CHAPTER 6 – RESPIRATORY PROTECTION AND PERSONAL PROTECTIVE EQUIPMENT

GENERAL COMMENTS FOR INSTRUCTORS:

This chapter should educate and motivate workers to wear respiratory protection and personal protective equipment. It must be stressed to all students that their respirator will be their most important piece of personal protection. Since the respirator is the most important instrument used by the worker to protect his or her own health, its use must not be compromised by anything. At the very least, workers should understand how to protect themselves with their respirators.

OSHA and MIOSHA require that employers select and workers use only NIOSH-certified respirators to provide protection from dusts produced during abrasive-blasting operations. For example, a canvas shroud added to a negative pressure full facepiece air purifying respirator does not satisfy the approval requirement. NIOSH has developed a list of respirators that are certified for abrasive blasting operations. The NIOSH National Personal Protective Technology Laboratory (NPPTL) has a searchable list of approved abrasive blasting respirators at: http://www2a.cdc.gov/drds/cel/cel_form_code.asp. Scroll down the page to the box labeled "For Protections Against" and select "Abrasive Blasting".

A **Type C respirator** is an airline respirator, for entry into and escape from atmospheres not immediately dangerous to life or health, which consists of a source of respirable breathing air, a hose, a detachable coupling, a control valve, orifice, a demand valve or pressure demand valve, and arrangement for attaching the hose to the wearer and a facepiece, hood, or helmet.

NIOSH defines a **Type CE respirator** as a Type C supplied-air respirator equipped with additional devices designed to protect the wearer's head and neck against impact and abrasion from rebounding abrasive material, and with shielding material such as plastic, glass, woven wire, sheet metal, or other suitable material to protect the window(s) of facepieces, hoods, and helmets which do not unduly interfere with the wearer's vision and permit easy access to the external surface of such window(s) for cleaning. **All respirators certified by NIOSH as abrasive blasting respirators are Type CE**.

Depending upon the respirator manufacturer, the Type CE respirator may be a continuous supplied-air respirator or a pressure-demand respirator. MIOSHA requires the use of the use of an abrasive blasting respirator, thus a Type CE respirator, when certain working conditions apply.

Although not required by OSHA and MIOSHA, **we highly recommend the use of the Type CE respirator during abrasive blasting cleanup operations**.

CHAPTER 6 – RESPIRATORY PROTECTION AND PERSONAL PROTECTIVE EQUIPMENT

At the conclusion of this chapter, participants who are required to wear a respirator should understand:

- the proper function of each part of their respirator
- how to perform routine daily cleaning and maintenance of their respirator
- how to correctly put on, take off, and wear their respirator
- how to conduct a user seal check if they are wearing a tight fitting negative pressure respirator
- the importance of fit testing a negative pressure respirator
- the need for a good air source and for personal air filter to remove oil and moisture when utilizing an supplied air respirator
- why they need a medical evaluation prior to fit testing and wearing the respirator

Although employers are required to develop and implement a written respiratory protection when respirators are required to be worn, workers should also understand the need for the written respiratory protection program and their employer's responsibilities under the program.

Additionally, employers and workers should understand how to select and use other protective equipment, such as hearing protectors (hearing conservation program may be required depending upon noise levels), protective gloves, clothing, etc.

AUDIO VISUAL AIDS:

- OSHA Video: Respiratory Fit Testing. https://www.osha.gov/video/respiratory_protection/fittesting.html. The link provides the video in both English and Spanish
- Literature and information on respiratory protective equipment and personal protective equipment presented by PPE salesman.
- Hands on demonstration
  - Types of PPE.
  - Respirator fit testing and user seal check.
- Respirator Assigned Protection Factor (APF) Handout
- PowerPoint® Chapter 6

APPENDICES

- Appendix IV- MIOSHA Occupational Health Standards
  - Appendix IV-A: PART 523 - Abrasive Blasting
  - Appendix IV-D: PART 680 - Noise Exposure in Construction
  - Appendix IV-E: PART 360 - Noise Exposure in General Industry

APPENDICES FOR RESPIRATORY PROTECTION:

- Appendix XIV: Respiratory Protection Resources

- Appendix XIV-A: MIOSHA Occupational Health Standard Part 451 – Respiratory Protection
- Appendix XIV-B: MIOSHA Construction Safety and Health Fact Sheet: Respiratory Protection
- Appendix XIV-C: MIOSHA CET Publication SP-05: Respiratory Protection - Sample Program
- Appendix XIV-D: MIOSHA Physician or Licensed Health Care Professional (PLHCP) Interpretation
- Appendix XIV-E: Respirator Medical Questionnaire en Espanol

APPENDICES FOR PERSONAL PROTECTIVE EQUIPMENT:

- Appendix XV: Personal Protective Equipment Resources
  - Appendix XV-A: MIOSHA Construction Safety Standard Part 6 - Personal Protective Equipment
  - Appendix XV-B: MIOSHA General Industry Safety Standard Part 33 - Personal Protective Equipment
  - Appendix XV-C: MIOSHA General Industry Occupation Health Standard Part 433- Personal Protective Equipment
  - Appendix XV-D: MIOSHA CET Publication SP#16: Personal Protective Equipment for General Industry

- Appendix XVI: Noise and Hearing Conservation Resources
  - Appendix XVI-A: MIOSHA Consultation, Education and Training, Construction Fact Sheet – Noise, Publication #014
  - Appendix XVI-B: MIOSHA Consultation Education and Training Summary of Occupational Noise Standard, Publication 5600
  - Appendix XVI-C: Hearing Loss Prevention Publication #5620
  - Appendix XVI-D: MIOSHA Fact Sheet – Noise and Hearing
  - Appendix XVI-E: MIOSHA Consultation Education and Training – Noise Information and Training, Publication #5621
  - Appendix XVI-F: Pinnacle – Sample Hearing Conservation Program
  - Appendix XVI-G: Michigan Municipal League – Sample Hearing Conservation Program

CHAPTER 6 – RESPIRATORY PROTECTION AND PERSONAL PROTECTIVE EQUIPMENT

WHEN YOU PERFORM ABRASIVE BLASTING YOU MUST WEAR A TYPE CE SUPPLIED AIR RESPIRATOR

MIOSHA adopted the federal regulation §1910.134 Respiratory Protection. 1910.134. Your employer is required to select and you are required to wear a NIOSH-certified respirator when respiratory protection is required to be worn.

WHAT IS A SUPPLIED AIR RESPIRATOR?

A supplied air respirator is also known as an "atmosphere supplying respirator". An atmosphere-supplying respirator supplies clean air directly to the user from a source other than the air surrounding the user. There are different types of supplied air respirators: Type A, Type B and C. Types A and B are "hose masks" – a long, large diameter, low resistance hose to the clean air source. The worker breathes and clean air is supplied.

⇒ **What is a Type C Respirator?**

A **Type C respirator** makes use of a hose to deliver clean, safe air from a stationary source of compressed air. A Type C respirator is also known as an "airline respirator" and can only be used for entry into and escape from atmospheres not immediately dangerous to life or health. The Type C airline respirator consists of the following components:

- a source of respirable breathing air (compressed air source)
- filtration (including carbon monoxide monitor)
- air distribution (air pressure regulator, pressure gauge, safety relief valve, approved respirator couplings – also known as point of attachment (POA))
- respirator (facepiece, hood or helmet (NOTE: MAXIMUM LENGTH OF HOSE IS 300 FEET FROM POA TO WORKER WEARING RESPIRATOR)

Type C respirators come in three configurations:

⇒ *Constant Flow*: supplies air continuously and is normally used when there is an ample supply of air such as when a compressor supplies the air to the user

⇒ *Demand Flow*: air supplied only when the user inhales-pressure inside the mask is positive during exhalation and negative during inhalation (lower level of protection)

⇒ *Pressure Demand*: supplies air "on demand" but has a modified regulator and special exhalation valve that are designed to maintain positive pressure in the face piece during both inhalation and exhalation

⇒ **What is a Type CE Supplied Air Respirator?**

NIOSH defines a **Type CE respirator** as a Type C supplied-air respirator equipped with additional devices designed to protect the wearer's head and neck against impact and abrasion from rebounding abrasive material, and with shielding material such as plastic, glass, woven wire, sheet metal, or other suitable material to protect the window(s) of facepieces, hoods, and helmets which do not unduly interfere with the wearer's vision and permit easy access to the external surface of such window(s) for cleaning. **This type of respirator is the only airline respirator approved for abrasive blasting.**

MIOSHA OCCUPATIONAL HEALTH STANDARD PART 523: ABRASIVE BLASTING

MIOSHA Occupational Health Standard Part 523 – Abrasive Blasting contains many but not all of the requirements of OSHA's 1910.94 -Ventilation standard. Part 523 applies to both general industry and construction. NOTE: Part 523 does not apply to steam blasting or steam cleaning, or hydraulic-cleaning methods where work is done without the aid of abrasives.

Similarities include, but are not limited to the following:

MIOSHA and OSHA define an abrasive-blasting respirator as a respirator constructed so that it covers the wearer's head, neck, and shoulders to protect the wearer from rebounding abrasive and a particulate filter respirator as an air-purifying respirator, commonly referred to as a dust or fume respirator, which removes most of the dust or fume from the air passing through the device.

MIOSHA and OSHA require abrasive blasting respirators be worn by abrasive blasting operators when:

- working inside blast-cleaning rooms
- using silica sand in manual blasting operations where the nozzle and blast are not physically separated from the operator in an exhaust-ventilated enclosure
- concentrations of toxic dust dispersed by the abrasive blasting may exceed the exposure limits set in R 325.51102 et seq., being the Michigan occupational health air contaminant standard, and the nozzle and blast are not physically separated from the operator in an exhaust-ventilated enclosure

MIOSHA and OSHA permit the use of:

- Properly fitted particulate-filter respirators, commonly referred to as dust-filter respirators, for short, intermittent, or occasional dust exposures such as cleanup, dumping of dust collectors, or unloading shipments of sand at a receiving point when it is not feasible to control the dust by enclosure, exhaust ventilation or other means. The respirator used shall be for protection against the specific type of dust encountered. **Although not required by OSHA and MIOSHA, we highly recommend the use of the Type CE respirator during abrasive blasting cleanup operations.**
- Dust-filter respirators to protect the operator of outside abrasive-blasting operations where non-silica abrasives are used on materials that have low toxicities, but does not permit these types of respirators for continuous protection if silica sand is used as the blasting abrasive or if toxic materials are blasted.

NOTE: When N95 respirators (also known as filtering face piece respirators or dust masks) are required to be used, fit testing is required along with all the requirements of a written program.

MIOSHA Silica Standards, Part 590 and Part 690 (and OSHA standards)

Part 590 and Part 690 require that respiratory protection be provided and worn:

- when silica exposures exceed the PEL during periods necessary to install or implement feasible engineering and work practice controls
- when silica exposures exceed the PEL during tasks, such as certain maintenance and repair tasks, for which engineering and work practice controls are not feasible
- during tasks for which an employer has implemented all feasible engineering and work practice controls and such controls are not sufficient to reduce silica exposures to or below the PEL
- when in a regulated area (Part 590 requirement only – no similar requirement in Part 690-Silica in Construction- See Chapter 5)

NIOSH recommends that you use a Type CE, supplied-air respirator attached to a *good air source* when open blasting *with any media*.

⇒ **What is a good air source?**

A good air source would be an ambient air pump, breathing air cylinders, or an air compressor. The source of supplied air, whether it is a breathing air compressor or an ambient air pump, should be located in a clean air environment so contaminated air will not enter the compressor intake. An ambient air pump and an air compressor should always

have an inlet filter.

Between the air compressor and the airline respirator, an airline filter (purifying sorbent beds and filter) to remove oil mist, moisture, particulates and odor must be present. This airline filter must be maintained, replaced and refurbished per manufacturer's instructions. This information, along with the signature of the individual doing the maintenance, must be recorded on a tag and placed at the compressor. **The airline filter does not remove carbon monoxide (CO).** It will **never** remove carbon monoxide.

It is extremely important that the filtration system is not undersized. The employer should select the appropriately sized filtration system based upon the air flow and pressure requirements of the respirators being worn and the number of workers. If a vortex cooling or heating tube is used by workers, the filtration system size should be based on the total air consumed by the vortex tube(s).

⇒ **MIOSHA Rules Related to "Good Air Source"**

MIOSHA Part 523- Abrasive Blasting, Rule (8). Air for abrasive-blasting respirators must be free of harmful quantities of dusts, mists, or noxious gases, and meets the requirements for supplied-air quality and use specified in MIOSHA Occupational Health Standard, Part 451: Respiratory Protection.

MIOSHA Part 451 (i) - Respiratory Protection. Compressed breathing air shall meet at least the requirements for Grade "D" breathing air as described in ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1 - 1989.

- ➔ Part 451(i)(4): If cylinders are used to supply breathing air to respirators, the cylinders must meet the following requirements: (1) cylinders must be tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR Part 173 and Part 178), (ii) cylinders must have a certificate of analysis from the supplier that the breathing air meets the requirements for Grade D breathing air; and (iii) the moisture content in the cylinder does not exceed a dew point of –50 degrees F at 1 atmosphere pressure.
- ➔ Part 451(1)(5): If a compressor is used to supply breathing air to respirators, it shall be constructed and situated so as to: (i) prevent entry of contaminated air into the air-supply system; (ii) minimize moisture content to that the dew point at 1 atmosphere is 10 degrees F below the ambient temperature; (iii) have suitable in-line air purifying sorbent beds and filters to further ensure breathing air quality. Sorbent beds and filters shall be maintained and replaced or refurbished periodically following the manufacturer's instructions; (iv) have a tag containing the most recent change date and the signature of the person authorized by the employer to perform the change. The tag shall be maintained at the compressor.

- ➔ Part 451(i)(6-7): For compressors that are not oil-lubricated, the employer shall ensure that carbon monoxide (CO) levels in the breathing air do not exceed 10 ppm.* For oil-lubricated compressors, a high temperature or carbon monoxide alarm, or both, must be used to monitor carbon monoxide levels. If only high-temperature alarms are used, the air supply shall be monitored at intervals sufficient** to prevent carbon monoxide in the breathing air from exceeding 10 ppm.

  * Not required to have CO alarm, but must ensure that the breathing air has less than 10 ppm CO by appropriate compressor placement, frequent or continuous air monitoring, CO filters or high-temperature alarm.

  ** Intervals sufficient may be interpreted as having a program in place to monitor for CO, monitoring before, during and following each work shift, documenting the results of air monitoring, and being able to show documentation of air monitoring.
- ➔ Part 451 (i)(8): The employer shall ensure that breathing air couplings are incompatible with outlets for non-respirable worksite air or other gas systems. No asphyxiating substance shall be introduced into breathing airlines.

⇒ **What is Grade "D" breathing air?**

As stated by MIOSHA, all operators' breathing apparatus **must** be supplied with clean, breathable, Grade "D" quality or better air as defined by the ANSI/Compressed Gas Association Commodity Specification for air G-7.1 - 1989. The following requirements define Grade "D" breathing air per the 1989 specification:

➲ OXYGEN	19.5% to 23.5%
➲ HYDROCARBONS	5 mg/m^3 maximum
➲ CARBON MONOXIDE	10 ppm maximum
➲ CARBON DIOXIDE	1,000 ppm maximum
➲ ODOR	No detectable odor

➲ NO TOXIC CONTAMINANTS at levels that make air unsafe to breathe

RESPIRATORY PROTECTION -- WRITTEN RESPIRATORY PROTECTION PROGRAM

There are numerous MIOSHA and OSHA standards, including the Silica standard(s) and Abrasive Blasting standard that require a written respiratory protection program, with workplace specific procedures, to be established when respirators are necessary to protect the health of an employee or when the employer requires respirator use. The written program must include the procedures for:

- Procedures for selecting respirators for use in the workplace
- Medical evaluations of employees required to use respirators
- Fit testing procedures for tight-fitting respirators
- Procedures for proper use of respirators in routine and reasonably foreseeable emergency situations
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and otherwise maintaining respirators
- Procedures to ensure adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators
- Training of employees in the respiratory hazards to which they are potentially exposed during routine and emergency situations
- Training of employees in the proper use of respirators, including putting on and removing them, any limitations on their use, and their maintenance
- Procedures for regularly evaluating the effectiveness of the program

See Chapter 7 – Safety Training for the employee information and training required by the Respiratory Protection Standard.

Appendix XIV contains the MIOSHA Occupational Health Standard Part 451 – Respiratory Protection. MIOSHA Occupational Health Standard Part 451 – Respiratory Protection contains five mandatory appendices, four of which will be discussed on subsequent pages of this section. The appendices are:

- Appendix A to 1910.134: Fit Testing Procedures
- Appendix B-1 to 1910.134: User Seal Check Procedures
- Appendix B-2 to 1910.134: Respirator Cleaning Procedures
- Appendix C to 1910.134: OSHA Respirator Medical Evaluation Questionnaire
- Appendix D to 1910.134: Information for Employees Using Respirators When Not Required Under the Standard

⇒ **Appendix A: Fit-Testing the Respirator**

Employees must be fit tested with the same make, model, style and size of the respirator they will wear before using any respirator with a negative or positive pressure tight-fitting face piece. Loose-fitting respirators (such as hoods or helmets) that do not have a tight-fitting face piece are not required to be fit tested.

Respirators with tight fitting face pieces must fit properly to provide protection. A tight fitting respirator includes filtering face pieces, half- and full-face piece respirators. If a tight seal is not maintained between your face and the respirator face piece, contaminated air will be drawn into the face piece and you will be breathing contaminated air. Fit testing

may be either qualitative (QLFT) or quantitative (QNFT).

Qualitative fit testing involves introducing a gas, vapor, or aerosol test agent into an area around the head of the respirator user. If the respirator user can detect the presence of the test agent through subjective means, such as odor, taste, or irritation, the respirator fit is inadequate.

In a **Quantitative fit test**, the adequacy of respirator fit is assessed by measuring the amount of leakage into the respirator, by either generating a test aerosol as a test atmosphere, or using a controlled negative pressure to measure the amount of respirator leakage. Appropriate instrumentation is required to quantify respirator fit in QNFT.

Qualitative and quantitative fit testing must be conducted according to specific protocols and at specific intervals or on the occurrence of defined triggering events.

⇒ **Appendix B-1: User Seal Check**

Each time you put on a respirator with a negative or positive pressure tight-fitting facepiece, you must do a "User Seal" check before beginning work. The User Seal check is a quick and easy means of determining if your respirator is seated properly. This will minimize contaminant leakage into your respirator.

⇒ **Appendix B-2: Maintenance and Care For Your Respirator**

To work properly and function correctly, respirators need to be properly inspected, cleaned and maintained before and after each use. **Your health depends on it!** It is required that your respirator is:

- Cleaned and disinfected as often as necessary to maintain a sanitary condition and before being stored. Respirators issued to more than one employee must be cleaned and disinfected before being worn by different individuals.
- Visually inspected before each use and during cleaning for any damage. Visual inspection detects factors that would interfere with proper performance. Look at: tightness of connections, conditions of various components (e.g., face piece, head straps, valves, connecting tube, etc.), shape distortion, and missing or loose components. Examine any elastomer parts for pliability and signs of deterioration.
- Stored away from light, heat, cold, moisture, dusts, chemicals, and in a normal, upright position when not in use. To reduce dust contamination following cleaning, it is recommended that you store your respirator in an airtight plastic bag.

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MEDICAL EVALUATION BEFORE YOU'RE ISSUED A RESPIRATOR:

Using a respirator may place a physiological burden on you that varies with the type of respirator worn, the job and workplace conditions in which the respirator is used, and your medical status.

A medical evaluation must be performed by a physician or other licensed health care professional (PLHCP) to determine your ability to use a respirator. A PLHCP may be a physician, a registered nurse, a nurse practitioner, a physician assistant or other licensed health care professional acting within the scope of his or her state license, registration, or certification. The medical evaluation must be provided before the initial fit-testing and before the respirator is used for the first time.

A medical evaluation consists of the administration of a medical questionnaire or an initial medical examination that obtains the information contained on the questionnaire. The medical questionnaire and examinations must be administered in a confidential manner, during working hours or at a time and place convenient for you, and in a way that you understand the questionnaire content.

The following information must be provided to the PLHCP before the PLHCP makes a recommendation concerning your ability to use a respirator:

- The type and weight of the respirator to be used by the employee;
- The duration and frequency of respirator use (including use for rescue and escape);
- The expected physical work effort;
- Additional protective clothing and equipment to be worn; and
- Temperature and humidity extremes that may be encountered.
- Any supplemental information provided previously to the PLHCP regarding an employee need not be provided for a subsequent medical evaluation if the information and the PLHCP remain the same.

DID YOU KNOW? Your employer must provide the PLHCP with a copy of the employer's written respiratory protection program and a copy of the medical monitoring requirements of the Respiratory Protection Standard.

DID YOU KNOW? Your employer must provide an opportunity for you to discuss the questionnaire and examination results with the PLHCP, and provide for medical follow-up if indicated by the PLHCP. **See Appendix XIV - MIOSHA Respiratory Protection Standard, Part 451, Appendix C.**

DID YOU KNOW? A Spanish version of the medical evaluation is available! **See Appendix XIV**.

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OSHA RULE 1910.94(a)(6)) RELATED TO COMPRESSED AIR FOR BLASTING:

The air from the regular compressed air line of the plant can be used for the abrasive blasting respirator if (a) a trap and carbon filter are installed and regularly maintained, to remove oil, water, scale and odor; (b) a pressure reducing diaphragm or valve is installed to reduce the pressure down to requirements of the particular type of abrasive blasting respirator; and (c) an automatic control is provided to either sound an alarm or shut down the compressor in case of overheating.

NIOSH RESPIRATOR USERS' NOTICE

Publication Date of Users' Notice: May 23, 1996

ATTENTION: ALL USERS OF TYPE CE, ABRASIVE-BLAST SUPPLIED-AIR RESPIRATORS

The National Institute for Occupational Safety and Health (NIOSH) is updating information on (1) the kinds of respirators approved for abrasive-blast (sandblasting) operations and (2) the NIOSH recommendations for selection and use of these respirators. This information replaces the NIOSH Respirator User Notice dated October 4, 1993.

CURRENT CERTIFIED ABRASIVE-BLASTING RESPIRATORS

Type CE abrasive-blast supplied-air respirators are the only respirators suitable for use in abrasive-blasting operations.*

Currently, there are four kinds of Type CE abrasive-blast respirators certified by NIOSH. These four kinds of respirators and the NIOSH recommended assigned protection factors† (APF) are:

1. a continuous-flow respirator with a loose-fitting hood and an APF of 25;
2. a continuous-flow respirator with a tight-fitting facepiece and an APF of 50;
3. a positive-pressure respirator with a tight-fitting half-mask facepiece and an APF of 1000;
4. a pressure-demand or positive-pressure respirator containing a tight-fitting full facepiece and an APF of 2000.

*Note: Air purifying and powered-air purifying respirators are not recommended for abrasive blasting operations, but may be suitable for auxiliary work such as outside clean-up operations.

†Note: OSHA APFs for abrasive blasting operations may differ somewhat from NIOSH recommended APFs.

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NIOSH RECOMMENDATIONS

NIOSH recommends the following for all abrasive-blasting operations:

1. Silica sand should NOT be used as an abrasive medium.
2. Respirators should not be used as the only means of preventing or minimizing exposures to airborne contaminants. Dust source controls such as containment systems, local exhaust systems, dust suppressants, water sprays, and good work practices must be implemented as the primary means of protecting workers. When dust source controls cannot keep exposures below the recommended exposure limits, controls must be supplemented with the use of respiratory protection.
3. Environmental monitoring by trained personnel should be conducted in all abrasive-blasting applications. This is necessary to select the proper respirator (APF) and insure that workers are not overexposed (i.e., measured contaminant concentration is less than the exposure limit multiplied by the respirator APF).
4. Anytime environmental conditions, airborne contaminants, or their concentrations are highly variable or poorly defined, high-level respiratory protection should be used, even if silica is not the abrasive agent.
5. If silica sand is used, despite its much greater hazard relative to other abrasive agents, only the highest level protection respirators (i.e., respirators certified by NIOSH as pressure-demand or positive pressure and with NIOSH recommended APFs of 1000 or 2000) should be used.
6. Respirators will only provide a satisfactory level of protection when they are selected, fitted, used, and maintained according to the manufacturer's written instructions, NIOSH approval limitations and guidelines, and MIOSHA regulatory requirements.

FOR MORE INFORMATION on the NIOSH Notice

If you require additional information, or have further questions, please direct your request to:

Certification and Quality Assurance Branch
Division of Safety Research
1095 Willowdale Road
Morgantown, WV 26505
Telephone: (304) 285-5894, or call 1-800-35-NIOSH (1-800-356-4674)

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⇒ **OSHA STATEMENT RELATING TO PRESSURE VESSELS:**

1910.106(b) Pressure Vessels shall be built in accordance with the code for unfired Pressure Vessels, Section VIII of the ASME Boiler and Pressure Vessel code, 1968. All Direct Pressure Blast Machines must be built to this code. You are not allowed to alter, weld or cut on the Blast Machine Tank.

⇒ **OSHA STATEMENT RELATING TO REMOTE CONTROL DEADMAN CONTROL SYSTEMS:**

1910.244(b) The blast cleaning nozzle shall be equipped with an operating valve, which must be held open manually.

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PERSONAL PROTECTIVE EQUIPMENT

MIOSHA requires employers to determine if hazards are present or are likely to be present in the workplace. This process is called a hazard assessment. The best way to conduct a hazard assessment is to perform a walk-through survey to identify sources of hazards to feet, head, eyes, and face of workers.

During the walk-through survey, observe:

a. Sources of ***impact/motion***; i.e., machinery or processes where any movement of tools, machine elements, or particles could exist.
b. Sources of ***high temperatures*** that could result in burns, eye injury, or ignition of protective equipment, etc.
c. Types of ***chemical exposures***.
d. Sources of ***hazardous atmospheres.***
e. Sources of ***hazardous radiation***, i.e., welding, brazing, cutting, furnaces, heat treating, high intensity lights, etc.
f. Sources of ***falling objects*** or potential for dropping objects.
g. Sources of ***sharp objects*** which might pierce the feet or cut hands.
h. Sources of ***rolling or pinching objects*** which could crush the feet.
i. ***Layout of the workplace*** and ***location of co-workers***.
j. Any ***electrical hazards***.

Employers must complete a Certification of Hazard Assessment form to document the assessment of the workplace hazards. If the employer cannot eliminate or substantially reduce the hazards identified in the hazard assessment by feasible engineering controls, then the use of personal protective equipment (PPE) is required. When PPE must be used to reduce the exposure of employees to hazards, employers must:

- Select the types of PPE that will protect the affected employee from the hazards identified in the hazard assessment
- Communicate the PPE selection decisions to the affected employee
- Properly fit, and have each affected employee use the appropriate PPE
- Provide training to affected employees using the PPE. Employers are required to train each employee who must use PPE. Employees must be trained to know at least the following:
    - When PPE is necessary
    - What PPE is necessary
    - How to properly put on, take off, adjust and wear the PPE
    - The limitations of the PPE
    - Proper care, maintenance, useful life and disposal of PPE
    - Additional requirements when sharing PPE

- Keep training documentation that each affected employee has received and understood the training received
- Ensure that defective or damaged personal protective equipment is not used
- Provide continuing evaluation of the program to determine its effectiveness in preventing employee injury or illness

The employee is required to:

- Properly wear PPE
- Attend training sessions on PPE
- Care for, clean and maintain PPE and
- Inform a supervisor of the need to repair or replace PPE

DID YOU KNOW? Both the **General Industry** and **Construction** Personal Protective Equipment standards have provisions about who pays for personal protective equipment? Your employer is required to provide at no cost to his/her employees the personal protective equipment necessary to protect against hazards that the employer is aware of as a result of any required assessments. Your employer must pay for replacement PPE, as necessary, under either of the following conditions:

a) When the PPE no longer provides the protection it was designed to provide.
b) When the previously provided PPE is no longer adequate or functional.

DID YOU KNOW? Regarding foot protection, employers are required to provide, at no cost to employees, metatarsal guards attachable to shoes when metatarsal protection is necessary, when both of the following apply:

a) If metatarsal protection is necessary and an employer requires employees to use metatarsal shoes instead of detachable guards, then the employer shall provide the metatarsal shoe at no cost to the employee.
b) If an employer provides metatarsal guards and allows the employee, at his or her request, to use shoes or boots with built-in metatarsal protection, then the employer is not required to pay for the metatarsal shoes or boots.

OSHA STATEMENT RELATING TO ABRASIVE BLAST OPERATOR PROTECTION:

1910.94(a)(5)(v) Operators shall be equipped with heavy canvas or leather gloves and aprons or equivalent protection to protect them from the impact of abrasives. Safety shoes shall be worn to protect against foot injury where heavy pieces of work are handled.

1910.94(a)(5)(v)(b) Equipment for protection of the eyes and face shall be supplied to the operator when the respirator design does not provide such protection and to any other personnel working in the vicinity of abrasive blasting operations.

CHAPTER 6 – RESPIRATORY PROTECTION AND PERSONAL PROTECTIVE EQUIPMENT

MIOSHA STATEMENT RELATING TO ABRASIVE BLAST OPERATOR PROTECTION:

Personal Protective Equipment Part 33, Rule 3394(2) When abrasive blasting is not protected by an enclosure, the operator shall use heavy canvas or leather gloves and aprons or equivalent protection to provide protection from the impact of abrasives.

Many abrasive blasters work at heights. **Appendix C (non-mandatory) of MIOSHA Construction Safety and Health Standard Part 6** contains construction industry threshold heights requiring fall prevention/protection equipment (updated May 24, 2016).

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NOISE HAZARDS

Workers conducting abrasive blasting are exposed to high levels of noise. Noise can be generated from the nozzle and the blasting object and noise generated by the air supply in the mask. Current hearing protection is inadequate at higher noise levels and are not compatible with protective hoods and respirators nor provide communications. Noise levels produced during abrasive blasting operations in shipyards, maintenance facilities, and factories for removing paint and surface coatings are high.

Noise levels at the air discharge from an abrasive blaster can be as high as 119 dB(A) and noise levels inside the mask and the inner hood can vary from 95 - 105 dBA.
Dust collectors on blast rooms, blast pots and spray machines are routine types of machinery that may require noise reduction measures on the job site.

Using the hierarchy of controls as described in Chapter 5 can assist in reducing noise levels at a blasting operation. Fairly inexpensive controls can include:

- Engineering Controls:
    - Positioning: increasing the distance between a noise source and worker or rotating the source often
    - Controlling vibration: machine maintenance, proper damping, mufflers, devices to isolate vibrating parts
    - Nozzle adjustment: Flow rate reduction, turbulence reduction device
    - Equipment selection: substitute a quieter machine, process or material
    - Barriers
- Administrative Controls:
    - Worker assignments: arrange work schedules, divide work among as many workers as needed to keep individual noise exposure within permissible time limits, ensure employees who have reached the upper limit of duration for a high noise level work the remainder of the day in an environment with a noise level well below criteria
    - Schedule equipment: don’t run it all day if not needed
- Personal Protective Equipment: ear plugs or muffs

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MIOSHA NOISE STANDARDS

There are differing requirements regarding noise exposure depending upon if an employer is considered a Construction employer or a General Industry employer. For both types of employers, **the PEL for an 8 hour day is a time weighted average of 90 decibels measured on the A-scale (dBA)**. The permissible exposure time decreases as the sound level increases (e.g., 15 minute maximum exposure to 115 dBA sound level).

⇒ In **Construction** (Part 680 - Noise Exposure for Construction), if the PEL is exceeded, the employer must implement feasible administrative or engineering controls to reduce exposure levels within the limits. If controls fail to reduce exposure levels within limits, the employer must implement a Hearing Conservation Program. Part 680 also establishes a peak sound pressure limit of 140 dB for impulse or impact noise, which may not be exceeded at any time.

⇒ In **General Industry** (Part 380 - Occupational Noise Exposure), when employees' exposures are at or above the "action level" (AL) of 85 dBA (expressed as an 8-hour time weighted average), an employer is required to implement a Hearing Conservation Program. Like Construction, if the PEL is exceeded, the employer must implement feasible administrative or engineering controls to reduce exposure levels within the limits.

Although Part 680 does not require the Construction employer to conduct audiometric testing of employees, we highly they do so.

At a minimum, an effective hearing conservation program must include the following elements:

- Noise Monitoring Program - Noise exposures must be measured to identify employees for inclusion in the program and to enable proper selection of hearing protection.
- Conducting audiometric tests. Audiometric tests must be administered to all employees who are enrolled in a hearing conservation program.
  - In Part 380, audiometric testing is required:
    - Within 6 months of an employee's first exposure at or above the action level, the employer must establish a valid baseline audiogram against which subsequent audiograms can be compared.
    - At least annually after obtaining the baseline audiogram, the employer must provide a new audiogram for each employee exposed at or above the action level.
- Engineering/Administrative Controls - Whenever feasible, engineering and/or administrative controls must be implemented to reduce exposure to below limits.

- Hearing Protectors - Employers must provide without charge and require use of suitable hearing protection. A variety of suitable hearing protection (plugs, muffs) should be available for selection.
- Training Program - The employer must provide training that addresses the effects of noise on hearing, the work activities requiring hearing protection, the purpose of hearing protection, the advantages, disadvantages and attenuation of various types of hearing protection, and on selection, fitting, use and care of hearing protectors.
- Maintain records – noise monitoring results, audiometric results, training.

General Industry employers:

⇒ **What is required if an employee's annual audiogram shows hearing loss?**

The term "standard threshold shift" (STS) describes an average change in hearing of 10 dB or more from the baseline audiogram for the frequencies of 2000, 3000 and 4000 Hz in either ear. If an STS is found, the employer must provide follow-up procedures that include evaluating the adequacy of hearing protectors, refitting, and retraining on their use and care. In addition, a referral for a clinical evaluation must be made if it is suspected that a medical pathology of the ear exists. The affected employee must be informed in writing of test results within 21 days of the determination of the STS.

⇒ **When are employees required to wear hearing protectors?**

Employers must provide and ensure that hearing protectors are worn by all employees whose exposure exceeds the PEL (90 dBA TWA8). When employees are exposed at or above the AL (85 dBA TWA8) and less than the PEL, hearing protectors are also required if the employee has incurred a standard threshold shift (STS), or when more than 6 months passes and the employee has not received a baseline audiogram.

⇒ **What are the requirements for reporting STS as an illness?**

Rule 1115 of Part 11 Recording and Reporting of Occupational Injuries and Illnesses requires employers to record a work-related STS under Column five on the MIOSHA 300 Log if the employee's total hearing is 25 dB or more above audiometric zero (averaged at 2000, 3000, and 4000 Hz) in the same ear as the STS. What follows is an example protocol for determining if an STS is to be recorded. If at any step a "no" is encountered, the process ends and the hearing change is not recorded on the Form 300.

Step 1: Compare the original baseline audiogram or last audiogram showing a recordable shift in hearing; is there an STS in either ear (age adjustments allowed)? If yes continue to Step 2.

Step 2: Is the average hearing loss on the current hearing test at 2000, 3000, and 4000 Hz in the same ear greater than or equal to 25 dB (no age adjustment allowed)? If yes, continue to Step 3.

Step 3: Is the STS confirmed upon 30-day retest (or was a retest not conducted)? If yes, continue to Step 4.

Step 4: Record the case on MIOSHA Form 300 within 7 days of retest (or within 37 days of test if retest is not conducted), unless a physician or other licensed health care professional has determined that the shift in hearing is not work related (i.e. hearing loss has not been significantly aggravated by occupational noise exposure).

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REFERENCES:

Appendix IV- MIOSHA Occupational Health Standards

Appendix IV-A: PART 523 - Abrasive Blasting

Appendix IV-D: PART 680 - Noise Exposure in Construction

Appendix IV-E: PART 360 - Noise Exposure in General Industry

APPENDICES FOR RESPIRATORY PROTECTION:

Appendix XIV: Respiratory Protection Resources

Appendix XIV-A: MIOSHA Occupational Health Standard Part 451 – Respiratory Protection

Appendix XIV-B: MIOSHA Construction Safety and Health Fact Sheet: Respiratory Protection

Appendix XIV-C: MIOSHA CET Publication SP-05: Respiratory Protection - Sample Program

Appendix XIV-D: MIOSHA Physician or Licensed Health Care Professional (PLHCP) Interpretation

Appendix XIV-E: Respirator Medical Questionnaire en Espanol

APPENDICES FOR PERSONAL PROTECTIVE EQUIPMENT:

Appendix XV: Personal Protective Equipment Resources:

Appendix XV-A: MIOSHA Construction Safety Standard Part 6 - Personal Protective Equipment

Appendix XV-B: MIOSHA General Industry Safety Standard Part 33 - Personal Protective Equipment

Appendix XV-C: MIOSHA General Industry Occupation Health Standard Part 433- Personal Protective Equipment

Appendix XV-D: MIOSHA CET Publication SP#16: Personal Protective Equipment for General Industry

Appendix XVI: Noise and Hearing Conservation Resources

Appendix XVI-A: MIOSHA Consultation, Education and Training, Construction Fact Sheet – Noise, Publication #014

Appendix XVI-B: MIOSHA Consultation Education and Training Summary of Occupational Noise Standard, Publication 5600

Appendix XVI-C: Hearing Loss Prevention Publication #5620

Appendix XVI-D: MIOSHA Fact Sheet – Noise and Hearing

Appendix XVI-E: MIOSHA Consultation Education and Training – Noise Information and Training, Publication #5621

Appendix XVI-F: Pinnacle – Sample Hearing Conservation Program

Appendix XVI-G: Michigan Municipal League: Sample Hearing Conservation Program

Notes