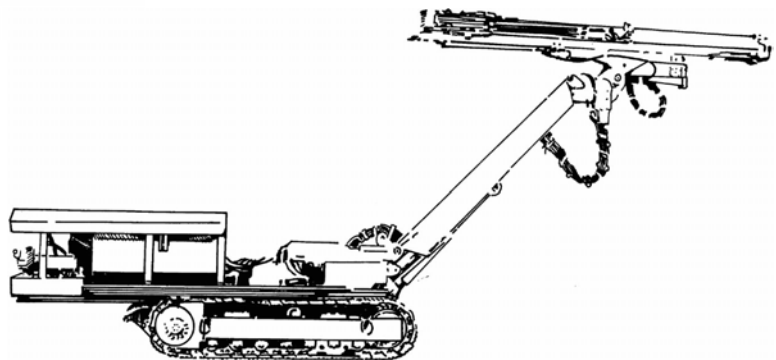
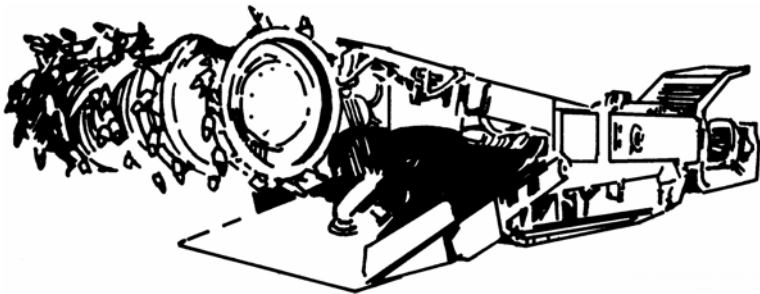
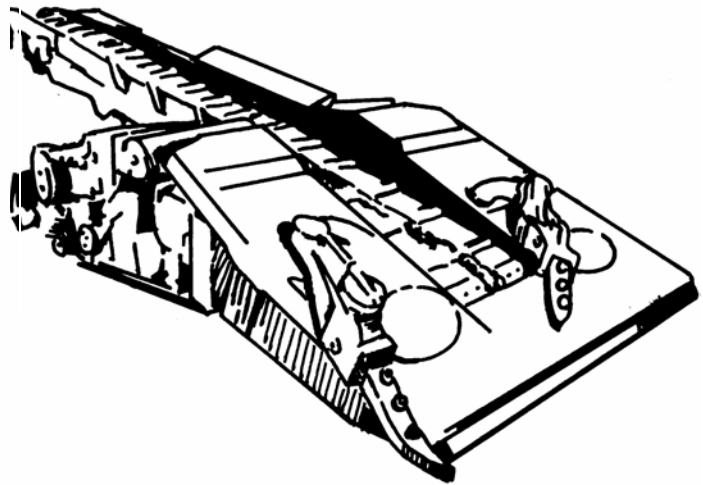
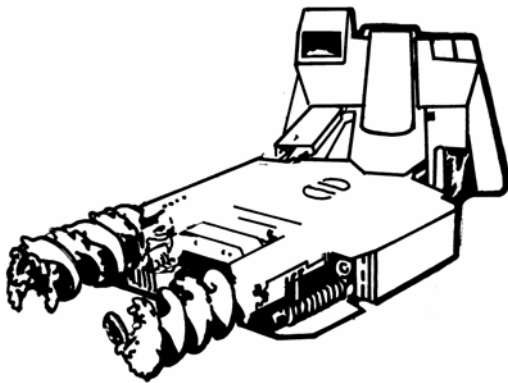


Noise Control Resource Guide - Underground Mining



U. S. Department of Labor
Mine Safety and Health Administration



**U.S. Department of Labor
Mine Safety and Health Administration**

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CONTENTS

Preface.....	1
Introduction	3
Noise Exposure Reduction.....	4
Dose from Multiple Noise Sources.....	5
Acoustical Materials	7
Flammability Guidelines.....	9
Installation Methods.....	9
Underground Mining Noise Controls	11
Continuous Miners – Auger Type.....	12
Continuous Miners – Drum Type	18
Conveyors – Chain.....	23
Cutting Machines.....	27
Drills (Jumbo).....	28
Fan Systems (Mine Ventilation).....	30
Hand-Held Pneumatic Drills.....	32
Load-Haul-Dumps (LHDs).....	34
Loaders – Face	36
Locomotives – Diesel	40
Longwalls – Shear and Plow.....	42
Mantrips – Rail-Mounted.....	45
Roof Bolters.....	47
Roof Scalers.....	51
Shuttle Cars – Diesel.....	53

APPENDICES

A. Partial listing of equipment manufacturers, addresses, Internet sites	54
B. Suppliers list of acoustical materials	58
C. Partial listing of aftermarket cab manufacturers, suppliers of stud-welding systems	77
D. Literature references.....	80

NOISE CONTROL RESOURCE GUIDE - UNDERGROUND MINING

PREFACE

The Mine Safety and Health Administration's (MSHA) Noise Control Resource Guide series is a compendium of resource information and guidance for reducing miners' noise exposures at coal and metal and nonmetal surface mines, underground mines, and mills and preparation plants. The Noise Control Resource Guides represent the Agency's continuing efforts to assist mine operators in lowering noise exposure, preventing miner hearing loss and achieving compliance with the Occupational Noise Exposure Standard (30 CFR Part 62).

Within this guide, you will find information that will help you:

- ❖ Identify noise sources on underground and surface mining machinery, and in mills and preparation plants.
- ❖ Determine the availability of engineering noise controls from original equipment manufacturers (OEMs) for new equipment.
- ❖ Identify sources of retrofit noise controls from the OEMs and after-market suppliers of noise controls, and in some cases, provides information on engineering controls that can be designed, fabricated, and installed at the mine site.
- ❖ Estimate the costs of engineering controls, where such costs are known.
- ❖ Identify contacts for machinery suppliers, and suppliers of sound and vibration controls and materials.

Technical experts and practitioners in the field of noise in the mining industry, as well as manufacturers of noise control equipment, provided information contained in this noise control resource guide. The material found in this guide should be considered a resource and not be construed to be a mandatory requirement. This guide should be used in conjunction with MSHA Program Information Bulletin (PIB) P04-18 "Technologically Achievable, Administratively Achievable and Promising Noise Controls (30 CFR Part 62)".

Due to the variability of the mining environment, it would be difficult to compile a document that would present controls that are feasible in each and every situation. The individual noise controls or series of controls found herein can reduce the exposure of most miners; however, they must be designed, tailored, and implemented according to the specific situation. Questions regarding technical applicability and feasibility of the controls to a specific mining situation should be referred to the local MSHA office.

DISCLAIMER

These guides are a compendium of resource information and guidance for reducing a miner's overexposure to noise. However, it is not an "all encompassing" answer to every problem dealing with overexposure to noise. There are three things the reader should keep in mind:

1. Every type of equipment used in mining operations is not included in these guides. Only the more common equipment types are discussed.
2. With regard to manufacturers of mining equipment and distributors of control products, the industry is a very dynamic one. Companies change names, merge, go out of business, relocate, etc. Thus, some of the information contained in the appendices may not be the most current. It is suggested that the reader may want to explore the Internet, or some of the monthly periodical magazines for current manufacturer/distributor information.
3. Reference to manufacturers is made to facilitate understanding and does not constitute an endorsement by the Mine Safety and Health Administration.

INTRODUCTION

The Mine Safety and Health Administration (MSHA) promulgated Health Standards for Occupational Noise Exposure for the metal, nonmetal and coal mining industry (30 CFR Part 62) in an effort to reduce the number of miners who will experience a material impairment of hearing. Part 62 establishes the full shift Permissible Exposure Level (PEL) at a TWA_8 of 90 dBA (100% Dose) and establishes an Action Level (AL) at a TWA_8 of 85 dBA (50% Dose). The operator is required to enroll affected miners in a Hearing Conservation Program if the Action Level is met or exceeded. If the PEL is exceeded, the mine operator is required to use all feasible engineering and/or administrative controls to reduce miner's exposure to the PEL.

The Noise Control Resource Guides deal with noise controls that are available on types of mining equipment typically used in different mining environments. The first guide covers surface mining, the second on underground mining, and the third on mills and preparation plants.

These guides will reference the type of mining equipment and noise controls that are available from the manufacturer of the equipment or as a retrofit for the equipment. If the cost of the control is well established and reliable, this information is also included. The guides do not address generic administrative controls that are universally accepted as being effective, i.e. rotation of workers, time limitations, distance, etc. However, if specific administrative controls have been shown to provide significant noise reduction, these administrative controls will be discussed with the equipment or the process. The guides also contain appendices that list equipment manufacturers, noise control products, aftermarket manufacturers, reference sources and contact information; however, these lists are not all inclusive.

NOISE EXPOSURE REDUCTION

In general, the amount of noise reduction achievable by, and the technologically achievability of a given noise control or a group of noise controls is widely variable and must be considered on a case-by-case basis. The amount of noise reduction that can be obtained from an individual noise control or suite of controls is dependent on a large number of factors:

- ❖ Type and model of machine
- ❖ Number and types of controls implemented
- ❖ Physical environment in which the machine is used
- ❖ Acoustical environment in which the machine is used
- ❖ Type of work the machine is performing
- ❖ Presence of other noise sources in the environment
- ❖ The degree to which the machine is noise-controlled prior to the installation of additional retrofit noise controls
- ❖ Quality of materials that are selected and used
- ❖ Quality of the installation of the controls
- ❖ Quality of the maintenance program for the machine
- ❖ Maintenance of noise controls
- ❖ Use of engineering controls in combination with administrative controls
- ❖ Experience of operator in using the machine

For these reasons, each of the machine and noise controls shown in this guide do not have specified noise reductions. Such figures are only obtainable after a complete acoustical investigation is conducted on each individual machine. Each noise control case study has a set of conditions that are unique to it.

Since the noise standards treat engineering controls equally with administrative controls, one may use either engineering or administrative controls or a combination of both to reduce miner's exposures. Each noise control guide is a valuable source of information for mine operators to use when deciding what type of mitigative action is best suited for the conditions encountered at their operation. In addition to the applicability of the control, the operator will need to consider the specific materials used when installing an engineering control. It is important to remember that the effectiveness of any engineering control used to reduce noise exposures is dependent on the appropriately selected, correctly installed and properly maintained acoustical material. As with most everything used in the mining industry, if an effective maintenance program is not put in place, the noise control will not last. Sometimes noise controls are expensive. It is in the operator's best interest to maintain the controls so as to reap the benefits of their investment.

DOSE FROM MULTIPLE NOISE SOURCES

Special considerations should be afforded to multiple noise sources, a situation common in the mining industry. Multiple noise sources present unique challenges in their measurement and control. The effectiveness of noise controls on multiple noise sources needs to be systematically evaluated in light of their contribution to a miner's exposure. To further illustrate this, consider the following:

When it is determined that there are multiple noise sources that contribute to a miner's noise exposure, and that these sources expose the miner to high levels of noise in a serial fashion, general noise control practices would direct you to lower the sound level of the highest noise source. However, noise exposure (dose) is a function of the sound level AND the amount of time the miner is exposed to the noise. Therefore, in planning which noise source(s) to treat, it is important to look at the sound level and the exposure time.

Table 1 illustrates the roles of sound level and exposure time. A particular miner's exposure is comprised of four levels and intervals: S1, a source of 90 dBA for 4 hours; S2, a source of 95 dBA for 2 hours; S3, a source of 100 dBA for 1 hour; and S4, a source of 88 dBA for 1 hour.

Source	Sound Level (dBA)	Measured Exposure Time (Hr.)	Allowable Exposure Time (Hr.)	% Contribution to PEL Dose
S1	90	4	8	50
S2	95	2	4	50
S3	100	1	2	50
S4	88	1	-	0
S3 mod	97	1	3.05	33
S1 mod	87	4	-	0
S2 mod	92	2	6.1	33

The miner's exposure [S1 + S2 + S3 + S4], computed in terms of percent dose compared to the permissible exposure level (PEL), with a 90-dBA threshold for 8 hours, is 150% [50 + 50 + 50 + 0].

By treating only the highest sound level source (S3) by application of an engineering noise control and reducing it from 100 dBA to 97 dBA (S3mod), the miner's exposure [S1 + S2 + S3mod + S4] would be 133% [50 + 50 + 33 + 0].

However, if the source to which the miner is exposed for most of the time (S1) is modified to obtain a 3-dBA reduction from 90 to 87 dBA [S1mod], the impact is to reduce the miner's exposure [S1mod + S2 + S3 + S4] to 100% [0 + 50 + 50 + 0]. Actually, a noise control yielding only a 1-dBA reduction applied to (S1) would achieve the same result.

If sources (S1) and (S2) are treated by 3 dBA each and reductions from 90 dBA to 87 dBA and from 95 dBA to 92 dBA obtained, the miner's resultant exposure [S1mod + S2mod + S3 + S4] would be 83% [0 + 33 + 50 + 0].

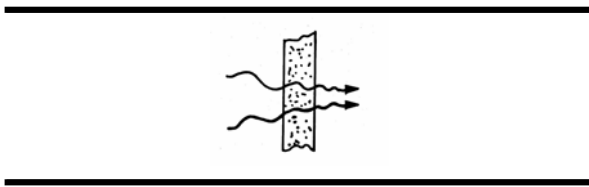
It is very important when conducting noise control work to examine the makeup of the miner's full shift noise exposure. The exposure may not be based solely on the highest sound level or the longest exposure time. It is the total noise dose, not just the individual sound levels or exposure times.

ACOUSTICAL MATERIALS

Acoustical materials can reduce noise either by absorbing or blocking sound waves, or damping vibrations. These materials are generally referred to as absorption, barrier, composite, and damping materials, and they can substantially increase the effectiveness of other acoustical devices. Selection of appropriate acoustical materials must be made based on a firm noise control engineering basis and commensurate to the task, properly installed, used, and maintained.

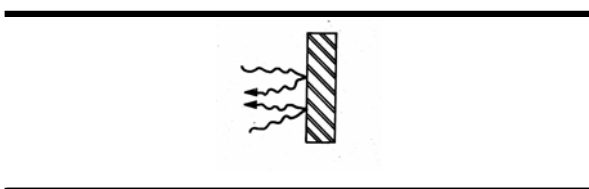
Acoustical devices include, but are not limited to, mufflers, silencers and enclosures. Absorption, barrier, composite, and damping/isolation materials are defined as follows:

Absorption



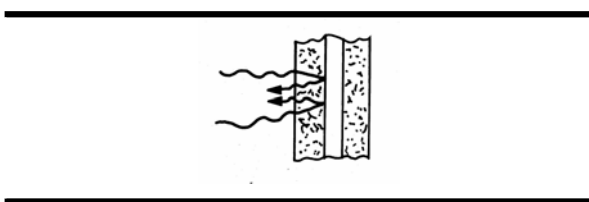
A material designed to absorb sound waves. It is not intended to be used for blocking sound waves. Some examples of absorption materials are foam and fiberglass. It may be used inside a cab or enclosure to prevent the reverberation of sound waves.

Barrier

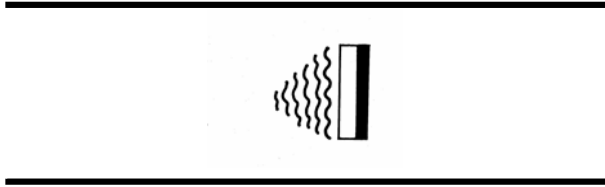


A material designed to block sound waves. It does not absorb sound waves. A typical use of a barrier materials would be on the firewall of a bulldozer to block low frequency engine noise. Some examples of sound barriers are mass-loaded vinyl curtains, lead, plywood, glass, steel and concrete

Composite



A material designed to both absorb and block sound. It may be used to provide additional barrier qualities to an enclosure or operator cab as well as absorption of radiating sound waves. Some examples are combinations of foam, vinyl, fiberglass and lead.

Damping/Isolation

Materials designed to damp, remove the ring from vibrating surfaces and decouple source from structure.

Flammability Guidelines

Although current MSHA regulations do not restrict the use of acoustical materials due to their flammability characteristics, MSHA has established a voluntary guideline regarding the flame spread index of acoustical materials. These indices were established based upon the results of ASTM E-162 – Radiant Panel Tests. Basically, a flame spread index of 25 or less is recommended for acoustical materials installed on equipment used in underground mines and a flame spread index of 50 or less for acoustical materials installed on equipment used at surface operations. Prior to the selection, installation and use of acoustical materials, operators should be aware of their flammability properties.

Installation Methods

Acoustical materials may be installed in the following ways:

1. Adhesives – The use of an industrial adhesive requires a thorough cleaning of the surface area. The adhesive should then be applied according to the manufacturer’s specifications. While the use of adhesives is economical and effective for installing the materials, the material cannot be removed intact and a potential hazard may exist from toxic fumes if subjected to intense heat. Also special solvents, that may have special conditions for use to avoid potential toxicity problems, may be needed to remove the adhesives.
2. Stud Welding – This method involves the use of a stud welder to attach a threaded, copper-coated stud to a metal surface such as a cab wall. The stud welder consists of a capacitance discharge unit and a hand-held triggering device, which holds the stud in place for welding. Upon release of the charge, an arc is struck between the tip of the stud and the metal surface, heating a small area. Simultaneously, the stud is plunged into the molten metal and the weld is completed. For a good quality weld the metal paint must be removed from the metal. The acoustical material is placed over the stud and secured with a rubber-cover button. This cover button not only holds the material in place, but offers a physical protection from the metal stud. The stud-welding method requires little surface preparation and allows for the removal and reinstallation of the materials for maintenance or repairs.

3. Bolts and Straps – Material may be held in place utilizing metal straps, which are secured by bolts and nuts at each end. This type of installation allows for easy removal and replacement of the acoustical material without damage. A perforated metal covering may be used in place of the straps to secure and protect the acoustical material. In some situations the weight of the acoustical materials may have an effect on the load bearing characteristics of the stick-on studs. Care should be taken.
4. Stick-on Studs – This method involves the use of threaded studs pre-welded to a metal disc having a self-adhesive backing. Surface preparation involves a thorough cleaning to remove oil, grease, or other contaminants. These studs may be attached to all types of surfaces. The materials are then pushed over the studs and held in place with a rubber-cover button.

COMPLIANCE ASSISTANCE

MSHA has produced several documents to aid the mining industry in complying with Part 62. These include:

- ❖ Hearing Protector Noise Reduction Rating List
- ❖ Compliance Guide to MSHA's Occupational Noise Exposure Standard – IG 33
- ❖ A Guide to Conducting Noise Sampling – IG 32
- ❖ Audiometric Testing Reference Guide for MSHA's Occupational Noise Exposure Standard – IG 57
- ❖ Program Information Bulletin (PIB) No. P04-05 - Basis for Assigning a P- Code for Noise Overexposure
- ❖ Program Policy Letter No. P04-IV-I and P04-V-1 Noise Enforcement Policy
- ❖ Program Information Bulletin (PIB) No. P04-18 "Technologically Achievable, Administratively Achievable and Promising Noise Controls" (30 CFR Part 62) dated August 2, 2004

MSHA will work with mine operators, miners, labor unions, industry associations, noise partnerships, mining equipment and noise control manufacturers, noise engineering professionals, and the National Institute for Occupational Safety and Health (NIOSH) in updating this document to reflect new solutions and experiences in controlling occupational noise exposures in the mining industry.

These compliance assistance documents are all available at MSHA's web site at <http://www.msha.gov>.

UNDERGROUND MINING NOISE CONTROLS

In underground mining, there is a wide variety of equipment used as well as site-specific mining practices, etc. The first recommendation in controlling noise is to identify the highest noise exposure tasks and the sources that contribute to the miner's noise exposure. Thus, it may be necessary to examine all aspects of the work shift (portal to portal) including transportation into and out of the mine, and the equipment operated by the specific miner, as well as the equipment which may be positioned in close proximity to the miner.

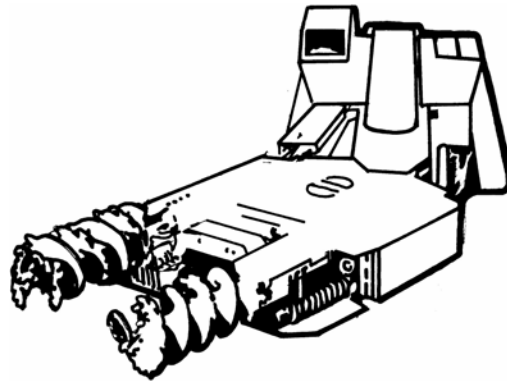
1. Engineering Controls

The application of engineering noise controls to underground mining equipment may, in general terms, be a more complicated task compared to that involving surface or processing facilities. In the case of new equipment, it is most advantageous to purchase the equipment from the manufacturer with the noise controls already engineered into the unit. If there is the availability of a fully-treated operator cab and ceiling height clearances permit, then in many cases the fully treated operator cab would be the most effective means of protecting the miner from overexposure. In the holistic approach, the treated cab would protect the miner from dust, temperature extremes, as well as overexposure to high sound levels. In the case of retrofit engineering controls on existing equipment, this may necessitate the removal of the equipment from the mine. In many instances, the noise controls can be applied during a scheduled rebuild. In some situations, the utilization of radio remote controls to remove the miner from the close proximity of the equipment may be considered.

2. Administrative Controls

There are many possible combinations of administrative controls that may be used to reduce a miner's noise exposure. A few general techniques to consider are time management, including maintenance during idle time and work rotation. Also, dividing routine work between different work shifts and changing actual shift lengths are other examples of administrative controls that may be utilized. However, because of the site-specific work practices, administrative controls need to be considered on a case-by-case basis.

CONTINUOUS MINERS - AUGER TYPE



Auger-type Continuous Miners are found only in low seam, underground coal mining. Twin auger heads with cutting bits mine and transport the coal to the gathering arms. The machine discharges the coal onto a series of bridges for transport out of the mine.

1. Original Equipment Manufacturer (OEM)

The following table illustrates OEMs offering noise controls for new underground auger miners as standard equipment. Local dealers should be contacted for availability and further details on noise controls available.

Noise Control Availability from OEMs		
Manufacturer	Treated Cutting Heads	Treated Pan Line
Fairchild International	X	X

"X" indicates product availability.

For underground auger miners without noise controls, additional retrofit noise controls are needed. For details regarding retrofit noise control applications, see Section 2.

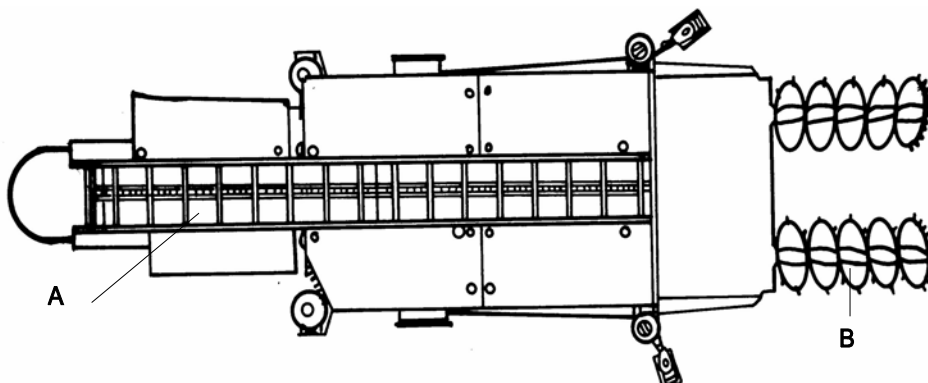
2. Retrofit Noise Controls

This section deals with underground auger miners without noise controls. The effectiveness of the retrofit noise controls is dependent upon the quality of both acoustical materials and installation. The following manufacturers should be contacted for information regarding retrofit noise control kits or options.

Retrofit Noise Controls Available from OEMs		
Manufacturer	Treated Cutting Heads (Cost)	Treated an Lines (Cost)
Fairchild International	X (\$20,000 per pair)	X (\$12,000-\$15,000)

"X" indicates product availability.

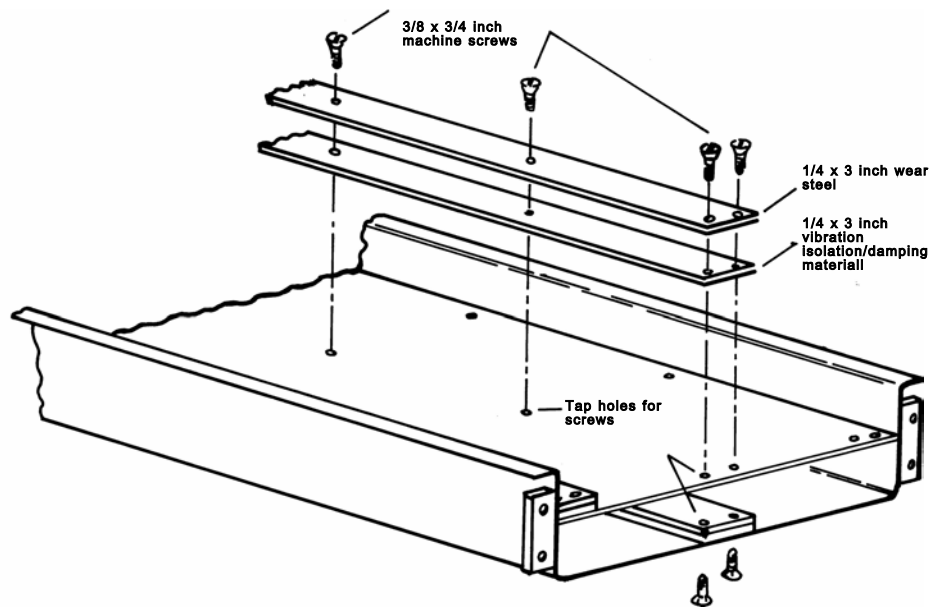
If the retrofit noise control kits or options are not commercially available, the following illustrates the "do-it-yourself" approach which can be done in a shop area or rebuild facility.



Areas Where Retrofit Noise Controls can be Applied to an Auger-Type Continuous Miner

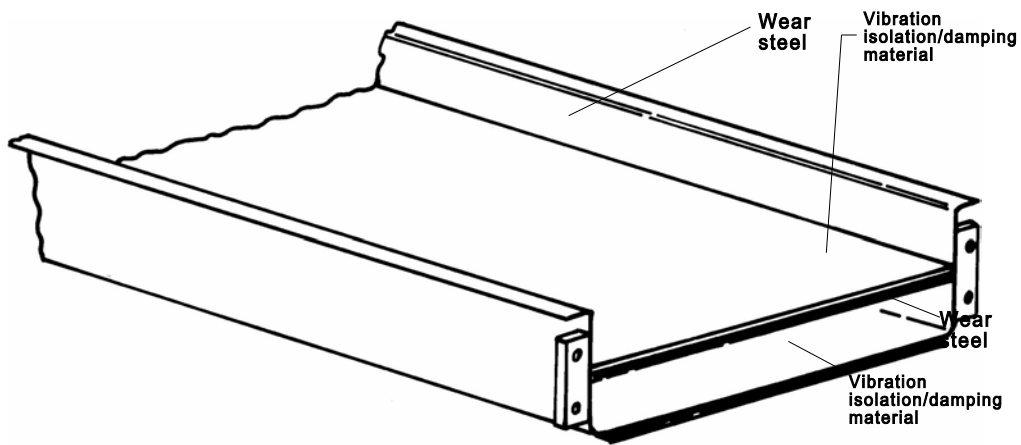
A. Conveyor Pan Lines

The conveyor pan lines should be treated to dampen vibration and also to isolate the chain conveyor flights from the pan. This can be accomplished with individual wear strips shown in the following illustration, or full coverage of the pan line as also illustrated. The chain turn-around should provide smooth transition for the chain and flights.



Installation of Wear Strips on Pan Line

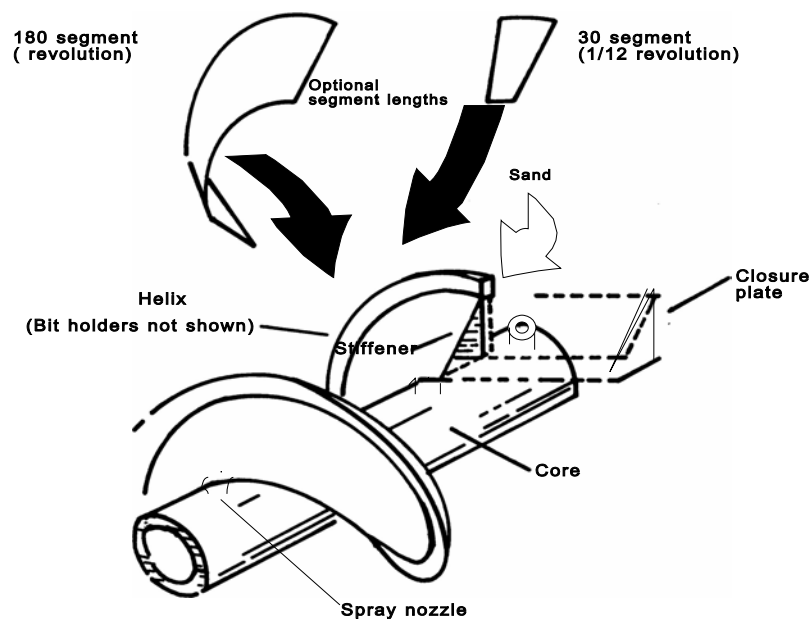
Note: Installation of the individual strips can be done by either welding or fastening with machine screws to the deck. If wear strips are welded in place the width and length of the damping material should be reduced so as to prevent damage to the material and the possible emission of toxic vapors.



Full Coverage Treatment to Both Upper and Lower Pan Lines

B. Auger Cutting Heads

The auger cutting heads are one of the major noise sources. A retrofit noise control application was developed by the U. S. Bureau of Mines (USBM). Originally, it was called the sand-filled cutting head because of the materials used. Explicit details for the construction of these cutting heads can be found in the USBM Informational Circular (IC) 8971. This method utilizes a steel stiffener welded to the one side of the cutting head helix. The hollow space formed between the stiffener and the helix is then filled with sand. This is shown in the following illustration.



Sand-Filled Auger Cutting Head

It should be emphasized that the construction of the sand-filled auger cutting head should only be done in a shop or rebuild facility.

C. Barriers

When a continuous-mining machine is operated from an operator's compartment, a barrier can be used to block and redirect sound away from the machine operator. A clear barrier such as plexiglass can be installed between the operator and the chain conveyor to reduce the operator's exposure. If the seam height varies, the barrier can be hinged so it can be easily lowered.

D. Transfer Points

When a bridge haulage system is being used, proper alignment of the bridge sections will reduce the impact noise generated as the material drops at the transfer points.

E. Maintenance

Good maintenance of the continuous-mining machine can help eliminate noise sources such as loose covers causing metal-on-metal impacts. Maintaining proper tension of the conveyor chain will also reduce the noise generated by the flights impacting the side of the pan. This will provide for a smoother transition of the chain and flights around the tail piece.

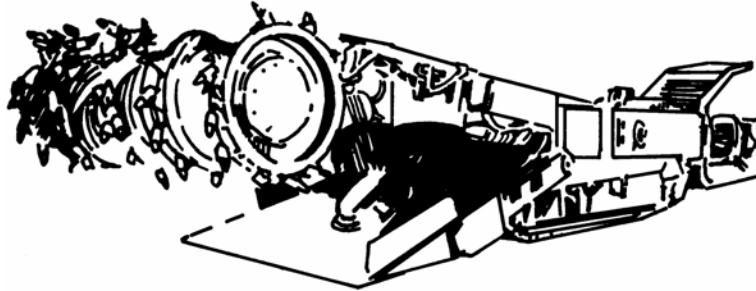
3. Alternative Technology

Under certain situations, remote control may be used as a noise control by increasing the distance between the operator and the machine. The use of remote control is dependent upon mining methodology and is very site-specific.

4. Administrative Controls

The sound levels created by the chain conveyor on continuous-mining machines and bridges are considerably higher when they are running with no material on them. Therefore, limiting the amount of time a chain conveyor is run without conveying material can reduce the overall exposure.

CONTINUOUS MINERS - DRUM TYPE



Drum-Type Continuous Miners are found in both coal and metal non-metal mines (salt, potash, nickel). They come in various configurations, some are operated by remote control and others operated from the machine. Some new machines have roof bolters mounted on either side. A large spinning drum with cutting bits cuts the material. The material falls on the floor and is picked up by the gathering arms. The machine discharges the material either on the floor behind it or directly into shuttle cars for transport. If the material is deposited back on the floor a loader machine gathers it and loads it into a shuttle car.

1. Original Equipment Manufacturers (OEM)

The following table illustrates OEMs offering noise controls for new continuous miners. Local dealers can provide cost and availability information on noise controls available.

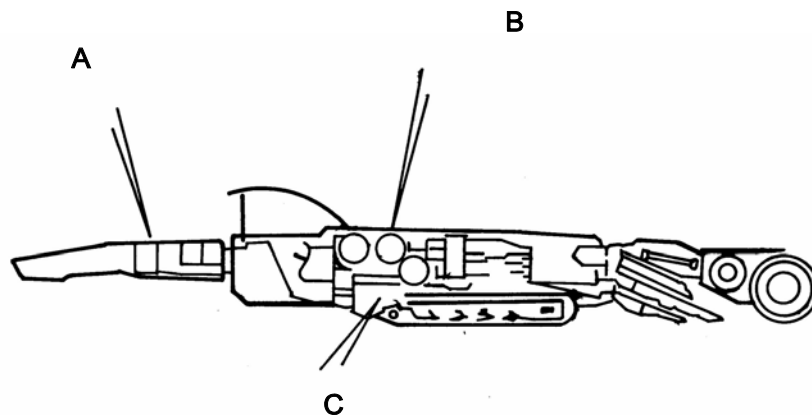
Noise Control Availability from OEMs			
Manufacturer	Treated Pan Line	Treated Dust Scrubber	Remote Control
Eimco	X	X	X
Jeffrey	X	None	X
Joy	X	X	X
Simmons-Rand	X	X	X

"X" indicates product availability

For continuous miners without noise controls, additional retrofit controls are needed. Section 2 details these retrofit approaches.

2. Retrofit Noise Controls

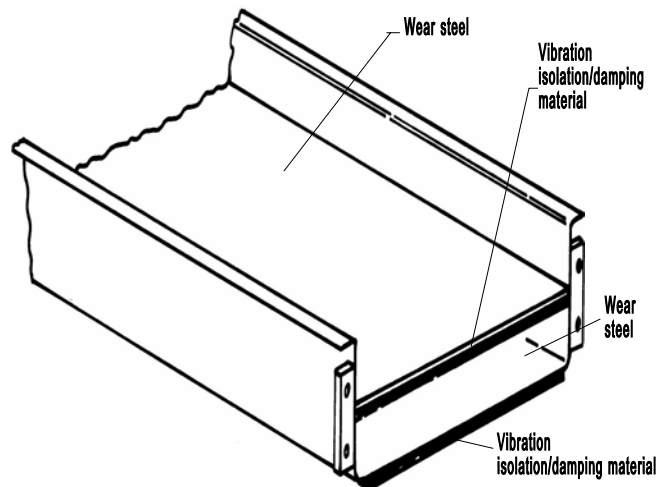
This section covers continuous miners without noise controls. The effectiveness of noise controls depends upon the quality of the acoustical materials and the installation. If a retrofit kit is unavailable, the acoustical materials may be purchased in bulk from suppliers listed in Appendix B. Retrofit noise controls should be applied to the following areas:



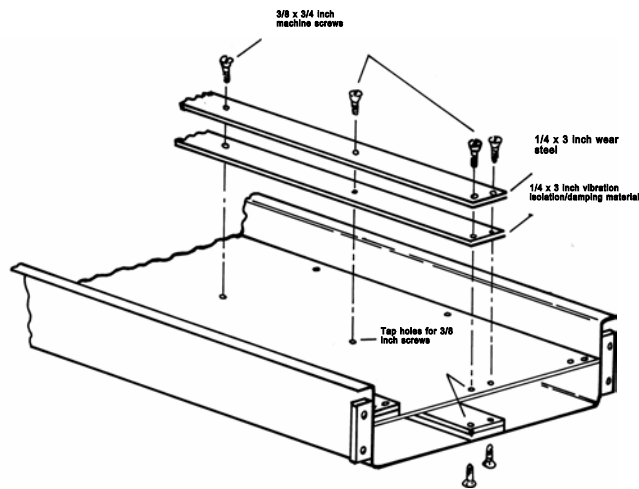
Areas Where Retrofit Noise Controls May be Applied on a Continuous Miner - Drum Type

A. Conveyor Pan Line and Chain Turn-Around

The conveyor pan line should be treated to dampen vibration and to isolate the chain and flights from the pan. This can be accomplished with individual strips or full coverage. The chain turn-around should provide smooth transition for the chain and flights.



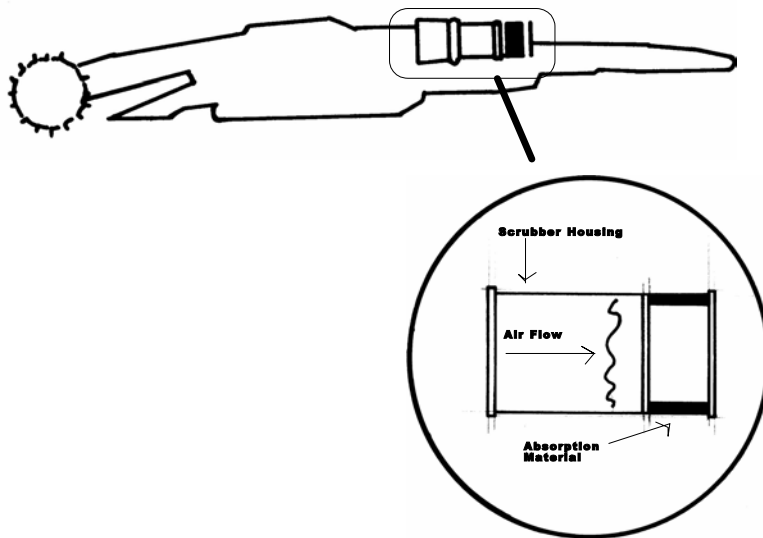
Constrained-Layer Damping of Conveyor Pan Using Full Coverage



Constrained-Layer Damping of Conveyor Pan
Using Individual Strip

B. Dust Scrubber

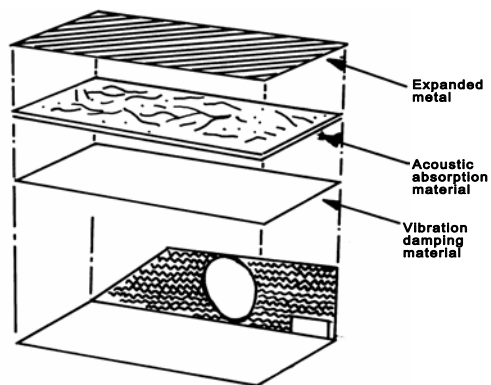
An acoustical silencer should be installed on the scrubber exhaust. The silencer is made from acoustical foam with a porous cover to protect against dust, water, and grease. This item must be properly and frequently maintained to assure its effectiveness. There are several types of silencers available. Selection is dependent upon the type of continuous-mining machine and scrubber being used. There is an acoustical-foam wrap available which can be wrapped around the scrubber housing to reduce the noise. There is also a sleeve-style attenuator, which slides inside the housing to absorb scrubber exhaust noise, an attenuator which is bolted onto the scrubber exhaust to help reduce the noise is also available. Space limitation must be considered when choosing these items. For scrubbers with dual exhausts and crossover duct-work, a kit is available for applying sound-absorbing material to the crossover duct-work.



Acoustical Silencer
Installed on Scrubber
Exhaust

C. Motor Covers

The motor cover panels can be treated to reduce motor noise reaching the operator. The acoustical materials needed for this treatment include an absorptive layer and a vibration damping layer.



Example of Layering Applied to Motor Covers

D. Barriers

A barrier can be used to block and redirect sound away from the machine operator when a continuous-mining machine is operated from an operator's compartment. A clear barrier, such as plexiglass between the operator and chain conveyor to reduce the operator's exposure. If the seam height varies, the barrier can be hinged so it can be easily lowered.

E. Transfer Points

When a bridge haulage system is being used, proper alignment of the bridge sections will reduce the impact noise generated as the material drops at the transfer points.

F. Maintenance

Proper maintenance of the continuous-mining machine can help eliminate noise sources such as loose covers causing metal-on-metal impacts. Maintaining proper tension of the conveyor chain will also reduce the noise generated by the flights impacting the side of pan and provide for a smoother transition of the chain and flights around the tail piece.

3. Alternative Technology

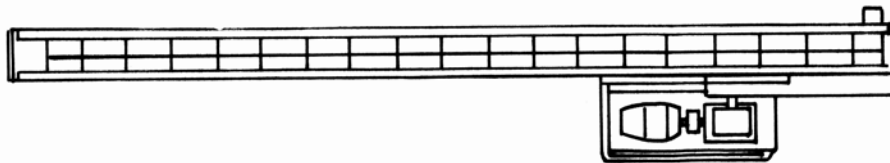
Under certain situations, remote control can be used as a noise control by increasing the distance between the operator and the machine. The use of remote control is dependent upon mining methodology and is very site-specific. Manufacturers of continuous miners can provide details on remote control systems for their machines.

4. Administrative Controls

The sound levels created by the chain conveyor on continuous-mining machines and bridges are considerably higher when they are running with no material. Therefore, limiting the amount of time a chain conveyor is run without conveying material can reduce the overall sound levels.

In certain situations, remote control can be used as a noise control by increasing the distance between the operator and the machine. In cases where remote control and a scrubber are used, the operator must consider the noise emitted from the scrubber exhaust when positioning them self. Standing directly behind the scrubber exhaust can greatly increase sound levels and exposures. Manufacturers of continuous miners can provide details on remote control systems for their machines.

CONVEYORS - CHAIN



Conveyors transport the cut ore from the gathering arms of a continuous miner to the discharge point or from one end of a bridge section to the other. They are also utilized to transport coal along a longwall panel. They are constructed in sequences of several links of chain to a metal flight.

1. Original Equipment Manufacturer (OEM)

The following table illustrates OEMs offering noise controls for new Chain Conveyors. Local dealers can provide cost and availability information on noise controls available.

Noise Control Availability from OEMs		
Manufacturer	Treated Pan Line	Remote Control
Eimco	X	X
Jeffrey	X	X
Joy	X	X
Simmons-Rand	X	X

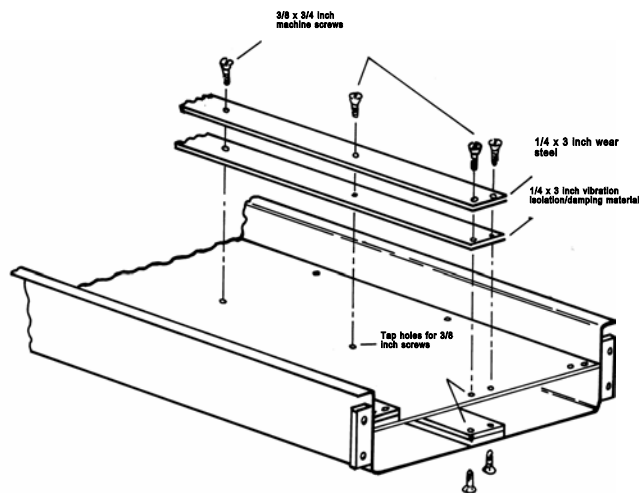
"X" indicates product availability.

For conveyors without noise controls, additional retrofit controls are needed. Section 2 details these retrofit approaches.

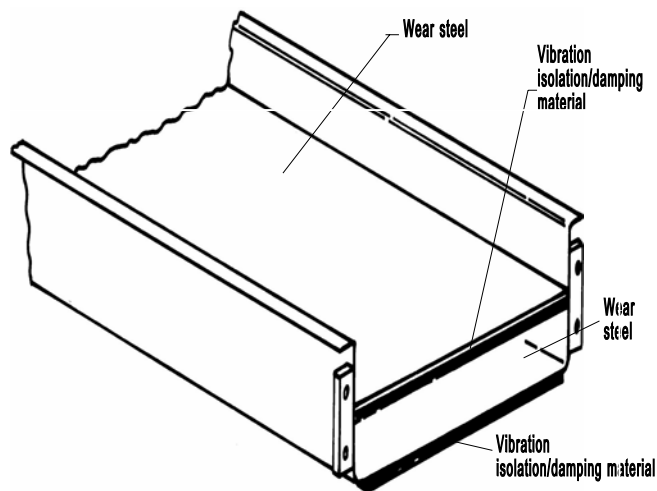
3. Retrofit Noise Controls

This section covers conveyors without noise controls. The effectiveness of noise controls depends upon the quality of the acoustical materials and the installation. If a retrofit kit is unavailable, the acoustical materials may be purchased in bulk from suppliers listed in Appendix B.

The conveyor pan line should be treated to dampen vibration and to isolate the chain and flights from the pan. This can be accomplished with individual strips or full coverage. The chain turn-around should provide smooth transition for the chain and flights.



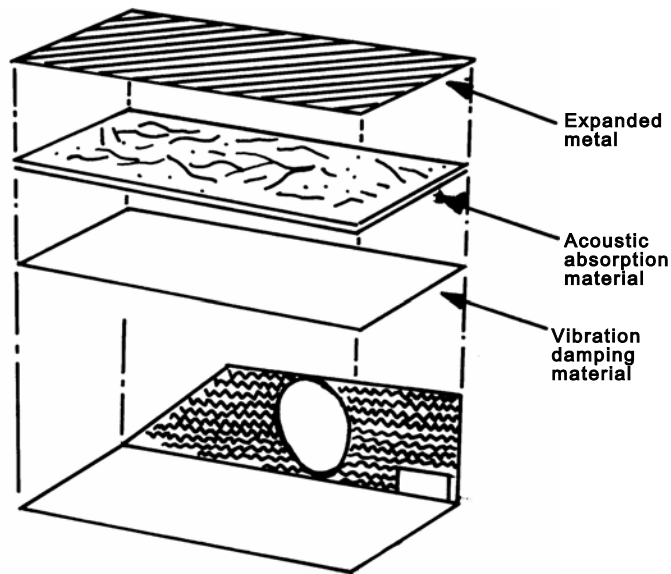
Constrained-Layer Damping of Conveyor Pan
Using Individual Strips.



Constrained-Layer Damping of Conveyor Pan
Using Full Coverage

B. Motor Covers

The motor cover panels can be treated to reduce motor noise reaching the operator. The acoustical materials needed for this treatment include an absorptive layer and a vibration damping layer.



Example of Layering Applied to Motor Covers

C. Barriers:

When a conveyor is operated from an operator's compartment, a barrier can be used to block and redirect sound away from the machine operator. A clear barrier, such as plexiglass can be installed between the operator and chain conveyor to reduce the operator's exposure. If the seam height varies, the barrier can be hinged so it can be easily lowered.

D. Transfer Points

When a bridge haulage system is being used, proper alignment of the bridge sections will reduce the impact noise generated as the material drops at the transfer points.

E. Maintenance

Proper maintenance of the conveyor can help eliminate noise sources such as loose covers causing metal-on-metal impacts. Maintaining proper tension of the conveyor chain will also reduce the noise generated by the flights impacting the side of pan this will provide a smoother transition of the chain and flights around the tail piece.

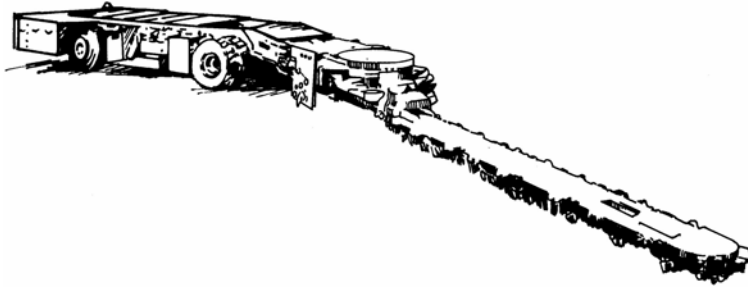
3. Alternative Technology

Under certain situations, remote control can be used as a noise control by increasing the distance between the operator and the machine. The use of remote control is dependent upon mining methodology and is very site-specific. Manufacturers of conveyors can provide details on remote control systems for their machines.

4. Administrative Controls

The sound levels created by the chain conveyor and bridges are considerably higher when they are running with no material on them. Therefore, limiting the amount of time a chain conveyor is run without conveying material can reduce the overall sound levels.

CUTTING MACHINES



Cutting machines are utilized in conventional mining (drill and shoot the face) of soft materials (salt and potash). The flat bar with a chain of bits on the outside edge undercuts the face and both sides of the face before it is shot creating a smooth floor and ribs.

1. Original Equipment Manufacturer (OEM)

Joy Technologies is the only OEM for underground cutting machines. Information from the manufacturer indicates that there is no noise controls incorporated into the new equipment of this type. Because of its unique design and operating positions, it would be difficult to install standard retrofit noise controls. Therefore, the only recommendation for noise control would be to assure that the cutting machine is properly maintained. This would include sharp cutting bits, proper chain tension, and replacing damaged or worn parts that may generate unwanted noise.

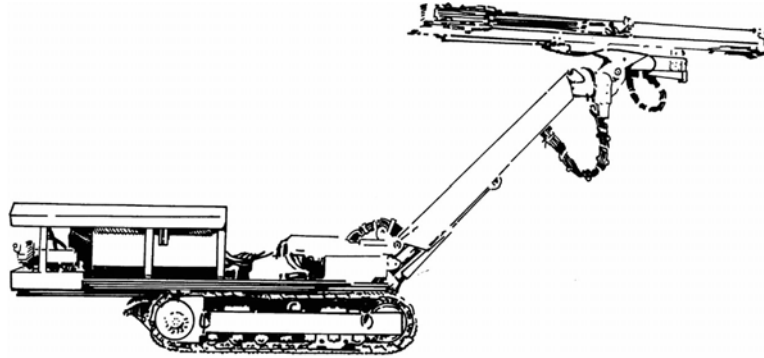
2. Retrofit Noise Controls

At the present time, there are no feasible retrofit noise controls available for underground cutting machines.

3. Alternative Technology

There is no alternate technology.

DRILLS (JUMBO)



Jumbo drills come in various configurations, either single, double, or triple booms on which drifter type drills are mounted. They are found in most all metal and non-metal, underground mines. They are utilized to drill blast holes in a pattern marked on the face.

1. Original Equipment Manufacturers (OEM)

The following table illustrates a partial list of OEMs for jumbo drills. Local dealers should be contacted for specific needs and details on noise controls.

Noise Control Availability from OEMs		
Manufacturer	Operator cab	Muffler
Cannon Industries, Inc.	X*	X
Tamrock	X**	X
J. H. Fletcher	X**	X
Atlas-Copco	X**	X
Gardner-Denver	X**	X

*DPI Series

**Certain Models

"X" indicates product availability.

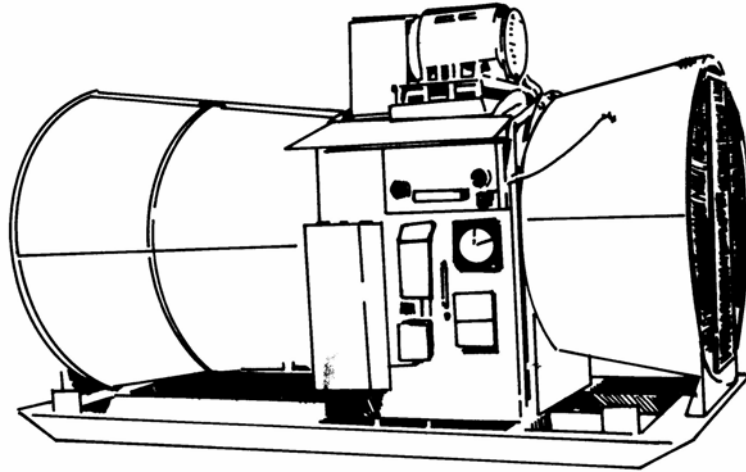
2. Retrofit Noise Controls

Suggested retrofit noise controls consist of the installation of an after-market cab where none currently exist (see Appendix C for listing of suppliers) and the installation of a muffler(s), if needed. Drill manufacturer or dealer should be contacted for selection of proper muffler(s).

3. Alternative Technology.

There is no alternate technology.

FAN SYSTEMS (MINE VENTILATION)



All underground mines are required to be properly ventilated. The main mine fans located on the surface provides forced ventilation. These fans pull/push air throughout the mine. Auxiliary fans are used to direct the air in active section or to increase the velocity of the air elsewhere in the mine.

1. Original Equipment Manufacturers (OEM).

The following table illustrates OEMs offering noise control for new fan systems. The typical cost on treated fan vanes is between \$1,000 to \$5,000 per vane.

Noise Control Availability from OEMs			
Manufacturer	Treated Fan Vanes	Install Muffler Ducts	Resonant Silencer
A. L. Lee Corp	None	X	X
Fairchild International	X	None	X
Hartzell Fan, Inc.	None	X	X
Dresser Industries	None	X	X
Joy Technologies	X	None	X
New York Blower Co.	X	None	X
Peabody ABC Corp.	X	None	None
Robinson Industries	None	X	X
Simmons-Rand Co.	X	None	X
Spendrup, Inc.	X	None	X
Air Pollution Control Products	X	None	None

"X" indicates product availability

Muffler ducts for inlet and discharge end of fans are commercially available for some models. However, use of this type of absorptive silencer might be jeopardized when used in a moist, dusty environment. The cost for muffler ducts can range from \$2,500 to \$8,000, depending upon the type of absorptive material used. The resonant silencer is suggested for mine fan applications for two specific reasons. The design of the silencer is such that the acoustical attenuating properties are not reduced if the appliance is operated in a moist, dusty environment. In addition, the design is tuned to specifically reduce the annoying tone of a fan, which is produced by the blade passing frequency. The cost on the resonant silencer can range from \$2,000 to \$12,000. Local dealers should be contacted for availability and further details.

2. Retrofit Noise Controls

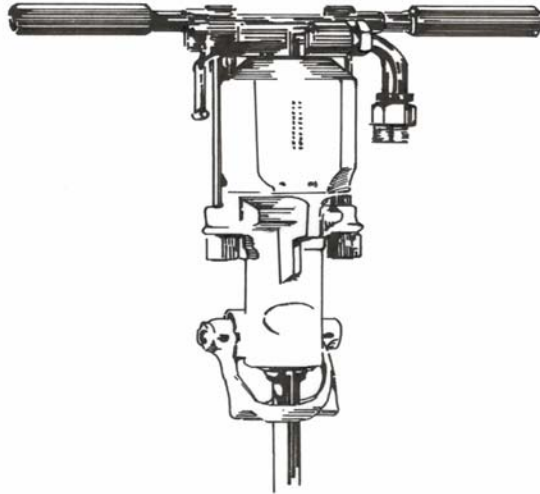
This section is for fans without noise controls. The effectiveness of noise controls is dependent upon the quality of both acoustical materials and installation.

Replacement of a noisy fan with a quieter model is recommended. Use of any noise control options in the above table is also suggested.

3. Alternative Technology

There is no alternate technology.

HAND-HELD PNEUMATIC DRILLS



Hand-held pneumatic drills can be found in above ground (sandstone, limestone, and dimension stone) and underground (coal, lead, zinc) mining environments. In some situations it is the primary tool used to mine and in other situations it is used as a utility tool.

1. Original Equipment Manufacturers (OEM)

The following table illustrates OEM's offering hand-held pneumatic drills.

Noise Control Availability from OEMs	
Manufacturer	Available Noise Controls
Mid-Western Machinery Company	Muffler
Sullair	Muffler
Chicago Pneumatic	Muffler
SIG Rocktools AG	Under Development

2. Retrofit Noise Controls

Install mufflers to reduce the exhaust air noise. Use equipment mufflers as provided by drill manufacturer.

Provide air pressure monitors and regulators at use locations.

Use the lowest air pressure possible to complete the task. Increased air pressure generates more noise without increasing work efficiency.

Collar the drill steel before applying full drilling pressure.

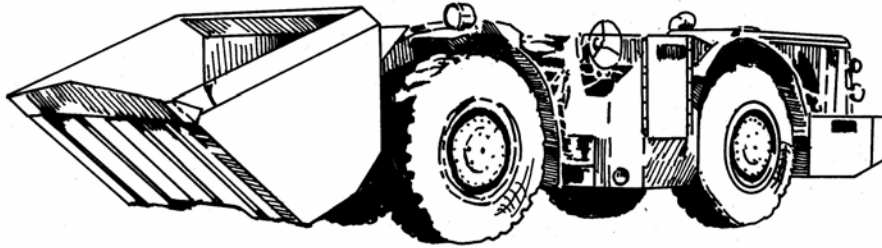
Use drill steels of different materials and use the smallest diameter steel to accomplish the task.

3. Alternate Technology

Use hydraulic drills

Use high pressure water-jet drills.

LOAD-HAUL-DUMPS (LHDs)



Load-Haul-Dump machines are used primarily in conventional underground metal and non-metal mining. They are used to scoop up ore and transport it a short distance e.g. to load a truck or feed a crusher. They come in a variety of sizes depending on the mine.

1. Original Equipment Manufacturers (OEM)

The following table illustrates the OEMs offering noise controls for load-haul-dumps (LHDs) as standard equipment. Local dealers should be contacted for specific needs and details.

Noise Control Availability from OEMs	
Manufacturer	Noise Controls
Atlas-Copco-Wagner, Inc.	Exhaust silencer/cowl-type muffler; absorptive material under canopy. A fully enclosed, sound-suppressed operator cab is available with air conditioning on Model ST-7.5Z
Dux Machinery Corporation	Exhaust silencer/cowl-type muffler
Mining Technologies International, Inc.	Cowl-type muffler - operator cab
Tamrock EJC USA, Inc.	Cowl-type muffler; absorptive material under canopy
Caterpillar-Elpinstone	Exhaust muffler, fully enclosed and sound suppressed, air conditioned operator cab.

2. Retrofit Noise Controls

The standard noise controls, which can be applied to all LHDs, include sealing the openings between the operator's compartment and the transmission compartment. Installing an appropriately matched exhaust silencer/muffler and the installation of acoustical materials reduces the noise on certain larger model machines.

Retrofit Noise Controls Available for Load Haul Dumps (LHDs)				
MANUFACTURER	SEAL OPENINGS	EXHAUST SYSTEM	ACOUSTICAL MATERIALS	SOUND SUPPRESSED CAB
Atlas-Copco-Wagner	X	X	X	None
Dux Machinery Corp.	X	X	X	None
Mining Technologies	X	X	X	In near future
Tamrock EJC USA	X	X	X	None
Caterpillar-Elphinstone	X	X	X	X

"X" indicates product availability.

The cost of exhaust mufflers is dependent upon engine size and machine configuration. They can range in price from \$150 to \$700.

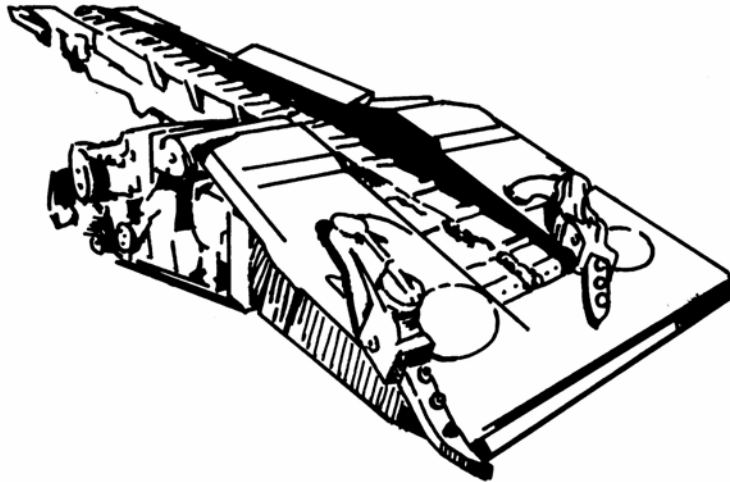
The cost of acoustical materials is dependent upon the size of the machine. They can range in price from \$500 to \$1200.

The cost of a sound suppressed, air-conditioned cab from Elphinstone is approximately \$70,000.

3. Alternative Technology

Under certain situations, remote controls can be used as a noise control by increasing the distance between the operator and the machine. The use of remote controls is dependent upon mining methodology and is very site-specific. Manufacturers of load-haul-dumps (LHDs) can provide details on remote control systems for their machines.

LOADERS - FACE



Face Loaders are primarily used in coal mines. After the coal is mined a loading machine with gathering arms picks up the coal and transports it to the rear of the machine where it is discharged into shuttle cars.

1. Original Equipment Manufacturer (OEM)

Joy Technologies is the only OEM having noise controls for new underground loaders. Local dealers should be contacted for specific needs and details.

Noise Control Availability from OEM	
Manufacturer	Sound Damping Conveyor (Cost)
Joy Technologies	X (\$30,000-\$40,000)

“X” indicates product availability.

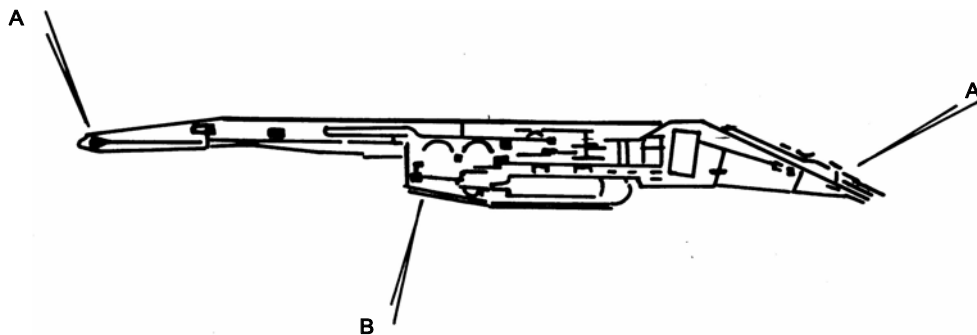
Information from the manufacturer indicates that a sound dampened conveyor can be engineered into new equipment of this type. For underground loaders without noise controls, this retrofit noise control is available. The cost of the sound dampened conveyor is indicated in the table above.

2. Retrofit Noise Controls

This section is for underground loaders without noise controls. The effectiveness of noise controls is dependent upon the quality of both the materials and installation techniques. If a retrofit kit is unavailable, the materials may be purchased in bulk from using Appendix C as a reference.

The following figure illustrates where the predominate noise is being generated on a loading machine and where the acoustical materials should be installed.

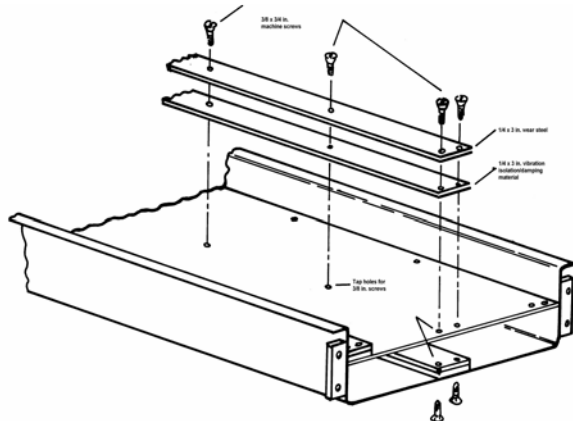
Areas Where Retrofit Noise Controls Should be Installed



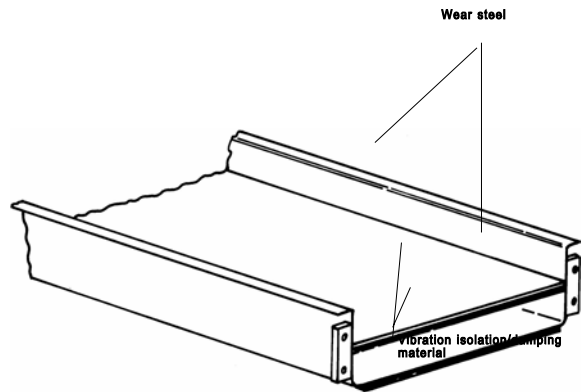
A. Conveyor Pan Line and Chain Turn-Around Noise

The conveyor pan line should be treated to dampen vibration. Isolating the chain and flights from the pan is also recommended. This can be accomplished with individual steel strips or full coverage, as shown in the illustration below. The chain turn-around should provide a smooth transition for the chain and flights.

Estimated cost - The estimated cost of noise controlling the pan line and turn-around points of an older underground loader is in the range of \$30,000 to \$40,000.



Conveyor Pan Line Treated With Individual Steel Strips

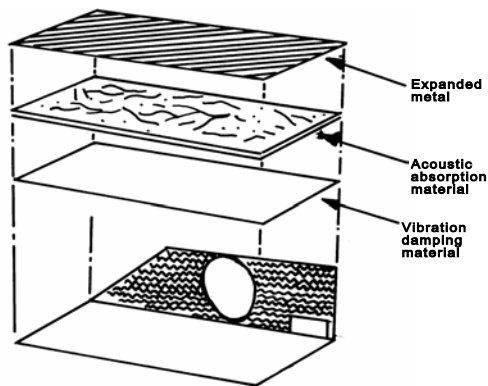


Conveyor Pan Line Treated with Full Coverage

B. Hydraulic Pump Compartments:

These pump compartments should be treated with both a barrier and absorptive-type acoustical materials so that the pump noise will be contained within the enclosure. Vibration material should also be installed where the pumps are mounted onto the loader structure. These areas are detailed in the illustration below.

Estimated cost - The cost of noise controlling the hydraulic pump compartments of an older underground loader is in the range of \$1,000 to \$2,000.

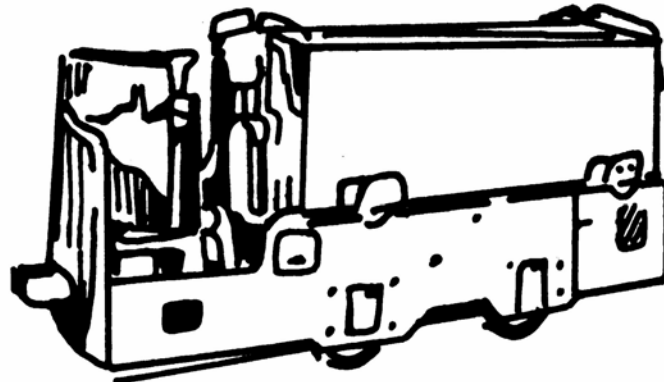


Barrier Insulation Applied to Hydraulic Pump Compartments

3. Alternative Technology.

Under certain situations, remote controls may be used as a noise control by increasing the distance between the operator and the machine. The use of remote controls is dependent upon mining methodology and is very site-specific.

LOCOMOTIVES - DIESEL



Diesel powered locomotives are utilized to transport coal, ore, workers, and other materials underground in mine cars.

1. Original Equipment Manufacturers (OEM)

The following table illustrates OEMs offering noise controls for new diesel locomotives as standard equipment. Local dealers should be contacted for availability and further details.

Noise Control Availability from OEMs			
Manufacturer	Exhaust Muffler	Enclosed Power Train	Optional Treated Operator Cab (Cost)
Brookville Mining	X	X	(\$5,000+)
Eimco	X	None	None
Goodman	X	None	None

"X" indicates product availability.

For diesel locomotives without any noise controls, additional retrofit noise controls are needed.

2. Retrofit Noise Controls

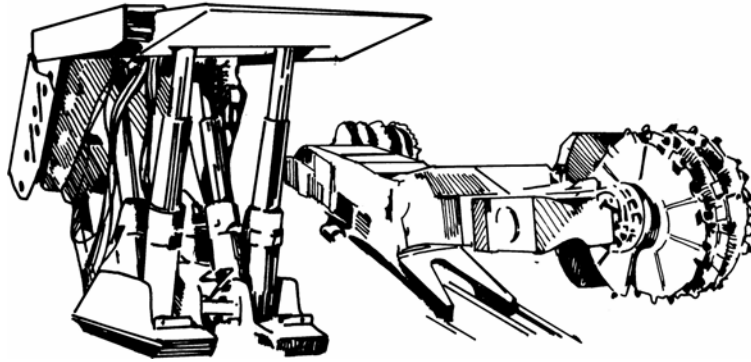
This section deals with diesel locomotives without any noise controls. The effectiveness of the retrofit noise controls is dependent upon the quality of both acoustical materials and installation.

- A. Installation of composite acoustical material around the operator compartment.
- B. Enclosure of transmission on some models where it is located near the operator position. The manufacturer should be contacted regarding this installation to assure that an overheating problem does not occur.

3. Alternative Technology

There is no alternate technology.

LONGWALLS - SHEAR AND PLOW



Longwall mining is a method of removing coal from an extended working face or wall. There are two distinct types of machines that are used to accomplish this task. A shearing machine makes vertical cuts in coal while a plow uses steel blades to plane the coal off the face. Radio remote controls for longwall systems are used for roof supports, cutter/shearer, plow systems, support movers, chain and chainless haulage units, and stage loaders. These controls tend to be more expensive than umbilical remote control systems.

1. Original Equipment Manufacturers (OEM)

The following table illustrates OEMs offering noise controls for longwall systems.

Noise Control Availability from OEMs		
Manufacturer	Radio Remote Control (Cost)	Umbilical Remote Control (Cost)
American Longwall	X (\$15,000-\$30,000)	X (\$5,000-\$10,000)
Anderson-Mavor	X (\$15,000-\$30,000)	X (\$5,000-\$10,000)
Eichoff Corporation	X (\$15,000-\$30,000)	X (\$5,000-\$10,000)
Joy Manufacturing	X (\$15,000-\$30,000)	X (\$5,000-\$10,000)
Simmons-Rand	X (\$15,000-\$30,000)	X (\$5,000-\$10,000)

“X” indicates product availability.

Install a memory cut feature on the shearer so the shearer operators can position themselves as far as 100 feet from the shearer. Install water-cooled motors which are

generally quieter than air-cooled motors and are less likely to overheat if covered with acoustical material.

2. Retrofit Noise Controls

At the present time, no commercially available retrofit noise controls exist. Therefore, operator developed retrofit noise controls and preventive maintenance on longwall systems equipment is recommended.

A. Retrofit Noise Controls which can be implemented include:

1. Locate the pump station in the intake entry, outby the headgate, away from where miners normally perform their duties.
2. Fully enclose the stageloader (except for the entrances and exits) with secure, sealed, rigid covers.
3. Attenuate the stageloader scrubbers as much as possible. Direct scrubber discharge away from operator locations.
4. Install sound-absorptive material on motors, panels, and gearboxes provided that overheating does not occur.
5. Design the entrance doors or chain curtains on the crusher to minimize the number of loose parts that can rattle. If possible, replace the chain curtains with conveyor belting.
6. Cover the end of the stage loader discharge with conveyor belting.
7. Attach belting to the shearer spray arms in a manner so that the belting extends above the spray arms.

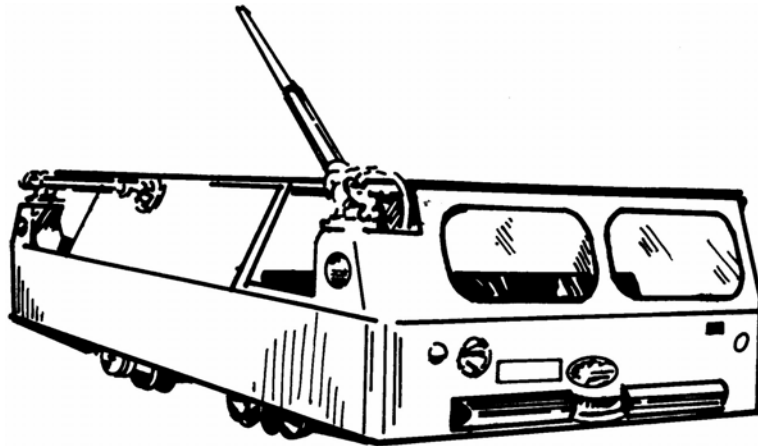
3. Alternative Technology

Under certain situations, remote controls may be used as a noise control by increasing the distance between the operator and the machine. The use of remote controls is dependent upon mining methodology and is very site-specific.

4. Maintenance.

Proper maintenance of machine pan lines may reduce noise levels as much as 10 dBA. Maintain proper conveyor chain tension as both over-tensioned and under-tensioned chains can cause increased noise levels. Adjust the pan line flight bar spacing so that flight bars do not contact all the pan line joints simultaneously.

MANTRIPS - RAIL-MOUNTED



Rail mounted mantrips are used to transport workers in mines. They are either diesel powered or electrically powered from trolley wires. Mantrips can be utilized in both metal and non-metal mines as well as coal mines.

1. Original Equipment Manufacturers (OEM)

The following table illustrates OEMs offering noise controls for new personnel/mantrip rail-mounted carriers. Local dealers should be contacted for availability and further details. For personnel/mantrip vehicles without noise controls, retrofit noise controls are needed.

Noise Control Availability from OEMs				
Manufacturer	Enclosed Treated Cab (Optional Cost)	Partial Enclosed Cab (Optional Cost)	Treated Engine Housing	Acoustically Redesigned Open-Cab
J. H. Fletcher	None	None	X	None
Goodman Equipment	None	(\$2,000-\$5,000)	None	None
Lee A&L Co.	(\$5,000-\$8,000)*	X	X	None
Hagar Equipment Co. of Alabama, Inc.	None	None	None	(\$97,000)

*Large model diesel

"X" indicates product availability.

B. Retrofit Noise Controls

The following OEMs offer retrofit noise controls for personnel/mantrip carriers. Local dealers should be contacted for availability and further details.

Retrofit Noise Controls Availability	
Manufacturer	Treated Cab (Cost)
Goodman Equipment	X (\$2,000-\$5,000)
Lee A&L Company	X (\$5,000-\$8,000*)

*Large models. "X" indicates product availability.

Additional noise controls include the installation of absorption material to the inner surfaces of existing cabs or passenger compartments.



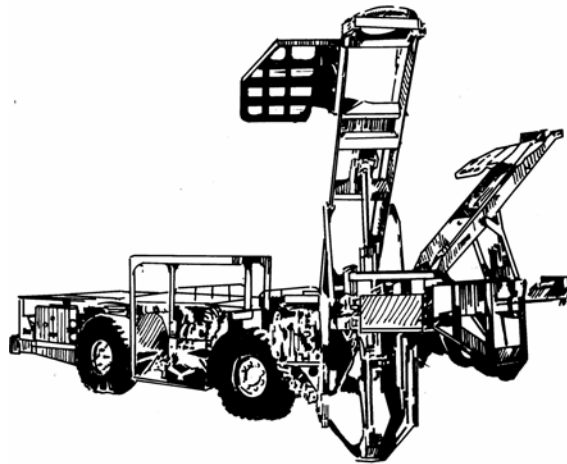
Absorption Material Used to Insulate Inner Surfaces of Cabs or Passenger Compartment

Vibration isolation and/or damping material or components may be installed on certain components such as motors and sheet metal panels. Some standard components may be replaced with noise controlled components.

C. Alternative Technology

There is no alternate technology.

ROOF BOLTERS



Roof bolters are machines designed to drill boreholes into the roof of a mine. These holes allow for the insertion of a long steel bolt that strengthens the pinning of the rock strata above by means of a split cone or other device. Roof bolters are used in most all underground mining operations.

1. Original Equipment Manufacturers (OEM)

At the present time, there are no OEMs that offer or engineer a noise control package for new underground roof bolting machines as standard equipment. There are however, a number of instructional and mechanical features available from the OEMs that do play significant roles in reducing the noise exposure of the roof bolter operator. Such features include:

- a. Newer models of roof bolting machines have quieter hydraulic motors.
- b. New models with dry dust collection systems have dust blower motors that only operate when the drill head is in use. This feature completely eliminates a phenomenon called "Drill Pot Whistle." The whistle in some cases is due to air traveling across sharp edges/cavities in the drill pot or chuck insert. In field studies, the whistle has been measured at a constant 104 dBA at the drill pot without drill steel inserted.
- c. Another new feature on some roof bolting machines is a computer-assisted drill cycle which regulates the rotational speed and thrust based on the rock that is being drilled. Drill steel guides are often used in conjunction with this process.

Both of these features promote the correct alignment of the drill steel, thereby helping to facilitate minimal amounts of side-hole to drill steel contact and allowing the roof bolter operators an opportunity to physically distance themselves from the drilling of the hole; the dominate noise source for the roof bolter.

- d. Roof bolting machines should be equipped with the appropriate exhaust muffler. Some OEMs have exhaust conditioners/water boxes available. A water box is a divided chamber (partially filled with water) where the roof bolter exhaust enters after exiting the muffler. In field studies, reductions of 3-8 dBA were measured at the bumper/near operator's deck and < 1 - 2 dBA at the operator's position at the front of the roof bolter. However, other evaluations have shown that this device has little effect on the operator's exposure. The effectiveness of this device needs to be examined on a case-by-case basis.
- e. Follow the OEM's maintenance recommendations regarding the upkeep of the roof bolter. Checklists and maintenance schedule guides (daily, weekly, monthly, etc.) are provided for most roof bolting machines. A good maintenance program can eliminate two of the most significant noise sources at the drill pot:
 1. A worn/drifted drill pot results in a misaligned drill hole, which increases the amount of side-hole-to-drill steel contact.
 2. Holes in drill pot vacuum hoses promote clogged drill steel, thereby leading to banging of the drill steel, an increase in cycle time, and increased exposure time.
- f. Follow the OEM's recommendations for rotational speed and thrust. These recommendations are based on the type of rock and the length of hole that is to be drilled. Also, follow the OEM's recommendations regarding vacuum for the dry-dust collection system. Low vacuum promotes clogged drill steel.
- g. It is also important to address the usage of the best possible tools for the task of drilling the holes:
 1. The use of sharp drill bits limits lateral drift of the hole, which reduces side-hole-to-drill steel contact and helps to sustain the penetration rate.
 2. Use the straightest and most dense drill steel that is compatible with the roof bolting machine's drill pot/chuck insert. The thickness of the straight drill steel limits the flexing of the steel, thereby limiting the potential for side-hole-to-drill steel contact.

3. It is imperative that aligned/straight hole is drilled. To help achieve this, the use of starter steel of no more than 2-feet in length is recommended.

The implementation of these features/recommendations can help to facilitate the good working order of the roof bolting machine, which is of foremost importance in the effort to reduce the exposure of the bolter operator to high sound levels. Local dealers may be contacted for availability of state-of-the-art and other noise control options for underground roof bolting machines.

OEMs Which Provide Noise Control Systems for Roof Bolters			
Manufacturer	Dry-Dust Systems	Quieter Hydraulics	Other Options
Alminco, Inc.	X	X	None
Alpine Equipment Corporation	X	X	None
Atlas-Copco	X	X	None
Bateman Mining	None	X	None
Eimco Coal Machinery	X	X	None
Fairchild International	None	X	None
J. H. Fletcher & Company	X	X	X*
Ingersoll-Rand	X	X	None
Tamrock EJC USA, Inc.	X	X	None

"X" indicates product availability.

*Operator cab on some models

2. Retrofit Noise Controls

Exhaust conditioners/water boxes can be installed on most dry-dust exhaust systems. If such a device is retrofitted, contact your MSHA district office for instructions regarding a Field Modification for the dust collection system approval.

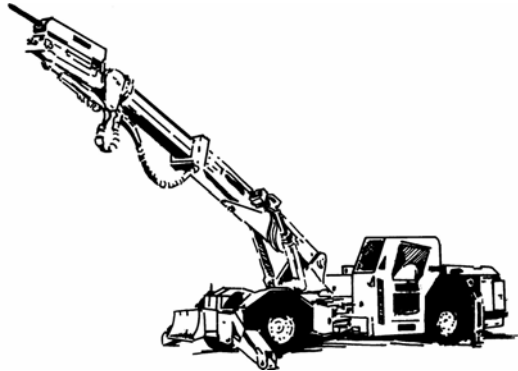
Install a durable material (such as belting) as liners in the tool trays and on top of the roof bolter.

Consider constructing a partial barrier (three-sided) between the operator and the drilling mechanism. Some roof bolting machines can accommodate such a barrier.

3. Alternative Technology

Wet drilling is a viable alternative to dry-dust drilling systems, however, it is not suitable to all mining environments. In field studies of wet drilling systems, reductions in sound levels were found to range from 3 -10 dBA. The wet systems that are available can regulate the water flow so that only the amount of water necessary to clear the hole is supplied. Sharp drill bits and straight, dense drill steel play the same important role in a wet system as in a dry system. Wet drilling systems are available from OEMs and as retrofits. The effective use of wet drilling systems can vary from mine to mine and is often a function of the mine environment. It needs to be evaluated on a case-by-case basis.

ROOF SCALERS



Roof scalers are a type of machine designed with a telescopic boom with either a hammer or a pick at its terminus. The purpose of the machine is to safely remove loose material from the roof of a mine.

1. Original Equipment Manufacturers (OEM)

The following is a listing of OEMs for scalers used in the mining environment. Local dealers should be contacted for specific needs and details. Some manufacturers will build a unit to specific needs.

- a. Fletcher
- b. Getman Corporation
- c. Gradall

Information from the manufacturers indicates there is no noise controls incorporated into the scaler. Operator enclosures are available for some models, however, they are not designed specifically for noise control. The scalers are powered by diesel engines, which are considered to be a primary noise source. If the hydraulic hammer is used for scaling, then the percussive hammer noise would be considered an additional noise source. The height of the mine seam will determine the size of the scaler needed. Local dealers can generally advise customers on their particular application.

2. Retrofit Noise Controls.

The effectiveness of noise controls is dependent upon the quality of both the acoustical materials and installation techniques.

If a retrofit kit is not available, the materials may be purchased in bulk form using Appendix C as a reference.

The majority of noise associated with scalers is produced by the diesel engines and percussive noise when using a hydraulic hammer.

A. Acoustical Treatment of Operator Cab Enclosure

The enclosure should be treated with acoustical materials for the purpose of reducing the overall noise at the operator's position. These materials should cover as much surface area as possible without hindering the operator's vision or movement. A unique problem with scalers is that a wide range of visibility is needed for operator control. Another problem is that roof debris will be falling, and possibly shattering on the floor and flying towards the cab. If safety glass or shatterproof plastic is to be used, it will have to be cleaned regularly due to dust build-up.

One positive note on controlling scaler noise is the diesel engine is generally located to the rear of the operator, the majority of noise controlling effort will be focused behind the operator.

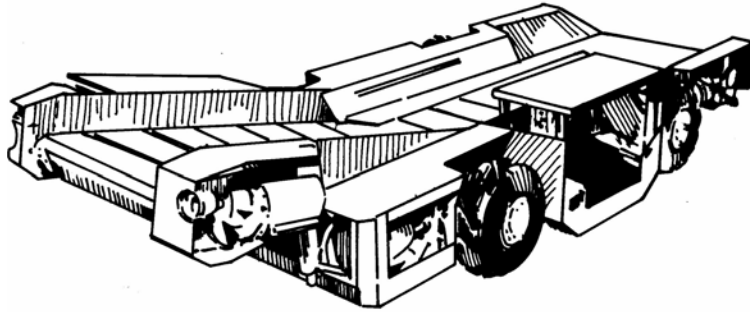
It should be noted that with any enclosure work (equipment or personnel), heat build-up can become a concern and appropriate ventilation or air-conditioning may be needed.

To assist in the selection and installation of acoustical materials for the above option, please refer to the appropriate appendices in the rear of this manual.

3. Alternative Technology

There is no alternate technology.

SHUTTLE CARS - DIESEL



Diesel powered shuttle cars are utilized to transport coal or other ores from an underground working face area to a crusher/breaker or directly to a hopper that feeds the main conveyor belt line.

1. Original Equipment Manufacturers (OEM).

The following table illustrates OEMs offering noise controls for new diesel shuttle cars as standard equipment. Local dealers should be contacted for availability and further details.

Noise Control Availability from OEMs	
Manufacturer	Exhaust Mufflers
Jeffrey Division of Dresser Industries	X
Wagner Mining	X

"X" indicates product availability.

For diesel shuttle cars without noise controls, additional retrofit noise controls are needed.

2. Retrofit Noise Controls.

None available at this time.

3. Alternative Technology.

None available at this time.

APPENDIX A

A Partial Listing of Machine Manufacturers

Manufacturer

A. L. Lee Corporation
2075 Lester Highway
Lester, WV 25865-0099
(304) 934-5361
(304) 934-5388 (fax)
allee@inetone.net

Air Pollution Control, Inc.
2130 Kalist Saloom Road
Lafayette, LA 70508-0614
(318) 989-0672

Alminco, Inc.
1267 Industry Road
Lexington, KY 40505-0381
(606) 231-7022
(606) 255-2279 (fax)

Atlas-Copco Raise Borings
22445 76th Avenue South
Kent, WA 98032
(253) 872-0500
(253) 872-0199 (fax)

Atlas Copco Wagner, Inc.
4424 North East 158th Avenue
Portland, OR 97230
(503) 255-2863
(503) 255-7175 (fax)

Bateman Engineering, Inc.
3900 South Wadsorth Blvd. #175
Denver, CO 80235
(303) 989-4921
(303) 989-1327 (fax)

Manufacturer

Brookville Mining Equipment
175 Evans Street
Brookville, PA 15825
(814) 849-2000
(814) 849-2010 (fax)
www.bmec.com

Cannon Drills
P. O. Box 1470
Claremont, NH 03743
(603) 542-9548

Caterpillar Elphinstone Priority
Limited
2 Hopkinson Street
South Burnie, Tasmania 7320
Australia
61-03-6431-2311 (International)
61-03-6431-7262 (International fax)

Dux Machinery Corporation
615 Lavoisier
Repentigny, Quebec J6A 7N2
Canada
(450) 581-8341
(450) 581-5138 (fax)

Eickhoff Corporation
2000 Parkwest Drive
Pittsburgh, PA 15275
(412) 788-1400

Eimco Process Equipment Company
669 East 200 South
Salt Lake City, UT 84102-0213
(801) 526-2000
(802) 526-2911 (fax)

Manufacturer

Eimco Coal Machinery, Inc.
2 Paisley Industrial Park
Carmichaels, PA 15320
(724) 966-8700

Fairchild International
1849 South 6th Street
Indiana, PA 15701-8551
(724) 463-7660
(724) 349-4535 (fax)

Gardner Denver
1800 Gardner Expressway
Quincy, IL 62301
(217) 222-5400

Getman Corp.
59750 34th Avenue
Bangor, MI 49013
(616) 427-8781
Fax (616) 427-8781
www.getman.com

Goodman Equipment Corporation
5430 West 70th Place
Chicago, IL 60638
(708) 496-1188
(708) 496-3939 (fax)
www.locomotives.com

Gradall Industries, Inc.
406 Mill Avenue South West
New Philadelphia, OH 44663
(330) 339-2211
www.gradall.com

Hager Equipment Co., of Alabama ,
Inc.
1901 Morgan Road S. E.
Bessimer, AL 35022-4812
(205) 424-1363

Manufacturer

Hartzell Fan, Inc.
910 South Downing Street
Piqua, OH 45356
(937) 773-7411

Ingersoll-Rand
1495 Valley Center Parkway
Bethlehem, PA 18017
Fax (610) 882-8847

J. H. Fletcher & Company
700 Goucher Street
Johnstown, PA 15905
(814) 255-1613

Jeffrey Mining Products
274 East 1st Avenue
Columbus, OH 43201
(614) 297-3123
(614) 297-3036 (fax)

Jeffrey Part of Global Process
398 Willis Road
Woodruff, SC 29388
(864) 476-7523
(864) 476-7510 (fax)

Joy Mining Machinery
177 Thorn Hill Road
Warrendale, PA 15086
(724) 779-4500
(724) 779-4509 (fax)

Joy Mining Machinery
2101 West Pike Street
Houston, PA 15342
(724) 873-4200
(724) 873-4312 (fax)

Manufacturer

Joy Mining Machinery
26161 Old Trail Road
Abingdon, VA 24210
(540) 628-4141

Mining Technologies International
PO Box 2097
Sudbury, Ontario P3A 4R8
Canada
(416) 869-5500
(416) 947-0866 (fax)

New York Blower Company
7660 Quincy Street
Willowbrook, IL 60521
(630) 794-5700
(630) 794-5776 (fax)
nyb@nyb.com
www.nyb.com

Robinson Industries
PO Box 100
(724) 452-0388 (fax)
(724) 452-6121
Zelienople, PA 16063
www.robinsongfans.com

Spendrup Fan Company
PO Box 4308
Grand Junction, CO 81502
(970) 242-3429 or (800) 525-1450
(970) 242-6724 (fax)
www.spendrupfanco.com

Sullair Corporation
3700 E. Michigan Blvd.
Michigan City, IN 46360
(219) 879-5451
(800) 785-5247
Fax (219) 874-1252

Manufacturer

Tamrock Drilltech, Inc.
PO Box 338
Alaghua, FL 32616
(904) 462-4100
(904) 462-3247 (fax)

Tamrock Loaders EJC
860 Westlake Parkway
Atlanta, GA 30336
(404) 346-6820 or (800) TAMROCK
(404) 346-6821 (fax)

Wagner Mining
PO Box 20307
Portland, OR 97220
(503) 251-3189

APPENDIX B

Buyer's Guide for Noise Control Products

(Reproduced with permission of *Sound and Vibration* magazine.)

SOUND ABSORPTIVE MATERIALS

1. Felts
2. Foams
3. Glass Fiber
4. Mineral Fiber
5. Perforated Sheet Metal
6. Spray-On Coatings
7. Wall Treatments

American Acoustical, 6 October Hill Road, Holliston, MA 01746; (508) 429-1165;
FAX (508) 429-8545; americanacoustic@aol.com - (2,3,4,5,7)

BASF Corp.; 1609 Biddle, Wyandotte, MI, 48192; (734) 324-6292; FAX (734) 324-5245
edwardga@basf.com; - (2)

Blachford, Inc., 1400 Nuclear Drive, West Chicago, IL 60185; (630) 231-8300;
FAX (630) 231-8321 - (2,3)

Comercial Acoustics; 5960 W. Washington St., Phoenix, AZ 85043; (602) 233-2322;
FAX (602) 233-2033; www.mfmca.com - (5)

Diamond Manufacturing Co., 243 W. Eighth St., Wyoming, PA 18644; (800) 233-9601;
FAX (717) 693-3500; perf@dmc.microserve.com - (5)

E-A-R Specialty Composites, 7911 Zionsville Rd., Indianapolis, IN 46268;
(317) 692-1111; FAX (317) 692-3111; solutions@ears.com - (2)

Eckel Industries, Acoustic Div., 155 Fawcett St., Cambridge, MA 02138; (617) 491-3221;
FAX (617) 547-2171; eckel@eckelacoustic.com - (2,3)

Empire Acoustical Systems, 36744 Constitution Dr., Trinidad, CO 81082; (719) 846-2300;
FAX (719) 846-7466; empmkico@rmi.net - (4,5)

ESSI Acoustical Products Co., 11740 Berea Rd., Cleveland, OH 44101; (800) 886-6678;
FAX (216) 251-9933; eacoustical@aol.com - (3,4,7)

Ferguson Perforating, 130-140 Ernest St., Providence, RI 02905; (401) 941-8876;
FAX (401) 941-2950 - (5)

Illbruck, Inc., 3800 Washington Ave., Minneapolis, MN 55412; (612) 521-3555;
FAX (612) 521-5639; sales@illbruck.com - (2,7)

Industrial Acoustics Co., Inc., 1160 Commerce Ave., Bronx, NY 10462; (718) 931-8000;
FAX (718) 863-1138; info@industrialacoustics.com - (5,7)

Kinetics Noise Control, Inc., 6300 Irelan Pl., Dublin, OH 43017; (614) 889-0480;
FAX (614) 889-0540; vib@kineticsnoise.com - (2,3,5,7)

McGill Air Pressure Corp.; 2400 Fairwood Ave., Columbus, OH 43207; (614) 443-0192;
FAX (614) 542-2620; www.mcgillairpressure.com - (2,3,4,5,6,7)

MPC, Inc., 835 Canterbury Rd., Westlake, OH 44145; (440) 835-1405;
FAX (440) 835-9313 - (7)

Noise Reduction Corp., 32321 County Highway 25, Redwood Falls, MN 56283; (507) 641-3067; FAX (507) 644-3737; noisered@means.net - (2,3)

Patterson Associates, 935 Summer St., Lynnfield, MA 01940; (781) 334-5777; FAX (781) 246-0888 - (2-4,6,7)

Polymer Technologies Inc.; 420 Corporate Blvd., Newark, DE 19702; (302) 738-9001; FAX (302) 738-9085; loretta@polytechnic.com

Pyrok, Inc., 121 Sunset Rd., Mamaroneck, NY 10543; (914) 777-7070; FAX (914) 777-7103 - (6)

Rogers Corp., One Technology Dr., Rogers, CT 06263; (860) 794-9605; FAX (860) 779-5509 - (2)

Roush Anatrol, Inc., 935 Benecia Ave., Sunnyvale, CA 94086; (408) 481-1090; FAX (408) 481-1096 - (2)

Singer Safety Company, 2300 W. Logan Blvd., Chicago, IL 60647; (800) 621-0089; FAX (773) 235-0363 - (2,3,7)

Soundcoat, Inc., 1 Burt Drive, Deer Park, NY 11729; (516) 242-2200; FAX (516) 242-2246; sales@soundcoat.com - (1,2,6,7)

Sound Fighter Systems, 6135 Linwood Ave., Shreveport, LA 71106; (318) 861-6640 FAX (318) 865-7373; soundfighter@soundfighter.com - (4)

Sound Seal; 50 HP Almgren Dr. Agawam, MA 01001; (413) 789-1790 FAX (413) 789-4444 sales@soundseal.com - (2,3,6,7)

Tamer Industries, 185 Riverside Ave., Somerset, MA 02725; (508) 677-0900; FAX (508) 677-3037 - (4,7)

Technicon Industries, Inc., 4412 Republic Dr., Concord, NC 28027; (704) 788-1131; FAX (704) 788-7772 - (1,2,6)

Tectum, Inc., P.O. Box 3002, Newark, OH 43058; (888) 977-9691; FAX (800) 832-8869; arid@tectum.com - (7)

The E. J. Davis Co., 10 Dodge Ave., P. O. Box, North, CT 06473; (203)-239-5391; FAX (203) 234-7724 cs@ejdavis.com; www.ejdavis.thomasre

The Proudfoot Co., Inc., P.O. Box 276, Monroe, CT 06468; (800) 445-0034; FAX (203) 459-0033 - (2,3,7)

SOUND ABSORPTIVE SYSTEMS

1. Ceiling Systems
2. Masking Noise Generators
3. Panels
4. Unit Absorbers
5. Wall Treatments

Acoustic Systems, 415 E St. Elmo Rd., Austin, TX 78745; (800) 749-1460;

FAX (512) 444-2282; acoustic@inetport.com, - (1-3)

American Acoustics, 6 October Hill Rd., Holliston, MA 01746; (508) 429-1165;

FAX (508) 429-8545 americanacoustic@aol.com - (2,3,4,5,7)

Commercial Acoustics Div., 5960 W. Washington St., Phoenix, AZ 85043;

(602) 233-2322; FAX (602) 233-2033 - (3)

Eckel Industries, Acoustic Div., 155 Fawcett St., Cambridge, MA 02138; (617) 491-3221;

FAX (617) 547-2171; eckel@eckelacoustic.com - (1,3-5)

Empire Acoustical Systems, 36744 Constitution Dr., Trinidad, CO 81082; (719) 846-2300;

FAX (719) 846-7466; empmkico@rmi.net - (1-3,5)

ESSI Acoustical Products Co., 11740 Berea Rd., Cleveland, OH 44101; (800) 886-6678;

FAX (216) 251-9933; eacoustical@aol.com - (3-5)

George Koch Sons, Inc., 10 S. 11th Ave., Evansville, IN 47744; (888) 873-5624;

FAX (812) 465-9876; ddh@kochg.com - (3)

Illbruck, Inc., 3800 Washington Ave., Minneapolis, MN 55412; (612) 521-3555;

FAX (612) 521-5639; sales@illbruck.com - (1,3)

Industrial Acoustics Co., Inc., 1160 Commerce Ave., Bronx, NY 10462; (718) 931-8000;

FAX (718) 863-1138; info@industrialacoustics.com - (1,3-5)

Kinetics Noise Control, Inc., 6300 Irelan Pl., Dublin, OH 43017; (614) 889-0480;

FAX (614) 889-0540; vib@kineticsnoise.com - (1-3,5)

MBI Products Co., 5309 Hamilton Ave., Cleveland, OH 44114; (216) 431-6400;

sales@mbiproducts.com www.mbiproducts.com (1,3,5)

McGill Air Pressure Corp., 2400 Fairwood Ave., Columbus, OH 43207; (614) 443-0192;

FAX (614) 542-2620; www.mcgillairpressure.com- (3)

MPC, Inc., 835 Canterbury Rd., Westlake, OH 44145; (440) 835-1405;

FAX (440) 835-9313 - (1,3,5)

Patterson Associates, 935 Summer St., Lynnfield, MA 01940; (781) 334-5777;

FAX (781) 246-0888 - (1-5)

Pyrok inc., 121 Sunset Rd., Mamaronec, NY, 10543; (914) 777-7070; FAX (914) 777-7103;

info@pyrokinc.com www.pyrokinc.com - (1)

Singer Safety Company, 2300 W. Logan Blvd., Chicago, IL 60647; (800) 621-0089;

FAX (773) 235-0363 - (1-3,5)

Sound Fighter Systems, Inc., 6135 Linwood Ave., Shreveport, LA 71106; (318) 861-6640;
FAX (318) 865-7373 - (3)

Sorbothane Inc., 2144 State Rt. 59 Kent, OH 44240; (330) 678-9444; FAX (330) 678-1303;
sales@sorbothane.com - (5)

Tamer Industries, 185 Riverside Ave., Somerset, MA 02725; (508) 677-0900;
FAX (508) 677-3037 - (3-5)

Technicon Industries, Inc., 4412 Republic Dr., Concord, NC 28027; (704) 788-1131;
FAX (704) 788-7772 - (3)

The Proudfoot Co., Inc., P.O. Box 276, Monroe, CT 06468; (800) 445-0034;
FAX (203) 459-0033 - (2-5)

SOUND BARRIER MATERIALS

1. Pipe Lagging
2. Plain and Mass-Loaded Plastics
3. Sealants and Sealing Tapes
4. Sheet Glass, Metal and Plastic

American Acoustical, 6 October Hill Rd., Holliston, MA 01746; (508) 239-1165

FAX (508) 239-8545; americanacoustic@aol.com - (1,2)

Amorim Industrial Solutions; 1015 Memorial Dr., Manitowoc, WI 54220 (920) 683-9998;

FAX (920) 683-9994; dkvckins@amerimsolutions.com - (2)

Blachford, Inc., 1400 Nuclear Drive, West Chicago, IL 60185; (630) 231-8300;

FAX (630) 231-8321 - (2)

Dodge-Regupol Inc., 715 Fountain Ave., Lancaster, PA 17601; (717) 295-3400;

FAX (717) 295-3414; www.regupol.com - (1)

Duracote Corp., 350 N. Diamond St., P.O. Box 1209, Ravenna, OH 44266; (800) 321-2252;

FAX (330) 296-5102; custserv@duracote.com - (1,2)

E-A-R Specialty Composites, 7911 Zionsville Rd., Indianapolis, IN 46268;

(317) 692-1111; FAX (317) 692-3111; solution@ears.com - (1,2,4)

Illbruck, Inc., 3800 Washington Ave., Minneapolis, MN 55412; (612) 521-3555;

FAX (612) 521-5639; sales@illbruck.com - (1)

Kinetics Noise Control, Inc., 6300 Irelan Pl., Dublin, OH 43017; (614) 889-0480;

FAX (614) 889-0540; vib@kineticsnoise.com - (1,2)

McGill Air Pressure Corp., 2400 Fairwood Ave., Columbus, OH 43207; (614) 443-1092;

FAX (614) 542-2620; www.mcgillairpressure.com - (1,2,4)

Noise Reduction Corp., 32321 County Highway 25, Redwood Falls, MN 56283;

(507) 641-3067; FAX (507) 644-3737; noised@means.net - (1,3)

Patterson Associates, 935 Summer St., Lynnfield, MA 01940; (781) 334-5777;

FAX (781) 246-0888 - (1-3)

Polymer Technologies Inc., 420 Corporate Blvd., Newark, DE 19702; (302) 738-9001

FAX (302) 738-9085; loretta@polytechnic.com - (2,6)

Singer Safety Company, 2300 W. Logan Blvd., Chicago, IL 60647; (800) 621-0089;

FAX (773) 235-0363 - (2)

Soundcoat, Inc., 1 Burt Drive, Deer Park, NY 11729; (516) 242-2200; FAX (516) 242-2246;

sales@soundcoat.com - (1,2)

Sound Fighter Systems, 6135 Linwood Ave., Shreveport, LA 71106; (318) 861-6640;

FAX (318) 865-7373; soundfighter@soundfighter.com; www.soundfighter.com - (4)

Sound Seal, 50 HP Almgren Dr., Aganam, MA 01001 (413) 789-1770; FAX (413) 789-4444

sales@soundseal.com - (2,3,6,7)

Technicon Industries, Inc., 4412 Republic Dr., Concord, NC 28027; (704) 788-1131;

FAX (704) 788-7772 - (1,2))

The Kennedy Company, 11665 Al Hwy 79, P.O. Box 1216, Scottsboro, AL 35768;
(256) 259-4436; FAX (256) 259-6253 - (1,2)
The Proud Foot Co., Inc., P.O. Box 276, Monroe, CT 06468; (800) 445-0034;
FAX (203) 459-0033 - (1,2)

SOUND BARRIER SYSTEMS

1. Curtains
2. Doors
3. Operable Partitions
4. Panels
5. Seals
6. Transportation Noise Barriers
7. Walls
8. Windows

Acoustic Systems, 415 E St. Elmo Rd., Austin, TX 78745; (800) 749-1460;
FAX (512) 444-2282; acoustic@inetport.com - (1-4,6-8)

American Acoustical, 6 October Hill Road, Holliston, MA 01746; (508) 429-1165; FAX
(508) 429-8543; americanacoustic@aol.com - (1)

Commercial Acoustics Div., 5960 W. Washington St., Phoenix, AZ 85043;
(602) 233-2322; FAX (602) 233-2033 - (2,4,6-8)

E-A-R Specialty Composites, 7911 Zionsville Rd., Indianapolis, IN 46268;
(317) 692-1111; FAX (317) 692-3111; solutions@earsc.com - (1,6)

Eckel Industries, Acoustic Div., 155 Fawcett St., Cambridge, MA 02138; (617) 491-3221;
FAX (617) 547-2171; eckel@eckelacoustic.com - (2,4,6-8))

Empire Acoustical Systems, 36744 Constitution Dr., Trinidad, CO 81082; (719) 846-2300;
FAX (719) 846-7466; empmkico@rmi.net - (1-4,6-8)

George Koch Sons, Inc., 10 S. 11th Ave., Evansville, IN 47744; (888) 873-5624;
FAX (812) 465-9876; ddh@kochg.com - (2,4,6-8)

Illbruck, Inc., 3800 Washington Ave., Minneapolis, MN 55412; (612) 521-3555;
FAX (612) 521-5639; sales@illbruck.com - (1,4,7)

Industrial Acoustics Co., Inc., 1160 Commerce Ave., Bronx, NY 10462; (718) 931-8000;
FAX (718) 863-1138; info@industrialacoustics.com - (2-4,6-8)

International Cellulose, 12315 Robin Blvd., Houston, TX 77045; (713) 433-6701; FAX
(713) 433-2029; icc@spray-on.com; www.spray-on.com; (7)

Jamison Door Co., P.O. Box 70, Hagerstown, MD 21741; (800) 532-3667;
FAX (301) 791-7339; sales@jamison-door.com - (2,8)

Kinetics Noise Control, Inc., 6300 Irelan Pl., Dublin, OH 43017; (614) 889-0480;
FAX (614) 889-0540; vib@kineticsnoise.com - (1,4,6,7)

McGill Air Pressure Corp., 2400 Fairwood Ave., Columbus, OH; (614) 443-0192;
FAX (614) 542-2620; www.mcgillairpressure.com - (1,2,3,4,5,6,7)

MPC, Inc., 835 Canterbury Rd., Westlake, OH 44145; (440) 835-1405;
FAX (440) 835-9313 - (4)

Noise Reduction Corp., 32321 County Highway 25, Redwood Falls, MN 56283;
(507) 641-3067; FAX (507) 644-3737; noisered@means.net - (1)

Overly Manufacturing, 574 W. Otterman St., Greensburg, PA 15601; (800) 979-7300 - (2)
Patterson Associates, 935 Summer St., Lynnfield, MA 01940; (781) 334-5777;
FAX (781) 246-0888 - (1-7)
Singer Safety Company, 2300 W. Logan Blvd., Chicago, IL 60647; (800) 621-0089;
FAX (773) 235-0363 - (1,2,4,6)
Sorbothane Inc.; 2144 State Rt 59, Kent, OH 44240; (330) 678-9444; FAX (330) [678-1303](tel:678-1303); sales@sorbothane.com - (5)
Sound Fighter Systems, Inc., 6135 Linwood Ave., Shreveport, LA 71106; (318) 861-6640;
FAX (318) 865-7373; soundfighter@soundfighter.com; www.soundfighter.com - (4,6,7)
Sound Seal, 50 HP Almgren Dr., Agawam, MA 01001; (413) 789-1790; FAX
(413) 789-4444; sales@soundseal.com - (2,3,6,7)
Tamer Industries, 185 Riverside Ave., Somerset, MA 02725; (508) 677-0900;
FAX (508) 677-3037 - (2,4,7)
Technicon Industries, Inc., 4412 Republic Dr., Concord, NC 28027; (704) 788-1131;
FAX (704) 788-7772 - (1)
The E. J. Davis Co., 10 Dodge Ave., P. O. Box, North, CT 06473 (203) 239-5391;
FAX (203) 234-7724; cs@ejdavis.com; www.ejdavis.thomasre; (3)
The Kennedy Co., 11655 A1 Hwy 79, Scottsboro, AL 35768; (888) 884-6957; FAX
(256) 259-6253; vinylusa@aol.com - (126)
The Proudfoot Co., Inc., P.O. Box 276, Monroe, CT 06468; (800) 445-0034;
FAX (203) 459-0033 - (1,4,6)

COMPOSITE MATERIALS

1. Barrier/Fiber Composites
2. Barrier/Foam Composites
3. Masonry Units

American Acoustical, 6 October Hill Road, Holliston, MA 01746; (508) 429-1165; FAX (508) 429-8543; americanacoustic@aol.com - (1)

Blachford, Inc., 1400 Nuclear Drive, West Chicago, IL 60185; (630) 231-8300; FAX (630) 231-8321 - (2)

Dodge-Regupol Inc., 715 Fountain Ave., Lancaster, PA 17601 (717) 295-3400; FAX (717) 295-3414; www.regupol.com - (1)

Duracote Corp., 350 N. Diamond St., P.O. Box 1209, Ravenna, OH 44266; (800) 321-2252; FAX (330) 296-5102; custserv@duracote.com - (2)

E-A-R Specialty Composites, 7911 Zionsville Rd., Indianapolis, IN 46268; (317) 692-1111; FAX (317) 692-3111; solutions@earsc.com - (1,2)

Empire Acoustical Systems, 36744 Constitution Dr., Trinidad, CO 81082; (719) 846-2300; FAX (719) 846-7466; empmkico@rmi.net - (1)

Illbruck, Inc., 3800 Washington Ave., Minneapolis, MN 55412; (612) 521-3555; FAX (612) 521-5639; sales@illbruck.com - (2)

International Cellulose, 12315 Robin Blvd., Houston, TX 77045; (713) 433-6701; FAX (713) 433-2029; icc@spray-on.com; www.spray-on.com; (7)

Kinetics Noise Control, Inc., 6300 Irelan Pl., Dublin, OH 43017; (614) 889-0480; FAX (614) 889-0540; vib@kineticsnoise.com - (1,2)

McGill Air Pressure Corp., 2400 Fairwood Ave., Columbus, OH; (614) 443-0192; FAX (614) 542-2620; www.mcgillairpressure.com - (1,2,3,4,5,6,7)

Noise Reduction Corp., 32321 County Highway 25, Redwood Falls, MN 56283; (507) 641-3067; FAX (507) 644-3737; noisered@means.net - (2)

Patterson Associates, 935 Summer St., Lynnfield, MA 01940; (781) 334-5777; FAX (781) 246-0888 - (1,2)

Polymer Technologies Inc., 420 Corporate Blvd., Newark, DE 19702; (302) 738-9001 FAX (302) 738-9085; loretta@polytechnic.com - (2,6)

Rogers Corp., One Technology Dr., Rogers, CT 06263; (860) 794-9605; FAX (860) 779-5509 - (2)

Roush Anatrol, Inc., 935 Benecia Ave., Sunnyvale, CA 94086; (408) 481-1090; FAX (408) 481-1096 - (2)

Singer Safety Company, 2300 W. Logan Blvd., Chicago, IL 60647; (800) 621-0089; FAX (773) 235-0363 - (1,2)

Soundcoat, Inc., 1 Burt Drive, Deer Park, NY 11729; (516) 242-2200; FAX (516) 242-2246; sales@soundcoat.com - (2)

Sound Fighter Systems, Inc., 6135 Linwood Ave., Shreveport, LA 71106; (318) 861-6640; FAX (318) 865-7373; soundfighter@soundfighter.com; www.soundfighter.com - (4,6,7)

Sound Seal, 50 HP Almgren Dr., Agawam, MA 01001; (413) 789-1790; FAX (413) 789-4444; sales@soundseal.com - (2,3,6,7)

Tamer industries, 185 Riverside Ave., Somerset, MA 02725; (508) 677-0900; FAX (508) 677-3037; jhedly@tamerind.com; www.tamerind.com - (1,2)

Technicon Industries, Inc., 4412 Republic Dr., Concord, NC 28027; (704) 788-1131; FAX (704) 788-7772 - (1,2)

Tectum Inc., P. O. Box 3002, Newark, OH 43058; (888) 977-9691; FAX (800) 832-8869; aird@tectum.com; www.tectum.com - (1)

The E. J. Davis Co., 10 Dodge Ave., P. O. Box, North, CT 06473 (203) 239-5391; FAX (203) 234-7724; cs@ejdavis.com; www.ejdavis.thomasre; (3)

The Kennedy Company, 11665 Al Hwy 79, P.O. Box 1216, Scottsboro, AL 35768; (256) 259-4436; FAX (256) 259-6253 - (2)

The Proudfoot Co., Inc., P.O. Box 276, Monroe, CT 06468; (800) 445-0034; FAX (203) 459-0033 - (1-3)

COMPOSITE SYSTEMS

1. Curtains
2. Enclosures/ Quiet Rooms
3. Open-Plan Partitions
4. Panels
5. Quilted Composites
6. Roof Decks

Acoustic Systems, 415 E St. Elmo Rd., Austin, TX 78745; (800) 749-1460;

FAX (512) 444-2282; acoustic@inetport.com - (2,4)

American Acoustical, 6 October Hill Road, Holliston, MA 01746; (508) 429-1165; FAX (508) 429-8543; americanacoustic@aol.com - (1,5)

Amorim Industrial Solutions; 1015 Memorial Dr., Manitowoc, WI 54220 (920) 683-9998; FAX (920) 683-9994; dkvckins@amerimsolutions.com - (2)

Commercial Acoustics, 5960 W. Washington St., Phoenix, AZ 85043; (602) 233-2322; FAX (602) 233-2033; info@mfmca.com; www.mfmca.com - (2)

Eckel Industries, Acoustic Div., 155 Fawcett St., Cambridge, MA 02138; (617) 491-3221; FAX (617) 547-2171; eckel@eckelacoustic.com - (2,4)

Empire Acoustical Systems, 36744 Constitution Dr., Trinidad, CO 81082; (719) 846-2300; FAX (719) 846-7466; empmkico@rmi.net - (2-4)

George Koch Sons, Inc., 10 S. 11th Ave., Evansville, IN 47744; (888) 873-5624; FAX (812) 465-9876; ddh@kochg.com - (2-4)

Illbruck, Inc., 3800 Washington Ave., Minneapolis, MN 55412; (612) 521-3555; FAX (612) 521-5639; sales@illbruck.com - (1,2,4,5)

Industrial Acoustics Co., Inc., 1160 Commerce Ave., Bronx, NY 10462; (718) 931-8000; FAX (718) 863-1138; info@industrialacoustics.com - (2,4)

Kinetics Noise Control, Inc., 6300 Irelan Pl., Dublin, OH 43017; (614) 889-0480; FAX (614) 889-0540; vib@kineticsnoise.com - (1,2,4,5)

McGill Air Pressure Corp., 2400 Fairwood Ave., Columbus, OH 43207; (614) 443-0192; FAX (614) 542-2620; www.mcgillairpressure.com - (1,2,3,4,5,6,7)

MPC, Inc., 835 Canterbury Rd., Westlake, OH 44145; (440) 835-1405; FAX (440) 835-9313 - (4)

Noise Reduction Corp., 32321 County Highway 25, Redwood Falls, MN 56283; (507) 641-3067; FAX (507) 644-3737; noisered@means.net - (1)

Patterson Associates, 935 Summer St., Lynnfield, MA 01940; (781) 334-5777; FAX (781) 246-0888 - (1-5)

Singer Safety Company, 2300 W. Logan Blvd., Chicago, IL 60647; (800) 621-0089; FAX (773) 235-0363 - (1,2,4,5)

Soundcoat, Inc., 1 Burt Drive, Deer Park, NY 11729; (516) 242-2200; FAX (516) 242-2246; sales@soundcoat.com - (2)

Sound Fighter Systems, Inc., 6135 Linwood Ave., Shreveport, LA 71106; (318) 861-6640;
FAX (318) 865-7373 - (2,4)

Sound Seal, 50 HP Almgren Dr., Agawam, MA 01001; (413) 789-1790; FAX
(413) 789-4444; sales@soundseal.com - (2,3,6,7)

Tamer Industries, 185 Riverside Ave., Somerset, MA 02725; (508) 677-0900;
FAX (508) 677-3037 - (2,4)

Technical Mfg., 15 Centennial Dr., Peabody, MA 01960; (978) 532-6330; FAX
(978) 531-8682; sales@techmfg.com - (2)

Technicon Industries, Inc., 4412 Republic Dr., Concord, NC 28027; (704) 788-1131;
FAX (704) 788-7772 - (1,5)

Tectum, Inc., P.O. Box 3002, Newark, OH 43058; (888) 977-9691; FAX (800) 832-8869;
arid@tectum.com - (6)

The Proudfoot Co., Inc., P.O. Box 276, Monroe, CT 06468; (800) 445-0034;
FAX (203) 459-0033 - (1,2,4,5)

VIBRATION DAMPENING MATERIALS

1. Active Dampers
2. Adhesives
3. Constrained-Layer Composites
4. Coatings
5. Sheets
6. Tapes

3M Acoustical Control; 3M Center - 220 - 7E - 01, St. Paul, MN 55144; (651) 733-5245; FAX (651) 733-1771; daharman@mmm.com - (2,5,6)

American Acoustical, 6 October Hill Road, Holliston, MA 01746; (508) 429-1165; FAX (508) 429-8543; americanacoustic@aol.com - (2,3,5)

Amorim Industrial Solutions; 1015 Memorial Dr., Manitowoc, WI 54220 (920) 683-9998; FAX (920) 683-9994; dkvckins@amerimsolutions.com - (3,5)

BASF Corp.; 1609 Biddle, Wyandotte, MI, 48192; (734) 324-6292; FAX (734) 324-5245 edwardga@basf.com; - (1)

Blachford, Inc., 1400 Nuclear Drive, West Chicago, IL 60185; (630) 231-8300; FAX (630) 231-8321 - (6)

Dodge-Regupol Inc., 715 Fountain Ave., Lancaster, PA 17601 (717) 295-3400; FAX (717) 295-3414; www.regupol.com - (5)

E-A-R Specialty Composites, 7911 Zionsville Rd., Indianapolis, IN 46268; (317) 692-1111; FAX (317) 692-3111; solutions@earsc.com - (3,6)

Eckel Industries, Acoustic Div., 155 Fawcett St., Cambridge, MA 02138; (617) 491-3221; FAX (617) 547-2171; eckel@eckelacoustic.com - (6)

Kinetics Noise Control, Inc., 6300 Irelan Pl., Dublin, OH 43017; (614) 889-0480; FAX (614) 889-0540; vib@kineticsnoise.com - (4,6,7)

Material Sciences Corp., 2200 E. Pratt Blvd., Elk Grove, IL 60007; (847) 718-8110 FAX (847) 718-8862; bandc@interaccess.com; www.laminatesandcompo.com - (3,4,5)

McGill Air Pressure Corp., 2400 Fairwood Ave., Columbus, OH; (614) 443-0192; FAX (614) 542-2620; www.mcgillairpressure.com - (1,2,3,4,5,6,7)

MTS Systems, 14000 Technology Dr., Minneapolis, MN 55344; (800) 933-4617; info@mts.com; www.mts.com - (1)

Noise Reduction Corp., 32321 County Highway 25, Redwood Falls, MN 56283; (507) 641-3067; FAX (507) 644-3737; noised@means.net - (7)

Patterson Associates, 935 Summer St., Lynnfield, MA 01940; (781) 334-5777; FAX (781) 246-0888 - (3,4,6)

Polymer Technologies Inc., 420 Corporate Blvd., Newark, DE 19702; (302) 738-9001 FAX (302) 738-9085; loretta@polytechnic.com - (2,6)

Roush Anatrol, Inc., 935 Benecia Ave., Sunnyvale, CA 94086; (408) 481-1090; FAX (408) 481-1096 - (2,3,6,7)

Singer Safety Company, 2300 W. Logan Blvd., Chicago, IL 60647; (800) 621-0089;
FAX (773) 235-0363 - (1-4,6)

Sorbothane, Inc., 2144 State Rt. 59, Kent, OH 44240; (330) 678-9444; FAX (330) 678-1303 -
(6)

Soundcoat, Inc., 1 Burt Drive, Deer Park, NY 11729; (516) 242-2200; FAX (516) 242-2246;
sales@soundcoat.com - (2-4,6,7)

Sound Seal, 50 HP Almgren Dr., Agawam, MA 01001; (413) 789-1790; FAX
(413) 789-4444; sales@soundseal.com - (2,3,6,7)

Sterling Instrument, 2101 Jerico, New Hyde, NY 11042; (516) 328-3300; FAX
(516) 326-8827; support@sdp-si.com; www.sdp-si.com - (5)

Stock Drive Products, 2101 Jericho Tpk., Box 5416, New Hyde Park, NY 11042;
(516) 328-3300; FAX (516) 326-8827; support@sdp-si.com - (6)

Technicon Industries, Inc., 4412 Republic Dr., Concord, NC 28027; (704) 788-1131;
FAX (704) 788-7772 - (1,3,4)

VIBRATION ISOLATION SYSTEMS

1. Active Isolators
2. Bases
3. Cable Isolators
4. Elastomeric
5. Floating Floors
6. Machinery Mounts
7. Pipe Connectors
8. Pneumatic
9. Seismic
10. Steel Spring
11. Vibration Dampers

American Acoustical, 6 October Hill Road, Holliston, MA 01746; (508) 429-1165; FAX (508) 429-8543; americanacoustic@aol.com - (2,3,5)

Amorim Industrial Solutions; 1015 Memorial Dr., Manitowoc, WI 54220 (920) 683-9998; FAX (920) 683-9994; dkvckins@amerimsolutions.com - (3,5)

Amber/Booth Co., 6645 W. Tidwell, Houston, TX 77092; (713) 688-1228; FAX (713) 688-1175 - (1,2,4-11)

BASF Corp.; 1609 Biddle, Wyandotte, MI, 48192; (734) 324-6292; FAX (734) 324-5245 edwardga@basf.com; - (1)

Colbond Inc., P. O. Box 1057, Euka, NC 28728; (800) 365-7391; FAX (828) 665-5009 www.colbond-usa.com - (5)

Dodge-Regupol Inc., 715 Fountain Ave., Lancaster, PA 17601 (717) 295-3400; FAX (717) 295-3414; www.regupol.com - (5)

E-A-R Specialty Composites, 7911 Zionsville Rd., Indianapolis, IN 46268; (317) 692-1111; FAX (317) 692-3111; solutions@earsc.com - (4,6,11)

Fabreeka International, Inc., 1023 Turnpike St., P.O. Box 210, Stoughton, MA 02072; (781) 341-3655; FAX (781) 341-3983; info@fabreeka.com - (1-11)

Firestone Industrial Products Co., 12650 Hamilton Crossing Blvd., Carmel, IN 46032; (317) 818-8662; FAX (317) 818-8710 - (8)

Gerb Vibration Control, 1950 Ohio St., Lisle, IL 60532; (630) 724-1660; FAX (630) 724-1664; gerbusa@gerb.com; www.gerb.com - (1,2,5,9,10,11)

Kinetic Systems, Inc., 20 Arboretum Rd., Boston, MA 02131; (617) 522-8700; FAX (617) 522-6323; sales@kineticssystem.com - (1-3,6,8,11)

Kinetics Noise Control, Inc., 6300 Irelan Pl., Dublin, OH 43017; (614) 889-0480; FAX (614) 889-0540; vib@kineticsnoise.com - (2,4-7,9-11)

Machinery Mountings Inc., 11 Constance Ct., Hauppauge, NY 11788; (631) 851-0480; FAX (631) 851-0479 (6,10,11)

Material Sciences Corp., 2200 E. Pratt Blvd., Elk Grove, IL 60007; (847) 718-8110
FAX (847) 718-8862; bandc@interaccess.com; www.laminatesandcompo.com - (3,4,5)
MTS Systems, 14000 Technology Dr., Minneapolis, MN 55344; (800) 933-4617;
info@mts.com; www.mts.com - (1)
Patterson Associates, 935 Summer St., Lynnfield, MA 01940; (781) 334-5777;
FAX (781) 246-0888 - (4)
Polymer Technologies Inc., 420 Corporate Blvd., Newark, DE 19702; (302) 738-9001
FAX (302) 738-9085; loretta@polytechnic.com - (2,6)
Roush Anatrol, Inc., 935 Benecia Ave., Sunnyvale, CA 94086; (408) 481-1090;
FAX (408) 481-1096 - (11)
Sorbothane, Inc., 2144 State Rt. 59, Kent, OH 44240; (330) 678-9444; FAX (330) 678-1303 -
(6,11)
Sound Seal, 50 HP Almgren Dr., Agawam, MA 01001; (413) 789-1790; FAX
(413) 789-4444; sales@soundseal.com - (2,3,6,7)
Stock Drive Products, 2101 Jericho Tpk., Box 5416, New Hyde Park, NY 11042;
(516) 328-3300; FAX (516) 326-8827; support@sdp-si.com - (2-4,6,11)
Technical Manufacturing Corp., 15 Centennial Dr., Peabody, MA 01960; (978) 532-6330;
FAX (978) 531-8682; sales@techmfg.com - (1,8)
Technicon Industries Inc., 4412 Republic Ct., Concord, NC 28027; (704) 788-1131;
FAX (704) 788-7772; sfurr@tenind.com - (2,4,5)
The Noble Co., P. O. Box 350 Grand Haven, MI 44417; (800) 878-5788;
FAX (231) 799-8850; sales@noblecompany.com; www.noblecompany.com - (5)
Vibration Isolation, P. O. Box 2083, Houston, TX 77252; (713) 466-1562
FAX (713) 466-1355; sales@vip-tx.com - (2,4,10)
Vibration Mountings and Controls, Inc., 113 Main St., Bloomingdale, NJ 07403;
(800) low-vibe; FAX (201) 492-8430; plittlewood@vmc-kdc.com - (3,4,6,7,9-11)
Vibro/Dynamics Corporation, 2443 Braga Dr., Broadview, IL 60153; (708) 345-2050;
FAX (708) 345-2225; vibro@worldnet.att.net - (6)

SILENCERS

1. Active Attenuators
2. Ducts
3. Duct Silencers
4. Electric Motor Silencers
5. Fan Silencers
6. Filter Silencers
7. General Industrial Silencers
8. High-Pressure Exhaust Silencers
9. Intake and Exhaust Silencers
10. Pulsation Dampers
11. Splitter/Louvre Silencers

Airsan Corp., 4554 W. Woolworth Milwaukee, WI 53218; (800) 558-5494; FAX (414) 353-8402; www.airsan.com - (3,5,11)

Allied Witan Co., 13805 Progress Pkwy, Cleveland, OH 44133; (440) 237-9630; FAX (440) 237-9633; (6,8,9,10)

Beaird Industries Inc., 601 Benton Kelly St., Shreveport, LA 71106; (318) 865-6351 FAX (318) 868-1701; www.beairdindustries.com - (3,5,6,7,8,9)

Burgess-Manning, Inc., 227 Thorn Ave., Orchard Park, NY 14127; (716) 662-6540; FAX (716) 662-6548; info@nitram.com - (6-10)

Commercial Acoustics Div., 5960 W. Washington St., Phoenix, AZ 85043; (602) 233-2322; FAX (602) 233-2033 - (2-5,7-9,11)

Eckel Industries, Acoustic Div., 155 Fawcett St., Cambridge, MA 02138; (617) 491-3221; FAX (617) 547-2171; eckel@eckelacoustic.com - (9)

Exair Corp., 1250 Century Cr N., Cincinnati, OH 45246; (800) 903-9247; FAX (513) 671-3363; techhelp@exair.com; www.exair.com - (7)

Industrial Acoustics Co., Inc., 1160 Commerce Ave., Bronx, NY 10462; (718) 931-8000; FAX (718) 863-1138; info@industrialacoustics.com - (1,3,5,7-9,11)

Kinetics Noise Control, Inc., 6300 Irelan Pl., Dublin, OH 43017; (614) 889-0480; FAX (614) 889-0540; vib@kineticsnoise.com - (2,3,5,8,9,11)

McGill Air Pressure Corp., 2400 Fairwood Ave., Columbus, OH: (614) 443-0192; FAX (614) 542-2620; www.mcgillairpressure.com - (1,2,3,4,5,6,7)

Patterson Associates, 935 Summer St., Lynnfield, MA 01940; (781) 334-5777; FAX (781) 246-0888 - (2,3,5,7,9)

QuietFlo Noise Control 100B Airport Executive Park, Nanuet, NY 10954; (845) 352-8877; FAX (845) 352-4464; (3,4,5,7,8,9)

Stoddard Silencers, Inc., 1017 Progress Dr., Grayslake, IL 60030; (847) 223-8636; FAX (847) 223-8638; info@stoddardsilencersinc.com - (5-9,11)

The Spencer Turbine Co., 600 Day Hill Rd., Windsor, CT 06095; (860) 688-8361 - (3-6,8,9)

The Kennedy Company, 11665 Al Hwy 79, P.O. Box 1216, Scottsboro, AL 35768; (256) 259-4436; FAX (256) 259-6253 - (3)

APPENDIX C

Partial Listing of Aftermarket Cab Manufacturers,
Suppliers of Stud-Welding Systems

I. MOBILE SURFACE EQUIPMENT CAB MANUFACTURERS

Custom Products of Litchfield
1715 South Sibley Avenue
Litchfield, MN 55355
(320) 693-3221
Custom-made Cabs

Cabs & Rops, Inc.
2112 Staffeldt Road
Iron River, WI 54847
(715) 372-8864
New and Reconditioned Cabs

Saf-T-Cab, Inc.
3241 South Parkway Drive
Fresno, CA 93725
(559) 268-5541
Large Line of Aftermarket Cabs

Sims Manufacturing Company
230 North Maple Street
Payne, OH 45880
(419) 263-2321
*O.E.M. for Caterpillar, John Deere, Case;
Some Aftermarket Cabs*

X-Mark/Cdt, Inc.
2001 North Main Street
Washington, PA 15301
(724) 228-7373
*Rock Drill Cabs - Primarily for Ingersoll-
Rand*

Lake Superior Cab Company
118 West Harney Road
Esko, MN 55733
(218) 879-4526
Reconditioned Cabs, ROPS Skin Kits

Kenco Manufacturing Company
Highway 69S
Atoka, OK 74525
(580) 889-5222
New Cabs Only

Industrial Cab Company
1850 Oliver Avenue
Indianapolis, IN 46221
(317) 638-8145
Manufactures O.E.M. Cabs

I. STUD WELDERS, STUDS, COVER BUTTONS

Nelson Stud Welding
5213 Broadlea Drive
Pittsburgh, PA 15236
(412) 653-9344

Stud Welding Company
750 Glen Avenue
Moorestown, NJ 08057
(856) 866-9300

II. STICK-ON STUDS (SELF-ADHESIVE BACK)

Barrier Corporation
Tigard Industrial Park
9908 South West Tigard Street
Tigard, OR 97223
(503) 639-4192

APPENDIX D

Partial Listing of Reference Sources

I. TRADE JOURNALS

- A. Industrial Hygiene News
8650 Babcock Boulevard
Pittsburgh, Pennsylvania 15237-9916
- B. Industrial Maintenance and Plant Operation
PO Box 7682
Highlands Ranch, Colorado 80163-9482
- C. Material Handling Products News
301 Gibraltar Drive
PO Box 618
Morris Plains, New Jersey 07950-0618
- D. New Equipment Digest
A Penton Publication
PO Box 5113
Pittsfield, Massachusetts 01203-9166
- E. Pollution Equipment News
8650 Babcock Boulevard
Pittsburgh, Pennsylvania 15237-9915

II. MAGAZINES

- A. Coal Age
PO Box 12977
Overland Park, Kansas 66282-9859
- B. Rock Products
PO Box 12977
Overland Park, Kansas 66282-9859
- C. Sound & Vibration
PO Box 40416
Bay Village, Ohio 44140-9902
- D. Sensors
PO Box 5102
Pittsfield, Massachusetts 01203-5102

- E. Mobile Radio Technology
PO Box 12968
Overland Park, Kansas 66282-2968
- F. Aggregates Manager
PO Box 823
Winchester, Massachusetts 01890-4223
- G. Occupational Safety and Health
Creative Data
650 South Clark Street, Floor 6
Chicago, Illinois 60605-9626
- H. Occupational Hazards
PO Box 217
Buffalo, New York 14205-9818

III. GOVERNMENT PUBLICATIONS

- A. "Noise Abatement of Pneumatic Rock Drill," Report of Investigations (RI) 7998, U.S. Department of Interior, U.S. Bureau of Mines (USBM), 1974.
- B. "Noise Reduction of a Pneumatic Rock Drill," RI 8082, U.S. Department of Interior, USBM, 1975.
- C. "Noise Control Proceedings," Informational Circular (IC) 8686, U.S. Department of Interior, USBM, 1975.
- D. "Noise Control of Diesel-Powered Underground Mining Machines," IC 8837, U.S. Department of Interior, USBM, 1979.
- E. "Bulldozer Noise Control," Contract Number J0177049, Bolt, Beranek, and Newman, Inc., U.S. Department of Interior, USBM, 1980.
- F. "Front-End Loader Noise Control," Contract Number J0395028, Bolt, Beranek, and Newman, Inc., U.S. Department of Interior, USBM, 1980.
- G. "Mining Machinery Noise Control Guidelines," U.S. Department of Interior, USBM, 1983.
- H. "Fabrication Manual for a Reduced-Noise Auger Miner Cutting Head," IC 8971, U.S. Department of Interior, USBM, 1984.
- I. "Retrofit Noise Control Modifications for Crushing and Screening

Equipment in the Nonmetallic Mining Industry – An Applications Manual,” IC 8975, U.S. Department of Interior, USBM, 1984.

- J. “Noise Control of an Underground Continuous Miner-Auger Type,” Informational Report (IR) 1056, U.S. Department of Labor, Mine Safety and Health Administration (MSHA), 1977.
- K. “Improving Barrier Insertion Loss,” IR 1117, U.S. Department of Labor, MSHA, 1980.
- L. “Compendium of Materials for Noise Control,” NIOSH Publication No. 80-116, 1980.
- M. “Summary of Noise Controls for Mining Equipment,” U.S. Department of Labor, MSHA, 1985.
- N. “In-Plant Partial Noise Enclosures for the Mining Industry,” IF 1154, U.S. Department of Labor, MSHA, 1993.

IV. REFERENCE BOOKS

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