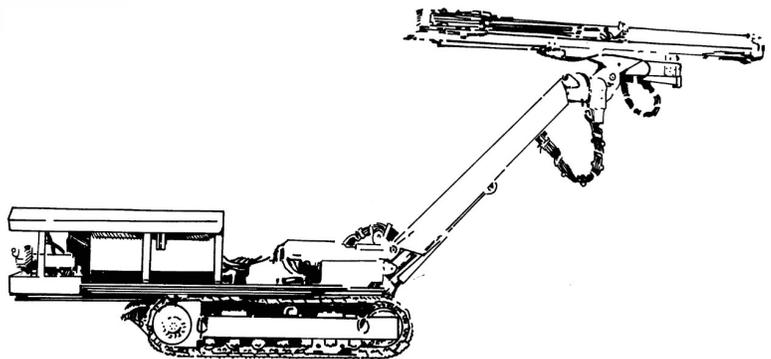
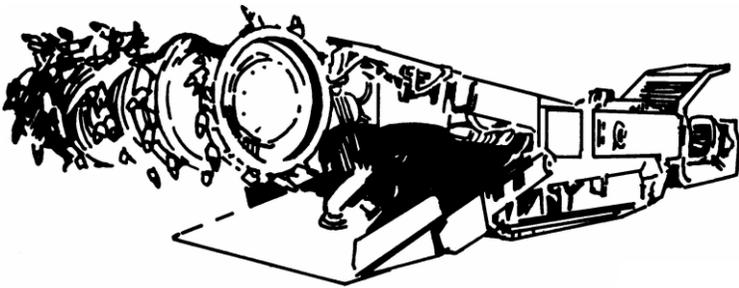
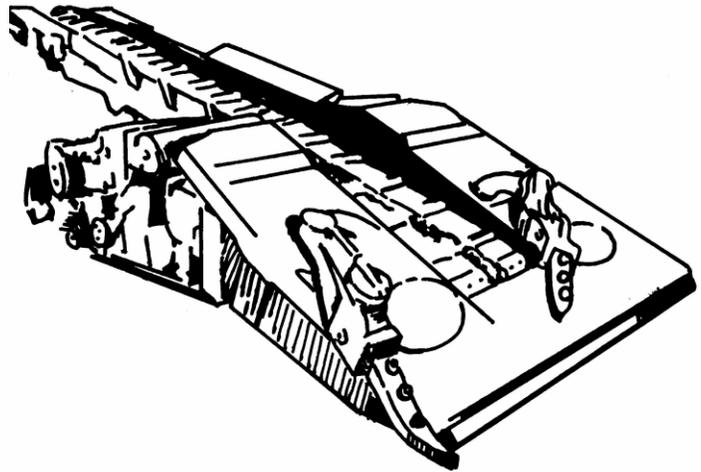
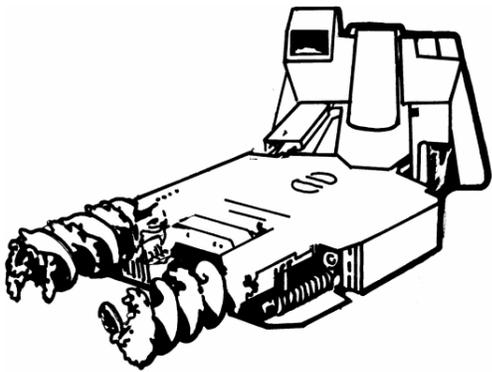


# Noise Control Resource Guide – Underground Mining



U. S. Department of Labor  
Mine Safety and Health Administration  
(May 2012 Revision)



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

**List of Contributors (May 2012 Revision)**

The following people contributed to the writing and production of the series of Noise Control Resource Guides:

Jerry W. Antel (Retired) - Technical Support – PTAD  
Anthony S. Argirakis - Technical Support – PTAD  
Gene E. Autio – MNMS&H – Health Division  
Link R. Bowers - Technical Support – PTAD  
Doris Cash – MNMS&H – Health Division  
Calvin L. Cumerlato (Deceased) – Technical Support – PTAD  
James L. Custer - Technical Support – Arlington  
George Durkt Jr. - Technical Support – PTAD  
John P. Homer- Technical Support - PTAD  
Jennifer Honor – Office of the Solicitor  
Michael Horbatko – CMS&H – District 9  
Carol J. Jones – MNMS&H – Health Division  
Paul T. Kinevy (Retired) - Technical Support – PTAD  
William Knepp - CMS&H - District 3  
Dennis Lowmaster - CMS&H - District 2  
Carla Marcum - CMS&H - District 7  
Leonard C. Marraccini (Retired) - Technical Support – PTAD  
William McKinney - National Mine Health & Safety Academy  
Gregory Meikle – CMS&H – Health Division  
Carlos Mosley - CMS&H - District 3  
Jason R. Novakovich - Technical Support - PTAD  
Melinda Pon – CMS&H – Health Division  
Bryan Sargent - CMS&H - District 8  
John L. Schmeichel (Deceased) - Technical Support - PTAD  
John P. Seiler – Technical Support - PTAD  
Donald Starr - National Mine Health & Safety Academy  
Wayne W. Woodruff (Retired) - Technical Support - PTAD  
David R. Zuchelli - Technical Support – PTAD

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## **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 mining machinery.
- ❖ 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, provide information on engineering controls that can be designed, fabricated, and installed at the mine site.
- ❖ 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) P11-45 "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**

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 Time Weighted Average over eight hours ( $TWA_8$ ) 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 AL 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, underground mining; and the third, 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. 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.

<b>Source</b>	<b>Sound Level (dBA)</b>	<b>Measured Exposure Time (Hr.)</b>	<b>Allowable Exposure Time (Hr.)</b>	<b>% Contribution to PEL Dose</b>
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 (S3 mod), the miner's exposure [S1 + S2 + S3 mod + 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 [S1 mod], the impact is to reduce the miner's exposure [S1 mod + 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 [S1 mod + S2 mod + S3 + S4] would be 83% [0 + 33 + 50 + 0].

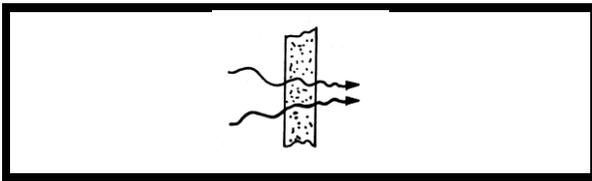
It is very important when conducting noise control work to examine the makeup of the miner's full shift noise exposure. The exposure may not be based solely on the highest sound level or the longest exposure time. It is the total noise dose, not just the individual sound levels or exposure times.

## 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.

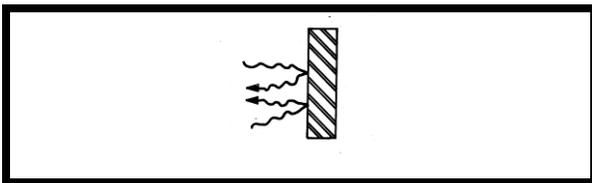
Acoustical devices include, but are not limited to, mufflers, silencers and enclosures. Absorption, barrier, composite, and damping/isolation materials are defined as follows:

### Absorption



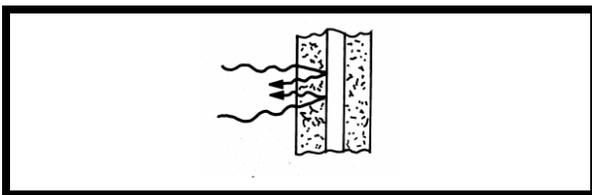
A material designed to absorb sound waves. It is not intended to be used for blocking sound waves. Some examples of absorption materials are foam and fiberglass. It may be used inside a cab or enclosure to prevent the reverberation of sound waves.

### Barrier



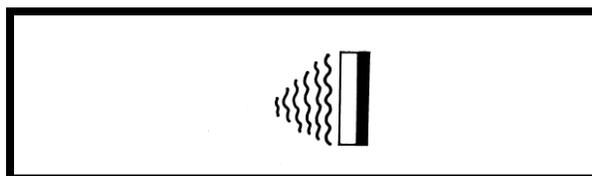
A material designed to block sound waves. It does not absorb sound waves. A typical use of barrier materials would be on the firewall of a bulldozer to block low frequency engine noise. Some examples of sound barriers are mass-loaded vinyl curtains, lead, plywood, glass, steel, and concrete.

### 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.
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. 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.

## 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 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
- ❖ Program Information Bulletin (PIB) No. P08-12 “Technologically Achievable, Administratively Achievable and Promising Noise Controls” (30 CFR Part 62) dated June 18, 2008 (Update of PIB No. P04-18)
- ❖ Program Information Bulletin (PIB) No. P11-45 “Technologically Achievable, Administratively Achievable and Promising Noise Controls” (30 CFR Part 62) dated June 20, 2011 (Update of PIB No. P08-12)

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 [www.msha.gov](http://www.msha.gov).

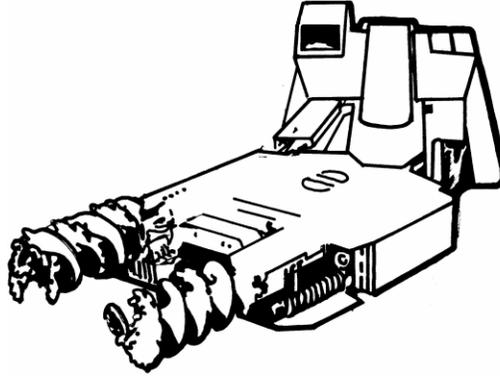
## UNDERGROUND MINING NOISE CONTROLS

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 mines. 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.

<b>Noise Control Availability from OEMs</b>		
<b>Manufacturer</b>	<b>Treated Cutting Heads</b>	<b>Treated Pan Line</b>
Fairchild International	X	X
"X" indicates product availability.		

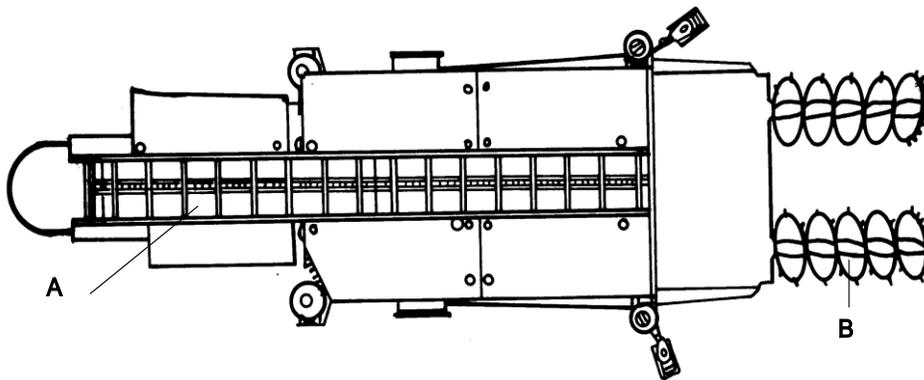
For underground auger miners without noise controls, additional retrofit noise controls are needed. For details regarding retrofit noise control applications, see Section 2.

#### **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 manufacturer should be contacted for information regarding retrofit noise control kits or options.

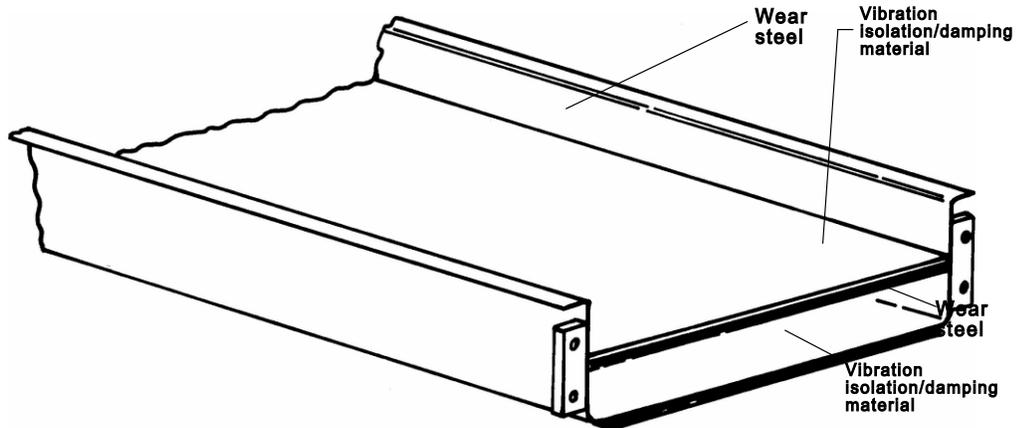
Retrofit Noise Controls Available from OEMs		
Manufacturer	Treated Cutting Heads	Treated Pan Lines
Fairchild International	X	X
"X" indicates product availability.		

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.



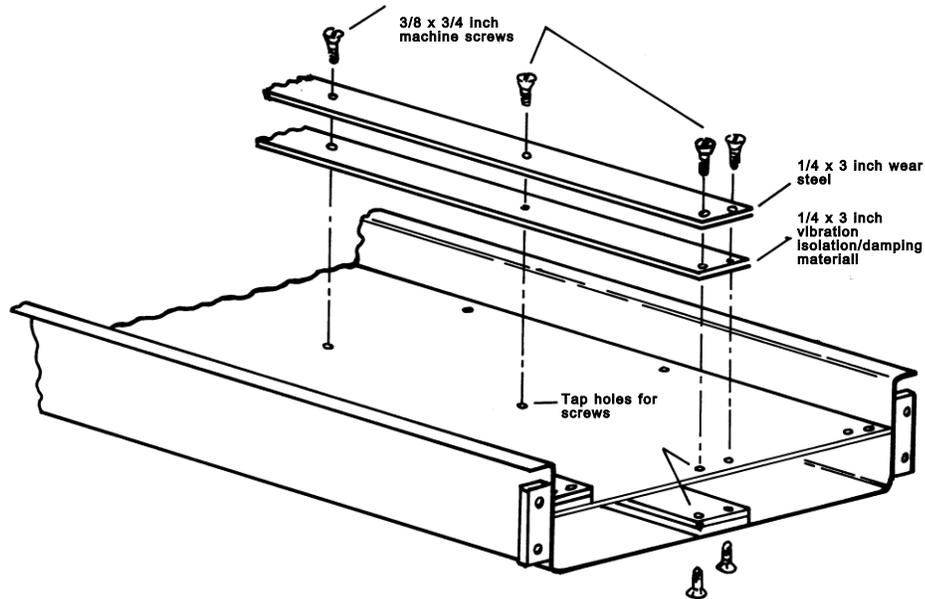
Areas Where Retrofit Noise Controls can be Applied to an Auger-Type Continuous Miner

**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

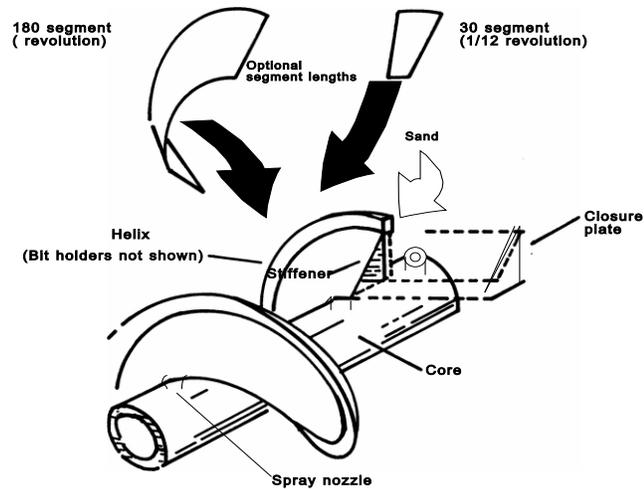
Note: Installation of the individual strips can be done by either welding or fastening with machine screws to the deck. If wear strips are welded in place the width and length of the damping material should be reduced so as to prevent damage to the material and the possible emission of toxic vapors.



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 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.

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



Sand-Filled Auger Cutting Head

**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

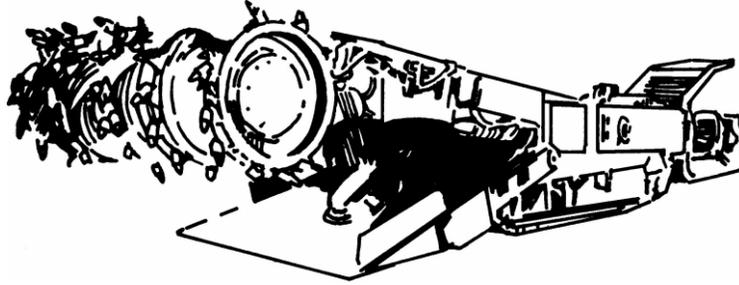
Under certain situations, remote controls may be used as a noise control by increasing the distance between the operator and the machine. The use of remote controls is dependent upon mining methodology and is very site-specific.

### 4. 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)**

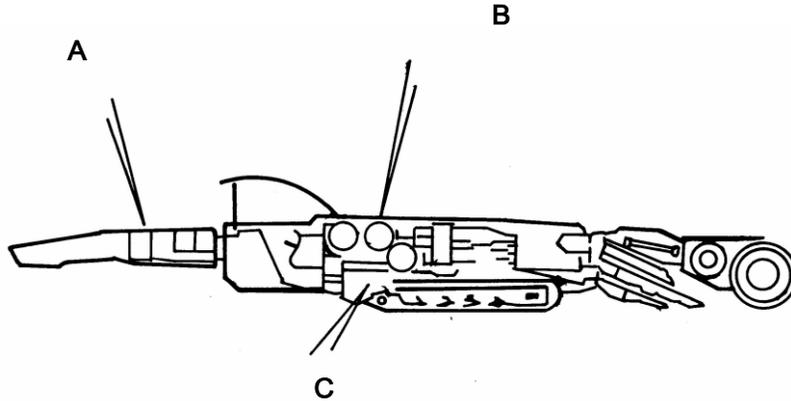
The following table illustrates OEMs offering noise controls for new continuous miners. Local dealers can provide cost and availability information on noise controls available.

<b>Noise Control Availability from OEMs</b>				
<b>Manufacturer (acquired OEMs)</b>	<b>Treated Pan Line</b>	<b>Treated Dust Scrubber</b>	<b>Remote Control</b>	<b>Dual Conveyor Sprocket</b>
Sandvik (Eimco)	X	X	X	None
Bucyrus (Jeffrey, Simmons-Rand)	X	X	X	None
Joy	X	X	X	X
"X" indicates product availability.				

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

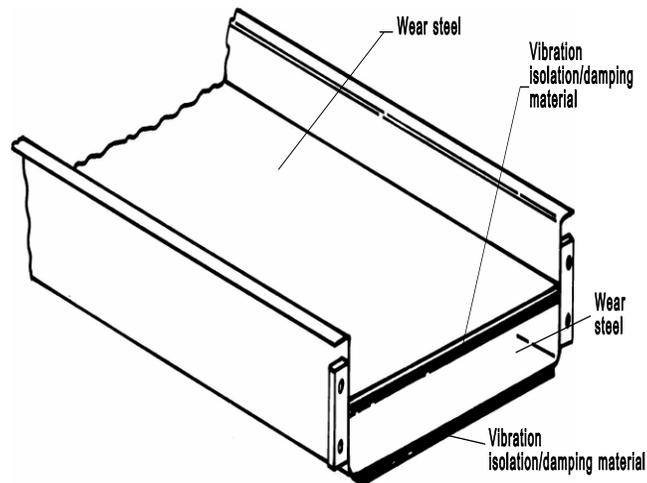
## 2. Retrofit Noise Controls

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.

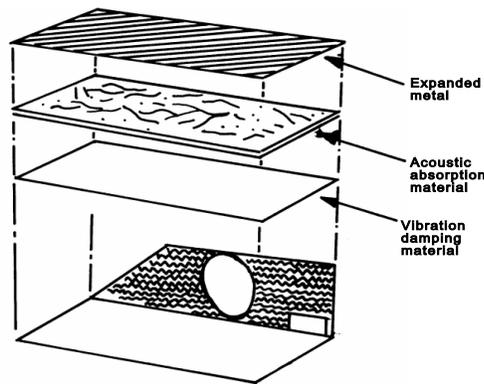


Constrained-Layer Damping of Conveyor Pan Using Individual Strip

**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.

**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. Coated Conveyor Chains.** The flight bars of the continuous miner’s conveyor chain can be treated with a highly durable polyurethane coating to reduce impact noise between the conveyor chain and the conveyor pan and tail roller. Conveyor chains with coated flight bars are available from retrofit conveyor chain manufacturers.

Noise Control Availability from Retrofit Manufacturer	
Manufacturer	Coated Conveyor Chain
Cincinnati Mine Machinery Co.	X
Joy	X
“X” indicates product availability.	

**E. Dual Conveyor Sprocket and Chain.** Continuous miners equipped with a dual conveyor sprocket and a corresponding dual sprocket conveyor chain has been shown to reduce the machine operator’s overall noise exposure. This combination reduces impact noise between the conveyor chain and the conveyor pan and tail roller.

**F. 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, has been shown to reduce the operator's exposure. If the seam height varies, the barrier can be hinged so it can be easily lowered.

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

**H. 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 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 continuous miners can provide details on remote control systems for their machines.

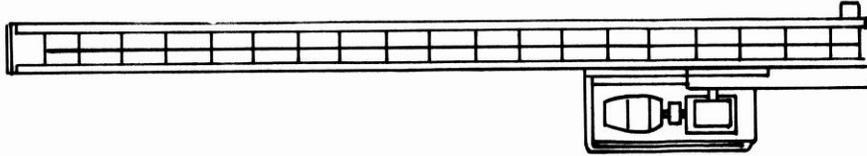
### **4. Administrative Controls**

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 controls can be used as a noise control by increasing the distance between the operator and the machine. In cases where remote controls 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 or coal 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 ore or 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.

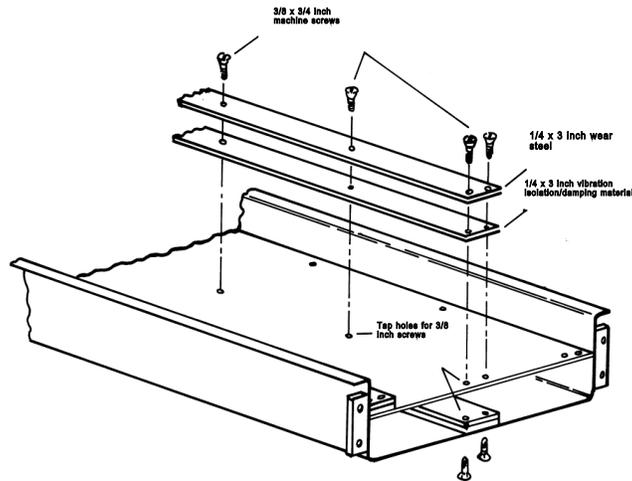
<b>Noise Control Availability from OEMs</b>		
<b>Manufacturer (acquired OEMs)</b>	<b>Treated Pan Line</b>	<b>Remote Control</b>
Sandvik (Eimco)	X	X
Bucyrus (Jeffrey, Simmons-Rand)	X	X
Joy	X	X
"X" indicates product availability.		

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

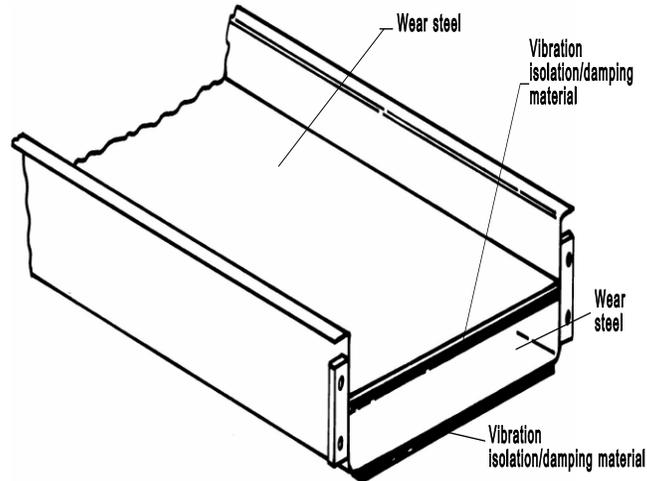
### **2. Retrofit Noise Controls**

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.

**A. Treated Pan Line.** 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.

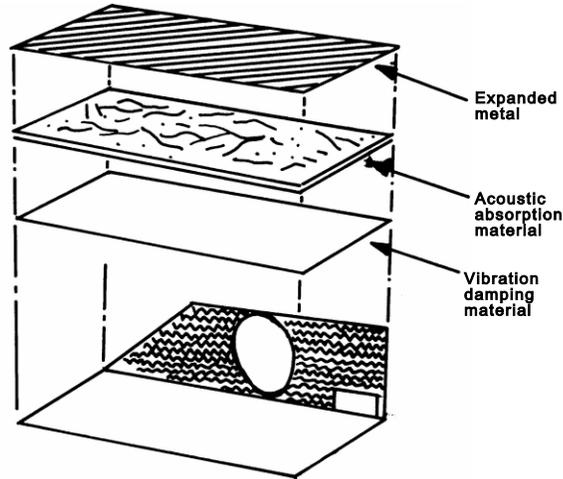


Constrained-Layer Damping of Conveyor Pan Using Individual Strips



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. Coated Conveyor Chains.** The flight bars of the conveyor chain can be treated with a highly durable polyurethane coating to reduce impact noise between the conveyor chain and the conveyor pan and tail roller. Conveyor chains with coated flight bars are available from retrofit conveyor chain manufacturers.

Noise Control Availability from Retrofit Manufacturer	
Manufacturer	Coated Conveyor Chain
Cincinnati Mine Machinery Co.	X
Joy	X
"X" indicates product availability.	

**D. 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 raised and 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 conveyor can help eliminate noise sources such as loose covers causing metal-on-metal impacting the side of the pan. 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 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 conveyors can provide details on remote control systems for their machines.

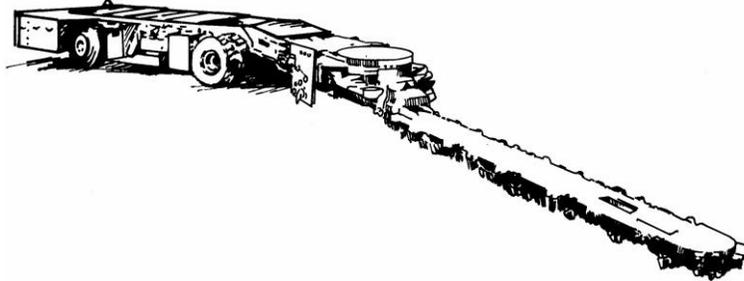
### **4. Administrative Controls**

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***

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Cutting machines are utilized in conventional mining (drill and shoot the face) of coal or soft material (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**

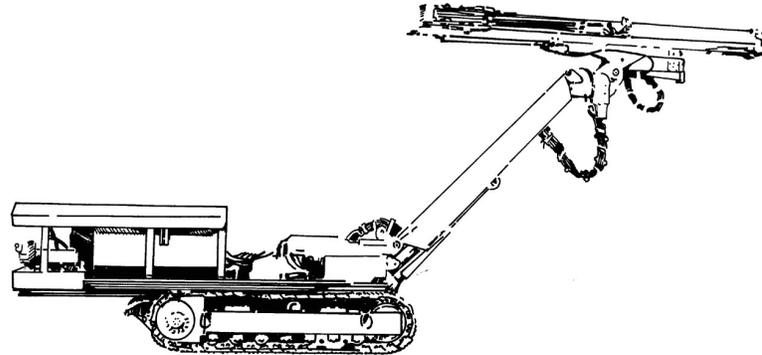
At the present time, there are no feasible retrofit noise controls available for underground cutting machines.

### **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.

<b>Noise Control Availability from OEMs</b>		
<b>Manufacturer (acquired OEMs)</b>	<b>Operator cab</b>	<b>Muffler</b>
Oldenburg-Cannon	X*	X
Sandvik (Tamrock)	X*	X
Fletcher Mining Equipment	X*	X
Atlas-Copco	X*	X
Gardner-Denver	X*	X
*Certain Models		“X” indicates product availability.

### **2. Retrofit Noise Controls**

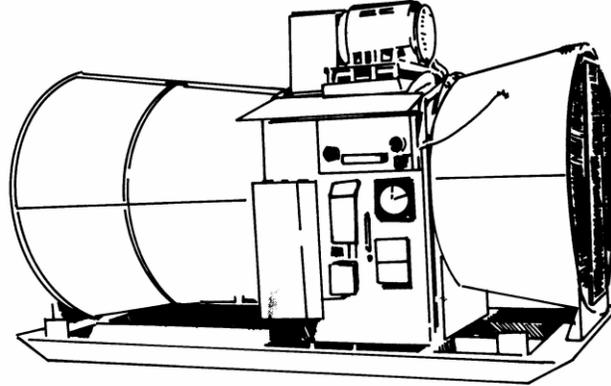
Suggested retrofit noise controls consist of the installation of an after-market cab where none currently exist (see Appendix C for listing of suppliers) and the installation of a muffler(s), if needed. The drill manufacturer or dealer should be contacted for selection of proper muffler(s).

### **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 provide forced ventilation. These fans pull/push air throughout the mine. Auxiliary fans are used to direct the air in the 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.

<b>Noise Control Availability from OEMs</b>			
<b>Manufacturer (acquired OEMs)</b>	<b>Treated Fan Vaness</b>	<b>Install Muffler Ducts</b>	<b>Resonant Silencer</b>
A. L. Lee Corp	None	X	X
Fairchild International	X	None	X
Hartzell Fan, Inc.	None	X	X
Howden (Joy)	X	None	X
New York Blower Co.	X	None	X
ABC Industries (Peabody ABC)	X	None	X
Robinson Industries	None	X	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 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. 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.

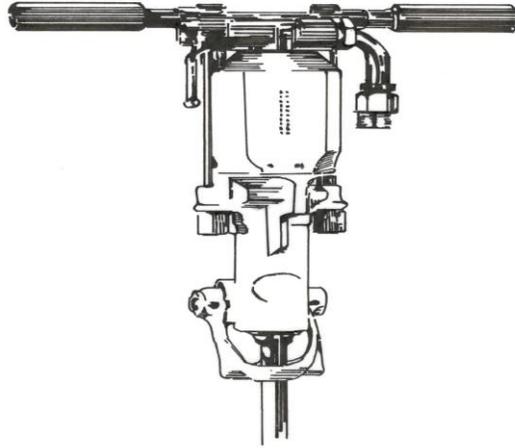
Replacement of a noisy fan with a quieter model is recommended. Use of any noise control options in the above table is also suggested.

## **3. Alternative Technology**

There is no alternate technology.

### ***HAND-HELD PNEUMATIC AND ELECTRO-PNEUMATIC DRILLS***

Hand-held pneumatic drills can be found in above ground (sandstone, limestone, and dimension stone) and underground (coal, lead, and 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. Electro-pneumatic drills can be utilized in the same capacity as a pneumatic drill. Although the electro-pneumatic drill is quieter by design, its penetration rate is markedly slower than that of a pneumatic drill and may be more suited to use as a utility tool.



#### **1. Original Equipment Manufacturers (OEM)**

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

<b>Noise Control Availability from OEMs</b>	
<b>Manufacturer</b>	<b>Available Noise Controls</b>
Mid-Western Machinery Company	Muffler
Sullair	Muffler
Chicago Pneumatic	Muffler
Boart Longyear (SIG Rocktools AG)	Muffler
Hilti*	Quieter by Design
* Electro-pneumatic drill.	

#### **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-DUMP (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 LHDs as standard equipment. Local dealers should be contacted for specific needs and details.

<b>Noise Control Availability from OEMs</b>	
<b>Manufacturer (acquired OEMs)</b>	<b>Noise Controls</b>
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
Sandvik(Tamrock)	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.

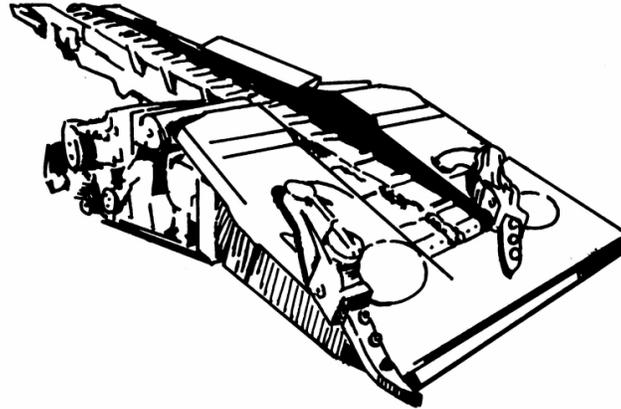
<b>Retrofit Noise Controls Available for LHDs</b>				
<b>Manufacturer (Acquired OEMs)</b>	<b>Seal Openings</b>	<b>Exhaust System</b>	<b>Acoustical Materials</b>	<b>Sound Suppressed Cab</b>
Atlas-Copco (Wagner)	X	X	X	X*
Dux Machinery Corp.	X	X	X	None
Mining Technologies Int.	X	X	X	X*
Sandvik (Tamrock)	X	X	X	X*
Caterpillar-Elphinstone	X	X	X	X*
*Certain Models		“X” indicates product availability.		

### 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 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.

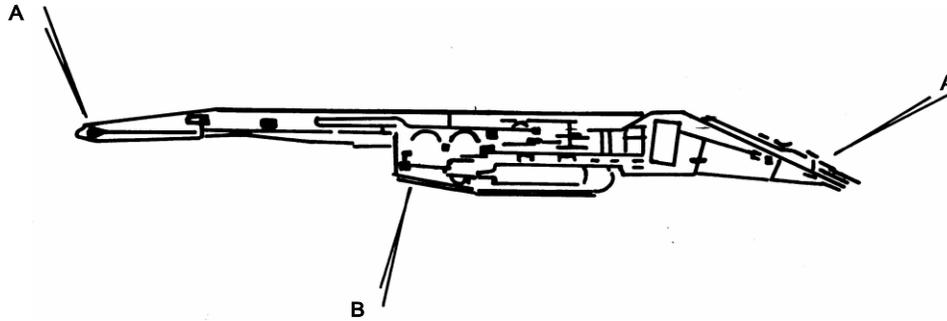
<b>Noise Control Availability from OEM</b>	
<b>Manufacturer</b>	<b>Sound Damping Conveyor</b>
Joy Technologies	X
"X" indicates product availability.	

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.

### **2. Retrofit Noise Controls**

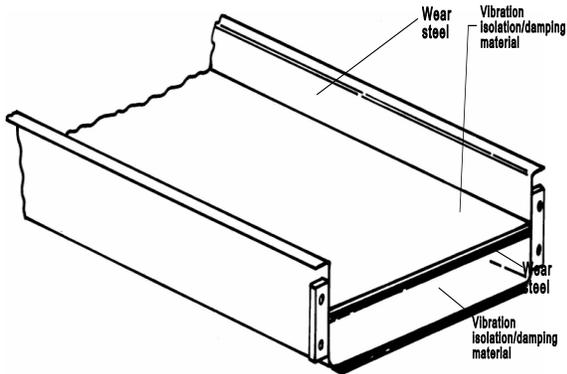
This section is for underground loaders without noise controls. The effectiveness of noise controls is dependent upon the quality of both the materials and installation techniques. If a retrofit kit is unavailable, the materials may be purchased in bulk from manufacturers using Appendix C as a reference.

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

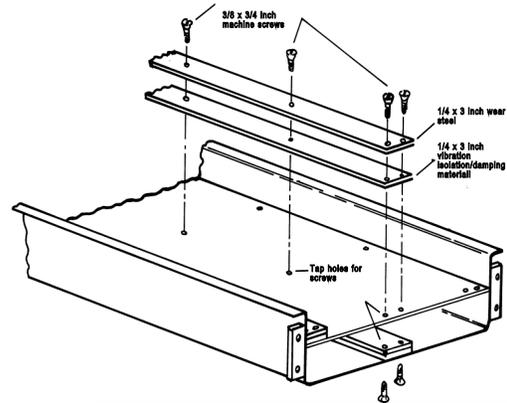


Areas Where Retrofit Noise Controls Should be Installed

**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.

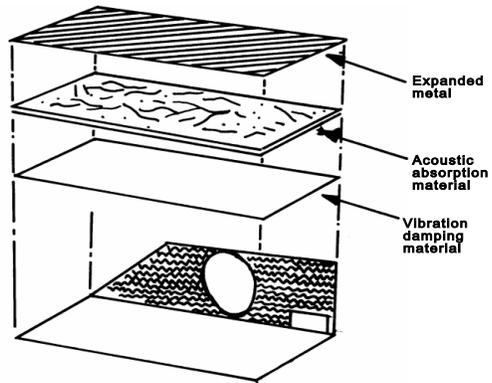


Conveyor Pan Line Treated with Individual Steel Strips



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.



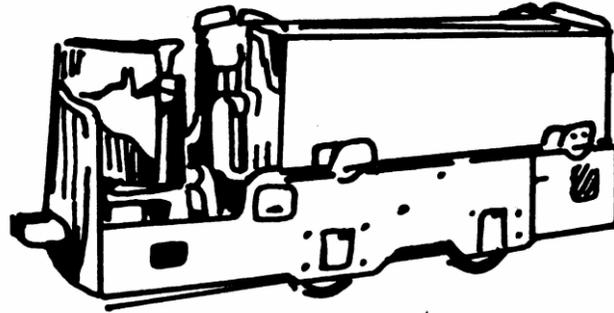
Barrier Insulation Applied to Hydraulic Pump Compartments

### 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.

<b>Noise Control Availability from OEMs</b>			
<b>Manufacturer (acquired OEM)</b>	<b>Exhaust Muffler</b>	<b>Enclosed Power Train</b>	<b>Optional Treated Operator Cab</b>
Brookville Mining	X	X	X
A. L. Lee Corp. (Eimco)	X	None	None
W.W. Williams (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**

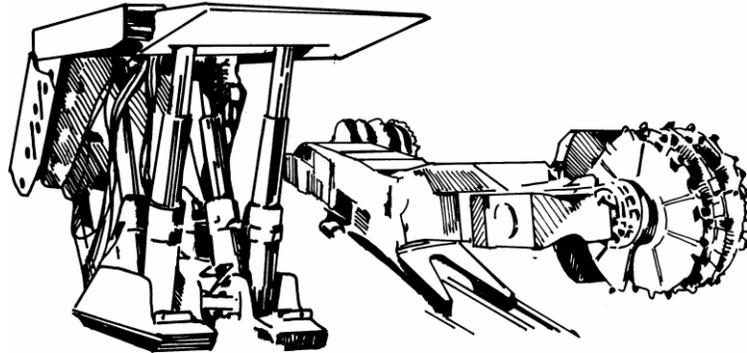
This section deals with diesel locomotives without any noise controls. The effectiveness of the retrofit noise controls is dependent upon the quality of both acoustical materials and installation. Installation of composite acoustical material should be applied around the operator compartment and the transmission enclosed on some models when it is located near the operator's position. The manufacturer should be contacted regarding this installation to ensure 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 (OEMs)**

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

<b>Noise Control Availability from OEMs</b>		
<b>Manufacturer (acquired OEMs)</b>	<b>Radio Remote Control</b>	<b>Umbilical Remote Control</b>
Joy (American Longwall)	X	X
Eichhoff Corporation	X	X
Bucyrus (DBT, Simmons-Rand, Anderson-Mavor)	X	X
“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. Retrofit noise controls which can be implemented include:

- A. Locate the pump station in the intake entry, outby the headgate, away from where miners normally perform their duties.

- B. Fully enclose the stage loader (except for the entrances and exits) with secure, sealed, rigid covers.
- C. Attenuate the stage loader scrubbers as much as possible. Direct scrubber discharge away from operator locations.
- D. Install sound-absorptive material on motors, panels, and gearboxes provided that overheating does not occur.
- E. 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.
- F. Cover the end of the stage loader discharge with conveyor belting.
- G. Attach belting to the shearer spray arms in a manner so that the belting extends above the spray arms.

### **3. Alternative Technology**

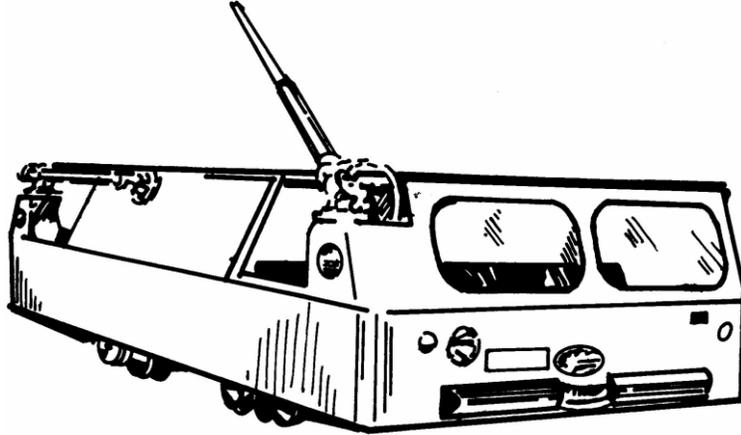
Under certain situations, remote controls may be used as a noise control by increasing the distance between the operator and the machine. The use of remote controls is dependent upon mining methodology and is very site-specific.

### **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.

<b>Noise Control Availability from OEMs</b>				
<b>Manufacturer (acquired OEM)</b>	<b>Enclosed Treated Cab</b>	<b>Partial Enclosed Cab</b>	<b>Treated Engine Housing</b>	<b>Acoustically Redesigned Open-Cab</b>
Fletcher Mining Equipment	None	None	X	None
W. W. Williams (Goodman)	None	X	None	None
A. L. Lee Corp.	X*	X	X	None
Hagar Equipment Co. of Alabama, Inc.	None	None	None	X
*Large model diesel		“X” indicates product availability.		

**2. Retrofit Noise Controls**

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

<b>Retrofit Noise Controls Availability</b>	
<b>Manufacturer (acquired OEM)</b>	<b>Treated Cab</b>
W. W. Williams (Goodman)	X
A&L Lee Company	X
*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

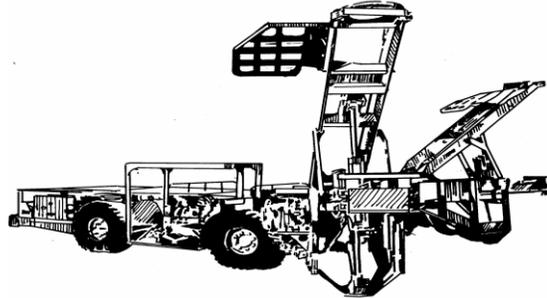
Vibration isolation and/or damping material or components may be installed on certain components such as motors and sheet metal panels. Some standard components may be replaced with noise controlled components.

### **3. 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, grouted bolt, or other device. Roof bolters are used in most 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 dominant 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 muffler’s exhaust terminates. 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.
  4. Use drill bit and chuck isolators to reduce roof bolting machine drilling noise. A drill bit isolator breaks the steel-to-steel link between the drill bit and the drill steel. A chuck isolator breaks the mechanical connection between the drill steel and the chuck. This effectively reduces the noise radiated by the drill steel and the chuck and reduces the noise exposure of the roof bolter operator.

<b>Noise Control Availability</b>	
<b>Manufacturer</b>	<b>Drill Bit and Chuck Isolators</b>
Corry Rubber Corporation	X
"X" indicates product availability.	

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.

<b>OEMs Which Provide Noise Control Systems for Roof Bolters</b>			
<b>Manufacturer (acquired OEMs)</b>	<b>Dry-Dust Systems</b>	<b>Quieter Hydraulics</b>	<b>Other Options</b>
Atlas-Copco	X	X	X*
Sandvik (Alpine, Eimco, Tamrock)	X	X	X*
Fairchild International	None	X	None
Fletcher Mining Equipment	X	X	X*
Bucyrus (Ingersoll-Rand)	X	X	None
*Operator cab on some models		"X" indicates product availability.	

## 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.

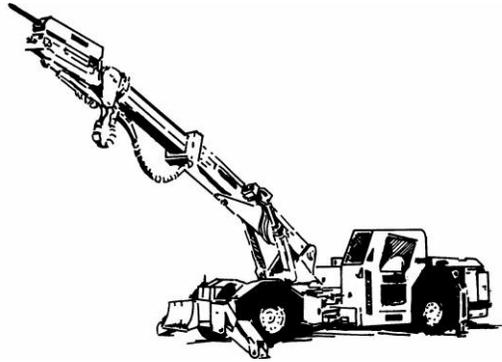
Consider constructing a partial barrier (three-sided) between the operator and the drilling mechanism. Some roof bolting machines can accommodate such a barrier.

## 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 table illustrates OEMs offering noise controls for new roof scalers. Local dealers can provide cost and availability information on noise controls available. Some manufacturers will build a unit to specific needs.

<b>Noise Control Availability from OEM's</b>	
<b>Manufacturer</b>	<b>Treated Cab</b>
Fletcher Mining Equipment	X*
Getman Corporation	X*
Gradall	X*
Dux Machinery Corp.	X*
*Some models	"X" indicates product availability.

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.

**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 that the diesel engine is generally located to the rear of the operator, with the majority of noise controlling effort 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.

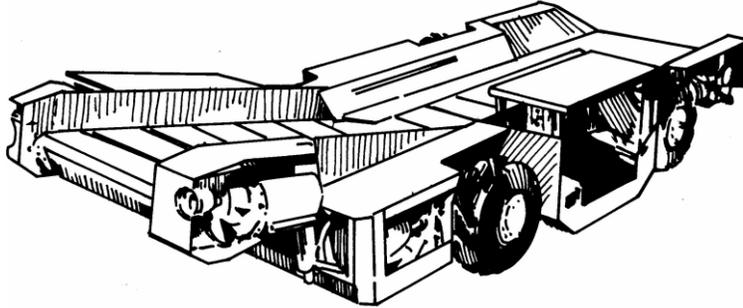
To assist in the selection and installation of acoustical materials for the above option, please refer to the appropriate appendices in the rear of this manual.

### **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.

<b>Noise Control Availability from OEMs</b>	
<b>Manufacturer (acquired OEM)</b>	<b>Exhaust Mufflers</b>
Bucyrus (Jeffrey)	X
Atlas-Copco (Wagner)	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

A. L. Lee Corporation  
 2075 Lester Highway  
 P.O. Box 99  
 Lester, WV 25865  
 Phone: 304.934.5361  
 Fax: 304.934.5388  
[www.alleecorp.com](http://www.alleecorp.com)

Air Pollution Controls, Inc.  
 2130 Kaliste Saloom Road  
 Lafayette, LA 70508-0614  
 Phone: 337.989.0672

Atlas-Copco North America LLC  
 34 Maple Avenue  
 PO Box 2028  
 Pine Brook, NJ 07058  
 Phone: 973.439.3494  
[Atlas Copco USA](http://Atlas Copco USA)

Boart Longyear  
 10808 South River Front Parkway  
 Suite 600  
 South Jordan, UT 84095  
 Phone: 801.972.6430  
 Fax: 801.977.3374  
[Boart Longyear](http://Boart Longyear)

Brookville Mining Equipment  
 175 Evans Street  
 Brookville, PA 15825  
 Phone: 814.849.2000  
 Fax: 814.849.2010  
[www.bmec.com](http://www.bmec.com)

Bucyrus International, Inc  
 1100 Milwaukee Ave  
 South Milwaukee, WI 53172  
 Phone: 414.768.4000  
[www.bucyrus.com](http://www.bucyrus.com)

Caterpillar Elphinstone Priority Ltd.  
 2 Hopkinson Street  
 South Burnie, Tasmania 7320  
 Australia  
 61.03.6431.2311 (International)  
 61.03.6431.7262 (International fax)  
[www.australia.cat.com](http://www.australia.cat.com)

Chicago Pneumatic  
 3700 E. 68th Avenue  
 Commerce City, Co 80022  
 Phone: 800.760.4049  
 Fax: 800.952.7975  
[www.cp.com](http://www.cp.com)

Cincinnati Mine Machinery Company  
 2950 Jonrose Avenue  
 Cincinnati, OH 45239-5319  
 Phone: 513.728.4040 or 800.543.4607  
 Fax: 513.728.4041  
[www.cinmine.com](http://www.cinmine.com)

Corry Rubber Corporation  
 601 West Main Street  
 Corry, PA 16407  
 Phone: 814.664.2313  
 Fax: 814.665.9155  
[www.corryrubber.com](http://www.corryrubber.com)

DUX Machinery Corporation  
 615 Lavoisier  
 Repentigny, Quebec J6A 7N2  
 Canada  
 Phone: 450.581.8341  
 Fax: 450.581.5138  
[DUX Machinery Corporation](http://DUX Machinery Corporation)

Eickhoff Corporation  
 200 Parkwest Drive  
 Pittsburgh, PA 15275  
 Phone: 412.788.1400  
 Fax: 412.788.4100  
[www.eickhoffcorp.com](http://www.eickhoffcorp.com)

Fairchild International  
 PO Box 300  
 Glen Lyn, VA 24093  
 Phone: 540.726.2380  
 Fax: 540.726.2388  
[www.fairchildint.com](http://www.fairchildint.com)

Fletcher Mining Equipment  
 PO Box 2187  
 Huntington, WV 25722  
 Phone: 304.525.7811  
[www.jhfletcher.com](http://www.jhfletcher.com)

Gardner Denver  
 1800 Gardner Expressway  
 Quincy, IL 62301  
 Phone: 217.222.5400  
 Fax: 217.228.8243  
[www.gardnerdenver.com](http://www.gardnerdenver.com)

Getman Corporation  
 59750 34<sup>th</sup> Avenue  
 Bangor, MI 49013  
 Phone: 269.427.5611  
 Fax: 269.427.8781  
[www.getman.com](http://www.getman.com)

Gradall Industries, Inc.  
 406 Mill Avenue SW  
 New Philadelphia, OH 44663  
 Phone: 330.339.2211  
 Fax: 330.339.8468  
[www.gradall.com](http://www.gradall.com)

Hager Equipment Co. of AL, Inc.  
 1901 Morgan Road SE  
 Bessemer, AL 35022  
 Phone: 205.424.1363  
[www.hagerequipment.com](http://www.hagerequipment.com)

Hartzell Fan, Inc.  
 910 South Downing Street  
 Piqua, OH 45356  
 Phone: 937.773.7411  
 Fax: 937.773.8994  
[www.hartzellfan.com](http://www.hartzellfan.com)

Hilti, Inc.  
 5400 South 122nd East Avenue  
 Tulsa, OK 74146  
 Phone: 866.445.8827  
 Fax: 800.879.7000  
[www.us.hilti.com](http://www.us.hilti.com)

Ingersoll-Rand Company  
 One Centennial Ave  
 Piscataway, NJ 08854  
 Phone: 732.652.7000  
[www.ingersollrand.com](http://www.ingersollrand.com)

Jeffrey Rader  
 398 Willis Road  
 Woodruff, SC 29388  
 Phone: 864.476.7523  
 Fax: 864.476.7510  
[www.jeffreyrader.com](http://www.jeffreyrader.com)

Joy Mining Machinery  
 177 Thorn Hill Road  
 Warrendale, PA 15086  
 Phone: 724.779.4500  
 Fax: 724.779.4509  
[www.joy.com](http://www.joy.com)

Mid-western Machinery Co. Inc.  
 902 E. 4th Street  
 Joplin, MO 64801  
 Phone: 417.624.2400  
 Fax: 417.624.2430  
[www.mwdrill.com](http://www.mwdrill.com)

Minerals Processing Technology Center  
 Dorr-Oliver Eimco  
 7158 S. FLSmidth Drive  
 Midvale, UT 84047-5559  
 Phone: 801.526.2000  
 Fax: 801.526.2923  
[www.flsmidth.com](http://www.flsmidth.com)

Mining Technologies Int'l Inc. - USA  
MTI Montana  
1124 Main Street  
Billings, MT 59105  
Phone: 406.256.1179  
Fax: 406.256.2088  
[www.mti.ca](http://www.mti.ca)

New York Blower Company  
7660 Quincy Street  
Willowbrook, IL 60521  
Phone: 630.794.5700  
Fax: 630.794.5776  
[www.nyb.com](http://www.nyb.com)

Oldenburg-Cannon Drills  
423 River Road  
P. O. Box 1470  
Claremont, NH 03743  
Phone: 603.542.9548  
Fax: 603.542.4229  
[www.oldenburggroup.com](http://www.oldenburggroup.com)

Robinson Industries  
400 Robinson Drive  
PO Box 100  
Zelienople, PA 16063  
Phone: 724.452.6121  
Fax: 724.452.0388  
[www.robinsonfans.com](http://www.robinsonfans.com)

Sandvik Mining & Construction  
300 Technology Court  
Smyrna, GA 30082  
Phone: 404.589.3800  
Fax: 404.589.2000  
[www.smc.sandvik.com](http://www.smc.sandvik.com)

Spendrup Fan Company  
2768 C 1/2 Road  
PO Box 4308  
Grand Junction, CO 81502  
Phone: 970.243.3429 or 800.525.1450  
Fax: 970.242.6724  
[www.spendrupfanco.com](http://www.spendrupfanco.com)

Sullair Corporation  
3700 E. Michigan Blvd.  
Michigan City, IN 46360  
Phone: 219.879.5451 or 800.785.5247  
Fax: 219.874.1252  
[www.sullair.com](http://www.sullair.com)

W. W. Williams  
1395 Triplett Boulevard  
Akron, OH 44306  
Phone: 330.794.1535  
[www.williamsdistribution.com](http://www.williamsdistribution.com)

## **APPENDIX B**

Buyer's Guide for Noise Control Products

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

This information is also available at [www.sandv.com](http://www.sandv.com) under Issues ->  
Buyers Guides -> July 20xx -> Buyers Guide to Products for Noise and Vibration Control

### Sound Absorptive Materials

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

3M E-A-R  
7911 Zionsville Rd.  
Indianapolis, IN 46268  
Phone: 877.327.4332  
Fax: 317.692.3111  
[info@earsc.com](mailto:info@earsc.com)  
[www.earsc.com](http://www.earsc.com)  
(1, 2)

Acoustax Noise Barriers  
243 W Eighth St.  
PO Box 4174  
Wyoming, PA 18644  
Phone: 800.233.9601  
Fax: 570.693.3500  
[info@acoustax.com](mailto:info@acoustax.com)  
[www.acoustax.com](http://www.acoustax.com)  
(5)

Acoustiblok, Inc.  
6900 Interbay Blvd.  
Tampa, FL 33616  
Phone: 813.980.1140  
Fax: 813.849.6347  
[info@acoustiblok.com](mailto:info@acoustiblok.com)  
[www.acoustiblok.com](http://www.acoustiblok.com)  
(5, 7)

Acoustical Surfaces  
123 Columbia Court N.  
Chaska, MN 55318  
Phone: 800.854.2948  
Fax: 952.448.2613  
[info@acousticalsurfaces.com](mailto:info@acousticalsurfaces.com)  
[www.acousticalsurfaces.com](http://www.acousticalsurfaces.com)  
(2, 5, 7)

American Acoustical Products/Ward Process  
311 Hopping Brook Rd,  
Holliston, MA 01746  
Phone: 508.429.1165  
Fax: 508.429.8543  
[info@aapusa.com](mailto:info@aapusa.com)  
[www.aapusa.com](http://www.aapusa.com)  
(2-5, 7)

Blachford, Inc.  
1400 Nuclear Drive  
West Chicago, IL 60185  
Phone: 630.231.8300  
Fax: 630.231.8321  
[info@blachford.com](mailto:info@blachford.com)  
[www.blachford.com](http://www.blachford.com)  
(1-5, 7)

Eckel Industries  
Acoustic Division  
155 Fawcett St.  
Cambridge, MA 02138  
Phone: 617.491.3221  
Fax: 617.547.2171  
[info@eckelusa.com](mailto:info@eckelusa.com)  
[www.eckelusa.com](http://www.eckelusa.com)  
(5, 7)

Ferguson Perforating  
130 Ernest St.  
Providence, RI 02905  
Phone: 800.341.9800  
Fax: 401.941.2950  
[info@fergusonperf.com](mailto:info@fergusonperf.com)  
[www.fergusonperf.com](http://www.fergusonperf.com)  
(5)

George Koch Sons, LLC.  
10 S. Eleventh Avenue  
Evansville, IN 47712  
Phone: 888.873.5624  
Fax: 877.726.5427  
[info@kochllc.com](mailto:info@kochllc.com)  
[www.kochllc.com](http://www.kochllc.com)  
(4)

Industrial Acoustics Co. Inc.  
1160 Commerce Ave.  
Bronx, NY 10462  
Phone: 718.931.8000  
Fax: 718.863.1138  
[info@industrialacoustics.com](mailto:info@industrialacoustics.com)  
[www.industrialacoustics.com](http://www.industrialacoustics.com)  
(7)

Industrial Noise Control, Inc.,  
401 Airport Rd.  
North Aurora, IL 60542  
Phone: 800.954.1998  
Fax: 800.420.4928  
[info@industrialnoisecontrol.com](mailto:info@industrialnoisecontrol.com)  
[www.industrialnoisecontrol.com](http://www.industrialnoisecontrol.com)  
(1, 4, 5, 7)

International Cellulose, Inc.  
12315 Robin Blvd.  
Houston, TX 77045  
Phone: 800.444.1252  
Fax: 713.610.4761  
[info@internationalcellulose.com](mailto:info@internationalcellulose.com)  
[www.spray-on.com](http://www.spray-on.com)  
(6)

Kinetics Noise Control, Inc.,  
6300 Ireland Place  
Dublin, OH 43017  
Phone: 877.457.2695  
Fax: 614.889.0540  
[info@kineticsnoise.com](mailto:info@kineticsnoise.com)  
[www.kineticsnoise.com](http://www.kineticsnoise.com)  
(2, 3, 5, 7)

Maxxon Corp.  
920 Hamel Rd.  
P.O. Box 253  
Hamel, MN 55340  
Phone: 800.356.7887  
Fax: 763.478.2431  
[info@maxxon.com](mailto:info@maxxon.com)  
[www.maxxoncorporation.com](http://www.maxxoncorporation.com)  
(1)

MBI Products Company  
801 Bond St.  
Elyria, OH 44035  
Phone: 440.322.6500  
Fax: 440.322.1900  
[info@mbiproducts.com](mailto:info@mbiproducts.com)  
[www.mbiproducts.com](http://www.mbiproducts.com)  
(7)

McGill Air Silence, LLC,  
2400 Fairwood Ave.  
Columbus, OH 43207-2700  
Phone: 614.829.1200  
Fax: 614.829.1488  
[info@mcgillairsilence.com](mailto:info@mcgillairsilence.com)  
[www.mcgillairsilence.com](http://www.mcgillairsilence.com)  
(2-7)

Metal Form Manufacturing  
5960 W. Washington St.  
Phoenix, AZ 85043  
Phone: 602.233.1211  
Fax: 602.233.2033  
[info@mfmc.com](mailto:info@mfmc.com)  
[www.mfmc.com](http://www.mfmc.com)  
(5)

Pyrok, Inc.  
121 Sunset Rd.  
Mamaroneck, NY 10543  
Phone: 914.777.7070  
Fax: 914.777.7103  
[info@pyrokinc.com](mailto:info@pyrokinc.com)  
[www.pyrokinc.com](http://www.pyrokinc.com)  
(6, 7)

RPG Diffusor Systems, Inc.,  
651-c Commerce Drive  
Upper Marlboro, MD 20774  
Phone: 301.249.0044  
Fax: 301.390.3602  
[info@rpginc.com](mailto:info@rpginc.com)  
[www.rpginc.com](http://www.rpginc.com)  
(2, 4, 7)

Sound Fighter Systems, LLC.  
1305 Airport Dr.  
PO Box 7216  
Shreveport, LA 71137  
Phone: 866.348.0833  
Fax: 318.865.7373  
[info@soundfighter.com](mailto:info@soundfighter.com)  
[www.soundfighter.com](http://www.soundfighter.com)  
(7)

Soundown Corporation  
16 Broadway  
Salem, MA 01970  
Phone: 978.745.7000  
Fax: 978.745.0900  
[info@soundown.com](mailto:info@soundown.com)  
[www.soundown.com](http://www.soundown.com)  
(2-5, 7)

Tectum Inc.  
105 S. 6th St.  
Newark, OH 43055  
Phone: 888.977.9691  
Fax: 800.832.8869  
[info@tectum.com](mailto:info@tectum.com)  
[www.tectum.com](http://www.tectum.com)  
(7)

The Soundcoat Company  
1 Burt Drive  
Deer Park, NY 11729  
Phone: 800.394.8913  
Fax: 631.242.2246  
[info@soundcoat.com](mailto:info@soundcoat.com)  
[www.soundcoat.com](http://www.soundcoat.com)  
(2)

### Sound Absorptive Systems

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

Acoustax Noise Barriers  
243 W Eighth St.  
PO Box 4174  
Wyoming, PA 18644  
Phone: 800.233.9601  
Fax: 570.693.3500  
[info@acoustax.com](mailto:info@acoustax.com)  
[www.acoustax.com](http://www.acoustax.com)  
(3-5)

Acoustiblok, Inc.  
6900 Interbay Blvd.  
Tampa, FL 33616  
Phone: 813.980.1140  
Fax: 813.849.6347  
[info@acoustiblok.com](mailto:info@acoustiblok.com)  
[www.acoustiblok.com](http://www.acoustiblok.com)  
(3, 5)

Acoustical Surfaces  
123 Columbia Court N.  
Chaska, MN 55318  
Phone: 800.854.2948  
Fax: 952.448.2613  
[info@acousticalsurfaces.com](mailto:info@acousticalsurfaces.com)  
[www.acousticalsurfaces.com](http://www.acousticalsurfaces.com)  
(3-5)

American Acoustical  
Products/Ward Process  
311 Hopping Brook Rd,  
Holliston, MA 01746  
Phone: 508.429.1165  
Fax: 508.429.8543  
[info@aapusa.com](mailto:info@aapusa.com)  
[www.aapusa.com](http://www.aapusa.com)  
(3)

Blachford, Inc.  
1400 Nuclear Drive  
West Chicago, IL 60185  
Phone: 630.231.8300  
Fax: 630.231.8321  
[info@blachford.com](mailto:info@blachford.com)  
[www.blachford.com](http://www.blachford.com)  
(1, 3, 5)

Eckel Industries  
Acoustic Division  
155 Fawcett St.  
Cambridge, MA 02138  
Phone: 617.491.3221  
Fax: 617.547.2171  
[info@eckelusa.com](mailto:info@eckelusa.com)  
[www.eckelusa.com](http://www.eckelusa.com)  
(1, 3-5)

Ferguson Perforating  
130 Ernest St.  
Providence, RI 02905  
Phone: 800.341.9800  
Fax: 401.941.2950  
[info@fergusonperf.com](mailto:info@fergusonperf.com)  
[www.fergusonperf.com](http://www.fergusonperf.com)  
(1, 5)

George Koch Sons, LLC.  
10 S. Eleventh Avenue  
Evansville, IN 47712  
Phone: 888.873.5624  
Fax: 877.726.5427  
[info@kochllc.com](mailto:info@kochllc.com)  
[www.kochllc.com](http://www.kochllc.com)  
(3, 5)

Industrial Acoustics Co. Inc.  
1160 Commerce Ave.  
Bronx, NY 10462  
Phone: 718.931.8000  
Fax: 718.863.1138  
[info@industrialacoustics.com](mailto:info@industrialacoustics.com)  
[www.industrialacoustics.com](http://www.industrialacoustics.com)  
(1, 3, 5)

Industrial Noise Control, Inc.,  
401 Airport Rd.  
North Aurora, IL 60542  
Phone: 800.954.1998  
Fax: 800.420.4928  
[info@industrialnoisecontrol.com](mailto:info@industrialnoisecontrol.com)  
[www.industrialnoisecontrol.com](http://www.industrialnoisecontrol.com)  
(1, 3-5)

Keene Building Products  
5910 Landerbrook Dr.  
Ste #210  
Mayfield Heights, OH 44124  
Phone: 877.514.5336  
Fax: 440.605.1120  
[info@keenebuilding.com](mailto:info@keenebuilding.com)  
[www.keenebuilding.com](http://www.keenebuilding.com)  
(1)

Kinetics Noise Control, Inc.,  
6300 Irelan Place  
Dublin, OH 43017  
Phone: 877.457.2695  
Fax: 614.889.0540  
[info@kineticsnoise.com](mailto:info@kineticsnoise.com)  
[www.kineticsnoise.com](http://www.kineticsnoise.com)  
(1, 3, 5)

MBI Products Company  
801 Bond St.  
Elyria, OH 44035  
Phone: 440.322.6500  
Fax: 440.322.1900  
[info@mbiproducts.com](mailto:info@mbiproducts.com)  
[www.mbiproducts.com](http://www.mbiproducts.com)  
(1, 3, 5)

McGill Air Silence, LLC,  
2400 Fairwood Ave.  
Columbus, OH 43207-2700  
Phone: 614.829.1200  
Fax: 614.829.1488  
[info@mcgillairsilence.com](mailto:info@mcgillairsilence.com)  
[www.mcgillairsilence.com](http://www.mcgillairsilence.com)  
(1, 3, 5)

Metal Form Manufacturing  
5960 W. Washington St.  
Phoenix, AZ 85043  
Phone: 602.233.1211  
Fax: 602.233.2033  
[info@mfmca.com](mailto:info@mfmca.com)  
[www.mfmca.com](http://www.mfmca.com)  
(3, 5)

Pyrok, Inc.  
121 Sunset Rd.  
Mamaroneck, NY 10543  
Phone: 914.777.7070  
Fax: 914.777.7103  
[info@pyrokinc.com](mailto:info@pyrokinc.com)  
[www.pyrokinc.com](http://www.pyrokinc.com)  
(1, 5)

RPG Diffusor Systems, Inc.,  
651-c Commerce Drive  
Upper Marlboro, MD 20774  
Phone: 301.249.0044  
Fax: 301.390.3602  
[info@rpginc.com](mailto:info@rpginc.com)  
[www.rpginc.com](http://www.rpginc.com)  
(1, 3-5)

Sound Fighter Systems, LLC.  
1305 Airport Dr.  
PO Box 7216  
Shreveport, LA 71137  
Phone: 866.348.0833  
Fax: 318.865.7373  
[info@soundfighter.com](mailto:info@soundfighter.com)  
[www.soundfighter.com](http://www.soundfighter.com)  
(2-5)

Soundown Corporation  
16 Broadway  
Salem, MA 01970  
Phone: 978.745.7000  
Fax: 978.745.0900  
[info@soundown.com](mailto:info@soundown.com)  
[www.soundown.com](http://www.soundown.com)  
(1, 3, 5)

Tectum Inc.  
105 S. 6th St.  
Newark, OH 43055  
Phone: 888.977.9691  
Fax: 800.832.8869  
[info@tectum.com](mailto:info@tectum.com)  
[www.tectum.com](http://www.tectum.com)  
(1, 3, 5)

Vibro-Acoustics  
727 Tapscott Rd.  
Scarborough, Ontario,  
Canada M1X 1A2  
Phone: 800.565.8401  
Fax: 888.811.2264  
[info@vibro-acoustics.com](mailto:info@vibro-acoustics.com)  
[www.vibro-acoustics.com](http://www.vibro-acoustics.com)  
(3)

### Sound Barrier Materials

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

3M E-A-R  
7911 Zionsville Rd.  
Indianapolis, IN 46268  
Phone: 877.327.4332  
Fax: 317.692.3111  
[info@earsc.com](mailto:info@earsc.com)  
[www.earsc.com](http://www.earsc.com)  
(1, 2)

Acoustiblok, Inc.  
6900 Interbay Blvd.  
Tampa, FL 33616  
Phone: 813.980.1140  
Fax: 813.849.6347  
[info@acoustiblok.com](mailto:info@acoustiblok.com)  
[www.acoustiblok.com](http://www.acoustiblok.com)  
(1-3)

Acoustical Surfaces  
123 Columbia Court N.  
Chaska, MN 55318  
Phone: 800.854.2948  
Fax: 952.448.2613  
[info@acousticalsurfaces.com](mailto:info@acousticalsurfaces.com)  
[www.acousticalsurfaces.com](http://www.acousticalsurfaces.com)  
(1)

American Acoustical  
Products/Ward Process  
311 Hopping Brook Rd  
Holliston, MA 01746  
Phone: 508.429.1165  
Fax: 508.429.8543  
[info@aapusa.com](mailto:info@aapusa.com)  
[www.aapusa.com](http://www.aapusa.com)  
(1, 2)

Blachford, Inc.  
1400 Nuclear Drive  
West Chicago, IL 60185  
Phone: 630.231.8300  
Fax: 630.231.8321  
[info@blachford.com](mailto:info@blachford.com)  
[www.blachford.com](http://www.blachford.com)  
(1, 2)

Ferguson Perforating  
130 Ernest St.  
Providence, RI 02905  
Phone: 800.341.9800  
Fax: 401.941.2950  
[info@fergusonperf.com](mailto:info@fergusonperf.com)  
[www.fergusonperf.com](http://www.fergusonperf.com)  
(4)

Industrial Noise Control, Inc.,  
401 Airport Rd.  
North Aurora, IL 60542  
Phone: 800.954.1998  
Fax: 800.420.4928  
[info@industrialnoisecontrol.com](mailto:info@industrialnoisecontrol.com)  
[www.industrialnoisecontrol.com](http://www.industrialnoisecontrol.com)  
(1, 2)

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[www.kineticsnoise.com](http://www.kineticsnoise.com)  
(1, 4)

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2400 Fairwood Ave.  
Columbus, OH 43207-2700  
Phone: 614.829.1200  
Fax: 614.829.1488  
[info@mcgillairsilence.com](mailto:info@mcgillairsilence.com)  
[www.mcgillairsilence.com](http://www.mcgillairsilence.com)  
(1-3)

Noble Company  
7300 Enterprise Dr.  
Spring Lake, MI 49456  
Phone: 800.878.5788  
Fax: 800.272.1519  
[info@noblecompany.com](mailto:info@noblecompany.com)  
[www.noblecompany.com](http://www.noblecompany.com)  
(4)

Sound Fighter Systems LLC  
PO Box 7216  
Shreveport, LA 71137  
Phone: 866.348.0833  
Fax: 713.865.7373  
[info@soundfighter.com](mailto:info@soundfighter.com)  
[www.soundfighter.com](http://www.soundfighter.com)  
(2)

Soundown Corporation  
16 Broadway  
Salem, MA 01970  
Phone: 978.745.7000  
Fax: 978.745.0900  
[info@soundown.com](mailto:info@soundown.com)  
[www.soundown.com](http://www.soundown.com)  
(1, 2)

The Soundcoat Company  
1 Burt Drive  
Deer Park, NY 11729  
Phone: 800.394.8913  
Fax: 631.242.2246  
[info@soundcoat.com](mailto:info@soundcoat.com)  
[www.soundcoat.com](http://www.soundcoat.com)  
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**Sound Barrier Systems**

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

Acoustax Noise Barriers  
243 W 8th St.  
Wyoming, PA 18644  
Phone: 800.233.9601  
Fax: 570.693.3500  
[info@acoustax.com](mailto:info@acoustax.com)  
[www.acoustax.com](http://www.acoustax.com)  
(3, 4, 7)

Acoustiblok, Inc.  
6900 Interbay Blvd.  
Tampa, FL 33616  
Phone: 813.980.1140  
Fax: 813.849.6347  
[info@acoustiblok.com](mailto:info@acoustiblok.com)  
[www.acoustiblok.com](http://www.acoustiblok.com)  
(4, 6, 7)

Acoustical Surfaces  
123 Columbia Court N.  
Chaska, MN 55316  
Phone: 952.448.5300  
Fax: 952.448.2613  
[info@acousticalsurfaces.com](mailto:info@acousticalsurfaces.com)  
[www.acousticalsurfaces.com](http://www.acousticalsurfaces.com)  
(1-5, 7, 8)

American Acoustical  
Products/Ward Process  
311 Hopping Brook Rd  
Holliston, MA 01746  
Phone: 508.429.1165  
Fax: 508.429.8543  
[info@aapusa.com](mailto:info@aapusa.com)  
[www.aapusa.com](http://www.aapusa.com)  
(1, 4, 7)

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1400 Nuclear Drive  
West Chicago, IL 60185  
Phone: 630.231.8300  
Fax: 630.231.8321  
[info@blachford.com](mailto:info@blachford.com)  
[www.blachford.com](http://www.blachford.com)  
(1, 6, 7)

Eckel Industries  
Acoustic Division  
155 Fawcett St.  
Cambridge, MA 02138  
Phone: 617.491.3221  
Fax: 617.547.2171  
[info@eckelusa.com](mailto:info@eckelusa.com)  
[www.eckelusa.com](http://www.eckelusa.com)  
(2, 4, 7, 8)

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10 S. Eleventh Avenue  
Evansville, IN 47712  
Phone: 888.873.5624  
Fax: 877.726.5427  
[info@kochllc.com](mailto:info@kochllc.com)  
[www.kochllc.com](http://www.kochllc.com)  
(2, 4, 6-8)

Industrial Acoustics Co. Inc.  
1160 Commerce Ave.  
Bronx, NY 10462  
Phone: 718.931.8000  
Fax: 718.863.1138  
[info@industrialacoustics.com](mailto:info@industrialacoustics.com)  
[www.industrialacoustics.com](http://www.industrialacoustics.com)  
(2-4, 6-8)

Industrial Noise Control, Inc.,  
401 Airport Rd.  
North Aurora, IL 60542  
Phone: 800.954.1998  
Fax: 800.420.4928  
[info@industrialnoisecontrol.com](mailto:info@industrialnoisecontrol.com)  
[www.industrialnoisecontrol.com](http://www.industrialnoisecontrol.com)  
(1, 2, 4, 6-8)

Jamison Door Co.  
55 JV Jamison Drive  
Hagerstown, MD 21740  
Phone 800.532.3667  
Fax: 301.791.7339  
[info@jamisondoor.com](mailto:info@jamisondoor.com)  
[www.jamisondoor.com](http://www.jamisondoor.com)  
(2)

Keene Building Products  
5910 Landerbrook Dr.  
Ste #210  
Mayfield Heights, OH 44124  
Phone: 877.514.5336  
Fax: 440.605.1120  
[info@keenebuilding.com](mailto:info@keenebuilding.com)  
[www.keenebuilding.com](http://www.keenebuilding.com)  
(7)

Kinetics Noise Control, Inc.,  
6300 Irelan Place  
Dublin, OH 43017  
Phone: 877.457.2695  
Fax: 614.889.0540  
[info@kineticsnoise.com](mailto:info@kineticsnoise.com)  
[www.kineticsnoise.com](http://www.kineticsnoise.com)  
(1, 2, 4, 7)

Krieger Specialty Products  
4880 Gregg Rd.  
Pico Rivera, CA 90660  
Phone: 562.695.0645  
Fax: 562.692.0146  
[info@kriegerproducts.com](mailto:info@kriegerproducts.com)  
[www.kriegerproducts.com](http://www.kriegerproducts.com)  
(2, 8)

McGill Air Silence, LLC,  
2400 Fairwood Ave.  
Columbus, OH 43207-2700  
Phone: 614.829.1200  
Fax: 614.829.1488  
[info@mcgillairsilence.com](mailto:info@mcgillairsilence.com)  
[www.mcgillairsilence.com](http://www.mcgillairsilence.com)  
(1, 2, 4, 7, 8)

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5960 W. Washington St.  
Phoenix, AZ 85043  
Phone: 602.233.1211  
Fax: 602.233.2033  
[info@mfmca.com](mailto:info@mfmca.com)  
[www.mfmca.com](http://www.mfmca.com)  
(2, 4, 6, 7)

Noble Company  
7300 Enterprise Dr.  
Spring Lake, MI 49456  
Phone: 800.878.5788  
Fax: 800.272.1519  
[info@noblecompany.com](mailto:info@noblecompany.com)  
[www.noblecompany.com](http://www.noblecompany.com)  
(3)

Overly Door Company  
574 W. Otterman St.  
Greensburg, PA 15601  
Phone: 800.979.7300  
Fax: 724.830.2871  
[info@door.overly.com](mailto:info@door.overly.com)  
[www.overly.com](http://www.overly.com)  
(2, 8)

PAC International, Inc.  
6585 Whispering Sands Dr.  
Las Vegas, NV 89131-2221  
Phone: 866.774.2100  
Fax: 866.649.2710  
[info@pac-intl.com](mailto:info@pac-intl.com)  
[www.pac-intl.com](http://www.pac-intl.com)  
(7)

Plywall  
154 Wire Rd.  
Thomson, GA 30824  
Phone: 800.531.5558  
Fax: 706.595.6600  
[info@plywall.com](mailto:info@plywall.com)  
[www.plywall.com](http://www.plywall.com)  
(6)

RPG Diffusor Systems, Inc.  
651-c Commerce Drive  
Upper Marlboro, MD 20774  
Phone: 301.249.0044  
Fax: 301.390.3602  
[info@rpginc.com](mailto:info@rpginc.com)  
[www.rpginc.com](http://www.rpginc.com)  
(4, 7)

Sound Fighter Systems LLC  
PO Box 7216  
Shreveport, LA 71137  
Phone: 866.348.0833  
Fax: 713.865.7373  
[info@soundfighter.com](mailto:info@soundfighter.com)  
[www.soundfighter.com](http://www.soundfighter.com)  
(1, 2, 4, 6, 7)

Soundown Corporation  
16 Broadway  
Salem, MA 01970  
Phone: 978.745.7000  
Fax: 978.745.0900  
[info@soundown.com](mailto:info@soundown.com)  
[www.soundown.com](http://www.soundown.com)  
(1, 4, 7)

Soundproof Windows, Inc.  
4673 Aircenter Circle  
Reno, NV 89502  
Phone: 877.438.7843  
Fax: 877.226.4063  
[info@soundproofwindows.com](mailto:info@soundproofwindows.com)  
[www.soundproofwindows.com](http://www.soundproofwindows.com)  
(2, 8)

St. Cloud Window, Inc.  
PO Box 1577  
St. Cloud, MN 53602  
Phone: 800.383.9311  
Fax: 320.255.1513  
[info@stcloudwindow.com](mailto:info@stcloudwindow.com)  
[www.stcloudwindow.com](http://www.stcloudwindow.com)  
(8)

Vibro-Acoustics  
727 Tapscott Rd.  
Toronto, Ontario,  
Canada M1X 1A2  
Phone: 416.291.7371  
Fax: 416.291.8049  
[info@vibro-acoustics.com](mailto:info@vibro-acoustics.com)  
[www.vibro-acoustics.com](http://www.vibro-acoustics.com)  
(4)

### **Composite Materials**

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

3M E-A-R  
7911 Zionsville Rd.  
Indianapolis, IN 46268  
Phone: 877.327.4332  
Fax: 317.692.3111  
[info@earsc.com](mailto:info@earsc.com)  
[www.earsc.com](http://www.earsc.com)  
(1, 2)

Acoustiblok, Inc.  
6900 Interbay Blvd.  
Tampa, FL 33616  
Phone: 813.980.1400  
Fax: 813.849.6347  
[info@acoustiblok.com](mailto:info@acoustiblok.com)  
[www.acoustiblok.com](http://www.acoustiblok.com)  
(1)

Acoustical Surfaces  
123 Columbia Court N.  
Chaska, MN 55318  
Phone: 800.854.2948  
Fax: 952.448.2613  
[info@acousticalsurfaces.com](mailto:info@acousticalsurfaces.com)  
[www.acousticalsurfaces.com](http://www.acousticalsurfaces.com)  
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Fax: 508.429.8543  
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[www.aapusa.com](http://www.aapusa.com)  
(1, 2)

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1400 Nuclear Drive  
West Chicago, IL 60185  
Phone: 630.231.8300  
Fax: 630.231.8321  
[info@blachford.com](mailto:info@blachford.com)  
[www.blachford.com](http://www.blachford.com)  
(1, 2)

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401 Airport Rd.  
North Aurora, IL 60542  
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Fax: 800.420.4928  
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[www.industrialnoisecontrol.com](http://www.industrialnoisecontrol.com)  
(1, 2)

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(1, 2)

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[www.mcgillairsilence.com](http://www.mcgillairsilence.com)  
(1, 2)

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[www.rpginc.com](http://www.rpginc.com)  
(2, 3)

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Shreveport, LA 71137  
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Fax: 713.865.7373  
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[www.soundfighter.com](http://www.soundfighter.com)  
(1, 2)

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Salem, MA 01970  
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Fax: 978.745.0900  
[info@soundown.com](mailto:info@soundown.com)  
[www.soundown.com](http://www.soundown.com)  
(1, 2)

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Deer Park, NY 11729  
Phone: 800.394.8913  
Fax: 631.242.2246  
[info@soundcoat.com](mailto:info@soundcoat.com)  
[www.soundcoat.com](http://www.soundcoat.com)  
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## Composite Systems

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

Acoustax Noise Barriers  
243 W 8th St.  
Wyoming, PA 18644  
Phone: 800.233.9601  
Fax: 570.693.3500  
[info@acoustax.com](mailto:info@acoustax.com)  
[www.acoustax.com](http://www.acoustax.com)  
(2, 4)

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6900 Interbay Blvd.  
Tampa, FL 33616  
Phone: 813.980.1140  
Fax: 813.849.6347  
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[www.acoustiblok.com](http://www.acoustiblok.com)  
(4)

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Chaska, MN 55316  
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[www.acousticalsurfaces.com](http://www.acousticalsurfaces.com)  
(1, 2, 4, 5)

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(1, 4, 5)

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West Chicago, IL 60185  
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Fax: 630.231.8321  
[info@blachford.com](mailto:info@blachford.com)  
[www.blachford.com](http://www.blachford.com)  
(1, 5)

George Koch Sons, LLC.  
10 S. Eleventh Avenue  
Evansville, IN 47712  
Phone: 888.873.5624  
Fax: 877.726.5427  
[info@kochllc.com](mailto:info@kochllc.com)  
[www.kochllc.com](http://www.kochllc.com)  
(2-4)

Industrial Acoustics Co. Inc.  
1160 Commerce Ave.  
Bronx, NY 10462  
Phone: 718.931.8000  
Fax: 718.863.1138  
[info@industrialacoustics.com](mailto:info@industrialacoustics.com)  
[www.industrialacoustics.com](http://www.industrialacoustics.com)  
(2, 4)

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Fax: 614.829.1488  
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[www.mcgillairsilence.com](http://www.mcgillairsilence.com)  
(1-6)

Metal Form Manufacturing  
5960 W. Washington St.  
Phoenix, AZ 85043  
Phone: 602.233.1211  
Fax: 602.233.2033  
[info@mfmca.com](mailto:info@mfmca.com)  
[www.mfmca.com](http://www.mfmca.com)  
(2, 4)

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651-c Commerce Drive  
Upper Marlboro, MD 20774  
Phone: 301.249.0044  
Fax: 301.390.3602  
[info@rpginc.com](mailto:info@rpginc.com)  
[www.rpginc.com](http://www.rpginc.com)  
(4)

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Shreveport, LA 71137  
Phone: 866.348.0833  
Fax: 713.865.7373  
[info@soundfighter.com](mailto:info@soundfighter.com)  
[www.soundfighter.com](http://www.soundfighter.com)  
(4)

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Fax: 978.745.0900  
[info@soundown.com](mailto:info@soundown.com)  
[www.soundown.com](http://www.soundown.com)  
(5)

Vibro-Acoustics  
727 Tapscott Rd.  
Toronto, Ontario,  
Canada M1X 1A2  
Phone: 416.291.7371  
Fax: 416.291.8049  
[info@vibro-acoustics.com](mailto:info@vibro-acoustics.com)  
[www.vibro-acoustics.com](http://www.vibro-acoustics.com)  
(2, 4)

### **Vibration Damping Materials**

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

3M E-A-R  
7911 Zionsville Rd.  
Indianapolis, IN 46268  
Phone: 877.327.4332  
Fax: 317.692.3111  
[info@earsc.com](mailto:info@earsc.com)  
[www.earsc.com](http://www.earsc.com)  
(3, 5, 6)

Advanced Antivibration  
Components – AAC  
2101 Jericho Turnpike  
New Hyde Park, NY 11040  
Phone: 516.328.3662  
Fax: 516.328.3365  
[info@vibrationmounts.com](mailto:info@vibrationmounts.com)  
[www.vibrationmounts.com](http://www.vibrationmounts.com)  
(5, 6)

American Acoustical  
Products/Ward Process  
311 Hopping Brook Rd  
Holliston, MA 01746  
Phone: 508.429.1165  
Fax: 508.429.8543  
[info@aapusa.com](mailto:info@aapusa.com)  
[www.aapusa.com](http://www.aapusa.com)  
(1-3, 5)

Barry Controls  
82 South St  
Hopkinton, MA 01748  
Phone: 800.227.7962  
Fax: 508.417.7224  
[info@barrycontrols.com](mailto:info@barrycontrols.com)  
[www.barrycontrols.com](http://www.barrycontrols.com)  
(1, 3)

Blachford, Inc.  
1400 Nuclear Drive  
West Chicago, IL 60185  
Phone: 630.231.8300  
Fax: 630.231.8321  
[info@blachford.com](mailto:info@blachford.com)  
[www.blachford.com](http://www.blachford.com)  
(2-6)

Industrial Noise Control, Inc.,  
401 Airport Rd.  
North Aurora, IL 60542  
Phone: 800.954.1998  
Fax: 800.420.4928  
[info@industrialnoisecontrol.com](mailto:info@industrialnoisecontrol.com)  
[www.industrialnoisecontrol.com](http://www.industrialnoisecontrol.com)  
(4, 5)

Kinetics Noise Control, Inc.,  
6300 Irelan Place  
Dublin, OH 43017  
Phone: 877.457.2695  
Fax: 614.889.0540  
[info@kineticsnoise.com](mailto:info@kineticsnoise.com)  
[www.kineticsnoise.com](http://www.kineticsnoise.com)  
(2, 4, 5)

McGill Air Silence, LLC,  
2400 Fairwood Ave.  
Columbus, OH 43207-2700  
Phone: 614.829.1200  
Fax: 614.829.1488  
[info@mcgillairsilence.com](mailto:info@mcgillairsilence.com)  
[www.mcgillairsilence.com](http://www.mcgillairsilence.com)  
(2, 4, 5)

Moog CSA Engineering, Inc.  
2565 Leghorn St.  
Mountain View, CA 94043  
Phone: 650.210.9000  
Fax: 650.210.9001  
[info@csaengineering.com](mailto:info@csaengineering.com)  
[www.csaengineering.com](http://www.csaengineering.com)  
(1, 3)

PAC International, Inc.  
6585 Whispering Sands Dr.  
Las Vegas, NV 89131-2221  
Phone: 866.774.2100  
Fax: 866.649.2710  
[info@pac-intl.com](mailto:info@pac-intl.com)  
[www.pac-intl.com](http://www.pac-intl.com)  
(11)

RPG Diffusor Systems, Inc.  
651-c Commerce Drive  
Upper Marlboro, MD 20774  
Phone: 301.249.0044  
Fax: 301.390.3602  
[info@rpginc.com](mailto:info@rpginc.com)  
[www.rpginc.com](http://www.rpginc.com)  
(3, 5)

Silentium  
2 Bergman St.  
Tamar Science Pk.  
Rehovot 76703, Israel  
Phone: +972.8.946.8664  
Fax: +972.8.946.8604  
[info@silentium.com](mailto:info@silentium.com)  
[www.silentium.com](http://www.silentium.com)  
(1)

Soundown Corporation  
16 Broadway  
Salem, MA 01970  
Phone: 978.745.7000  
Fax: 978.745.0900  
[info@soundown.com](mailto:info@soundown.com)  
[www.soundown.com](http://www.soundown.com)  
(3-5)

Taylor Devices, Inc.  
90 Taylor Dr.  
N. Tonawanda, NY 14120  
Phone: 716.694.0800  
Fax: 716.695.6015  
[info@taylordevices.com](mailto:info@taylordevices.com)  
[www.taylordevices.com](http://www.taylordevices.com)  
(1)

The Soundcoat Company  
1 Burt Drive  
Deer Park, NY 11729  
Phone: 800.394.8913  
Fax: 631.242.2246  
[info@soundcoat.com](mailto:info@soundcoat.com)  
[www.soundcoat.com](http://www.soundcoat.com)  
(2, 3-5)

### **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

3M E-A-R  
7911 Zionsville Rd.  
Indianapolis, IN 46268  
Phone: 877.327.4332  
Fax: 317.692.3111  
[info@earsc.com](mailto:info@earsc.com)  
[www.earsc.com](http://www.earsc.com)  
(4, 6, 11)

Acoustical Surfaces  
123 Columbia Court N.  
Chaska, MN 55316  
Phone: 952.448.5300  
Fax: 952.448.2613  
[info@acousticalsurfaces.com](mailto:info@acousticalsurfaces.com)  
[www.acousticalsurfaces.com](http://www.acousticalsurfaces.com)  
(5, 11)

Advanced Antivibration  
Components – AAC  
2101 Jericho Turnpike  
New Hyde Park, NY 11040  
Phone: 516.328.3662  
Fax: 516.328.3365  
[info@vibrationmounts.com](mailto:info@vibrationmounts.com)  
[www.vibrationmounts.com](http://www.vibrationmounts.com)  
(2-4, 6, 7, 9-11)

Barry Controls  
82 South St  
Hopkinton, MA 01748  
Phone: 800.227.7962  
Fax: 508.417.7224  
[info@barrycontrols.com](mailto:info@barrycontrols.com)  
[www.barrycontrols.com](http://www.barrycontrols.com)  
(1-8, 10, 11)

Blachford, Inc.  
1400 Nuclear Drive  
West Chicago, IL 60185  
Phone: 630.231.8300  
Fax: 630.231.8321  
[info@blachford.com](mailto:info@blachford.com)  
[www.blachford.com](http://www.blachford.com)  
(11)

Eckel Industries  
Acoustic Division  
155 Fawcett St.  
Cambridge, MA 02138  
Phone: 617.491.3221  
Fax: 617.547.2171  
[info@eckelusa.com](mailto:info@eckelusa.com)  
[www.eckelusa.com](http://www.eckelusa.com)  
(4, 5, 10)

ECORE International  
715 Fountain Ave  
PO Box 989  
Lancaster, PA 17601  
Phone: 866.883.7780  
Fax: 717.295.3414  
[info@qtsoundcontrol.com](mailto:info@qtsoundcontrol.com)  
[www.ecoreintl.com/](http://www.ecoreintl.com/)  
(5)

Fabreeka International, Inc.  
1023 Turnpike St.  
Stoughton, MA 02072  
Phone: 800.322.7352  
Fax: 781.341.3983  
[info@fabreeka.com](mailto:info@fabreeka.com)  
[www.fabreeka.com](http://www.fabreeka.com)  
(4-6, 8, 10, 11)

Industrial Acoustics Co. Inc.  
1160 Commerce Ave.  
Bronx, NY 10462  
Phone: 718.931.8000  
Fax: 718.863.1138  
[info@industrialacoustics.com](mailto:info@industrialacoustics.com)  
[www.industrialacoustics.com](http://www.industrialacoustics.com)  
(5)

ITT - Enidine Inc.  
7 Centre Dr.  
Orchard Park, NY 14127  
Phone: 716.662.1900  
Fax: 716.662.1909  
[info@enidine.com](mailto:info@enidine.com)  
[www.enidine.com](http://www.enidine.com)  
(3, 4, 9-11)

Keene Building Products  
5910 Landerbrook Dr.  
Ste #210  
Mayfield Heights, OH 44124  
Phone: 877.514.5336  
Fax: 440.605.1120  
[info@keenebuilding.com](mailto:info@keenebuilding.com)  
[www.keenebuilding.com](http://www.keenebuilding.com)  
(5)

Kinetics Noise Control, Inc.,  
6300 Irelan Place  
Dublin, OH 43017  
Phone: 877.457.2695  
Fax: 614.889.0540  
[info@kineticsnoise.com](mailto:info@kineticsnoise.com)  
[www.kineticsnoise.com](http://www.kineticsnoise.com)  
(2-11)

Maxxon Corp.  
920 Hamel Rd.  
P.O. Box 253  
Hamel, MN 55340  
Phone: 800.356.7887  
Fax: 763.478.2431  
[info@maxxon.com](mailto:info@maxxon.com)  
[www.maxxoncorporation.com](http://www.maxxoncorporation.com)  
(5)

Moog CSA Engineering, Inc.  
2565 Leghorn St.  
Mountain View, CA 94043  
Phone: 650.210.9000  
Fax: 650.210.9001  
[info@csaengineering.com](mailto:info@csaengineering.com)  
[www.csaengineering.com](http://www.csaengineering.com)  
(1, 4, 11)

RPG Diffusor Systems, Inc.  
651-c Commerce Drive  
Upper Marlboro, MD 20774  
Phone: 301.249.0044  
Fax: 301.390.3602  
[info@rpginc.com](mailto:info@rpginc.com)  
[www.rpginc.com](http://www.rpginc.com)  
(2, 4, 5, 9-11)

Silentium  
2 Bergman St.  
Tamar Science Pk.  
Rehovot 76703, Israel  
Phone: +972.8.946.8664  
Fax: +972.8.946.8604  
[info@silentium.com](mailto:info@silentium.com)  
[www.silentium.com](http://www.silentium.com)  
(11)

Sorbothane Inc.  
2144 State Rte. 59  
Kent, OH 44240  
Phone: 800.838.3906  
Fax: 330.678.1303  
[info@sorbothane.com](mailto:info@sorbothane.com)  
[www.sorbothane.com](http://www.sorbothane.com)  
(4)

Soundown Corporation  
16 Broadway  
Salem, MA 01970  
Phone: 978.745.7000  
Fax: 978.745.0900  
[info@soundown.com](mailto:info@soundown.com)  
[www.soundown.com](http://www.soundown.com)  
(5, 6, 9-11)

Taylor Devices, Inc.  
90 Taylor Dr.  
N. Tonawanda, NY 14120  
Phone: 716.694.0800  
Fax: 716.695.6015  
[info@taylordevices.com](mailto:info@taylordevices.com)  
[www.taylordevices.com](http://www.taylordevices.com)  
(1, 2, 4-11)

The VMC Group  
113 Main St.  
Bloomington, NJ 07403  
Phone: 800.569.8423  
Fax: 973.492.8430  
[info@thevmcgroup.com](mailto:info@thevmcgroup.com)  
[www.thevmcgroup.com](http://www.thevmcgroup.com)  
(3, 4, 9, 10)

Vibro-Acoustics  
727 Tapscott Rd.  
Toronto, Ontario,  
Canada M1X 1A2  
Phone: 416.291.7371  
Fax: 416.291.8049  
[info@vibro-acoustics.com](mailto:info@vibro-acoustics.com)  
[www.vibro-acoustics.com](http://www.vibro-acoustics.com)  
(5)

#### **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

Acoustical Surfaces  
123 Columbia Court N.  
Chaska, MN 55316  
Phone: 952.448.5300  
Fax: 952.448.2613  
[info@acousticalsurfaces.com](mailto:info@acousticalsurfaces.com)  
[www.acousticalsurfaces.com](http://www.acousticalsurfaces.com)  
(2-5, 8, 9)

Allied Witan Co.  
13805 Progress Pkwy.  
North Royalton, OH 44133  
Phone: 440.237.9630  
Fax: 440.237.9633  
[info@alwitco.com](mailto:info@alwitco.com)  
[www.alwitco.com](http://www.alwitco.com)  
(6-10)

Barry Controls  
82 South St  
Hopkinton, MA 01748  
Phone: 800.227.7962  
Fax: 508.417.7224  
[info@barrycontrols.com](mailto:info@barrycontrols.com)  
[www.barrycontrols.com](http://www.barrycontrols.com)  
(8)

Eckel Industries  
Acoustic Division  
155 Fawcett St.  
Cambridge, MA 02138  
Phone: 617.491.3221  
Fax: 617.547.2171  
[info@eckelusa.com](mailto:info@eckelusa.com)  
[www.eckelusa.com](http://www.eckelusa.com)  
(9)

Exair Corporation  
11510 Goldcoast Dr.  
Cincinnati, OH 45249-1621  
Phone: 513.671.3322  
Fax: 513.671.3363  
[info@exair.com](mailto:info@exair.com)  
[www.exair.com](http://www.exair.com)  
(7-9)

George Koch Sons, LLC.  
10 S. Eleventh Avenue  
Evansville, IN 47712  
Phone: 888.873.5624  
Fax: 877.726.5427  
[info@kochllc.com](mailto:info@kochllc.com)  
[www.kochllc.com](http://www.kochllc.com)  
(2)

Industrial Acoustics Co. Inc.  
1160 Commerce Ave.  
Bronx, NY 10462  
Phone: 718.931.8000  
Fax: 718.863.1138  
[info@industrialacoustics.com](mailto:info@industrialacoustics.com)  
[www.industrialacoustics.com](http://www.industrialacoustics.com)  
(2-9, 11)

Industrial Noise Control, Inc.,  
 401 Airport Rd.  
 North Aurora, IL 60542  
 Phone: 800.954.1998  
 Fax: 800.420.4928  
[info@industrialnoisecontrol.com](mailto:info@industrialnoisecontrol.com)  
[www.industrialnoisecontrol.com](http://www.industrialnoisecontrol.com)  
 (3, 5, 7)

Kinetics Noise Control, Inc.,  
 6300 Irelan Place  
 Dublin, OH 43017  
 Phone: 877.457.2695  
 Fax: 614.889.0540  
[info@kineticsnoise.com](mailto:info@kineticsnoise.com)  
[www.kineticsnoise.com](http://www.kineticsnoise.com)  
 (2, 3, 5, 7-9, 11)

McGill Air Silence, LLC,  
 2400 Fairwood Ave.  
 Columbus, OH 43207-2700  
 Phone: 614.829.1200  
 Fax: 614.829.1488  
[info@mcgillairsilence.com](mailto:info@mcgillairsilence.com)  
[www.mcgillairsilence.com](http://www.mcgillairsilence.com)  
 (2-9, 11)

Metal Form Manufacturing  
 5960 W. Washington St.  
 Phoenix, AZ 85043  
 Phone: 602.233.1211  
 Fax: 602.233.2033  
[info@mfmca.com](mailto:info@mfmca.com)  
[www.mfmca.com](http://www.mfmca.com)  
 (2, 7, 9, 11)

Silentium  
 2 Bergman St.  
 Tamar Science Pk.  
 Rehovot 76703, Israel  
 Phone: +972.8.946.8664  
 Fax: +972.8.946.8604  
[info@silentium.com](mailto:info@silentium.com)  
[www.silentium.com](http://www.silentium.com)  
 (1, 3-5, 7-9)

Soundown Corporation  
 16 Broadway  
 Salem, MA 01970  
 Phone: 978.745.7000  
 Fax: 978.745.0900  
[info@soundown.com](mailto:info@soundown.com)  
[www.soundown.com](http://www.soundown.com)  
 (2, 3, 9)

Vibro-Acoustics  
 727 Tapscott Rd.  
 Toronto, Ontario,  
 Canada M1X 1A2  
 Phone: 416.291.7371  
 Fax: 416.291.8049  
[info@vibro-acoustics.com](mailto:info@vibro-acoustics.com)  
[www.vibro-acoustics.com](http://www.vibro-acoustics.com)  
 (1, 3, 5, 7, 9, 11)

**APPENDIX C**

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

## I. MOBILE SURFACE EQUIPMENT CAB MANUFACTURERS

Angus-Palm  
 315 Airport Drive  
 Watertown, SD 57201  
 Phone: 605.886.5681  
 Fax: 605.886.6179  
[www.angus-palm.com](http://www.angus-palm.com)  
*OEM Cabs, ROPS & Custom Metal Fabrications*

Cabs, Rops & Attachments, Inc.  
 8725 S. Gravel Pit Road  
 Iron River, WI 54847  
 Phone: 800.743.3993  
 Fax: 715.372.8950  
[www.cabs-rops.com](http://www.cabs-rops.com)  
*New and Reconditioned Cabs*

Custom Products of Litchfield  
 1715 South Sibley Avenue  
 Litchfield, MN 55355-0070  
 Phone: 800.222.5463  
 Fax: 320.693.7252  
[www.800cabline.com](http://www.800cabline.com)  
*Custom-made Cabs*

Kenco Manufacturing  
 P.O. Box 837  
 Atoka, OK 74525  
 Phone: 580.889.5222  
 Fax: 580.889.7151  
[www.kencomfg.com](http://www.kencomfg.com)  
*New Cabs*

Lake Superior Cabs, Inc.  
 121 West Harney Road  
 Esko, MN 55733  
 Phone: 800.328.1823  
 Fax: 218.879.4640  
[www.lakesuperiorcabs.com](http://www.lakesuperiorcabs.com)  
*Reconditioned Cabs, ROPS Skin Kits*

Lankota, Inc.  
 270 West Park Avenue  
 Huron, SD 57350  
 Phone: 866.526.5682  
 Fax: 605.352.2927  
[www.lankotagroup.com](http://www.lankotagroup.com)  
*New and Retrofit Custom Cabs*

Saf-T-Cab Inc.  
 P.O. Box 2587  
 Fresno, CA 93745  
 Phone: 800.344.7491  
 Fax: 559.268.5822  
[www.saftcab.com](http://www.saftcab.com)  
*Aftermarket Cabs*

Sims Cab Depot  
 P.O. Box 340  
 200 Moulinette Road  
 Long Sault, Ontario, Canada K0C 1P0  
 Phone: 800.225.7290  
 Fax: 613.534.2182  
[www.cabdepot.com](http://www.cabdepot.com)  
*Aftermarket Cabs and ROPS*

## II. STUD WELDERS, STUDS, COVER BUTTONS

Nelson Stud Welding  
 9008 S. Thomas Avenue  
 Bridgeview, IL 60455  
 Phone: 708.430.3770  
 Fax: 708.430.3975  
[www.nelsonstud.com](http://www.nelsonstud.com)

Stud Welding Company  
 750 Glen Avenue  
 Moorestown, NJ 08057  
 Phone: 800.523.5092  
 Fax: 856.866.1818  
[www.studweldingco.com](http://www.studweldingco.com)

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

Barrier Corporation  
9806 SW Tigard Street  
Tigard, OR 97223  
Phone: 503.639.4192  
Fax: 503.684.1515  
[www.barriercorp.com](http://www.barriercorp.com)

**APPENDIX D**

Partial Listing of Reference Sources

## I. TRADE JOURNALS

Industrial Hygiene News  
Rimbach Publishing, Inc.  
8650 Babcock Boulevard  
Pittsburgh, PA 15237  
Phone: 800.245.3182  
Fax: 412.396.9720  
[www.rimbach.com](http://www.rimbach.com)

Modern Materials Handling  
EH Publishing Network  
P.O. Box 1496  
Framingham, MA 01701  
Phone: 800.315.1578 x 294  
Fax: 508.663.1599  
[www.mmh.com](http://www.mmh.com)

Pollution Equipment News  
Rimbach Publishing, Inc.  
8650 Babcock Boulevard  
Pittsburgh, PA 15237  
Phone: 800.245.3182  
Fax: 412.396.9720  
[www.rimbach.com](http://www.rimbach.com)

Industrial Maintenance and  
Plant Operation  
Advantage Business Media  
P.O. Box 3574  
Northbrook, IL 60065  
Phone: 847.559.7560  
Fax: 847.291.4816  
[www.impomag.com](http://www.impomag.com)

New Equipment Digest  
Penton Media, Inc.  
1300 East 9th Street  
Cleveland, OH 44114  
Phone: 216.696.7000  
Fax: 216.696.8208  
[www.newequipment.com](http://www.newequipment.com)

## II. MAGAZINES

Aggregates Manager  
Randall Reilly Publishing  
2340 S River Road, # 202  
Des Plaines, IL 60018  
Phone: 847.636.5060  
Fax: 847.636.5077  
[www.aggman.com](http://www.aggman.com)

EHS Today  
Penton Media, Inc.  
1300 East 9th Street  
Cleveland, OH 44114  
Phone: 216.696.7000  
Fax: 216.696.8208  
[www.ehstoday.com](http://www.ehstoday.com)

Industrial Safety & Hygiene News  
2401 W Big Beaver Rd, Ste 700  
Troy, MI 48084  
Phone: 847.763.9534  
Fax: 847.763.9538  
[www.ishn.com](http://www.ishn.com)

Coal Age  
Mining Media, Inc.  
8751 East Hampden Avenue  
Suite B-1  
Denver, CO 80231  
Phone: 303.283.0640  
Fax: 303.283.0641  
[www.coalage.com](http://www.coalage.com)

Engineering & Mining Journal  
Mining Media, Inc.  
8751 East Hampden Avenue  
Suite B-1  
Denver, CO 80231  
Phone: 303.283.0640  
Fax: 303.283.0641  
[www.e-mj.com](http://www.e-mj.com)

Occupational Safety & Health  
1105 Media, Inc.  
9201 Oakdale Ave., Ste 101  
Chatsworth, CA 91311  
Phone: 818.814.5200  
Fax: 818.734.1522  
[www.ohsonline.com](http://www.ohsonline.com)

Rock Products

Penton Media, Inc.  
330 North Wabash Avenue,  
Suite 2300  
Chicago, IL 60611  
Phone: 312.595.1080  
Fax: 312.595.0295  
[www.rockproducts.com](http://www.rockproducts.com)

Sensors

Questex Media Group  
275 Grove Street, Suite 2-130  
Newton, MA 02466  
Phone: 888.552.4346  
Fax: 617.219.8310  
[www.sensorsmag.com](http://www.sensorsmag.com)

Urgent Communications

Penton Media, Inc.  
330 North Wabash Avenue,  
Suite 2300  
Chicago, IL 60611  
Phone: 312.595.1080  
Fax: 312.595.0295  
[www.urgentcomm.com](http://www.urgentcomm.com)

Sound & Vibration

P.O. Box 40416  
Bay Village, OH 44140  
Phone: 440.835.0101  
Fax: 440.835.9303  
[www.sandv.com](http://www.sandv.com)

## III. GOVERNMENT PUBLICATIONS

“Noise Abatement of a Pneumatic Rock Drill,” Report of Investigations (RI) 7998, U.S. Department of Interior (DOI), U.S. Bureau of Mines (USBM), 1974.

“Noise Reduction of a Pneumatic Rock Drill,” RI 8082, DOI, USBM, 1975.

“Noise Control Proceedings,” Informational Circular (IC) 8686, DOI, USBM, 1975.

“Noise Control of Diesel-Powered Underground Mining Machines,” IC 8837, DOI, USBM, 1979.

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