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SUBJECT: Technologically Achievable, Administratively Achievable, and
Promising Noise Controls (30 C.F.R. Part 62)

Scope

This Program Information Bulletin (PIB) applies to all Mine Safety and Health Administration (MSHA) enforcement personnel, equipment manufacturers, coal, metal, and nonmetal mine operators, independent contractors, miners, miners' representatives, and other interested parties.

Purpose

The purpose of this PIB is to provide guidance to operators, miners, miners' representatives, contractors, and equipment manufacturers on technologically and administratively achievable engineering and administrative noise controls. This document also identifies those engineering and administrative noise controls which offer *promise* for further investigation. This PIB is a re-issuance of P04-18. The reason for this re-issuance is due to the recent NIOSH/MSHA upgrades of certain promising noise controls to technologically and/or administratively achievable noise controls. Specifically, this PIB addresses upgraded and additional controls for continuous mining machines, roof bolting

machines, and stone saws.

Information

The performance-oriented noise standards in 30 C.F.R. Part 62 equate administrative and engineering controls and require that, when a miner's noise exposure exceeds the permissible exposure level (PEL), all feasible engineering and administrative controls be utilized to reduce the miner's exposure to the PEL. A feasible control is one that is both technologically (or administratively) and economically achievable. If such controls fail to reduce the miner's exposure to the PEL, personal protection equipment must be provided and used. These standards do not permit the use of personal protection equipment in lieu of feasible engineering or administrative controls. A technologically or administratively achievable control or a combination of controls which achieves at least a 3 dBA reduction in a miner's noise exposure is considered significant, even if it fails to reduce the miner's exposure to the PEL. "If a miner's noise exposure continues to exceed the PEL despite the use of all feasible engineering and administrative controls, the mine operator must continue to use the engineering and administrative controls to reduce the miner's noise exposure to as low a level as is feasible." (30 C.F.R. § 62.130(b))

This PIB describes technologically achievable and promising controls for several types of machinery used in mines. Many of the controls listed in Section One are in use throughout the mining industry and have been referenced by MSHA in prior noise control documents. This PIB also provides guidance on taking a practical approach to reducing miners' exposure to noise. Section Two of this PIB is a checklist of simple, straightforward ways to control noise exposure. Examples of additional administrative controls are provided in Section Three of this PIB. MSHA's Noise Enforcement Policy states that labor/management agreements will not be affected by the noise standard. MSHA will not require an operator to hire additional miners in order to "exhaust" all feasible administrative controls.

For purposes of this PIB, MSHA limits use of the term "technologically achievable" to engineering controls. MSHA is mindful that this term is conventionally used to describe controls or devices that are mechanical in nature, rather than controls that reduce a miner's noise exposure by actions such as adjusting work practices, rotating miners from noisy activities to quieter ones, rescheduling tasks, or modifying work activities. For this reason, this PIB refers to certain administrative controls as "administratively achievable," rather than "technologically achievable." As with those controls denoted as "technologically achievable," use of the term "administratively achievable" to describe these administrative controls is solely intended to clarify that MSHA generally considers them to be capable of being done, executed, or effected, and not that it is necessarily economically achievable to do so.

Administratively and Technologically Achievable Noise Controls

Administratively and technologically achievable noise controls have demonstrated effectiveness either singly or as part of a suite of noise controls under actual mining conditions and are known to reduce sound levels and miner noise exposure in most cases. These controls:

1. Reduce sound levels or exposure time, as demonstrated in widespread application on similar types of equipment operating as part of similar mining methods, or alternatively demonstrated as part of a scientifically designed study in which the results can be generalized;
2. Reduce the noise exposure (3 dBA when used either singly or in combination) of miners performing the usual duties associated with the mining method and equipment, and based on measured miner doses; and
3. An engineering control does not necessarily have to be prefabricated or off-the-shelf, but it must have a realistic basis in present technology.

It is possible that unusual characteristics of the equipment, the mine, or the application could result in the inability of a technologically achievable control to reduce miner noise exposure, but it is unlikely. As with all technological achievability determinations, when these situations are encountered they will be evaluated on a case-specific basis. Some controls are technologically achievable, but only when used in more limited circumstances. These controls are considered conditional because they may work in some situations, and may not work in other settings; i.e., the case-by-case rationale. Some reasons for denoting a technologically achievable control as “conditional” would be:

1. Its effectiveness is dependent on the conditions that exist at the mine site; or
2. The installation and use of the control may create a collateral health or safety hazard which must be addressed.

Case-by-Case Feasibility Determinations

Recognizing that “one size does not fit all,” MSHA evaluates circumstances on a case-by-case basis to determine the achievability (technological or administrative and economic) of a listed control. Due to the large variety of mining equipment, mining methods and environmental conditions in mines, there may well be circumstances in which a described control is not technologically achievable for a specific application.

Promising Controls

Technologically and administratively promising (*promising*) noise controls offer potential for noise reduction by having demonstrated effectiveness but may lack evaluation and/or documentation in terms of significant reduction of a miner’s noise exposure either singly or as part of a suite of noise controls. Technologically

promising controls are being developed or studied by manufacturers, industry, and government. Some controls in this class demonstrate real potential and mine operators or equipment manufacturers may want to consider participating in cooperative research studies to further evaluate these controls. In general, promising controls:

1. Have potential for reducing sound levels or exposure time based on laboratory or limited field studies;
2. Have potential to reduce miner noise exposure based on time studies of miners performing the usual duties associated with the mining method and equipment; and
3. May require further development, refinement, study or research.

MSHA and others will further evaluate their demonstrated effectiveness during in-mine production usage and MSHA will make updated information available.

Other Considerations

While MSHA believes the listed controls are currently the most effective in reducing miner noise exposure, mine operators are not restricted in their selection of controls to those technologically and administratively achievable controls described in this document. They may use other administrative and engineering controls or combinations of controls to comply with MSHA's noise standard. We encourage the mining industry to share information regarding controls that have been implemented and found to be successful in reducing a miner's exposure to noise. Please contact MSHA's Directorate of Technical Support to provide information about noise control advances in the mining industry. This PIB will be updated as additional technologies and controls become available.

Section One

Descriptions of Technologically Achievable, Administratively Achievable, and Promising Noise Controls

Introduction

MSHA considers the engineering and administrative controls contained in this Program Information Bulletin (PIB) to be **technologically or administratively achievable** or to offer *promise* as noise controls which, when used either singly or in combination, have a demonstrated effectiveness or potential for achieving compliance with the PEL or for reducing a miner's noise exposure by at least 3 dBA. MSHA and others are further evaluating the demonstrated effectiveness of promising controls during in-mine production usage and updated information will be made available.

While the noise controls compiled in this PIB are on a machine/equipment basis, MSHA's noise standards are occupational exposure standards, not equipment-based standards. Compliance with the noise standard is determined by the miner's personal exposure and not the sound levels generated by the piece of equipment. Therefore, the miner's total noise exposure should be examined from an occupational viewpoint and not solely on a machine or equipment basis. All sources/tasks that generate noise must be identified and considered when determining appropriate noise controls and their effects. Engineering and administrative noise controls should be applied to those occupational noise sources and tasks that will yield a significant reduction in the miner's total noise exposure. For example, noise sources of 85 dBA or less should not require attention, especially when a competing noise source is at a much higher level.

The implementation of retrofit noise controls involves the use of individual devices, systems and/or materials designed for the specific purpose of reducing noise. Acoustical devices include, but are not limited to, cabs, enclosures, barriers, mufflers, and silencers which decrease sound levels to which the miner is exposed, or other electro-mechanical or video systems which reduce the amount of time miners are exposed to excessive noise levels.

Acoustical materials can reduce noise either by absorbing or blocking sound waves, or damping vibrations. These materials are generally referred to as absorption, barrier, damping, and composite materials, and they can substantially increase the effectiveness of other noise control devices. Selection of appropriate acoustical materials must be made based on firm noise control engineering principles and commensurate to the task, properly installed, used, and maintained. Also, mine operators should be aware of the flammability properties of acoustical materials and, prior to application, should consider MSHA's flammability guidelines. These guidelines can be obtained by contacting MSHA's Directorate of Technical Support, Approval and Certification Center.

In general, a noise control device specified by the original equipment manufacturer (OEM) and available for a specific piece of equipment will yield better results than one subsequently constructed by the mine operator, a third party or rebuild shop. However, much success in the mining industry in reducing sound levels has been realized through the design, production, installation, and use of noise controls developed by third party, after-market sources or individual mine operators. In the case of non-OEM noise controls, a detailed investigation and evaluation should be conducted on the machine or the environment to identify noise sources. This should be followed by the development of detailed instructions and specifications for the selection of appropriate acoustical materials and for the construction, fabrication, and installation of equipment-based noise controls.

Engineering noise controls are effective when they are properly selected, installed, used, and maintained. Care should be taken in their selection such that they are appropriate to the equipment design, and do not have a harmful effect on the operation or performance of the machinery on which they are installed. Hazards caused by the application of engineering noise controls should be addressed to minimize the effects on a miner's health and safety.

For the purposes of this PIB, an "environmental cab" or "environmental booth" includes the structure plus the application and installation of appropriate acoustical materials to the inside areas of the cab or booth (e.g., absorption materials, composite materials or acoustical floor mat), and an appropriate air filtration/air conditioning system. A "skin kit" is a sectionalized cab (e.g., a 4-section metal cab without acoustical materials) that is attached to the roll-over protection system (ROPS)/falling object protection system (FOPS) on a piece of mobile surface equipment. Prior to implementing and attaching such a device, guidance from the ROPS and FOPS manufacturers should be obtained so as not to void any structural certification.

This PIB contains a list of controls for the following equipment:

1. Air Arcing
2. Air-Actuated or Air-Operated Cylinders
3. Augers - Surface
4. Auxiliary Ventilation Fans
5. Car Shakers and Rotary Dumps
6. Channel Burners
7. Continuous-Mining Machines / Augers / Loaders (Underground)
8. Diesel - Locomotives
9. Diesel - Underground Diesel-Powered Equipment
10. Draglines, Shovels and Cranes Not Equipped with Operator Cabs
11. Draglines, Shovels and Cranes Equipped with Operator Cabs
12. Dredges and Associated Equipment
13. Drills - Jumbo Drills

14. Drills - Truck Mounted/Blast Hole/Air Track
15. Hand-Held Percussive Tools
16. Longwalls
17. Mantrips
18. Mills / Processing Plants / Coal Preparation Plants (including Breakers at Anthracite Mines)
19. Mobile Equipment - Surface
20. Portable Crushers / Screening Plants and Associated Equipment
21. Roof Bolting Machines
22. Scalers
23. Stone Saws

1. Air Arcing

Air arcing is a major tool used in bucket maintenance on draglines and other similar equipment. A welder's noise exposure depends on the amount of time spent using the air arcing equipment during the work shift. MSHA considers the following administrative noise controls, or a combination of these controls, to be **administratively achievable** in reducing the noise exposure of miners engaged in air arc welding:

- ❖ **Limit the duration of air arc welding per shift;**
- ❖ **Rotate welding personnel from noisy activities to quieter ones; and**
- ❖ **Avoid side-by-side air arc welding.**

Other noise controls that offer *promise* when there would be a need for the use of air arcing include:

- *Reduction of air pressure to the minimum;*
- *Use of constant current air arc welding/gouging techniques at the lowest effective current and air pressure;*
- *Use of constant voltage air arc welding/gouging techniques at the lowest effective voltage and air pressure; and*
- *Use of alternate rods (certanium and cronatron gouging rods) or a plasma torch with a gouging tip (these methods may be appropriate only in specific applications).*

2. Air-Actuated or Air-Operated Cylinders

MSHA considers the following engineering noise controls, or a combination of these controls, to be **technologically achievable** and effective in reducing the noise exposure of miners working around air-actuated or air-operated cylinders:

- ❖ Mufflers on exhaust outlets/ports;
- ❖ Hose extension on exhaust ports; and
- ❖ Enclosures.

MSHA considers the following engineering noise control to be conditional:

- Barriers.

3. Augers - Surface

MSHA considers the following engineering noise controls, or a combination of these controls, to be **technologically achievable** in reducing the noise exposure of miners operating or working around surface augers:

- ❖ Environmental cabs that include appropriately selected, correctly installed, and properly maintained acoustical materials (see Section One Introduction) applied to internal surfaces;
- ❖ Exhaust mufflers and redirection of exhaust; and
- ❖ Low-cost barrier between the engine and the operator.

MSHA considers the following engineering noise control to be conditional:

- Appropriately selected, correctly installed, and properly maintained acoustical materials (see Section One Introduction) in the operator's compartment and the engine compartment.

4. Auxiliary Ventilation Fans

MSHA considers the following engineering and administrative noise controls, or a combination of these controls, to be **technologically and administratively achievable** in reducing the noise exposure of miners working around auxiliary ventilation fans:

- ❖ Silencers matched to the fan;
- ❖ Barriers or enclosures for work areas to minimize occupational exposures;
- ❖ Locate fans away from areas where miners spend a significant amount of time; and
- ❖ Clean and maintain fan silencers on a regular basis.

MSHA considers the following engineering noise control to be conditional:

- Good maintenance practices, such as sealing air leaks and wrapping of ventilation tubing joints.

The following controls offer *promise* in reducing the exposure of miners who may be in the vicinity of auxiliary ventilation fans:

- *Install flexible connections between the fan and ventilation tubing;*
- *Install damping materials on tubing and fan blades; and*
- *Line several tube sections with appropriately selected, correctly installed, and properly maintained acoustical materials at the inlet side of the fan on an exhausting face ventilation system.*

5. Car Shakers and Rotary Dumps

Car shakers and rotary dumps are used to empty railroad cars containing coal or other materials. On a car shaker, electromagnets attach to the top of the car and vibrate the car so that the material falls out the bottom. A rotary dump grasps the car and rotates it, emptying it from the top.

MSHA considers the following engineering noise controls, or a combination of these controls, to be **technologically achievable** in reducing the noise exposure of miners working around car shakers or rotary dumps:

The following **technologically achievable** control is available for car shakers:

- ❖ **Operator environmental control booth that includes “appropriate acoustical materials” (see Section One Introduction) applied to internal surfaces.**

The following **technologically achievable** controls are available for rotary dumps:

- ❖ **Operator environmental control booth that includes “appropriate acoustical materials” (see Section One Introduction) applied to internal surfaces; and**
- ❖ **Radio remote controls installed to position the operator away from the dump.**

The following controls may hold *promise* in reducing the noise exposure of car shaker operators:

- *Top pad attenuator;*
- *Foot pads; and*
- *Air-actuated cushions.*

6. Channel Burners

MSHA considers the following engineering noise controls, or a combination of these controls, to be **technologically achievable** in reducing the noise exposure of miners operating channel burners:

- ❖ **Automated channel burner to replace manual channel burners for the majority of cuts. A handheld channel burner may be needed to initiate the main cut or to perform specialty cuts;**
- ❖ **Automated channel burner with a control booth and video monitoring system to observe the cut;**
- ❖ **Remote controls; and**
- ❖ **Appropriate pressures for the fuel/air mixture as per manufacturer’s specifications. Use oxygen instead of air.**

While MSHA considers the following noise controls to be **technologically achievable** in reducing the noise exposure of a miner operating a channel burner (or substitute equipment), the feasibility of their use must be evaluated on a case-by-case basis:

- ❖ Slot drill in combination with a 3-sided or portable enclosure for the operator;
- ❖ Wire saw or diamond wire saw;
- ❖ Use of hydraulic or pneumatic drill; and
- ❖ Water jet cutter.

The following control offers *promise* in reducing a miner's noise exposure:

- *Quiet tips on the burner.*

7. Continuous-Mining Machines / Augers / Loaders (Underground)

MSHA considers the following engineering and administrative noise controls, or a combination of these controls, to be **technologically and administratively achievable** in reducing the noise exposure of miners operating or working around this equipment:

- ❖ Remote control with proper positioning of the operator;
- ❖ Treated cutting heads on auger miners (e.g., the application of stiffening gussets to the helix and filling of voids with sand);
- ❖ Proper maintenance, such as replacing bent or misaligned conveyor flights or sides and use of a chain with proper tension or one having an automatic chain tension device;
- ❖ Polyurethane coated conveyor flights;
- ❖ Dual sprocket conveyor chain;
- ❖ Locate the shuttle car change-out point away from major noise sources (e.g., auxiliary fan);
- ❖ Avoid idle parking in high noise areas;
- ❖ Keep miners away from auxiliary fans;
- ❖ Have mechanics and electricians avoid working near high-noise sources during maintenance;
- ❖ Reduce utility personnel working time near face and auxiliary fan;
- ❖ Limit operation of empty chain conveyors on all equipment (i.e., shuttle car, loading machine, continuous miner, miner-bolter, and feeder-breaker);
- ❖ Eliminate a high-pitched screech on continuous miners equipped with integral roof bolting machines by instructing roof bolters to drill straight holes and to avoid metal strap contact with the drill steel;
- ❖ Follow a cutting cycle (e.g., reduce cutting into roof and floor rock, cutting directly into in-seam rock, and over sumping) to minimize noise generation from both the continuous mining machine and the cutting process;

- ❖ **Regulate engine RPM on diesel-powered shuttle cars during loading and dumping;**
- ❖ **Follow shuttle car loading and tramming procedures that minimize noise (e.g., time that the conveyor chain is turning, increase distance from continuous miner and its boom, etc.);**
- ❖ **Follow loading and tramming procedures for loading machines that minimize noise;**
- ❖ **Turn off any mobile equipment when not in operation;**
- ❖ **Maintain proper fan blade clearance on dust scrubbers associated with continuous-mining machines; and**
- ❖ **Constrained layer damping on the conveyor pan on an auger miner (e.g., the application of visco-elastic materials covered with wear steel to isolate the chain and flights from the conveyor pan line).**

The following engineering controls offer *promise* in reducing the noise exposure of miners working on continuous miner sections:

- *Transparent barrier between the operator and conveyor pan line;*
- *Constrained layer damping on the conveyor pan on a continuous ripper miner (e.g., the application of visco-elastic materials covered with wear steel to isolate the chain and flights from the conveyor pan line);*
- *Sand-filled conveyor decks;*
- *Enclosure and isolation of motors and pump housings where they have been demonstrated to be a significant noise source;*
- *Vibration isolation mounts on motors/pumps where they have been demonstrated to be a significant noise source;*
- *Isolated cutting bits (e.g., the application of vibration isolation materials between the bits/block and the drum); and*
- *Sand-filled cutting heads.*

The following administrative control offers *promise* for reducing an operator's noise exposure:

- *On continuous miners equipped with integral roof bolting machines, rotate center bolter operator with center bolter helper, roof bolter operators with utility personnel or shuttle car operators, miner-bolter operator with other machine operator, or continuous miner operator with shuttle car operator.*

The following noise controls offer *promise* for dust scrubbers associated with continuous-mining machines:

- *Silenced fan housing;*
- *Redesigned scrubber fan;*
- *Sleeve-style attenuators;*
- *Alternative face air flow distribution systems (e.g., spray fan systems);*
- *Bolt-on attenuators; and*
- *Appropriately selected, correctly installed, and properly maintained acoustical materials (see Section One Introduction) applied to the dust scrubber.*

8. Diesel - Locomotives

MSHA considers the following noise controls, or a combination of these controls, to be **technologically achievable** in reducing the noise exposure of miners working around this equipment:

- ❖ **Environmental cabs that include appropriately selected, correctly installed, and properly maintained acoustical materials (See Section One Introduction) applied to internal surfaces;**
- ❖ **Mufflers;**
- ❖ **Video cameras with monitors to view the rail and loading process;**
- ❖ **Smooth rail joints; and**
- ❖ **Good machine and track maintenance.**

MSHA considers the following engineering noise control to be conditional:

- **Appropriately selected, correctly installed, and properly maintained acoustical materials (see Section One Introduction) to the inside of the operator's compartment.**

The following engineering noise controls offer *promise* for reducing miners' noise exposures:

- *Composite wheels to prevent wheel-track squeal;*
- *Transmission enclosure; and*
- *Application of sound damping materials to the floorboards at the transmission.*

9. Diesel - Underground Diesel-Powered Equipment

MSHA considers the following engineering noise controls, or a combination of these controls, to be **technologically achievable** in reducing the noise exposure of miners operating underground diesel-powered equipment (e.g., LHD's, shuttle cars, haul trucks, tractors, generators, graders, scoops):

- ❖ OEM environmental cabs that include appropriately selected, correctly installed, and properly maintained acoustical materials (see Section One Introduction) applied to internal surfaces; and
- ❖ Exhaust mufflers.

MSHA considers the following engineering noise controls to be conditional:

- Non-OEM cabs; and
- Appropriately selected, correctly installed, and properly maintained acoustical materials (see Section One Introduction) to reduce noise from the engine and transmission compartments.

The following controls offer *promise* in reducing a miner's noise exposure:

- *Redirection of the exhaust away from the operator; and*
- *Remote controls.*

10. Draglines, Shovels, and Cranes Not Equipped with Operator Cabs

MSHA considers the following engineering noise controls, or a combination of these controls, to be **technologically achievable** in reducing the operator's noise exposure:

- ❖ Seal all openings (e.g., holes, cracks, openings around controls) to prevent outside noise from entering the operator compartment; and
- ❖ Exhaust mufflers.

MSHA considers the following engineering noise controls to be conditional:

- A barrier behind the operator to block the noise path of the diesel engine from reaching the operator compartment. The barrier may be flexible, constructed of acoustical vinyl curtain, or rigid;
- Appropriately selected, correctly installed, and properly maintained acoustical materials (see Section One Introduction) installed on the surfaces of the operator compartment, to the roof, sliding door, partition (if rigid) and any other available surface; and
- Silencers on air discharge valves.

The following administrative controls offer *promise* for reducing the mechanic/greaser/oiler noise exposure:

- *Limit time spent in engine compartment when the machine is running; and*
- *Perform cleanup duties when the dragline is not operating.*

11. Draglines, Shovels, and Cranes Equipped with Operator Environmental Cabs

MSHA considers the following engineering noise control to be **technologically achievable** in reducing the operator's noise exposure:

- ❖ Existing OEM environmental cab including appropriately selected, correctly installed, and properly maintained acoustical materials (see Section One Introduction) applied to the interior surfaces.

MSHA considers the following engineering noise control to be conditional:

- Appropriately selected, correctly installed, and properly maintained acoustical materials (see Section One Introduction) to an existing OEM cab.

Normally, the existing OEM environmental cab will be sufficient for assuring the operator's compliance.

MSHA considers the following engineering and administrative controls to be **technologically and administratively achievable** in reducing the oiler's noise exposure:

- ❖ Performance of cleanup duties during downtimes for repairs/maintenance;
- ❖ Limited exposure near the MG set;
- ❖ Limited oiler time in the revolving frame; and
- ❖ Rotation of the oiler and machine operator, oiler and dozer operator/groundsmen from noisy activities to quieter ones.

The following engineering controls offer *promise* for reducing oiler and mechanic noise exposure:

- *Barrier installed in front of MG sets, or where practical, enclosing the MG sets (may require additional ventilation or air conditioning); and*
- *Silencers on cooling fan motors.*

The following engineering and administrative controls offer *promise* for reducing the oiler noise exposure:

- *Silencers on compressed air discharge lines;*
- *Reduction in the time spent in engine house and revolving frame by utilizing the following:*
 - *Automatic lubrication system;*
 - *Remotely monitored temperature sensors;*
 - *Remotely monitored oil level gauges; and*
 - *Remotely monitored video coverage of strategic areas.*

The oiler and mechanic, due to their work demands, must spend time in the environment of the engine house. The isolation of the MG sets by either constructing a partial barrier in front of the sets or by totally enclosing them would reduce the sound levels. The implementation of this promising control would most likely require additional ventilation or air-conditioning for the MG sets.

12. Dredges and Associated Equipment

MSHA considers the following engineering noise controls, or a combination of these controls, to be **technologically achievable** in reducing the noise exposure of the dredge operator:

- ❖ Environmental cab/booth that includes appropriately selected, correctly installed, and properly maintained acoustical materials (see Section One Introduction) applied to internal surfaces;
- ❖ Pump enclosures;
- ❖ Engine barriers;
- ❖ Engine mufflers;
- ❖ Resilient screen decking;
- ❖ Barriers around pneumatic equipment;
- ❖ Redirection of the exhaust; and
- ❖ Enclosures / barriers at transfer points.

The following engineering noise control offers *promise* for reducing miners' noise exposures:

- *Video technology to position miners away from noise sources.*

13. Drills - Jumbo Drills

MSHA considers the following engineering noise controls, or a combination of these controls, to be **technologically achievable** in reducing the noise exposure of miners operating jumbo drills:

- ❖ Environmental cabs that include appropriately selected, correctly installed, and properly maintained acoustical materials (see Section One Introduction) applied to internal surfaces;
- ❖ Barrier such as a windshield; and
- ❖ Exhaust mufflers.

MSHA considers the following engineering noise controls to be conditional:

- Barrier between the engine/compressor and the operator;
- Flexible curtain material around the perimeter of the canopy; and
- Appropriate acoustical materials (see Section One Introduction) at the operator's position on a cab equipped jumbo drill.

While MSHA considers the following control to be **technologically achievable** in reducing the noise exposure of a miner operating a jumbo drill, the feasibility of its use must be evaluated on a case-by-case basis:

❖ **Hydraulic drill.**

The following controls offer *promise* in reducing miner noise exposures:

- *Remote controls;*
- *Ceramic or other non-metallic centralizers on the drill assembly;*
- *Programmable jumbo drills (computer automated); and*
- *Wet drilling (i.e., injection of water under pressure into the air stream of the drill hole clearance system) where it can be implemented due to the jumbo drill's design and when compatible with the geology and the mining method.*

14. Drills - Truck Mounted / Blast Hole / Air Track

MSHA considers the following engineering noise controls, or a combination of these controls, to be **technologically achievable** in reducing the noise exposure of miners operating drills:

- ❖ **Environmental cabs that include appropriate acoustical materials (see Section One Introduction) applied to internal surfaces;**
- ❖ **Exhaust mufflers and redirection of the exhaust away from the operator;**
- ❖ **Portable enclosures / barriers for the operator; and**
- ❖ **Appropriately selected, correctly installed, and properly maintained acoustical materials (see Section One Introduction) to treat the operator's compartment.**

MSHA considers the following engineering noise controls to be conditional:

- **Barrier between the engine /compressor and the operator;**
- **Silencers on air release nozzles; and**
- **Relocation of the air compressor away from the air track drill.**

The following control offers *promise* in reducing miner noise exposures:

- *Wet drilling (i.e., injection of water under pressure into the air stream of the drill hole clearance system) where it can be implemented due to the drill's design and is compatible with the geology and the mining method.*

15. Hand-Held Percussive Tools

MSHA considers the following engineering noise controls, or a combination of these controls, to be **technologically achievable** in reducing the noise exposure of miners operating many types of percussive tools:

- ❖ Exhaust muffler; and
- ❖ Body muffler.

MSHA considers the following engineering noise control to be conditional:

- Piping exhaust away from the operator.

16. Longwalls

MSHA considers the following noise controls, or a combination of these controls, to be **technologically achievable** in reducing the noise exposure of miners working around the longwall mining system:

- ❖ Automated shear;
- ❖ Automated jacks;
- ❖ Automated stage loader;
- ❖ Memory cut;
- ❖ Proper maintenance such as use of proper chain tensioning and flight spacing;
- ❖ Positioning of the miner to minimize exposure to noise such as keeping stageloader operator away from crusher, motors and gears, head drive, belt tail; head drum shear operator staying a minimum of 3 m (10 ft) outby the drum head; and
- ❖ Reduced run-time for face and stageloader conveyors when empty.

MSHA considers the following engineering noise control to be conditional:

- Remote operation.

MSHA also considers the following noise controls to offer *promise* in reducing the noise exposure of the shear operators and other miners working around the longwall mining system:

- *Barriers where appropriate;*
- *Appropriately selected, correctly installed, and properly maintained acoustical materials (see Section One Introduction);*
- *Rotation of head and tail shear operators with each other, shear operators with shieldman, stageloader operator with shieldman;*
- *Video cameras to monitor the cutting and other functions to limit miner exposure;*
- *Enclosure of motors, gears, pumps where demonstrated to be a significant noise source and can be done without damage to the equipment;*
- *Damping of enclosures and panels where demonstrated to be a significant noise source;*
- *Water-cooled motors instead of air-cooled motors where practical and when the motors are a significant source of noise exposure;*
- *Enclosure for the other miners (e.g., headgate operators) where practical;*
- *Isolated cutting bits on the longwall drum (e.g., the application of vibration isolation materials between the bits/block and the drum); and*
- *Sand-filled cutting heads.*

17. Mantrips

Mantrips and other similar modes of transportation may be a significant contributor to a miner's overall noise exposure and should be examined on a case-by-case basis. When attempting to reduce a miner's noise exposure, there are instances where engineering controls should be applied to mantrips to achieve a significant reduction.

MSHA considers the following noise controls, or a combination of these controls, to be **technologically achievable** in reducing the noise exposure of miners working around and riding in mantrips:

- ❖ Muffler(s);
- ❖ A fully enclosed passenger compartment
- ❖ Smooth rail joints; and
- ❖ Good machine and track maintenance.

MSHA considers the following engineering noise controls to be conditional:

- Motor enclosure for those machines where the motor is a significant noise source; and
- A passenger compartment treated with appropriate acoustical materials (see Section One Introduction).

The following control offers *promise* in reducing miner noise exposures:

- *Composite wheels to reduce wheel-rail squeal.*

18. Mills / Processing Plants / Coal Preparation Plants (Including Breakers at Anthracite Mines)

Miners working in mills, processing plants, coal preparation plants and breakers at anthracite mines, typically encounter high sound levels and are engaged in mobile occupations. Consequently, it is usually necessary to identify where and which tasks contribute the most to the miner's overall noise exposure, i.e., time-motion study. The successful reduction of a miner's noise exposure depends on the application of engineering and administrative controls to the locations and tasks which contribute the most to the miner's overall noise exposure. Therefore, the application of these controls must be evaluated on a case-by-case basis.

MSHA considers the following engineering and administrative noise controls, or a combination of these controls, to be **technologically and administratively achievable** in reducing the noise exposure of miners working in coal preparation plants and metal/nonmetal processing plants and mills:

- ❖ Acoustically treated control booths; and
- ❖ Full enclosures without a top around equipment or miner work locations;
- ❖ Electro-mechanical sensing devices to limit exposure times;
- ❖ Video technology to limit exposure time;
- ❖ Bin-level indicators;
- ❖ Rotation of plant operator with control room operator; inside mechanics with outside mechanics; high-noise floor workers with low-noise floor workers; and in-plant workers with outside-plant workers;
- ❖ Limit plant worker time on noisy floors, working in or next to noisy equipment such as screens, crushers, centrifuges, and dryers;
- ❖ Relocate work stations / controls to quieter locations;
- ❖ Relocate tool boxes, cabinets, and supplies to quiet area;
- ❖ Operate noisy equipment / processes (welding, grinding, etc.) when fewer miners will be exposed; and
- ❖ Perform maintenance during downtimes, if possible.

MSHA considers the following engineering noise controls to be conditional:

- Partial enclosures without a top around equipment or miner work locations;
- Barriers, including curtains, especially on traveled walkways;
- Acoustic baffles suspended above enclosures;
- Resiliently backed mill liners;
- Chute liners;
- Covered chute enclosures;
- Dead boxes and impact pads; and
- Resilient screen decking.

Other noise controls that offer *promise* for reducing the noise emitted from screens and other sizing devices include:

- *Replacement of spring mounts with vibration isolation mounts made of rubber, ROSTA mounts, and air bags (due to the engineering parameters involved in this type of equipment and the forces generated being transferred to the structure, their use should be considered on a case-by-case basis in conjunction with the equipment manufacturer);*
- *“Double isolation” mounting methods; and*
- *Banana screens (due to height requirements, banana screens may be applicable only in certain situations.)*

The following administrative control offers *promise* for reducing an operator's noise exposure in coal preparation plants:

- *Move density measuring to quiet location.*

19. Mobile Equipment -- Surface

MSHA considers the following engineering noise controls, or a combination of these controls, to be **technologically achievable** in reducing the noise exposure of miners operating surface mobile equipment (e.g., bulldozers, front-end loaders, trucks, graders, scrapers):

- ❖ **Environmental cabs (primarily on equipment manufactured since the mid-1970s) that include appropriately selected, correctly installed, and properly maintained acoustical materials (see Section One Introduction);**
- ❖ **Exhaust mufflers; and**
- ❖ **Redirection of the exhaust away from the operator.**

MSHA considers the following engineering noise controls to be conditional:

- **Installation of a full or partial skin kit to the ROPS/FOPS.**
- **Appropriate acoustical materials (see Section One Introduction) to treat the operator's compartment.**

The following control offers *promise* in reducing miner noise exposures:

- *Remote controls.*

20. Portable Crushers / Screening Plants and Associated Equipment

MSHA considers the following noise controls, or a combination of these controls, to be **technologically achievable** in reducing the noise exposure of crusher operators:

- ❖ Acoustically treated environmental control booths isolated from the main structure through the use of vibration-isolation techniques or through physical isolation (permanent or portable);
- ❖ Remotely controlled picks;
- ❖ Video monitoring of plant operations;
- ❖ Mufflers; and
- ❖ OEM controls on diesel engine/generator sets.

MSHA considers the following engineering noise controls to be conditional:

- Sound damping material at transfer points;
- Chute liners;
- Resilient screen decking; and
- Barriers, especially on traveled walkways.

21. Roof Bolting Machines

MSHA considers the following engineering control and work practices to be **technologically and administratively achievable** in reducing a miner's noise exposure when working on or around a roof bolting machine:

- ❖ Wet drilling (where it can be implemented due to the roof bolter design and when compatible with the geology and mining method);
- ❖ Sharp drill bits;
- ❖ Starter drill steel to begin the hole;
- ❖ Straight drill steel (one piece and with thick wall, if conditions and dust collection allow);
- ❖ Replacement of worn or defective drilling components (e.g., drill pot bushings or bearings, worn steel, bent steel); and
- ❖ Maintenance of manufacturer-recommended drilling parameters for thrust, torque, and rotational speed.

The following engineering controls and work practices offer *promise* in reducing a miner's noise exposure:

- *Automated dust collection system or actuation of the dust collection system motors only during drilling, or use of administrative controls to accomplish the same task;*
- *Exhaust conditioner (water box) and/or manufacturer-recommended exhaust muffler;*
- *Chuck isolator;*
- *Drill bit isolator;*
- *Acoustic drill steel enclosure;*
- *Controls for optimizing the drilling parameters (drill feedback system);*
- *Water misting system (i.e., injection of a small volume of water in a mist form into the drill hole clearance system);*
- *Grommet to isolate the drill steel and chuck;*
- *Acoustical liner in the tool tray; and*
- *Damped drill steels.*

22. Scalers

MSHA considers the following engineering noise controls, or a combination of these controls, to be **technologically achievable** in reducing the noise exposure of miners working around scalers:

- ❖ **Environmental cabs that include appropriately selected, correctly installed, and properly maintained acoustical materials (see Section One Introduction) applied to internal surfaces;**
- ❖ **Sealing of openings (e.g., around the gear controls, doors); and**
- ❖ **Muffler.**

MSHA considers the following engineering noise controls to be conditional:

- **Appropriately selected, correctly installed, and properly maintained acoustical materials (see Section One Introduction) on the inside surfaces of existing cabs; and**
- **Barrier between the engine and the operator.**

23. Stone Saws

MSHA considers the following engineering noise controls, or a combination of these controls, to be **technologically achievable** in reducing the noise exposure of the stone saw operator:

- ❖ **Operator booth with appropriately selected, correctly installed, and properly maintained acoustical materials (see Section One Introduction) applied to internal surfaces;**
- ❖ **Barrier between the saw and the operator; and**
- ❖ **Composite saw blades**

There are two types of cutting blades. One is a silent core blade that is laminated. The other is a composite blade with filled expansion slots. These are available for all existing saws. Blade maintenance and the type of saw blade also are important factors.

Methods that offer *promise* for reducing the noise exposure of miners using stone saws include:

- *Wet sawing systems.*

Section Two

Practical Approach to Reducing A Miner's Noise Exposure

MSHA believes that there is a practical approach that can be taken to reduce a miner's exposure to noise. Consideration of the responses to the following questions can be a valuable part of the noise control evaluation process. Besides the reduction of noise exposure, proper maintenance, work practices, and procedures, if applicable, may result in increased efficiency and less downtime.

Maintenance

- Are all existing noise controls maintained?
- Are mechanical components / systems adequately maintained including maintaining and greasing rollers, bearings, hubs, etc.?
- Are bolts tight, covers and compartments secure to prevent noise exposures?
- Do smooth transitions exist between track rails?
- Are openings around doors and between compartments sealed? Are air conditioners installed? Are broken windows repaired?
- Is all equipment properly maintained to reduce excessive noise resulting from lack of oil, grease, worn parts, etc.?
- Are miners instructed on proper use, operation and maintenance of equipment with noise controls?
- Is the air conditioning in booths and enclosures maintained?
- Are filters replaced on a scheduled basis for all air conditioners?

Work Practices

- Are sharp cutting tools used?
- Do dust collection systems operate only when needed?
- Are proper thrust, rotational speed, torque and chain tensioning being used?
- Are good work practices being employed?
- Are there work practices that result in unnecessary exposure to noise?
- Are conveyors operated either wet or with materials?
- Are doors and windows to cabs and booths kept closed?

- Are radios turned off or the volume reduced as low as possible?
- Is the exposed miner maintaining the greatest distance from the noise source while still being able to perform his/her job?
- What kind of cleanup or maintenance is used, e.g., hand shovels vs. small loaders?
- Do miners spend their breaks near high noise areas?
- Do miners park or idle equipment in high noise areas for waiting, loading or dispatching?
- Do miners stand next to high noise areas?
- Are manufacturer's air pressure recommendations followed for air-operated equipment?
- Are manufacturer's recommendations / maintenance schedules, etc. followed?
- Are air hoses used for cleanup rather than manual tools, vacuuming, or washing down with water?
- Is equipment located in such a manner to minimize miner exposures?

Engineering/ Administrative Controls

- Are all feasible engineering and administrative controls installed and maintained?
- Are environmental cabs used on surface mobile equipment?
- Can a video camera/monitor be used to observe critical operations, thus limiting a miner's exposure?
- Can a remote control system be used to remove an operator or miner from a noisy environment?
- Are sound-treated booths provided for miner use, even on a periodic basis, where applicable?
- Are exhausts directed away from miners?
- Can miners be rotated from noisy activities to quieter ones to reduce exposure?
- Has the proper type of acoustical material been selected to suit the job? Has consideration been given to the material's flammability properties?
- Do impact points employ vibration damping materials?
- Do barriers separate miners and noise sources?
- If multiple noise sources are present, can barriers be installed to prevent the combined

effects of sources?

- Is cleanup performed when the plant is running?
- Are normal travelways located away from noise sources?
- Are high noise areas identified with warning signs?
- Are miners instructed to avoid these high noise areas?
- Can noisy machines be replaced by quieter ones?
- When new or used equipment is purchased, are noise controls included? Is sound level or exposure data included?
- Is a "Buy Quiet" program in effect at the mine for the purchase of the quietest new and used equipment available?
- Has noise been considered in operational design?

Section Three **Some Examples of Administrative Controls**

MSHA considers the following administrative controls to be applicable in many mining situations but administrative achievability must be assessed on a case-by-case basis. The following controls should be discussed with miners, miners' representatives and mine operators during the inspection process, as appropriate.

1. Adjust work schedules.
 - Share work tasks and/or rotate miners from noisy activities to quieter ones.
 - Schedule work tasks during quiet periods.
 - Limit duration of work shifts.
2. Utilize work practices to lower noise exposures.
 - Position miners in quieter locations without increasing safety risks;
 - Keep miners from congregating at high-noise areas;
 - Provide quiet areas while taking breaks;
 - Limit the duration of noisy tasks;
 - Switch / rotate miners from high- to low-noise exposure jobs/occupations;
 - Modify work activities to shorten time or decrease noise level;
 - Provide job-task-analysis training for the specific occupation to complete tasks more efficiently, safely, and in a manner to reduce the occupational noise exposure;
 - Eliminate tasks that are unnecessarily noisy;
 - Operate noisy equipment or complete noisy tasks during periods when fewer miners will be exposed; and
 - Restrict or limit miner access to high noise areas.
3. Use real-time noise dosimetry / instrumentation to measure exposures, trigger an administrative control, and prevent overexposures.
4. Use remote sensing technology and video monitoring.
5. Designate low-noise walkways /areas (e.g., dinner holes) or locate walkways /areas away from noise sources.
6. Assure maintenance practices critical to reducing noise generation are identified and followed:
 - Keep chain tension adjusted to specifications;
 - Keep panels tightly bolted;
 - Keep seals around compartments secure; and
 - Keep drive trains aligned and lubricated.

Background

Overexposure to occupational noise continues to be a pervasive health problem. In this light, MSHA intends to continue offering its assistance to mine operators in the implementation of the noise standard.

Authority

The Federal Mine Safety and Health Act of 1977, as amended, 30 U.S.C. § 801 et seq.; 30 C.F.R. Part 62

Internet Availability

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