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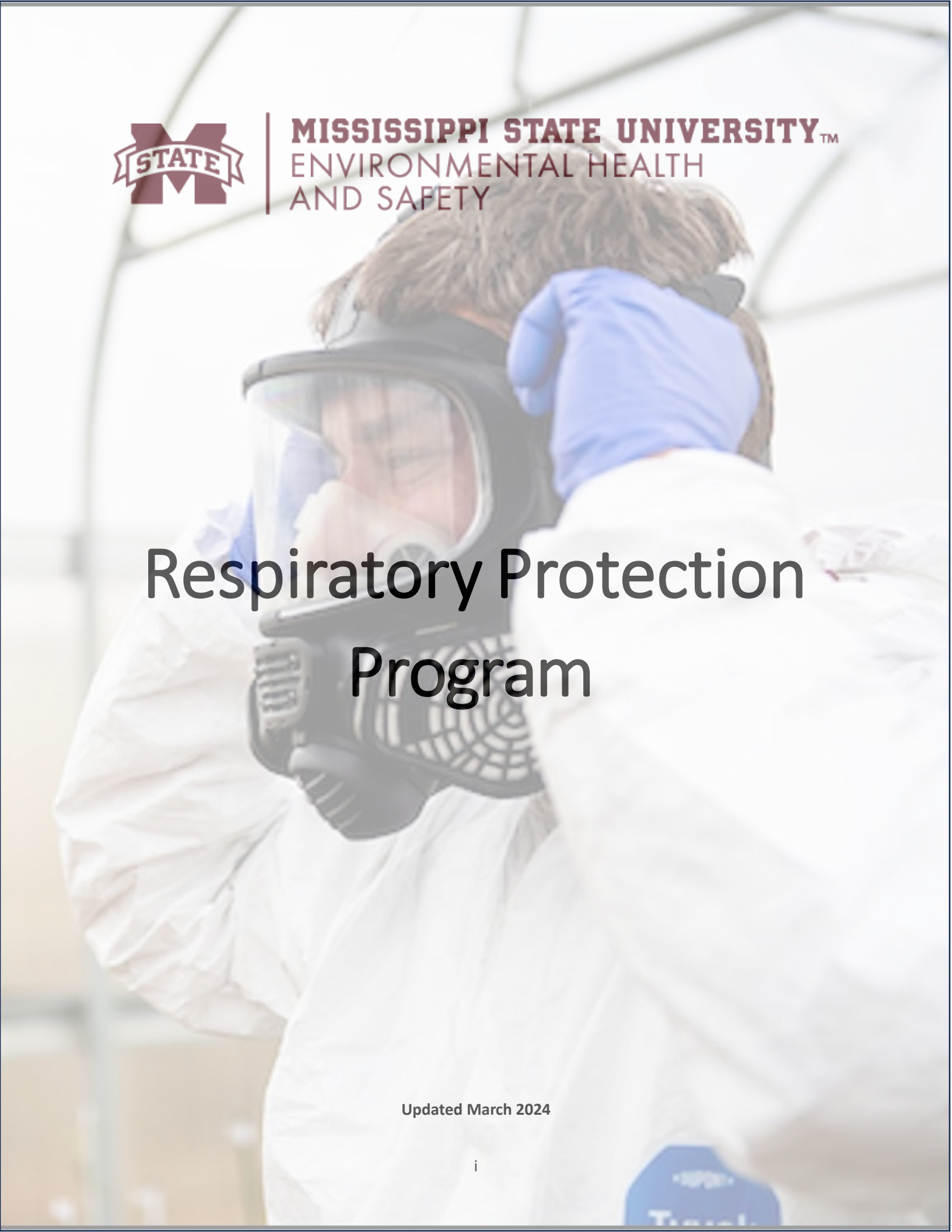

Respiratory Protection Program

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Introduction

Mississippi State University (MSU) is committed to protecting the health and safety of all MSU faculty, staff, and students. This commitment extends to mitigating respiratory hazards. The most effective way to mitigate air contaminants that create respiratory hazards is through engineering and administrative controls. When engineering and administrative controls are not feasible, or additional protection is needed, respirators will be used to ensure employees and students are not exposed to hazardous levels of air contaminants.

The Mississippi State University (MSU) Respiratory Protection Program (RPP) outlines the institutional requirements for respiratory protection. It is intended to provide program requirements, procedures, information, and guidance that is consistent with regulatory standards. This document is established to detail the requirements and proper procedures for the use of protective respiratory equipment as deemed necessary to minimize exposure to airborne concentrations of hazardous substances and infectious agents and help ensure the safety of individuals enrolled in the RPP.

Scope

This document applies to all MSU employees, faculty, researchers, student workers, and volunteers or interns that perform task requiring the use of respiratory protection at university facilities or other locations during the execution of MSU work activities. Persons using respiratory protection in the execution of their MSU job duties are **required to be enrolled** in this program through MSU Environmental Health and Safety (EH&S).

Individuals who *voluntarily* wear a tight-fitting, negative pressure respirator when a respirator is *not required* are still subject to partial participation in the RPP. EH&S determines that voluntary use will not in itself create a hazard, the employee is still subject to the medical evaluation, cleaning, maintenance, and storage elements of this program and the supervisor must provide the employee with the written information provided in **Voluntary Use of Respiratory Protection (Appendix D)**. The voluntary use of respirators that have a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium (e.g. N95, N100, P100) does not require participation in the RPP; however, the individual must be provided with the information in **Appendix D**.

Responsibilities

Environmental Health & Safety (EH&S)

EH&S shall serve as the Program Administrator and is responsible for developing, implementing, and administering the overall RPP for MSU. The RPP Program Administrator will assist with implementing the following:

- Assisting departments in identifying and assessing respiratory hazards in the workplace. Recommending engineering and administrative methods to control those hazards.

- Providing assistance with generating a **Worksite-Specific Respiratory Protection Plan (Appendix F)** for use in conjunction with the RPP.

- Conducting exposure risk assessments and personnel exposure monitoring of airborne respiratory hazards as needed.

- Assisting departments in selecting respirators, filtering media, and related equipment appropriate to needs and exposure hazards to respirator users.

- Providing guidance and assisting respirator users with obtaining respirator medical clearances.

- Providing training in the proper use and maintenance of respiratory protection. Ensuring compliance to respiratory protection training requirements.

- Offering respirator fit testing services.

- Maintaining records of respirator medical clearances received, respirator training and fit test results. Maintaining records and reports of contaminant air monitoring and copies of the **Worksite-Specific Respiratory Protection Plans (Appendix F).**

- Reviewing and updating the RPP to meet current standards of care and regulatory requirements.

Longest Student Health Center (LSHC)

The Longest Student Health Center provides for medical evaluations for respirators use clearance and maintains medical records.

Supervisors

Supervisors are responsible for identifying specific applications which may require the use of respirators. Supervisors in charge of project or activities requiring the use of respiratory protection equipment are responsible for implementing and overseeing the RPP in their particular areas. In addition to being knowledgeable about the program requirements, supervisors must also ensure that the program is understood and followed by the respirator users under their charge.

Supervisors, in consultation with EH&S, are responsible for:

- Identifying and evaluating worksite hazards for respirator users under their charge, notifying EH&S of those hazards that may require respirator use. A hazard evaluation must be completed for any activity requiring respiratory protection. This can be completed by filling out the **Respiratory Hazard Evaluation Form (Appendix A)** and submitting it to EH&S to determine the need of an exposure risk assessment.

- Developing a **Worksite-Specific Respiratory Protection Plan (Appendix F)**, in coordination with EH&S, for use in conjunction with the RPP for operations that present health and safety hazards requiring the use of a respirator.

- Ensuring those respirator users under their supervision who require respiratory protection equipment are in compliance with hazard assessment, enrollment, medical evaluation, training requirements, and fit testing.

- Providing respirator users with respiratory protection per EH&S recommendations, and the supplies and facilities necessary to properly clean, maintain, and store the respiratory protection equipment.

- Ensuring that respirators fit well and do not cause discomfort. If an individual wears corrective glasses or goggles or other personal protective equipment (PPE), ensuring that such equipment is worn in a manner that does not interfere with the seal of the facepiece to the face of the user.

- Periodically checking and enforcing the proper use of the respiratory protection when necessary. Continually ensuring that respirators are properly cleaned, maintained, inspected, and stored according to the RPP.

- Being aware of tasks requiring the use of respiratory protection.

- Continually monitoring work areas and operations to identify respiratory hazards. Notify EH&S if additional respiratory hazards are identified and reporting any changes in existing operations in the workplace conditions (workload, protective clothing, or temperature) that may result in substantial increase in physiological burden placed on an individual or impact the adequacy of the currently assigned respiratory protection.

- Informing EH&S if voluntary use of respiratory protection is desired for individuals under their supervision and ensuring that individuals who voluntarily wear a respirator have signed and understand **Voluntary Use of a Respirator (Appendix D)**, and that this signed copy of voluntary use form to EH&S.

Respirator Users

The use of respiratory protection at MSU requires enrollment into the MSU RPP. Prior enrollment into MSU RPP, respirator users should work with their supervisors to complete the hazard evaluation form and notify EH&S of those hazards that may require respirator use. To initiate enrollment into the MSU RPP, the **Initial Respirator Clearance and Enrollment Form (Appendix B)** must be completed and submitted to EH&S. Respirator users may not use a respirator until they have been enrolled, medically approved to wear respiratory protection, trained, and fit tested as defined in this RPP.

Respirator users shall remain informed of potential respiratory health hazards and the respiratory protective requirements for their work areas. Respirator users are responsible for the following requirements of the RPP, including:

- Wearing respiratory equipment when and where required, in the manner in which they were trained. Using only the make, model, and size of respirators for which they have been medically cleared and fitted to wear.

- Participating in required medical evaluations and completing the **Respirator Medical Evaluation Questionnaire (Appendix C)**, scheduling and attending applicable follow-up medical examinations,

annually renewing medical clearance by completing the **Annual Respiratory Protection Clearance Form (Appendix E)**, completing respiratory protection training, and fit testing.

- Inspecting respirator(s) prior to each use and conducting user seal checks every time the respirator is donned (put on), reporting any deficiencies or malfunctions of the respirator to their supervisor, and not using defective respiratory protection equipment.

- Cleaning and disinfecting respirators as instructed and storing them in clean, sanitary, and accessible work areas to guard against damage to respirator equipment, ensuring respirators are not disassembled, modified, or otherwise altered in anyway other than by changing of respirator cartridges or filters.

- Notifying their supervisor if prescription glasses inserts are required for use with full-face respiratory protection.

- Reporting physiological changes (i.e., facial scarring, dental changes, cosmetic surgery, or change in body weight), any medical problems, or any other changes that could affect the respirator fit or ability to safely wear a respirator to their supervisor, and notifying their supervisor when the assigned respirator no longer fits.

- When required to use tight-fitting respirators, removing facial hair to ensure a proper seal between the face and the respirator and proper valve function.

- Reporting any existing or planned operations that may present a respiratory hazard to their supervisor to initiate a respirator hazard assessment.

- Informing their supervisor of any respirator hazards that they feel are not adequately addressed in the workplace and of any other concerns that they have regarding the RPP.

Respiratory Protection Program (RPP)

When it comes to mitigating exposures to chemicals and inhalation hazards, engineering controls and safe working practices take precedence. However, in situations where these measures are not feasible, the use of respirators become essential. The key elements of a robust respiratory protection program include:

- **Respirator Selection Procedures:** establishing guidelines for selecting appropriate respirators based on workplace hazards.

- **Medical Evaluations:** conducting medical assessments for individuals required to use respirators to ensure they are physically fit to do so.

- **Fit Testing Protocols:** implementing procedures to verify the proper fit of tight-fitting respirators on individual users.

- **Proper Respirator Use:** outlining protocols for the correct use of respirators during routine operations and foreseeable emergencies.

- **Respirator Maintenance Procedure:** establishing protocols and schedules for cleaning, disinfecting, storing, inspecting, repairing, and discarding respirators.

- **Ensuring Breathing Air Quality:** implementing measures to guarantee the adequacy of breathing air quality, quantity, and flow for atmosphere-supplying respirators.

- **Training on Respiratory Hazards:** providing training to respirator users on potential respiratory hazards they may encounter during both routine and emergency situations.

- **Proper Respirator Usage Training:** educating respirator users on the correct techniques for donning, doffing, and using respirators, as well as any limitations and maintenance requirements.

- **Program Evaluation Procedures:** establishing methods for regularly assessing the effectiveness of the respiratory protection program and making necessary adjustments.

EH&S, in collaboration with the supervisor, will determine the appropriate respiratory protection for the work area and decide if its usage is required or voluntary. Respiratory protection will be chosen following EH&S's completion of a Respiratory Hazard Assessment. If engineering or administrative controls fail to reduce hazardous substance concentrations below exposure limits, EH&S provide recommendations on suitable respiratory protection.

Respiratory Hazard Assessment

Supervisors must conduct a hazard evaluation for each operation, process, or work area under their supervision where airborne contaminants may be present to identify the respiratory hazards to which their respirator users are exposed in operations and notify EH&S of potential respiratory hazards. This can be done by completing the **Respiratory Hazard Evaluation Form (Appendix A)**. This form, once submitted to EH&S, serves as a request for an evaluation of potential worksite exposure conditions. EH&S will conduct exposure risk assessments and personnel exposure monitoring of airborne respiratory hazards as needed.

Employees who believe that respiratory protection is needed during a particular activity should contact their supervisor or EH&S for an assessment.

Employees must report any existing or planned operations that may present a respiratory hazard to their supervisor to initiate a respiratory hazard assessment if one has not been completed. Examples of operations that may require respiratory protection include, but are not limited to:

- Activities that generate fumes or dusts such as welding. metals cutting, woodworking and agricultural work
- Safety data sheet or chemical label require the use of a respirator
- Work in areas where contaminant levels may become unsafe without warning, such as emergency response
- Painting with oil-based paint or epoxies
- Pesticide application or fumigation
- Chemical usage without adequate ventilation or other engineering controls

- Laboratory operations that may generate uncontained hazardous bioaerosols, gases, or vapors
- Animal handling
- Asbestos removal
- Concrete cutting
- Sanding or grinding of lead-based paint
- Clinical or healthcare operations where exposure to airborne infectious pathogens is suspected
- Work with BSL3 agents

Supervisors are required to have respirator selection criteria reassessed whenever circumstances change that may compel use of different levels of respiratory protection or if the work environment places increased physical demands upon the individual.

Types of Respirators

This section contains information about the various types of respiratory protection equipment commonly used at MSU. It includes information on respirator use, limitations, and maximum allowable protection factors. The maximum allowable protection factor is the maximum level of respiratory protection that a class of respirators shall be used for at MSU.

The ability of a respirator to protect depends on the respirator type, filter, or canister type, contaminant type and concentration, environmental conditions and respirator fit. At MSU, all respiratory protection equipment selection shall be performed by EH&S.

Air-Purifying Respirators (APRs)

Air-purifying respirators have filters, cartridges, and/or canisters that remove contaminants by passing the ambient air through the air-purifying element before it reaches the user. The maximum contaminant concentration against which an APR will protect is determined by the design efficiency, capability of the filter, and the facepiece-to-face seal on the user. Since APRs use filters and do not provide uncontaminated air separate from the surrounding atmosphere, it is crucial to know what contaminates are present and their relative concentrations. APRs do not protect users against oxygen-deficient atmospheres or chemical absorption through exposed skin, and shall not be used in unknown, oxygen-deficient or IDLH atmospheres.

Negative Pressure APRs

Negative pressure APRs are tight-fitting respirators which use the negative pressure created inside the respirator facepiece when a user inhales, to draw ambient air through an air-purifying element in order to remove contaminants. It is important that negative pressure APRs be fit tested to ensure proper fit, because poor fit may allow contaminants to be drawn around the seal unfiltered and into the mask. Due to this feature users of tight-fitting negative pressure respirators shall not have any facial hair which interferes with the respirator-to-face seal. Additionally, negative pressure air-purifying respirators may cause pulmonary strain and/or discomfort to the user due to breathing resistance caused by the filtration media; therefore, it is important that users are medically cleared and in good health. The four main types of negative pressure APRs used at MSU are:

1. Dust Mask and Other Non-NIOSH Certified Masks

Maximum Assigned Protection Factor: 0

Use: Disposable non-NIOSH certified masks that may only be worn for comfort against non-toxic nuisance dusts and odors.

Limitations: Does not protect against hazardous dusts, gases, or vapors. If used in an occupational environment, its use would fall under "voluntary use" of respiratory protection.

2. Filtering Facepiece Respirators

Maximum Assigned Protection Factor: 5

Use: NIOSH approved filtering facepiece respirators are typically single use (one shift) and are designed to reduce inhalation exposure to low hazard particulate contaminants such as wood dust, animal dander, smoke, and some bioaerosols. N-95 respirators are the most common type of filtering facepiece respirators; however, there are N-100 and P-100 filtering facepiece respirators on the market.

In healthcare, there are N-95 surgical masks which are designed to prevent droplets, splashes, and splatters from reaching the nose and mouth of the wearer. The N-95 aspect of the N-95 surgical mask is to protect the wearer from certain bioaerosols. The surgical mask part, which protects from droplets, splashes, and splatter is approved by the FDA.

Limitations: Filtering facepiece respirators only offer limited contaminant protection generally because of their poor respirator-to-face sealing properties. Additionally, their design makes it difficult for users to perform respirator seal checks to ensure fit prior to use. If respirator fit is not adequate, contaminant leakage around the respirator-to-face seal may occur. Filtering facepiece respirators do not provide protection against gases, vapors, or oxygen-deficient atmospheres, and shall not be used for protection against highly toxic contaminants.

3. Half-facepiece Elastomeric Respirators

Maximum Assigned Protection Factor: 10

Use: Half-facepiece respirators are typically equipped with high efficiency particulate air (HEPA) filters, gas/vapor cartridges, or a combination of the two. It is very important that the proper filter or cartridge is selected for use based on the contaminant type.

Limitations: Half-facepiece APRs can only be used for specific contaminants which is based on the filter/cartridge type. Certain cartridges have a designated maximum use concentration, which should never be exceeded. Furthermore, cartridges must be replaced regularly as they may become saturated over time. The wearer should leave an area immediately if he or she detects an odor, experiences nose or throat irritation, or if breathing becomes difficult.

4. Full-facepiece Elastomeric Respirators

Maximum Assigned Protection Factor: 50

Use: Full-facepiece respirators typically provide more protection than half-facepiece respirators because their shape allows a better respirator-to-face seal. They also protect the user's eyes from irritating chemicals or particulate atmospheres.

Limitations: Full-facepiece APRs have the same limitations for use as the half-facepiece APRs. Additionally, standard eyeglasses interfere with the mask-to-face seal; therefore, individuals who require corrective lenses may need to acquire special lenses for use with the mask. Consult EH&S for assistance with, or questions about, obtaining special lenses for respirator use.

Positive Pressure APRs

Positive pressure APRs are typically known as powered air-purifying respirators (PAPRs). PAPRs use a blower to create positive pressure inside the respirator face and can be either tight or loose fitting.

1. Tight-fitting PAPRs

Maximum Assigned Protection Factor: 50 Half-face/1,000 Full-face

Use: This PAPR has an elastomeric facepiece made of rubber or silicone. It has filters and a blower that operate as they do on a loose-fitting facepiece PAPR. Because this PAPR has a tight-fitting facepiece, it must be fit tested.

Limitations: Tight-fitting PAPRs have the same limitations as other air-purifying respirators. Additionally, they can be bulky and cumbersome due to the need for a motor and battery pack which is usually worn on the user's belt.

2. Loose-fitting PAPRs

Maximum Assigned Protection Factor: 25 or 1,000 (Helmets/Hoods with Manufacturer Data Supporting 1,000 APF only)

Use: Loose-fitting PAPRs use a blower to force ambient air through the air-purifying elements and into the user's facepiece creating a positive pressure in the face mask of loose-fitting hood. Loose-fitting PAPRs do not need to be fit tested and can be used by workers with facial hair, wear glasses, or have facial prosthetics because it is loose-fitting.

Limitations: Loose-fitting PAPRs can be bulky and cumbersome due to the need for a motor and battery pack which is usually worn on the user's belt.

Atmosphere-Supplying Respirators (ASR)

Atmosphere-supplying respirators supply users with breathing air from a source independent of the work environment. The maximum contaminant concentration against which an atmosphere supplying respirator will protect is determined by the facepiece type and design. When using these devices, it is important to ensure that the location of the air tank is not near a source of carbon monoxide or other contaminants, and that Grade D air is supplied as described by the Compressed Gas Association. Departments wanting to utilize ASR units must notify EH&S prior to use and are responsible for ensuring all requirements of use are met. The two most common types of ASRs are:

1. Airline Atmosphere Supplying Respirators

   Maximum Assigned Protection Factor: Varies by Facepiece Type

   Use: Supplied-air respirator (SAR) or airline respirator is an atmosphere-supplying respirator for which supply air is provided by an external, fixed compressed gas source or compressor.

   Limitations: The wearer's movements are restricted by the hose, and they must return to a respirable atmosphere by retracing their route of entry. In addition, supply hoses may become severed or pinched, or the external compressed gas source may fail. The maximum hose length allowed for airline respirators is 300 feet.

2. Self-Contained Breathing Apparatus (SCBA)

   Maximum Assigned Protection Factor: Varies by Facepiece Type

   Use: Self-contained breathing apparatus (SCBA) is an atmosphere-supplying respirator for which the breathing air source is contained within a portable compressed gas cylinder designed to be carried by the user.

   Limitations: The air supply in a SCBA cylinder is normally rated for a specified limited time; however, heavy exertion and stress will increase breathing rates and may deplete the air in less than the rated time. For this reason, most units come with built-in alarms which alert the user when the air supply is low. Additional limitations are their weight and bulk, their limited service-life, and the need for specialized training for their maintenance and safe use.

3. Emergency Escape Respirator

   Use: Respirators which provide wearers with safe breathing air in locations where the air quality has been compromised. Typically, emergency escape respirators provide anywhere from 3 to 15 minutes of breathing air.

   Limitations: Emergency escape respirators are only to be used for escape purposes only. They are not to be used for rescue.

Authorization for Use of Respiratory Protection Equipment

The purpose and use of all respiratory protection by MSU personnel shall be reviewed and approved by EH&S. If it is determined that respiratory protection equipment is required to reduce exposures below applicable exposure limits, those individuals who are required to use respiratory protection equipment shall be enrolled in the MSU Respiratory Protection Program.

In order to remain enrolled in the MSU Respiratory Protection Program, individuals must be up to date on all training, medical evaluation, and fit testing requirements. EH&S will notify respirator users and their supervisors approximately one (1) month prior to the user becomes due for training, fit testing, or a medical evaluation.

When a respirator user becomes past due for training, fit testing, or medical evaluation, their supervisor shall ensure that the respirator user is no longer assigned to tasks requiring the use of respirators until all the program enrollment requirements are met.

When a respirator user is thirty (30) days or more overdue for one or more of the enrollment requirements, EH&S will notify the respirator user and their supervisor that the user has been unenrolled from the program, and that they must return or discard their respirator.

Supervisors have the primary responsibility for ensuring their users continue to comply with program requirements and are using respiratory protection equipment properly. EH&S will also monitor for proper use during audits and inspections.

Respirator Use in Specific Circumstances

It is important to realize that every situation can present a new set of circumstances. Respirator users should be aware of the following examples of specific circumstances that could be encountered while wearing respiratory protective equipment.

Facial Hair

Facial hair that lies along the sealing area of the respirator, such as beard, sideburns, moustaches, or even a few days growth of stubble, will not be allowed on respirator users that rely on a tight facepiece fit to achieve maximum protection. Facial hair between the wearer's skin and the sealing surface of the respirator will prevent a good seal.

A respirator that permits negative air pressure inside the facepiece during inhalation may allow leakage and, in the case of positive pressure devices, will either reduce service time or waste breathing air. Respirator users should not enter a contaminated work area when conditions prevent a good seal of the respirator facepiece to the face. A loose-fitting hood or helmet style respirator must be provided to respirator users with facial hair.

Eyeglasses

Ordinary eyeglasses should not be used with full-facepiece respirators. Eyeglasses with temple bars or straps that pass between the sealing surface of a full-facepiece,and the respirator user's face will prevent a good seal, and should not be used. Special corrective lenses can be mounted inside a full-facepiece respirator and are available from all manufacturers of full-facepiece respirators. To ensure good vision,

comfort, and a proper facepiece seal, these corrective lenses should be mounted by an individual designated by the manufacturer as qualified to install accessory items.

Eyeglasses or goggles may interfere with the half facepieces. When interferences occur, a full-facepiece with special corrective lenses should be provided and worn.

Contact Lenses

Several factors may restrict or even prohibit the use of contact lenses while wearing any type of respiratory device. This is especially true of atmosphere-supplying respirators. With full-facepieces, incoming air directed toward the eye can cause discomfort from dirt, lint, or other debris lodging between the contact lens and the pupil.

Facial Deformities

Facial deformities, such as scars, deep skin creases, prominent cheekbones, severe acne, and the lack of teeth or dentures, can prevent a respirator from sealing properly.

Communications

Talking with wearing a respirator equipped with a facepiece may break the seal. When communication is necessary within a contaminated area, it should be done with the help of special communicating equipment obtained from the manufacturer of the respirator.

IDLH Atmospheres

Written procedures (**Appendix J)** must be prepared for safe respirator use in immediately dangerous to life or health (IDLH) atmospheres that may occur in normal operations or emergencies. Personnel need to be familiar with these procedures and respirators. At least one standby person, equipped with proper rescue equipment, including a SCBA, should be present in the nearest safe area for emergency rescue of those wearing respirators in an IDLH atmosphere.

Communications (visual, voice, signal line, telephone, radio, or other suitable type) have to maintained among all persons present (those in the IDLH atmosphere and the standby personnel). Respirator users must be equipped with safety harnesses and safety lines to permit their removal from the IDHL atmosphere if they are overcome.

Confined Spaces

Confined spaces are enclosures that are difficult to get into and out of, such as storage tanks, tank cars, boilers, sewers, tunnels, pipelines, pits, and vats. The atmospheres in a confined space can be immediately dangerous to life or health because of toxic air contaminants or lack of oxygen concentration; the presence and concentration of flammable/combustible vapors or gases; and the presence of toxic airborne particulates, vapors, or gases.

The confined space should be forced air ventilated to keep the concentration of flammable substance at a safe level. No one should enter if a flammable substance exceeds the lower explosive limit. No one should enter without wearing the proper type of respirator if any air contaminant exceeds the established permissible exposure limit of if there is an oxygen deficiency. Even if the contaminant concentration is below the established breathing time-weighted average limit and there is enough oxygen, the safest procedure is to ventilate the entire space continuously and to monitor the

contaminant and oxygen concentrations continuously if people are to work in the confined space without respirators.

Appropriate air-purifying respirators may be worn in a confined space only if tests show that the atmospheres contain adequate oxygen and that air contaminants are below levels immediately dangerous to life or health. While people wearing these types of respirators are in a confined space, its atmosphere should be monitored continuously.

If the atmosphere in a confined space is immediately dangerous to life or health owing to a high concentration of air contaminant or oxygen deficiency, those who must enter the space should wear a pressure-demand SCBA or a combination pressure-demand airline and self-contained breathing apparatus that always maintains positive pressure air pressure inside the respiratory inlet covering. This is the best safety practice for confined spaces.

While personnel are in a confined space, at least one standby person with proper rescue equipment, including a SCBA, should be present outside for emergency rescue. Communications (visual, voice, signal line, telephone, radio, or other suitable type) should be maintained with those inside. Also, those inside the space should be equipped with safety harnesses and safety lines to allow their removal in case they are overcome.

Low Temperatures

Low temperatures may fog respirator lenses. Coating the inner surface of the lens with the anti-fogging compound normally available from the respirator manufacturer should prevent fogging down to 32°F, but severe fogging may occur below 0°F. Full facepieces with nose cups that direct the warm, moist exhaled air through the exhalation valve without its touching the lens, are available. They should provide satisfactory vision at as low as -30°F. At very low temperatures, exhalation valves may freeze due to moisture. Dry respirable air should be used with airline respirators and with the type of SCBA that has an air cylinder when they are used in low temperatures.

NIOSH performs cold temperature testing on SCBAs. The minimum temperature that SCBA has been tested to and approved for is listed on the approval label.

High Temperatures

High temperatures often place a person under physical stress. Wearing a respirator causes additional stress which should be minimized by using a light-weight respirator low breathing resistance. In atmospheres that are not immediately dangerous to life or health, the airline type supplied-air respirator is recommended. Such a respirator used in low or high temperature atmospheres may be equipped with a vortex tube to either warm or cool the air supplied.

Physiological Stress

Use of respirators in conjunction with protective clothing can greatly affect the human response and endurance, especially in hot environments. Normally, in hot environments or during heavy work, the body relies a great deal on heat loss through the evaporation of sweat. With impermeable clothing, the heat loss by water evaporation is not possible. Additionally, the weight of the respirator (up to 35 pounds for a SCBA) adds to the metabolic rate of individuals, increasing the amount of heat the body produces. The net effect is one of heat stress.

Based on this limited research, the following recommendations are made:

1. Select the lightest weight protective ensembles and respiratory protective devices that adequately protect the respirator user. This will minimize the physiological demands placed on the respirator user by carrying the weight of this equipment.

2. If available, select protective clothing made of material that will allow evaporation of water vapor, while providing skin protection from the contaminant.

3. Reduce work rate by:
    a. adjusting the work/rest schedules,
    b. using automated procedures and/or mechanical assistance where possible, and
    c. minimizing the work intensity.

4. Educate respirator users on the symptoms and prevention of heat illness and schedule periodic fluid replacement breaks.

5. Reduce heat stress by scheduling work at night or early morning or by providing external cooling, where possible (either through cooling garments and/or by providing cool respirable breathing air through pressure-demand supplied respirators).

6. When conducting pipe/boiler lagging removal, ensure that steam lines are cool to minimize heat exposure from these sources.

Respirator Selection

EH&S will assist departments in selecting respirators, filtering media, and related equipment appropriate to the needs and exposure hazards of respirator users.

Proper selection respirators shall be made according to chemical and physical properties of the contaminant, the toxicity and concentration of the hazardous material, and the amount of oxygen present in the area. The nature and extend of the hazard, work activity and rate, environment, length of exposure time, work requirements and conditions, as well as the limitations and characteristics of the respirator users, are all selection factors that must be considered.

When **respirator use is required**, supervisors must provide individuals with respiratory equipment following their medical evaluation and training, at no cost to the individual. All respirators worn by MSU respirator users must be certified by the National Institute for Occupational Safety and Health (NIOSH) and used in compliance with the condition of certification.

Choosing the correct respiratory protection equipment involves several steps:

1. Determination of the hazard;
2. Choose equipment that is certified for the hazard; and
3. Assuring the device is performing as it is intended to do.

Costs

Where respiratory protection equipment is required, the cost of the required equipment and medical evaluation shall be covered by the respirators users' department.

Medical Evaluation

The use of a respirator may impose physiological stress on employees, which varies based on factors like respirator type, task, environment, and individual health. Individuals cannot wear a negative pressure respirator (tight-fitting full face or half mask) until a medical evaluation has been completed.

Before an individual undergoes fit testing or is mandated to use a respirator, a medical evaluation is necessary to assess their ability to use the respirator. The medical evaluation will be conducted by a medical professional from the Longest Student Health Center, using the medical questionnaire provided in the **Respirator Medical Evaluation Questionnaire (Appendix C**).

The following information will also be provided to the medical professional through the medical questionnaire. This information is required to determine the individual's ability to use a respirator:

- Type and weight of the respirator to be used
- Duration and frequency of respirator use (including use for rescue and escape)
- Expected physical work effort
- Additional protective clothing and equipment to be worn
- If the respirator user will be wearing corrective lenses while wearing a respirator; and
- Any temperature and humidity extremes that may be encountered

The licensed medical professional shall provide the prospective respirator user and EH&S with a written recommendation regarding individual's ability to use the respirator. The recommendation shall provide only the following information:

- Any limitations on respirator use related to the medical condition of the individual, or relating to the workplace conditions in which the respirator will be used, including whether or not the individual is medically able to use the respirator;

- Special precautionary procedures which the respirator user must follow if the employee wears contact lenses with respiratory protection; and

- The need, if any, for follow-up medical evaluations.

Respirator users shall stop using respiratory protection equipment and be reevaluated immediately if any of the following occur:

- Individual reports medical signs or symptoms related to the ability to use a respirator.
- The medical professional or supervisor recommends and employee for re-evaluation.
- Information obtained during program evaluation or fit testing indicated a need for re-evaluation.

- There are changes in workplace conditions (physical work effort, PPE, and temperature) that may result in substantial increases in physiological burden placed on the employee.

Follow-up Medical Examination

A follow-up medical examination will be provided if there has been changes to the respirator user's health, medical status, physical abilities, or if the initial medical examination demonstrates the need for a follow-up examination. The follow-up examination includes tests, consultations, or diagnostic procedures that the licensed medical professional deems necessary to make a final determination.

If the respirator is a negative pressure respirator and the licensed medical professional finds a medical condition that may place the respirator user's health at increased risk if the respirator is used, a powered air-purifying respirator (PAPR) will be provided if the licensed medical professional's medical evaluation finds that the respirator user can use such a respirator. If a subsequent medical evaluation finds that the respirator user is medically able to use a negative pressure respirator, then the PAPR will no longer be required.

Additional Medical Examinations

Additional medical evaluation will be provided if:

- Respirator user reports medical sign or symptoms that are related to ability to use a respirator;
- A licensed medical professional, the supervisor, or EH&S determines the respirator user needs to be re-evaluated;
- Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for re-evaluation;
- A change occurs in the workplace conditions (e.g., physical work effort, protective clothing, temperature) that may result in a substantial increase in the physiological burden placed on the respirator user.

Training

To ensure proper and safe respirator usage, employees will receive comprehensive training during initial fit testing and annually thereafter. EH&S will offer both in-person and computer-based training. The training will cover:

A. The necessity of respirator use and how improper fit, usage, or maintenance can compromise effectiveness;
B. Respirator limitations and capabilities;
C. Effective respirator use in emergencies and malfunction scenarios;
D. Inspection, donning, doffing, usage, and seal checking procedures;
E. Maintenance and storage protocols;
F. Recognition of medical signs affecting respirator use;
G. Workplace respiratory hazards and their effects;
H. Reporting problems to supervisors;

I. Reasons for selecting specific respirators for particular hazards;
J. Successful completion of fit testing;
K. Demonstrating understanding of training elements

Fit Testing

Once the individual receives medical clearance from a medical professional to wear a respirator, they must undergo fit testing. Fit testing must be conducted using the same make, model, style, and size of respirator intended for use.

It is the responsibility of the respirator user's supervisor to ensure that the respirator user using a tight-fitting facepiece respirator undergo fit testing at the following times:

- Before the initial use of the respirator
- Whenever a different respirator facepiece (size, style, model, or make) is used
- At least annually thereafter

Respirator users must undergo an additional fit test whenever there are changes in their physical condition that could impact respirator fit. These changes include, but are not limited to:

- Facial scarring
- Dental changes
- Cosmetic surgery
- Obvious changes in body weight

This fit test should be conducted if the respirator user reports these changes or if they are visually observed by the responsible medical professional or supervisor.

Facial Hair Requirements

If facial hair interferes with the seal between the facepiece and the face, respirator users cannot use tight-fitting respirators, including filtering facepieces. Therefore, respirator users must be clean-shaven when wearing and undergoing fit testing for these respirators.

EH&S will maintain records of respirator user fit test, documenting the make, model, style, and size of the respirator tested.

For detailed information for fit testing procedures, see **Respirator Fit-Test Protocols, Appendix G**.

Proper Use of Respirators

MSU EH&S has established and implemented procedures for the proper use of respirators. These requirements include prohibiting conditions that may result in facepiece seal leakage, preventing respirator users from removing respirators in hazardous environments, and taking actions to ensure continued effective respirator operation throughout the work shift.

- Respirators shall not be used in a manner inconsistent with their NIOSH certification or manufacturer's instructions.

- MSU will not permit respirators with tight-fitting facepieces to be worn by respirator users who have facial hair that comes between the sealing surface of the facepiece and the face or that interferes with valve function; or any condition that interferes with the face-to-facepiece seal of valve function.

- For all tight-fitting respirators, MSU will ensure that respirator users perform a user seal check each time they put on the respirator using procedures outlined during fit testing or procedures recommended by the respirator manufacturer that the respirator demonstrates are as effective as the Appendix reference above.

- Appropriate surveillance shall be maintained of work areas conditions and degree of respirator exposure or stress. When there is a change in work area conditions or degree of respirator user exposure or stress that affect respirator effectiveness, we will reevaluate the continued effectiveness of the respirator.

- Respirator users will leave the respirator use area under the following conditions: to wash their faces and respirator facepieces as necessary to prevent eye or skin irritation associated with respirator use, if they detect vapor or gas breakthrough, changes in breathing resistance, or leakage of the facepiece, or to replace the respirator or the filter, cartridge, or canister elements.

- If the respirator user detects vapor or gas breakthrough, changes in breathing resistance, or leakage of the facepiece, we will replace or repair the respirator before allowing the respirator user to return to the work area.

Respiratory Protection Care, Inspection, and Maintenance

Supervisors are responsible for providing an ample supply of respiratory protection in good working order. Reusable respiratory gear must be properly maintained to uphold performance standards.

Respirator users are responsible for the maintenance and care of their assigned respirator. Respirator maintenance responsibilities include:

- Cleaning and disinfecting
- Storage
- Inspection
- Repair
- Cartridge and filtering facepiece replacements

Supervisors are responsible for following the guidance in this manual regarding the removal from service and repair or adjustment of defective respirators and informing respirator users of warning systems and cartridge change-out schedules.

Cleaning and Disinfecting

MSU will furnish each affected individual with a respirator that is clean, hygienic, and functioning properly. Respirator users are tasked with ensuring the proper cleaning and disinfection of their respirators. This involves routine cleaning and disinfection using alcohol wipes or towelettes to clean the interior of their respirator.

Cleaning procedures are detailed in **Appendix H** of this manual.

Storage

Supervisors must ensure sufficient storage space and supplies are provided for respiratory protection to safeguard respirators from various potential sources of damage and contamination, such as dust, sunlight, extreme temperatures, and moisture. Typically, this involves storing respirators in plastic zippered bags in locations that meet these requirements. If the equipment manufacturer specifies specific storage procedures, those guidelines will take precedence over the general storage requirements described here.

Inspection

Each respirator user is required to conduct a thorough inspection of their respirator(s) before each use. This inspection entails checking the functionality of connections and the condition of various components, including the facepiece, head straps, valves, connecting tube, cartridges/canisters/filters, and batteries. Additionally, elastomeric parts must be assessed for pliability and signs of deterioration. Any defects discovered during inspection should be promptly reported to supervisors for repair or replacement of the affected respirator.

Detailed inspection procedures are detailed in **Appendix I** of this manual.

Repairs

Supervisors ensure that respirators failing inspection or found defective are promptly removed from service and either repaired or adjusted, as necessary. If a respirator cannot be fixed, it must be discarded. Only NIOSH-approved replacement parts designed for a specific respirator may be used, and repairs must be adhered to the manufacturer's recommendations and specifications. Departments should coordinate with EH&S before making any repairs.

In cases where a respirator is disposed of, respirator users will receive a replacement of the same make, model, style, and size. A new fit test will be required before using the new respirator.

Cartridge and Filtering Facepiece Change Schedules

Air-purifying respirators equipped with vapor and/or gas cartridges rely on two warning systems to protect users from contaminant breakthrough; end-of-service life indicators (ESLI) on cartridges or cartridge replacement schedules based on manufacturer breakthrough test data.

Supervisors, with EH&S assistance, establish change schedules based on sampling data and manufacturer information. Minimum change schedules for respirator cartridges and filtering facepieces are as follows:

- Immediate replacement upon vapor or dust breakthrough detection or difficulty breathing.
- Organic vapor or chemical cartridges: 8 hours or one workday of use (whichever is less), with no reuse beyond one day.
- Particulate filters for radioactive materials or microorganisms; no reuse beyond one day.
- Filtering facepieces (dust masks) replacement:
    - Immediate upon fume or dust breakthrough detection or difficulty breathing.
    - When soiled, dirty, damaged, or after one day or use for protection against radioactive materials or microorganisms.

Voluntary Use

Individuals who voluntarily use respiratory protective equipment are covered in this program; however, voluntary use has different program requirements than required use. "Voluntary Use" is only permitted if there are no airborne hazards at concentrations requiring the use of a respirator. Individuals may request to wear a respirator when it is not required as an extra precaution or for comfort and protection against nuisance dust or odors. Voluntary use must be approved and is permitted only if the respirator use will not interfere with an individual's ability to work safely or create a new health hazard.

The decision to allow voluntary use of respiratory protection is made by the supervisor in consultation with EH&S. Situations that may warrant voluntary use of respiratory protection might include:

- Avoid exposure to airborne contaminants that are below limits established by regulatory agencies.
- Avoid nuisance dust or odors.
- Work in patient clinics (as a voluntary precaution when not required by guidelines or procedures).
- Work with animals.
- Work around potential allergens (e.g., sensitized individuals)

A hazard evaluation must be performed prior to voluntary use of a respirator to determine if use is voluntary or required. Where no recognized respiratory hazards exist, respirators may be used on a voluntary basis under the following requirements, based on the type of respirator:

Voluntary use of a filtering facepiece respirators. There are very limited requirements when it comes to allowing employees to wear filtering facepiece respirators voluntarily:

1. Determine that the respirator use will not itself pose a hazard to the employee; and

2. Provide the respirator user with the information contained in the **Voluntary Use of Respirator Form (Appendix D)** on a one-time basis. This appendix provides important information the respirator user needs to know about wearing filtering facepiece respirators. Supervisors should maintain a signed copy for their records and must send a copy to EH&S.

Voluntary use of filtering facepiece respirators does not require any medical evaluation or fit test.

Voluntary use of respirators other than filtering facepiece respirators. These types of respirators, such as tight-fitting negative pressure respirators, place a much greater physiological burden on respirator users, so there are more requirements when allowing their use even on a voluntary basis:

1. Determine that the respirator use will not in itself create a hazard,

2. Provide the respirator user with the information contained in **Voluntary Use of Respirator Protection Form (Appendix D)**. Supervisors should maintain a signed copy for their records and must send a copy to EH&S,

3. Respirator users must be medically qualified to wear a respirator (see **Medical Evaluations** section), and

4. Respirators must be properly cleaned, stored, and maintained so their use does not present a health hazard to the user (**see Respiratory Protection Care, Inspection, and Maintenance** section).

Implementing the above aspects of the RPP for voluntary use will ensure that the respirator is used properly and does not create a hazard to the user. If these provisions are not implemented, potential hazards or problems could result:

- A respirator user's health could be jeopardized due to an undetected medical condition (e.g., asthma, heart condition).
- A dirty respirator could cause dermatitis.
- A dirty or poorly disinfected respirator could cause an ingestion hazard.

Either the supervisor or the respirator user can provide the respirator for voluntary use. The department is not required to pay for the voluntary-use respirators, but the department does have to pay for any expenses related to providing the **Voluntary Use of Respirator Protection Form (Appendix D)** information, as well as any necessary medical evaluations and respirator cleaning equipment.

Unlike for required respirator use, individuals are not prohibited from having facial hair when they are using tight-fitting respirator voluntarily because the air is safe to breathe. However, this is discouraged, and individuals are advised to follow the manufacturer's instructions, even for voluntary use.

Records

The Respirator Medical Evaluation Questionnaire is confidential and will remain with the licensed healthcare professional medically evaluating the respirator user. MSU EH&S will only retain the physician's medical clearance form or other written recommendation regarding each respirator user's ability to wear a respirator.

Training and fit test records, enrollment forms and initial and annual respiratory protection clearance forms are maintained centrally by EH&S. These records will be updated as new respirator users are trained, as existing respirator users received refresher training, and as fit test are conducted. Fit test

records will be retained for respirator users until the next fit test is administered. Copies of records documenting medical approvals, training, and fit testing must be provided to EH&S.

MSU EH&S will retain a copy of the current written respirator program. Individuals may access the RPP through the MSU EH&S website.

Program Evaluation

The Respiratory Protection Program undergoes annual evaluations to ensure effective implementation. These evaluations consider workplace changes and feedback from individuals required to use respirators on the program's effectiveness. The **Respiratory Program Evaluation Checklist in Appendix K** serves as an evaluation tool.

Acronyms and Definitions

Acronyms

ACGIH: American Conference of Governmental Industrial Hygienists
ANSI: American National Standards Institute
APF: Assigned Protection Factor
APR: Air-Purifying Respirator
CDC: Center for Disease Control
CFR: Code of Federal Regulations
CGA: Compressed Gas Association
ESLI: end-of-life indicator
HEPA: high efficiency particulate air filter
IDLH: immediately danger to life or health
MUC: maximum use concentration
NIOSH: National Institute of Occupational Safety and Health
PAPR: powered air-purifying respirator
PEL: permissible exposure limit
PPE: personal protective equipment
QLFT: qualitative fit test
QNFT: quantitative fit test
REL: recommended exposure limit
RPP: Respiratory Protection Program
SAR: supplied-air respirator
SCBA: self-contained breathing apparatus
TLV: threshold limit valve

Definitions

Air-purifying respirator: means a respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air purifying element.

Assigned protection factor (APF): the workplace level of respirator protection that a respirator or class of respirators is expected to provide to respirator users when the employer implements a continuing, effective respiratory protection program as specified by this section.

Atmosphere-supplying respirator: a respirator that supplies the respirator use with breathing air from a source independent of the ambient atmosphere and includes supplied-air respirators (SARs) and self-contained breathing apparatus (SCBA) units.

Canister or cartridge: a container with a filter, sorbent, or catalyst, or combination of these items, which removes specific contaminants from the air passed through the container.

Demand respirator: an atmosphere-supplying respirator that admits breathing air to the facepiece only when a negative pressure is created inside the facepiece by inhalation.

Emergency situation: any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.

Employee exposure: exposure to a concentration of an airborne contaminant that would occur if the employee were not using respiratory protection.

End-of-service-life indicator (ESLI): a system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective.

Escape-only respirator: a respirator intended to be used only for emergency exit.

Filter or air purifying element: a component used in respirators to remove solid or liquid aerosols from the inspired air.

Filtering facepiece (disposable respirator): a negative pressure respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium. Often referred to as a N95.

Fit factor: a quantitative estimate of the fit of a particular respirator to a specific individual, and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.

Fit test: the use of a protocol to evaluate the fit of a respirator qualitatively or quantitatively on an individual. (See also Qualitative fit test and Quantitative fit test)

Helmet: a rigid respiratory inlet covering the also provides head protection against impact and penetration.

High efficiency particulate air (HEPA) filter: a filter that is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter. The equivalent NIOSH 42 CFR 84 particulates filters are N-100, R-100, and P-100 filters.

Hood: a respiratory inlet covering that completely covers the head and neck and may also cover portions of the shoulders and torso.

Immediately dangerous to life or health (IDLH): an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

Licensed medical professional: an individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide, or be delegated the responsibility to provide, some or all of the health care services required in the Respiratory Protection Program.

Loose-fitting facepiece: a respiratory inlet covering that is designed to form a partial seal with the face.

Maximum use concentration (MUC): the maximum concentration atmospheric concentration of a hazardous substance from which an employee can be expected to be protected when wearing a respirator and is determined by the APF of the respirator or class of respirators and the exposure limit of the hazardous substance. The MUC can be determined mathematically by multiplying the APF specified for a respirator by the required permissible exposure limit, short-term exposure limit, or ceiling limit. When no exposure limit is available for a hazardous substance, an employer must determine a MUC on the basis of relevant available information and informed professional judgment.

Negative pressure respirator (tight fitting): a respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.

Oxygen deficient atmosphere: an atmosphere with an oxygen content below 19.5% by volume.

Positive pressure respirator: a respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

Powered air-purifying respirator (PAPR): an air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

Pressure demand respirator: a positive pressure atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.

Qualitative fit test (QLFT): a pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.

Quantitative fit test (QNFT): as assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

Respiratory inlet covering: that portion of the respirator that forms the protective barrier between the user's respiratory tract and an air-purifying device or breathing air source, or both. It may be a facepiece, helmet, hood, suit, or a mouthpiece respirator with nose clamp.

Self-contained breathing apparatus (SCBA): an atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

Service life: the period of time that a respirator, filter or sorbent, or other respiratory equipment provides adequate protection to the wearer.

Supplied-air respirator (SAR) or airline respirator: an atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.

Tight-fitting facepiece: a respiratory inlet covering forms a complete seal with the face.

User seal check: an action conducted by the respirator user to determine if the respirator is properly seated to the face.

Appendix

Appendix A: Respiratory Hazard Evaluation Form

Appendix B: Initial Respirator Clearance and Enrollment Form

Appendix C: Respirator Medical Evaluation Questionnaire

Appendix D: Voluntary Use of a Respirator Form

Appendix E: Annual Respiratory Protection Clearance Form

Appendix F: Worksite-Specific Respiratory Protection Plan

Appendix G: Respirator Fit-Test Protocols

Appendix H: Respirator Cleaning & Sanitizing Procedures

Appendix I: Inspection Procedures for Respirator Use

Appendix J: Procedures for IDLH Atmospheres

Appendix K: Respiratory Protection Program Evaluation Checklist Form