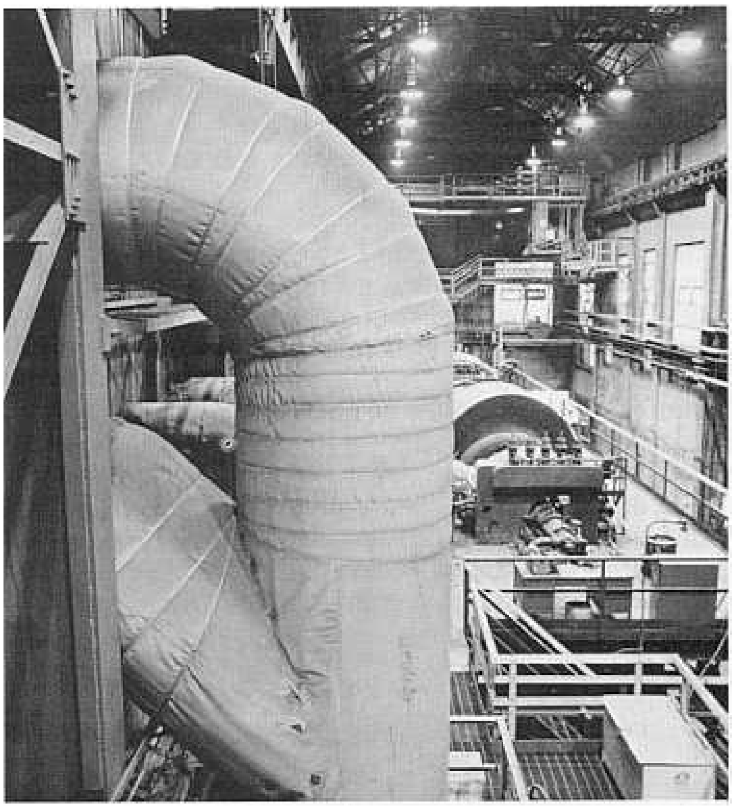
NOTES: 1. 1-1/8", 6PCF FIBERGLASS BOARD USED FOR SPECIMEN V
2. 1-1/2", 1.5 PCF FIBERGLASS USED FOR SPECIMEN W

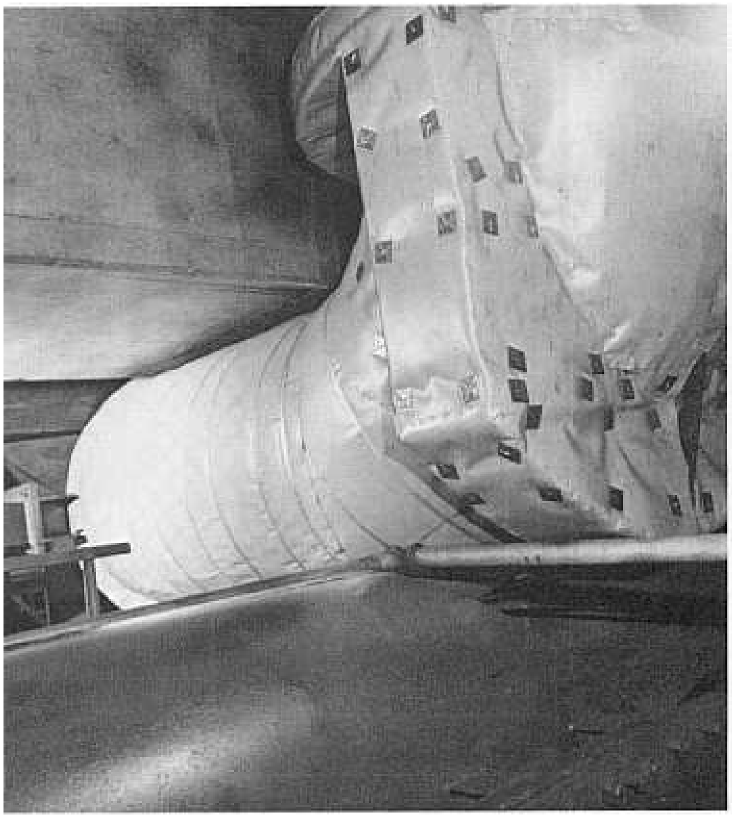
Lead: The Acoustical Problem Solver

No two industrial situations are alike, so no cast-in-stone solutions can be provided for any specific noise control problem. However the following "real life" success stories will give you a broad range of ideas on how lead-based materials can be used in virtually any industrial setting to put the lid on excess sound.

Controlling Machinery Noise
Not surprisingly, the sounds made by industrial machinery are the number one culprit in contributing to in-plant noise pollution. Therefore, the most cost-effective way to make the workplace quieter is to cut down the noise at its source by constructing noise-containment enclosures around offending machines. Lead and lead-based composites are the materials of choice for such applications because they can best handle the wide frequency range of the sounds emitting from noisy machinery.

In addition, lead-based materials can be easily cut and conformed on-site to quickly match the configurations needed to effectively enclose equipment of varying shapes and sizes. That significantly reduces the downtime involved in "soundproofing" industrial machinery.





Leaded vinyl pipe wrap quiets a steel mill.

Sawing and Milling Equipment

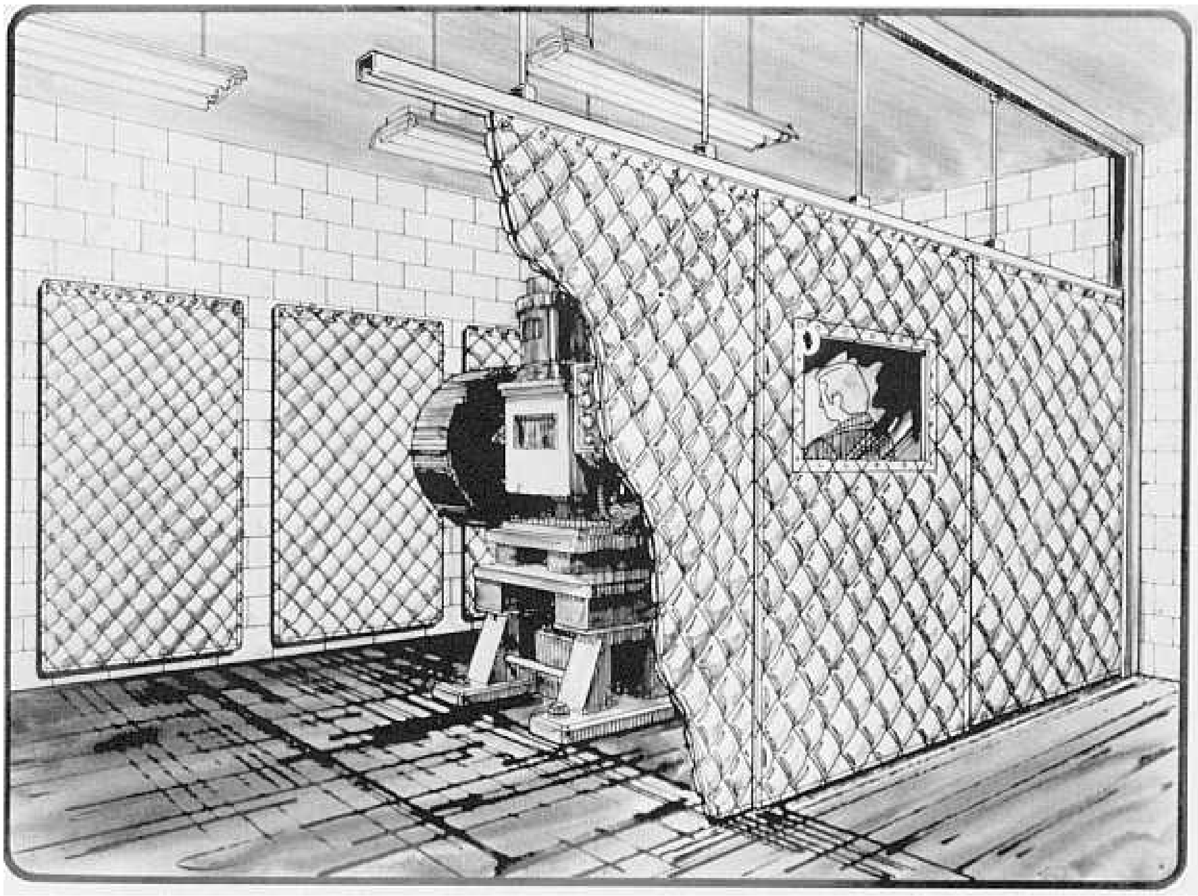
Problem:

Furniture plant sawing and mullion machinery with a noise level of 98 dBA.

Solution:

Build a lead-paneled noise enclosure designed to bring the sound levels outside the unit to 90 dBA. The system consists of two ½ lb. psf (.0078″ thick) sheet lead septa, sandwiched in acoustical foam. The combination is, in turn, bonded to the backside of sheet metal exterior and interior face panels.

The design features openings at either end so that wood furniture components can enter and leave the workstation. Glass panels installed in the enclosure's sides permit an unobstructed view of the proceedings.



Centrifugal Compressors

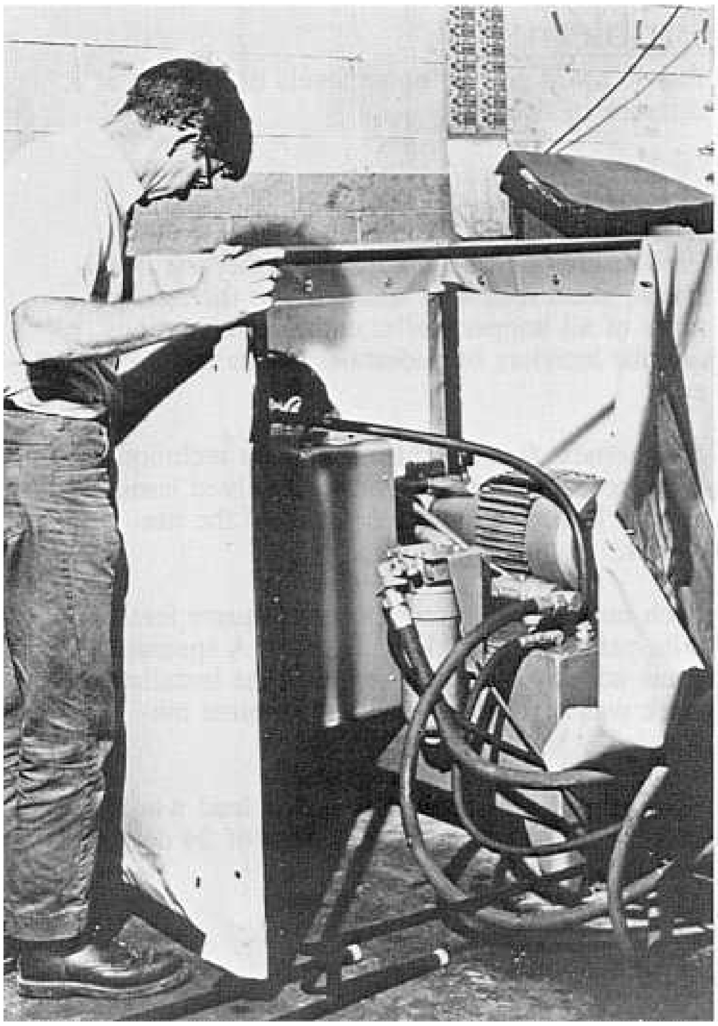
Problem:
Centrifugal compressor noise levels as high as 100 dBA.

Solution:
An analysis showed that the high-level noise was being produced by the compressor's main drive gears, impeller vanes and gear-type oil pump—all located in the mid section of the unit.

A lead/foam combination was used to cover the area in question. It consisted of a 1 lb. psf. (.0156″ thick) lead sheet sandwiched in a 1″ thick layer of foam.

The composite was applied over a previously sprayed-on undercoat layer. Then, a steel shroud was placed over the top of the enclosed section.

To conduct away heat build-up, louvers were designed into the top and bottom of the enclosure. The result was a 67% decrease in noise levels to 84 dBA, compared to original levels as high as 100 dBA.



Plastic Scrap Grinders

Problem:

Plastic scrap grinder noise levels of 88 dBA at a distance of two feet.

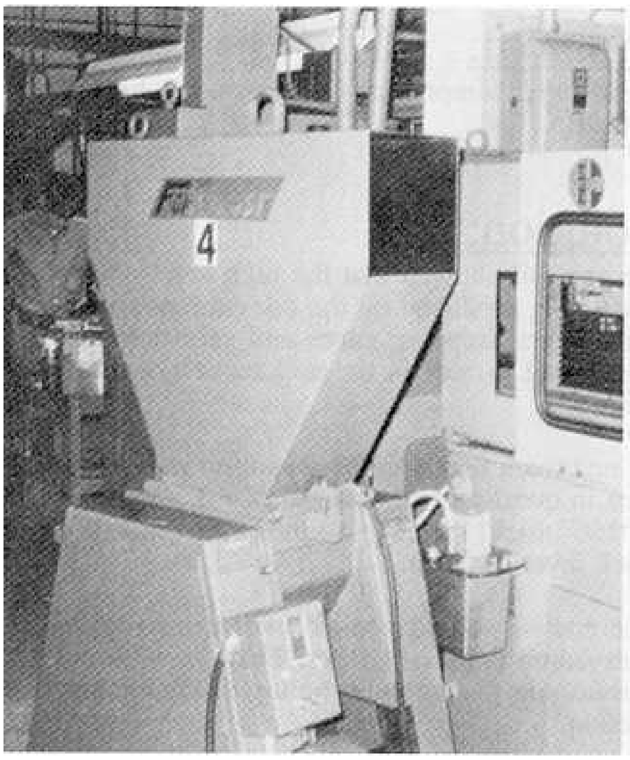
Solution:

Five machines were involved. In the first installation, sheet lead was laminated to the *interior* faces of all hopper walls, underneath portions, and the interiors of pedestals, stands and covers.

For the next four machines, a faster technique was successfully employed. It involved laminating the lead to the *exterior* faces of the machines.

Each machine required about 25 square feet of 2 lb. psf (.0312″ thick) sheet lead. A special urethane adhesive was utilized, and the installation work was accomplished by an in-plant mechanic.

The sound meter reading after the lead was applied declined to 64 dBA—a drop of 24 decibels.



Lead laminated directly to exterior face of plastic scrap grinders reduced noise by 85%.

Metal Cutting Saws

Problem:

At a large metal working plant, the noise level at the operator's station was as high as 130 dBA.

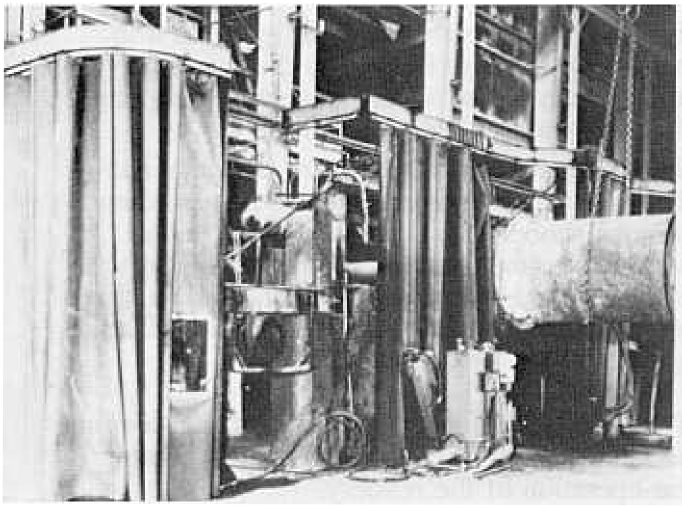
Solution:

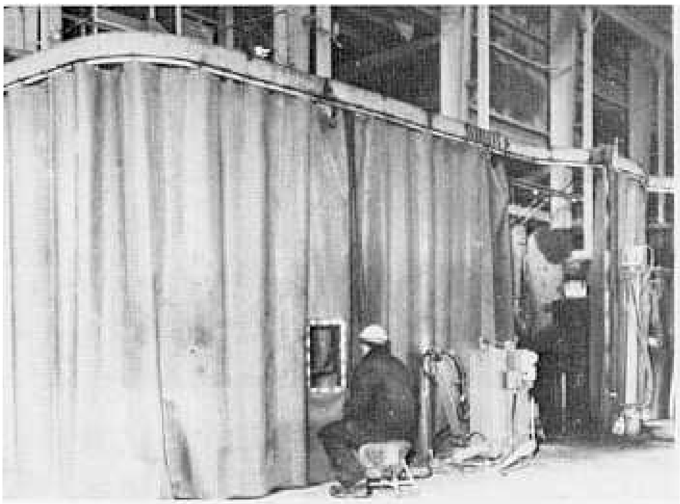
The plant built an 8′ high by 20′ long semicircular enclosure of sheet steel, completely surrounding the cutting operation. The lower half was fixed to the floor and the upper half mounted on steel rails, so as to be movable and provide access to the saw. A viewing window was provided for the operator.

The inside of the enclosure was lined with a 1½″ thick composite of two lead septums floating in three layers of foam. Meanwhile, a 120 ounce per square foot leaded composite material was used for seals at the floor and the junction of the two enclosure halves. Finally, a leaded vinyl curtain was installed beneath the machine in the scrap tunnel. The treatment reduced the sound level at the operator's station to 88 dBA.

In a second installation in the same plant, a highspeed automatic billet cutter was also silenced with lead. The solution was use of a lead-loaded foam material to line the saw blade guard housing. As a result, the saw's noise level was reduced below the 90 dBA limit for an eight-hour shift.

Attached to the frame with mechanical fasteners and adhesive. Holes were cut in the sheet to permit airflow and the passage of shafts and piping. After-installation readings disclosed that the noise from the two refiners declined in the range of 6-13 dBA.





At top, open view of leaded-vinyl noise barrier curtain shows swing-away overhead track which permits easy access by crane. Closed view of curtain (bottom) shows safety window which enables machine operator to monitor manufacturing process.

Problem:

A major East Coast refinery had to quiet down process and industrial equipment without considerable downtime and subsequent decrease in production.

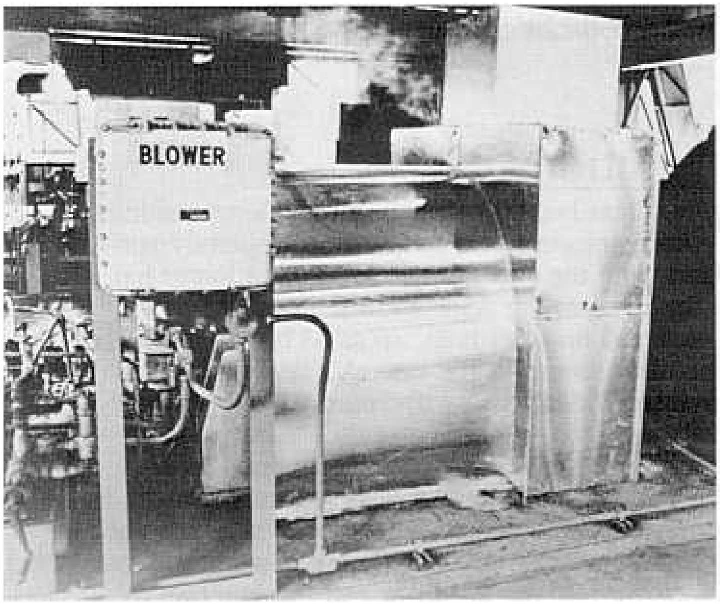
Solution:

A study revealed that gear boxes, blowers, steam chests and sections of the refinery's giant pipe network were the primary sources of noise. Corrective action involved shrouding the offending components with a combination of materials.

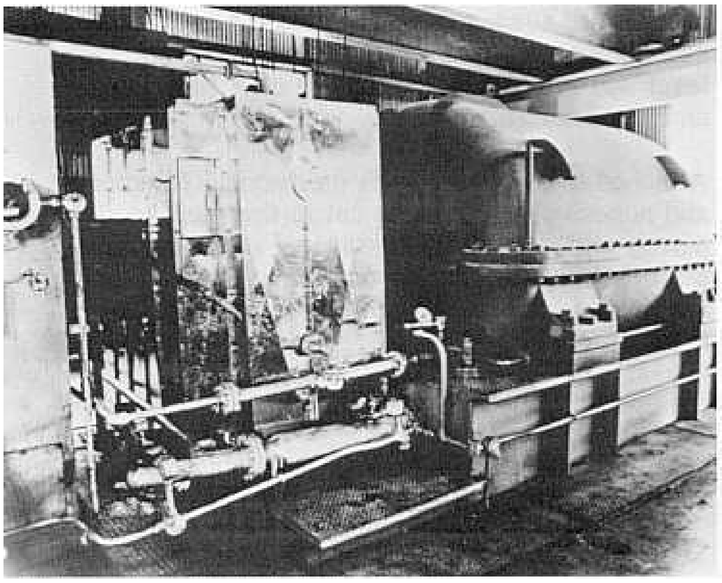
To modify the gearboxes, 3 lb. pcf and 6 lb. pcf fiberglass were bonded to the housings via anchor pegs. Lead sheet—generally weighing 2 lb. psf—was applied to finish the job.

Sound attenuation of such parts as valve handles and gauges was accomplished by adding silicone rubber and aluminum sliding doors. Meanwhile, the blowers were first layered with fiberglass and sheet lead, then encased in movable outer panels of aluminum, lead and fiberglass.

The combination approach resulted in achieving acceptable levels of sound without disrupting the operation of the refinery.



Sheet lead, glass fiber and aluminum reduced sound levels near this blower by more than eight decibels.



Gearbox noise was reduced to levels permitted by OSHA.

Printing Presses

Problem:

Shielding operators from the excessive noise level of high-volume newspaper printing presses.

Solution:

At the Dow Jones & Company plant in Orlando, Florida, the Southeast's distribution of *The Wall Street Journal* is printed on high-speed web presses. To protect operators from the dangerous din of the presses a remote control room was built of laminated-lead dry walls and windows of double-glazed glass. There, pressmen can regulate such factors as press speed and die control of ink and water without venturing out on the noisy plant floor.

The control room's walls are constructed of a $\frac{1}{16}''$ thick lead sheet sandwiched between two sheets of drywall board. The structure's massive front window consists of thick acoustical glass on the outside and safety glass on the inside.

The noise level outside of the enclosure averages 107 dBA, compared with an average of 87 dBA inside.

Remote control room at Dow Jones' Orlando, Fla. plant has lead laminated panels and double-glazed glass to shield operators from press noise outside.

Special Solutions for Public Utilities:

As their name implies, public utilities serve every member of the community in which they are located. Pleasing such a broad customer base involves keeping noise to a minimum.

That's particularly essential when production and distribution facilities boarder on residential neighborhoods, making sound abatement an especially high priority for utility officials. Increasingly they are turning to lead-based products to achieve their noise control objectives. The following sample of success stories gives you an idea of how they are doing it.

Problem:

Blowers and ductwork on a power plant's emission control system created noise in excess of 90 decibels.

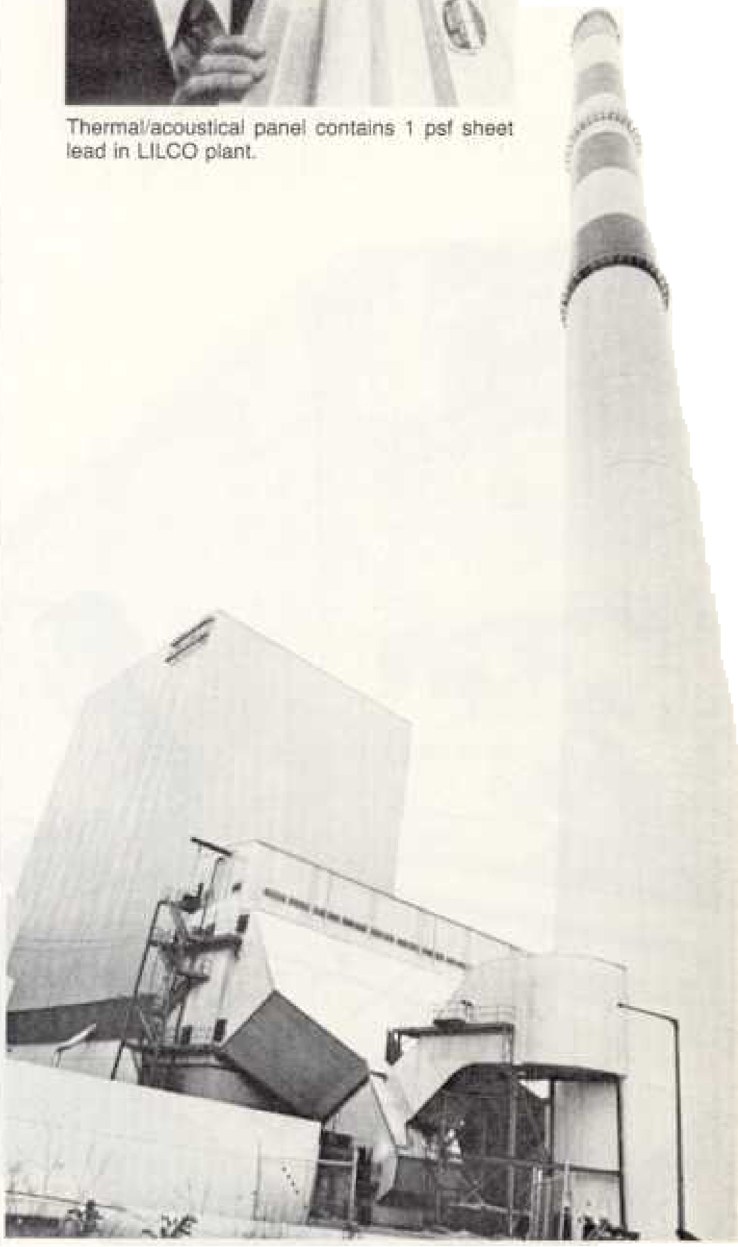
Solution:

A multi-panel system was designed both to shroud the equipment and form the exterior enclosure of the system. The panels consisted of:

- an exterior sheet of corrugated metal
- a layer of mineral wool insulation
- one or two sheets of lead sandwiched between additional layers of mineral wool, depending upon location
- a layer of aluminum foil
- a wire mesh retainer.

The ductwork and fan housing for two power generation units required about 20,000 square feet of the panels. A larger third unit required approximately 53,000 square feet of material. The panels were delivered in pre-cut sizes for ease of installation and reduced downtime. Since installation of these and other sound attenuation materials, the utility has encountered no community relations problems resulting from noise.

Thermal/acoustical panel contains 1 psf sheet lead in LILCO plant.



Natural Gas Turbine Compressors

Problem:

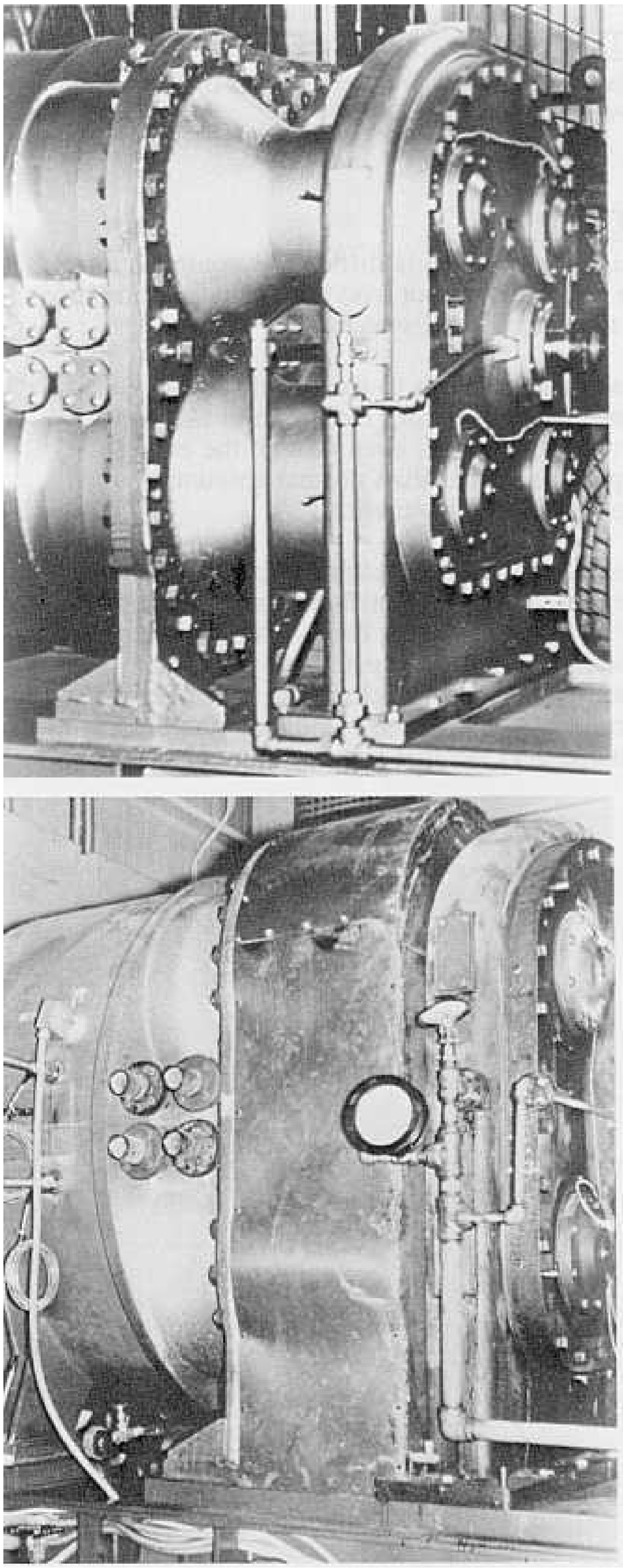
Two Canadian natural gas companies were concerned about the high-pitched whine produced by turbine compressors used to push natural gas through cross-country pipelines.

Solution:

The contractor who builds compressor stations in residential areas developed an acoustical building panel to enclose the installations. The panels consist of three layers:

- Inside face—2 lb. psf sheet lead bonded to the backside of 24 gauge V-rib galvanized steel sheet.
- Center core—one 4″ and one 3″ thick low density fiberglass layer with vinyl backing.
- Exterior face—26 gauge galvanized steel sheet with a backed enamel finish.

The panels were stiffened by girts, cold-rolled from steel Z-sections, and were tested to achieve a Sound Transmission Class (STC) rating of 40 decibels.



Gear and impeller section of compressor (top) prior to installation of noise barrier, and (bottom) with steel shroud covering lead/foam acoustical system.

Power Transformer Hum

Problem:

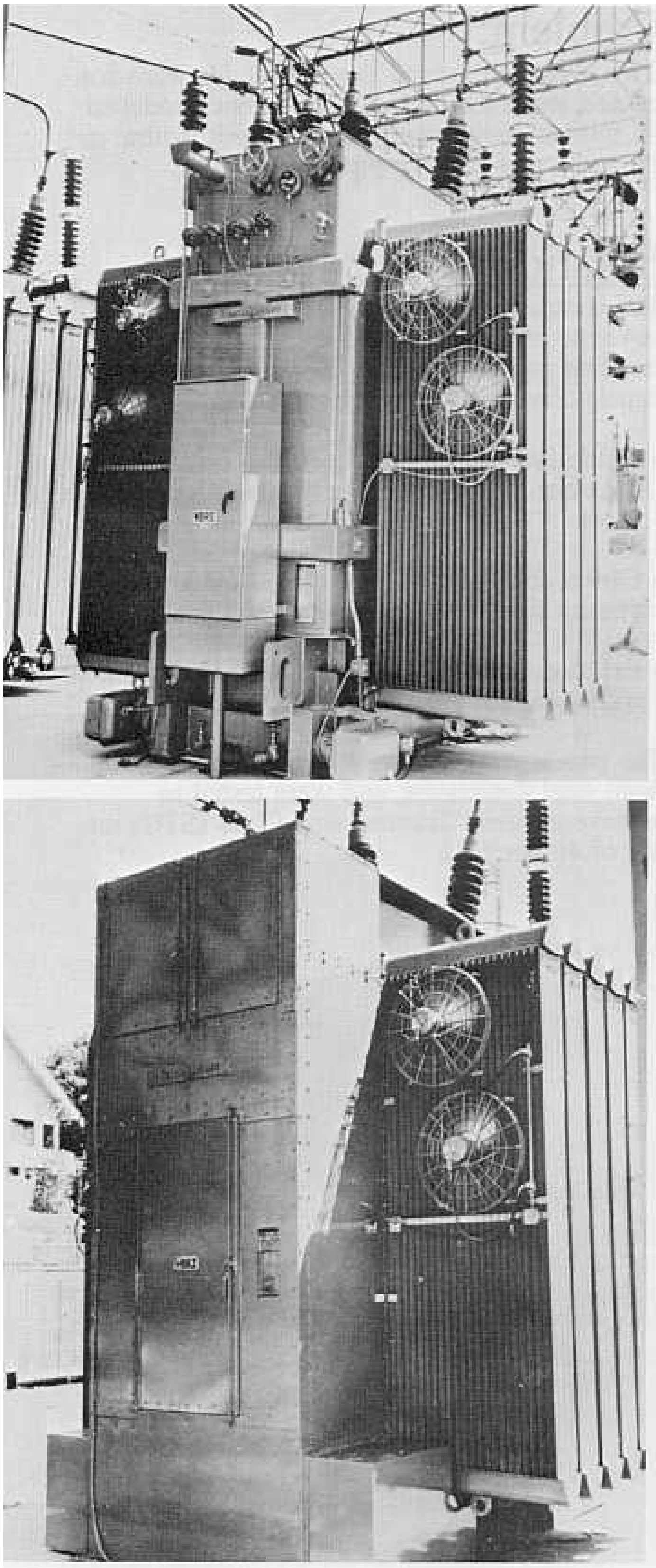
Silencing the low-frequency hum of large high-power transformers.

Solution:

This type of noise is difficult to control due to the notoriously poor low frequency performance of most acoustical systems.

Lead is not subject to such limits, however. It achieved a significant reduction in the transformer noise level, even though the enclosure required a higher than normal amount of openings for proper ventilation.

Rated at 41.7 MVA, each Portland General Electric Company transformer required a 5′ × 10′ × 14′ enclosure. Each of the housings was fabricated from 4 lb. psf (1⁄16″) lead sheet laminated to 10 gauge steel and an interface of fiberglass. A test of the completed enclosures showed a 17 decibel reduction in noise level.



One of the power tranformers before and after enclosure. The enclosure is 14 feet high.