MNM Mining and Health

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Outline

• Resources
• Miner Health and the Aggregate Industries
  – Construction Sand and Gravel
  – Crushed, Broken Granite
  – Crushed, Broken Limestone NEC
  – Crushed, Broken Marble
  – Crushed, Broken Sandstone
  – Crushed, Broken Slate
  – Crushed, Broken Stone NEC
  – Crushed, Broken Traprock
Health Effects

Hearing Loss (noise)

Hazardous Dust

– Respirable Dust
  • Silica Dust
– Total Dust
  • Nuisance Dust

Immunological Effects:

– Autoimmune disorders including systemic sclerosis (scleroderma), rheumatoid arthritis, systemic lupus erythematosus, ANCA-associated vasculitis, and sarcoidosis.
Health Effects

Renal Disease:
- Renal pathologies (called silicon nephropathy)
- Kidney disease, including nephritis and end-stage renal disease

- Lung and Airway Diseases
  - Lung Cancer
  - Asthma
  - Chronic Obstructive Pulmonary Disease (COPD)
    - Progressive lung disease including emphysema, chronic bronchitis, refractory (non-reversible) asthma, and some forms of bronchiectasis
  - Pneumoconiosis
    - Silicosis
## Top 10 Violations

### VA Aggregate Mines

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<th>CY 2009-2019</th>
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<tr>
<td><strong>30 CFR</strong></td>
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<td>56.14100(b)</td>
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Health Violations
VA Aggregate Mines
Noise Violations

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Health Violations
VA Aggregate Mines
Noise Exposure High Risk Occupations

• Dredge Operator
• Drill Operator
• Bull Dozer Operator
• Cleanup Man
• Utility Man
• Water Truck Driver
• Bagger Operator
• Crusher Operator
Health Violations
VA Aggregate Mines
Dust Exposure High Risk Occupations

• Mechanic
• Drill Operator
• Wash Plant Operator
• Utility Man
• Crusher Operator (Primary and Secondary)
• Plant Operator
• Pelletizing Plant Operator
• Bagger Operator
## VA Aggregate Mines
### CY 2019 Violations
### Top 10 Violations

<table>
<thead>
<tr>
<th>All Aggregate Mines</th>
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Health Violations
VA Aggregate Mines

• CY 2019:
  – 56.5001(a)/5005 Violations: 8
    • respirable and total dust
  – 56.20003 Violations: 49
  – 62.120 Violations: 1
    • Noise exposure equals or exceeds the action level
      (85dBA or a dose of 50%)
MSHA Standards Related to Controlling Respirable Dust – Silica and Total Dust:

- CFR Parts 56/57.5001 - Limit a miner’s exposure to airborne contaminants,
- CFR Parts 56/57.5005 – Control exposure to airborne contaminants. Approved respiratory protection has to be available when appropriate and in reliable condition.
- CFR Parts 56/57.5002 - Conduct exposure monitoring.
- CFR Parts 46 and 48 - Miners must be trained and retrained.
- CFR Parts 56/57.15002; 15003; 15004; and 15006 - Wear appropriate personal protection equipment and clothing.
- CFR Parts 56/57.18002 Examination of workplaces.
- CFR Parts 56/57.20003 House keeping: Keep workplaces clean.
MSHA Standards Related to Controlling Noise And Conserving Miner’s Hearing In Metal and Nonmetal Mines

• 30 CFR Part 62.100 Purpose and scope; effective date
• 30 CFR Part 62.101 Definitions
• 30 CFR Part 62.110 Noise exposure assessment
• 30 CFR Part 62.120 Action level
• 30 CFR Part 62.130 Permissible exposure limit (and maximum limit)
• 30 CFR Part 62.140 Dual hearing protection level.
• 30 CFR Part 62.150 Hearing Conservation program
• 30 CFR Part 62.160 Hearing protectors
• 30 CFR Part 62.170 Audiometric testing
• 30 CFR Part 62.171 Audiometric test procedures
• 30 CFR Part 62.172 Evaluation of audiograms
• 30 CFR Part 62.173 Follow-up evaluation when an audiogram is invalid
• 30 CFR Part 62.174 Follow-up corrective measures when a standard threshold shift is detected
• 30 CFR Part 62.175 Notification of results; reporting requirements
• 30 CFR Part 62.180 Training
• 30 CFR Part 62.190 Records
Exposure Monitoring

• CFR Part 56/57.5002 - Conduct exposure monitoring

• Resource:
  – American Industrial Hygiene Association
    • Occupational and Environmental Health and Safety Consulting Professionals
Exposure Monitoring

Printed Directory
BROWSE OUR PRINTED DIRECTORY.
Exposure Monitoring

Online Search
USE OUR ONLINE SEARCH.

Consultants Listing

MSHA.GOV  |  @USDOL #MSHA
Dust Controls

• National Institute for Occupational Safety and Health (NIOSH)
• Dust Control Handbook for Industrial Minerals Mining and Processing—Second Edition; NIOSH
• https://www.cdc.gov/niosh/mining/works/cover sheet2094.html
Dust Controls
Medical Monitoring

• Best Practices
  – What?
    • Radiographic monitoring
    • Spirometry
      – Pulmonary Function Testing
        » FVC, FEV₁, FEV₁/FVC
    • Audiogram
    • Vision screening
    • Blood test

• Who?
  – Newly hired miners
  – Journeymen

• How often?
  – Yearly
  – As recommended by a professional health care provider
  – Known best practices
Protective Clothing and Ensembles

• Aimed at protecting the skin from various health hazards that may be encountered in the workplace
• MSHA Standards
  – 30 CFR Part 56/57.15002 Hard hats (protection against falling objects);
  – 30 CFR Part 56/57.15003 Protective footwear;
  – 30 CFR Part 56/57.15004 Eye protection;
  – 30 CFR Part 56/57.15005 Safety belts and lines (fall protection);
  – 30 CFR Part 56/57.15006 Protective equipment and clothing for hazards and irritants;
  – 30 CFR Part 56/57.15007 Protective equipment or clothing for welding, cutting, or working with molten metal;
  – 30 CFR Part 56/57.15014 Eye protection when operating grinding wheels; and
Personal Protective Equipment (PPE)

- Includes all items or materials worn by a miner to prevent injury or illness from exposure to a chemical or physical agent, or from physical trauma.
- Examples include (but are not limited to): hard hats, protective footwear, safety glasses, face shields, goggles, respirators, hearing protectors, safety belts, harnesses and lanyards, gloves, chemical resistant clothing, vibration resistant gloves, and clothing or aprons which reflect heat or protect against contact with hot materials.
Eye Safety Best Practices

1. Create a safe work environment
   • Minimize hazards from falling or unstable debris.
   • Make sure that tools work and safety features (machine guards) are in place.
   • Make sure that miners know how to use tools properly.
   • Keep bystanders out of the hazard area.

2. Evaluate safety hazards.
   • Identify the primary hazards at the site.
   • Identify hazards posed by nearby workers, large machinery, and falling/shifting debris.

3. Wear the proper eye and face protection.
   • Select the appropriate Z87 eye protection for the hazard.
   • Make sure the eye protection is in good condition.
   • Make sure the eye protection fits and will stay in place.
Eye Safety Best Practices

4. Use good work practices.
   - Caution—Brush, shake, or vacuum dust and debris from hardhats, hair, forehead, or the top of the eye protection before removing the protection.
   - Do not rub eyes with dirty hands or clothing.
   - Clean eyewear regularly.

5. Prepare for eye injuries and first aid needs. Have an eye wash or sterile solution on hand.

https://www.cdc.gov/niosh/topics/eye/eyechecklist.html
Eye Safety Tool Box Talk

- [https://www.cdc.gov/niosh/topics/eye/toolbox-eye.html](https://www.cdc.gov/niosh/topics/eye/toolbox-eye.html)
Respiratory Protection

• ANSI Z88.2
  – Best Practices ANSI Z88.2-2015
Respirator

- Selection;
- Cleaning;
- Sanitizing;
- Inspecting, repairing, and disposal;
- Storing.
Respirator Selection

• NIOSH Respirator Selection Logic 2004
• DHHS (NIOSH) Publication Number 2005-100
• https://www.cdc.gov/niosh/docs/2005-100/default.html
• https://www.cdc.gov/niosh/topics/respirators/default.html
Respirator

• **Respirator Cleaning and Disinfecting:**
  – Program must include provision for:
    • Cleaning and disinfecting respirators on a regular basis, or after each use if they are used by more than one person; and
    • For disposable respirators, a provision for employees to obtain a new respirator when theirs becomes unusable, unsanitary, or exhibits excessive breathing resistance.

• **Respirator Storage:** Program must include provision for convenient, clean, and sanitary storage.
Respirator

- **Respirator Inspection:**
  - Program must make provision for respirator inspection before and after each use and during cleaning:
  - Visual inspection is OK and no written record is required;
  - Deficiencies identified must be corrected.

- **Surveillance:** Work area must be periodically checked to ensure respirator use and to monitor conditions, employee exposure, and employee stress due to breathing resistance.

- **Program Evaluation:** The respiratory protection program must be regularly evaluated to ensure continued effectiveness.
Respiratory Protection Program

• 30 CFR 56/57.5005, when respiratory protective equipment is used, the mine operator must establish a program meeting the following minimum requirements:

  – The employee shall be furnished with a NIOSH approved respirator which is applicable and suitable for the purpose intended, and the employee shall use it in accordance with training and instructions,

  – The respiratory protection program must be consistent with ANSI Z88.2 - 1969, and,

  – In atmospheres immediately harmful to life, the presence of at least one other person with backup equipment and rescue capability is required in the event of failure of the respiratory equipment.
Respiratory Protection Program

ANSI Z88.2 - 1969, requires, in part, that:

Written standard operating procedures be developed governing respirator selection, use and care (3.5.1, 7.11),

The user receive instruction and training in the nature of the hazard, the proper use of the respirator, and its limitations (3.5.3, 7.4),

The user be provided an opportunity to wear the respirator in a test atmosphere (7.4) (i.e. qualitative or quantitative fit test)

Respirators should not be worn when conditions prevent a good face seal, such as a growth of beard or sideburns that project under the face piece (7.5);
Respiratory Protection Program

ANSI Z88.2 - 1969, requires, in part, that:

Face piece fit be checked by the wearer each time the respirator is worn, by following the manufacturer's face piece-fitting instructions, such as conducting a positive and negative pressure test (7.5);

The program adequately address respirator maintenance and care, including inspection for defects, cleaning and disinfecting, repair, and storage (8); and,

Frequent random inspections be conducted by a qualified individual to assure that respirators are properly selected, used, cleaned, and maintained (10.3).
Respiratory Protection Program

• 30 CFR 56/57.20011-Barricades and Warning Signs

Areas where respirator use is required, must be posted with signs warning of the nature of the hazard and protective action required.
Fit Testing

- Must be performed for each employee using a respirator. Should include a written record of the following:
  - Name of employee tested;
  - Date of testing;
  - Respirator manufacturer, model, style, and size worn;
  - Fit test protocol used and the name of the person administering the fit test; and
  - Fit test results.
Fit Testing

PROCEDURES FOR CHECKING AND TESTING RESPIRATOR FIT

• **Negative Pressure Fit Check** - used with tight fitting face pieces to check the seal before entering a potentially contaminated atmosphere. The inlet(s) on the filters are sealed while the wearer gently inhales. The inward collapse of the mask, and absence of a noticeable inward rush of air, provides reasonable assurance that the mask is not leaking and is properly seated on the face.

• **Positive Pressure Fit Check** - used with tight fitting face pieces to check the seal before entering a potentially contaminated atmosphere. The exhalation port is sealed while the wearer gently exhales. The buildup of pressure inside the mask, and absence of a noticeable outward rush of air, provides reasonable assurance that the mask is not leaking and is properly seated on the face.
Fit Testing

PROCEDURES FOR CHECKING AND TESTING RESPIRATOR FIT

• **Qualitative Fit Test** - a pass/fail fit test that relies on the subject's sensory response to detect the leakage of a challenge agent past the respirator seal. The test is performed by exposing the wearer to a challenge agent easily detected by irritation (smoke), taste (Saccharine or Bittrex) or odor (isoamyl acetate). The subject must be able to sense the agent when not protected. If irritant smoke or isoamyl acetate are used, the respirator must be equipped with an appropriate air - purifying filter.

• **Quantitative Fit Test** - a fit test that uses an instrument to measure the effectiveness of a respirator seal in excluding the ambient atmosphere. The test is performed by dividing the measured concentration of a challenge agent outside of the respirator by the measured concentration of the challenge agent inside the respirator face piece. The normal air purifying element should be replaced with an essentially perfect purifying element such as an HEPA filter.
Preventing Hearing Loss

• Protection Against Noise
• Controls
• Program
• Monitoring
Preventing Hearing Loss

• Hearing hazard exposure monitoring is conducted for various purposes including:
  – To determine whether hazards to hearing exist.
  – To determine whether noise presents a safety hazard by interfering with speech communication or the recognition of audible warning signals.
  – To identify miners for inclusion in the hearing loss prevention program.
  – To classify miners' noise exposures for prioritizing noise control efforts and defining and establishing hearing protection practices.
  – To evaluate specific noise sources for noise control purposes.
  – To evaluate the success of noise control efforts.
Preventing Hearing Loss

Training and Education Best Practices
• Has training been conducted at least once a year?
• Was the training provided by a qualified instructor?
• Was the success of each training program evaluated?
• Is the content revised periodically?
• Are managers and supervisors directly involved?
• Are posters, regulations, handouts, and employee newsletters used as supplements?
• Are personal counseling sessions conducted for employees having problems with hearing protection devices or showing hearing threshold shifts?
Preventing Hearing Loss

Best Practices: Engineering and Administrative Controls

• Have noise control needs been prioritized?
• Has the cost-effectiveness of various options been addressed?
• Are mines and supervisors apprised of plans for noise control measures? Are they consulted on various approaches?
• Will in-house resources or outside consultants perform the work?
Preventing Hearing Loss

Best Practices: Engineering and Administrative Controls

• Have employees and supervisors been counseled on the operation and maintenance of noise control devices?

• Are noise control projects monitored to ensure timely completion?

• Has the full potential for administrative controls been evaluated? Are noisy processes conducted during shifts with fewer employees? Do miners have sound-treated lunch or break areas?
Preventing Hearing Loss

• Typical engineering controls involve:
  – Reducing noise at the source.
  – Interrupting the noise path.
  – Reducing reverberation.
  – Reducing structure-borne vibration.

• Common examples of the implementation of such controls are:
  – Installing a muffler.
  – Erecting acoustical enclosures and barriers.
  – Installing sound absorbing material.
  – Installing vibration mounts and providing proper lubrication.
Preventing Hearing Loss

• Best Practices:
  
  – For maximum protection of miners (and for that matter, the company), audiograms should be performed on the following five occasions:
    
    • Pre-employment.
    • Prior to initial assignment in a hearing hazardous work area.
    • Annually as long as the employee is assigned to a noisy job (a time-weighted average exposure level equal to or greater than 85 dBA)
    • At the time of reassignment out of a hearing hazardous job.
Best Practices
Monitoring Audiometry and Record Keeping

• Has the audiometric technician been adequately trained, certified, and recertified as necessary?
• Do on-the-job observations of the technicians indicate that they perform a thorough and valid audiometric test, instruct and consult the miner effectively, and keep appropriate records?
• Are records complete?
• Are follow-up actions documented?
• Are hearing threshold levels reasonably consistent from test to test? If not, are the reasons for inconsistencies investigated promptly?
• Are the annual test results compared to baseline to identify the presence of an OSHA standard threshold shift?
• Is the annual incidence of standard threshold shift greater than a few percent? If so, are problem areas pinpointed and remedial steps taken?
Best Practices

Monitoring Audiometry and Record Keeping

• Are audiometric trends (deteriorations) being identified, both in individuals and in groups of employees? (NIOSH recommends no more than 5% of workers showing 15 dB Significant Threshold Shift (STS), same ear, same frequency.)
• Do records show that appropriate audiometer calibration procedures have been followed?
• Is there documentation showing that the background sound levels in the audiometer room were low enough to permit valid testing?
• Are the results of audiometric tests being communicated to supervisors and managers as well as to employees?
• Has corrective action been taken if the rate of no-shows for audiometric test appointments is more than about 5%?
• Are miners incurring STS notified in writing within at least 10 working days? (CFR 62.175) (NIOSH recommends immediate notification if retest shows 15 dB STS, same ear, same frequency.)
Hearing Protection Devices

• Have hearing protectors been made available to all miners whose daily average noise exposures are 85 dBA or above?
• Are miners given the opportunity to select from a variety of appropriate protectors?
• Are miners fitted carefully with special attention to comfort?
• Are miners thoroughly trained, not only initially but at least once a year?
• Are the protectors checked regularly for wear or defects, and replaced immediately if necessary?
• If miners use disposable hearing protectors, are replacements readily available?
Hearing Protection Devices

- Do miners understand the appropriate hygiene requirements?
- Have any miners developed ear infections or irritations associated with the use of hearing protectors? Are there any miners who are unable to wear these devices because of medical conditions? Have these conditions been treated promptly and successfully?
- Have alternative types of hearing protectors been considered when problems with current devices are experienced?
- Do miners who incur noise-induced hearing loss receive intensive counseling?
Hearing Protection Devices

• Are those who fit and supervise the wearing of hearing protectors competent to deal with the many problems that can occur?
• Do miners complain that protectors interfere with their ability to do their jobs? Do they interfere with spoken instructions or warning signals? Are these complaints followed promptly with counseling, noise control, or other measures?
• Are miners encouraged to take their hearing protectors home if they engage in noisy non-occupational activities?
Hearing Protection Devices

• Are new types of or potentially more effective protectors considered as they become available?

• Is the effectiveness of the hearing protector program evaluated regularly?

• Have at-the-ear protection levels been evaluated to ensure that either over or under protection has been adequately balanced according to the anticipated ambient noise levels?

• Is each hearing protector user required to demonstrate that he or she understands how to use and care for the protector? The results documented?