

LEAD INDUSTRIES ASSOCIATION, INC.

292 MADISON AVENUE

NEW YORK, N. Y. 10017

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August 6, 1964

SUBJECT: Reprint on
Lead for Noise Control

To the Members of the Lead Industries Association, Inc.:

The enclosed reprint of an article on noise control from American City was prepared by the LIA staff after discussions with the editors of that magazine. It appeared in the June, 1964 issue and several dozen requests for additional information have been traced to it.

Copies of this reprint have also been mailed to our list of architects, builders, and contractors (about 12,000 in all) and will be made available through the "Lead Library" in the next issue of LEAD.

Additional copies are available for your use. The first 25 are free and, in bulk, larger quantities may be had at our cost of \$3.00 per 100.

Sincerely,

Ernest Foster
Manager, Technical Services

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Enc.

Look Ahead with Lead

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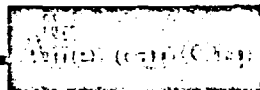
How to Stop Noise

By BRUCE FADER
Mgr., Technical Services
Lead Industries
Association, Inc.

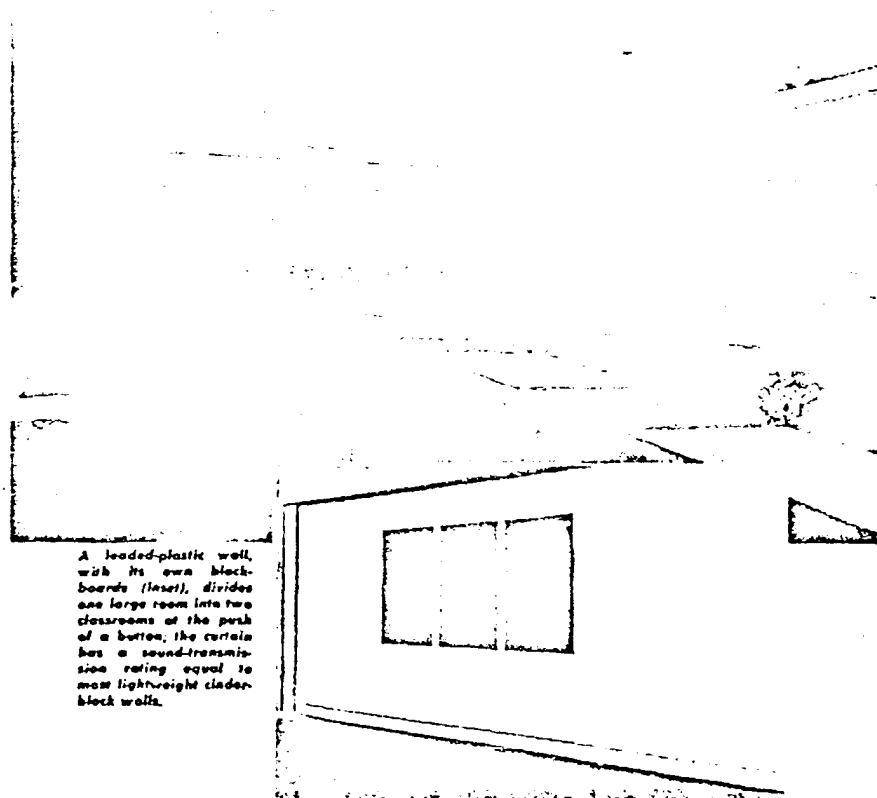
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CALDWELL



A leaded-plastic wall, with its own blackboards (inset), divides one large room into two classrooms at the peak of a butte; the curtain has a sound-transmission rating equal to most lightweight cladding block walls.

How to Stop Noise

By BRUCE FADER
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Stop for a moment and listen. What do you hear? If you are reading at home, probably nothing more than the dishwasher or television. But if you are in your office, you probably hear street noise, two telephone conversations in nearby offices, typewriters clacking away, and possibly even transformers or heavy machinery on some other floor. You may have been unconscious of the noise until you stopped to listen but these background noises have been vying for your attention, introducing errors in your work, and sandpapering your nerves.

In a recent article, *Time* magazine quoted the Air Force's Dr. von

Gierke on noise, "It impairs both manual dexterity and accuracy." Mechanics working near howling jets, for example, were inclined to rush through their job, getting it done rather than getting it right. The same article cites a study by the Aetna Life Insurance Co. When Aetna improved the acoustic situation in its own offices—

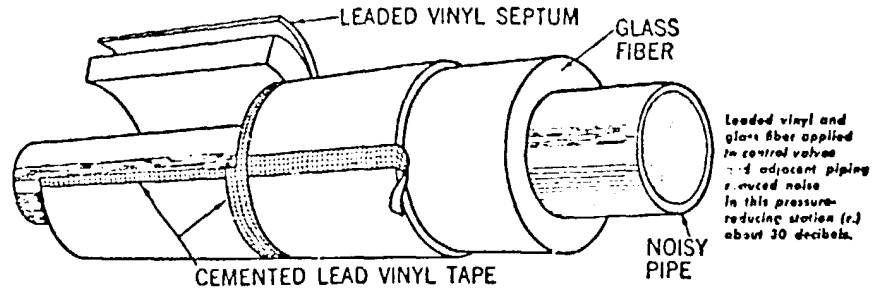
- typists' errors went down by 29%
- machine operators made 52% fewer mistakes
- employee turnover dropped 47%
- absenteeism decreased 37.3%

Noise need not be deafening to be a serious hindrance. Offices need telephones and typewriters and industry depends on dynamite and diesels. We make more noise than any previous generation in history and every new mechanical aid and

technical advance adds to the noise load. However, we can control it.

Most people know about materials that absorb noise. "Acoustic" ceiling tiles, carpeting, heavy drapes and overstuffed furniture soak up noise and reduce it by cutting down echoes. Oddly, though, very few people realize that there are other methods of noise control—and some of them are much more effective than absorption in dealing with the most common noise problems.

One of the best noise control measures consists of blocking the paths from the noise source to your ear. To build a good noise block, or wall, make it limp and heavy rather than stiff and light. For example, a sheet of lead foil only 0.008 inches thick produces the same effect as a sheet of 3/4-inch plywood, despite the fact that the lead is lighter than the plywood (about 1/2 pound per



square foot vs. more than a pound). The lead is limp while the wood is stiff and acts like a drumhead.

One can also control noise by preventing the vibration of the noise-making device from radiating through the air as sound. This method will never be applied to people's larynxes or their proxy counterparts, radios, intercoms and TV sets, but it can change the angry clockity-clack of a typewriter into a polite plunkity-plunk. Alert product designers make use of noise-damping materials, such as lead plastics, to effect good acoustical manners for office machinery, appliances, automobiles and industrial

equipment. While it may be difficult to solve office or home noise problems on the spot with damping compounds, they can often be used to reduce big noises produced in industrial operations, power plants, pumping stations and similar locations.

Noise Problems

No two noise problems are ever quite alike. They range from noise levels so intense as to risk permanent hearing loss, down to rooms so quiet that the noises of "silent" bearings can be tested. In each case presented here the limpness and weight of lead or flexible leaded-

plastic sheetings have been the basis of the solution.

One gas utility faced a situation typical of intense noise which cannot be avoided. Municipal operations in water pumping, power generation and other essential functions present similar problems.

Natural gas arrived at the utility's pressure-reduction station at 150 psi. This pressure had to be reduced to 15 psi for distribution. Although the demand for gas fluctuates greatly throughout the day, the utility maintains the same pressure in the mains at all times. To do this they used a double V-port control valve in the lines at the station. The internal parts of these valves casually resemble a factory whistle. And while the flow of gas past the valves did not produce a whistle, it did result in a throaty roar somewhat like a mixture of subway trains and waterfalls. Noise levels ranged between 110-130 decibels and though there was no other way to handle the gas, nobody was happy.

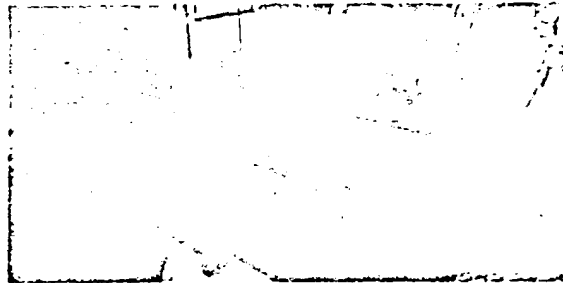
Treatment

The accompanying drawing shows the successful treatment, now employed in dozens of these stations across the country. The utility's maintenance men first wrapped the pipes and valves in two-inch-thick blankets of glass fiber. Then they covered them with flexible sheets of leaded vinyl. These weighed 0.87 pounds per square foot and were less than 1/16 of an inch thick. They taped all the seams and joints, taking particular care that no cracks were left in the covering. This resulted in:

- a 30-decibel reduction in noise levels in the pressure-reduction room.
- The ability of workers to converse in the room—something they could not do previously.
- maintenance and inspection con-

The Relation of Noise in Decibels to Commonly Heard Sounds

Noise Level in Decibels	Description or Example	Remarks
0	faintest possible sound	the lower limit of audibility varies widely among people and varies with the pitch of the sound
20	leaves rustling in a faint breeze	
40	whisper at four to five feet	
50	quiet conference room	
60	typical busy office	
80	loud radio or hi-fi	
90	inside a typical railroad car	
100	subway platform with a train pulling in	this is about the loudest noise which can be tolerated eight hours a day without some risk of hearing damage
110	full symphony orchestra playing loud passage	
120	many noisy industrial operations	
130	noise level at the ramp when a jet airliner takes off	
135	noise beginning to be painful	many experts feel that half a minute exposure may produce permanent hearing loss
160	near a jet airliner at full throttle	



ried out on schedule and without grumbling. Previously everyone avoided the room or "was busy" elsewhere.

Only six man-days of labor and a moderate budget for materials produced this change.

When the Franklin Institute in Philadelphia scheduled a research project to evaluate "silent" bearings even normal noises in the work area were excessive. These included street traffic, normal conversation and activity of half a dozen technicians and researchers, occasional machining or sheet-metal work, background noise of equipment on test and the usual ventilation and other noise sources. Requirements of this sort are not so uncommon in municipal operations either; officers and meeting rooms where confidential material is discussed, police interrogation rooms, study rooms and libraries should, ideally, offer the same degree of acoustical protection.

The available workroom had conventional drywalls (1/2-inch plasterboard on both sides of wood studs). Inside the room technicians added wood furring strips and then nailed 1/16-inch sheet lead to the furring. They finished the inner wall with plywood, also on furring, to support instruments, piping, etc., and acoustic tile. This resulted in an improvement of at least 14 decibels and probably much more (the original wall was not tested and we based the improvement on the best possible performance it might have given). It took careful attention to other details, of course, to achieve this degree of isolation. The ceiling and the door and other sound paths into the room were treated and sealed, but the final result was well worth the effort. As finished, the room, now 45 decibels quieter than its surroundings, permitted the tests to be carried out on schedule. It costs very little compared to

building a separate facility and the Institute's staff did the whole job in less than six weeks from the first planning to the first actual bearing test.

Seldom do budgets provide all the meeting rooms, special-purpose rooms and schoolrooms that local government would like to have. Leaded vinyl plastic sheeting makes such rooms available at little extra cost. A sheet of leaded plastic 1/4 inch thick and weighing three pounds per square foot is supported on a roller, motor driven and installed in the ceiling. Such a unit runs between the front and rear walls between two schoolrooms in a Long Island high school. In the unrolled position the vinyl forms a wall, with its own built-in roll-up blackboards with a rating of 34 decibels. This equals or exceeds most lightweight cinderblock walls. Classes held in the two rooms do not interfere with each other any more than they would in conventional classrooms. However, to acquire more space for special events the teacher unlocks the control switch and rolls the wall into the ceiling. Obviously, one large meeting room can be divided up by these walls to serve two, three or more groups without losing its usefulness as a large auditorium or calling for hours of expensive labor to make the changeover.

Transformer Noise

The hum of big power transformers does more than annoy, it costs money. When local residents complain, utilities face alternatives such as alterations, rebuilding or replacement of the offending unit. To solve the problem before it comes to this, one utility worked out a design for a transformer enclosure that trims 15 to 20 decibels from the radiated noise. The enclosure makes use of a laminate of steel and lead and has an interior

facing of glass-fiber batting. Sheet lead simplifies construction of this sort because it bends easily to fit the steel supporting structure exactly.

Polygraph Room

The polygraph, or lie detector, has proven its worth in speeding police investigations by eliminating the innocent and confirming statements. But in order to get unequivocal results with a polygraph the test must be kept free of sudden or startling noises and interruptions. Since the polygraph is such a recent addition to the equipment of law enforcement it is sometimes allocated a room or space far from ideal. In the Bergen County Courthouse in Hackensack, N. J., the officials set aside one of the regular rooms of the Bergen County Prosecutor's Office for polygraph examinations. The office walls were hollow-steel movable partitions and, together with a number of sound leaks around doors and through the ventilating system, they provided only 24 decibels of noise reduction. It came to the point where a polygraph test had to be scheduled for after hours (hard to do in the typical situation) or it meant conducting the normal work of the office on tip-toe and in whispers.

Laminating 1/16-inch lead to the walls and sealing up the sound leaks produced a minimum noise reduction of 40 decibels. The examinations no longer require unusual measures to insure excellent testing conditions.

Although many other examples could be cited, the modern practice of soundproofing with lead is still quite young. Most contractors and material suppliers are not yet familiar with it. The materials and techniques used, however, are widely available and quite easy to understand.

Sheet lead can be painted as a finish surface and the leaded plastic is available in colors and textures and can even be had with permanent printed decorator design or a cloth finish laminated to it.

Some of the other materials include prelaminate building stock of lead-gypsum board, lead plywood, lead-cored doors, leaded troweling and sealing compounds, and other specialties.

Information on the status of these materials, the performance that they can be expected to give, and help in selecting and using them are all available through the Lead Industries Association, Inc., 292 Madison Ave., New York, N. Y. 10017. -4-