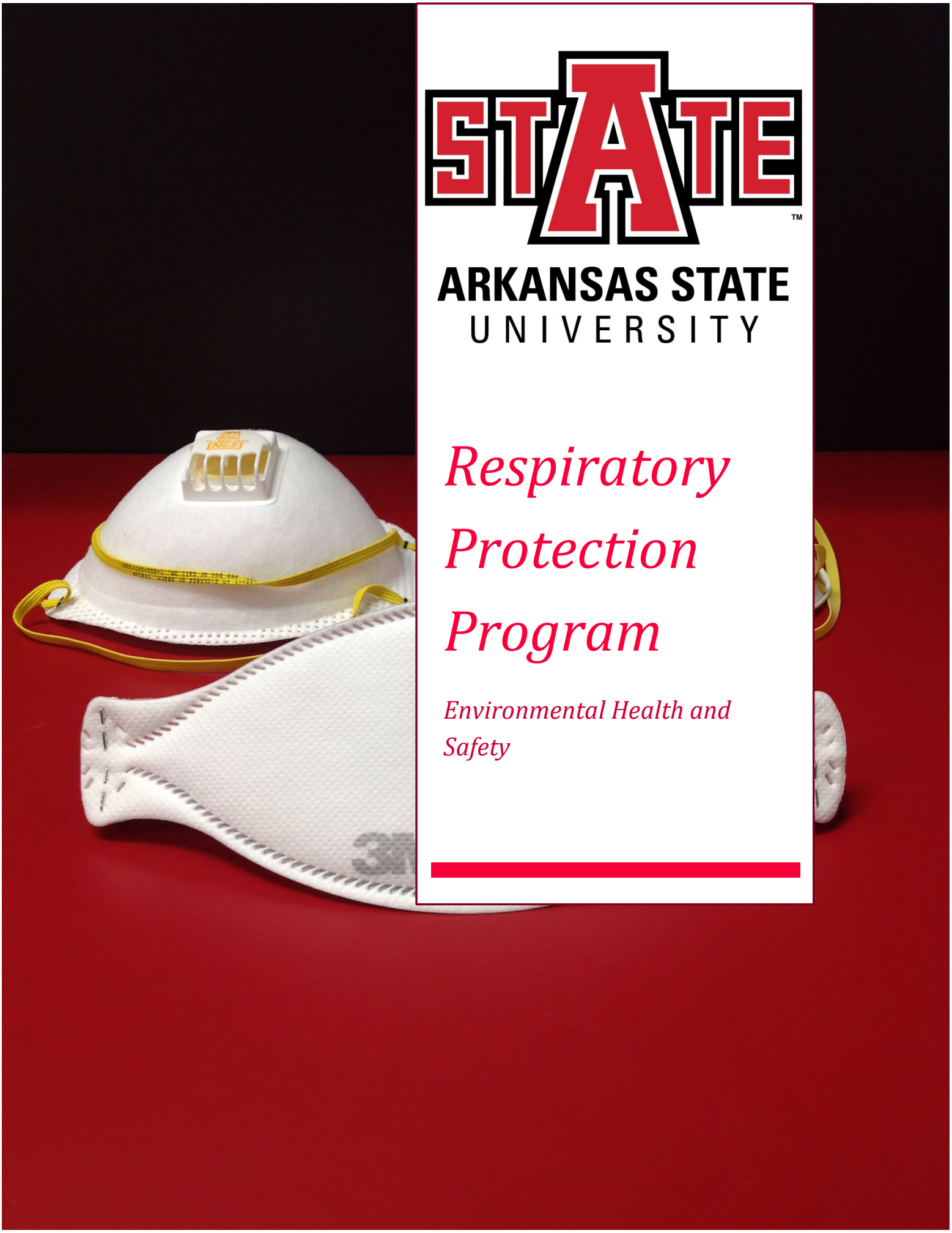

ARKANSAS STATE UNIVERSITY

Respiratory Protection Program

Environmental Health and Safety

1.0 Executive Summary

The Occupational Health and Safety Administration (OSHA) in the United States Department of Labor regulates workplace safety. Even in state agencies such as Arkansas State University, OSHA standards are the primary reference for workplace safety procedures. 29CFR1910 Subpart I contains the standards that apply to personal protective equipment (PPE), which includes respirators.

1910.134 within subpart I contains the standards that apply to the selection and use of respirators. The standard requires the development of a respiratory protection program in workplaces where respirators are required to be worn. Elements of the program includes evaluation of workplaces to determine the need for respiratory protection, procedures for the selection and use of respirators, training of employees who use respirators and fit-testing and medical clearance of individuals that are required to wear respirators. Where pesticides are applied, the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and the Environmental Protection Agency (EPA) Worker Protection Standard requires the use of respirators when the manufacturer of the pesticide indicates that the protection is necessary. This program is also intended to provide guidance to employees who use a respirator under these circumstances.

This program is intended to ensure that all employees that use respirators are aware of how to use them safely and effectively. Environmental Health and Safety (EHS) does not currently provide respirators, fit-testing or medical clearance of employees but EHS is responsible for developing programs that are relevant to workplace safety with reference to government standards and industry best practices. Respiratory protection is a very important element of worker protection; the technical nature of respiratory protection makes it appropriate for EHS to develop and implement this program.

Contents

2.0 Roles and Responsibilities

Employees, supervisors and EHS all have a role in the safe and compliant selection and use of respirators. The responsibilities of each role are defined below.

2.1 Employees

Employees that use respirators must:

- Be medically cleared and fit tested before wearing a respirator when required.
- Have permission from EHS and supervisor before wearing a respirator voluntarily.
- Change out respirator cartridges when appropriate.
- Clean, inspect, maintain and store assigned respirator according to manufacturer's instructions.
- Be clean shaven when fit tested or when respirator use is required.
- Use assigned respirator in accordance with this policy.
- Inform supervisor if changes in health status may require re-evaluation of medical clearance or fit testing.

2.2 Supervisors

Supervisors of employees that use respirators must:

- Ensure that employees that ship or prepare for shipment hazardous materials complete the prescribed training appropriate to the type of hazardous material being shipped and the method by which it is being shipped.
- Not require employees to ship or prepare for shipment hazardous materials if they have not been appropriately trained.
- Ensure shipping paperwork for hazardous materials shipments are maintained for a period of at least 3 years.

2.3 Environmental Health and Safety

Environmental Health and Safety shall:

- Assess work areas to determine the need for respiratory protection.
- Where feasible, recommend engineering or administrative controls instead of respiratory protection.
- Ensure selection of appropriate respiratory protection.
- Confirm medical clearance and fit testing of individuals who are required to don respirators.

- Conduct respirator training for all employees that may wear a respirator
- Periodically review and update this program.
- Maintain all training records for employees who use respirators.

3.0 Procedures

The procedures for the selection, care and use of respirators are given below. Note that 3.1-3.4 and training must be completed before a respirator can be used by an employee in the workplace. Requiring an employee to perform a task that requires a respirator prior to completing training, medical clearance and fit-testing is prohibited.

3.1 Evaluation of Workplace

Environmental Health and safety is continuously evaluating workplaces to determine the appropriate employee and public protection from recognized hazards. EHS conducts Job Hazard Analyses to prescribe appropriate engineering controls, administrative controls and PPE for each task. If an atmosphere is suspected of having a respiratory hazard, contact EHS for evaluation. The procedure for workplace evaluation is as follows:

1) EHS is informed of or observes a workplace that may contain a respiratory hazard.
2) EHS chooses the appropriate monitoring method to determine if further action is needed.
3) If further action is needed, EHS will recommend the use of engineering controls or administrative controls, where feasible, to mitigate the respiratory hazard.
4) If administrative controls and engineering controls are not feasible, EHS will recommend the use of respiratory protection.

3.2 Selection of Respirator

Selection of the appropriate respirator for a task is very important. The primary factor to consider is the level of the respiratory hazard in the workplace, but other factors include the physical features of the individual using the respirator, the maintenance requirements for the respirator and the cost of the respirator. Associated with each type of respirator is an assigned protection factor (APF), which is the level of protection that the respirator provides to the user. The APF of the respirator determines the level in excess of the permitted exposure limit (PEL) or threshold limit value (TLV) for a respiratory hazard to which an employee may be exposed while wearing the respirator. Currently, Arkansas State University only allows the use of air-purifying respirators (defined in the next section). Supplied-air respirators and self-contained breathing apparatuses (SCBAs) are not permitted as a form of protection as entrance into areas that have respiratory hazards at levels that are immediately dangerous to life or health (IDLH) is prohibited.

3.2.1 Types of Respirators

As previously stated, employees are not permitted to enter areas where the hazards would require the use of a SCBA or supplied air respirator. Thus, the types of respirators discussed in this section are all air-purifying respirators. An air-purifying respirator filters hazards out of the air to reduce the inhalation exposure of airborne hazards to the employee. Air-purifying respirators include dust masks, N/P/R95 or 100, tight-fitting respirator and powered air-purifying respirator (PAPR). Each of these types of respirators, which have a corresponding assigned protection factor, is discussed below and they are listed in order of increasing APF (i.e. increasing level of protection).

3.2.1.1 Dust Mask

A dust mask is not a true respirator, but they are commonly used in the workplace. Also, at the time of writing this plan (October 2020), the COVID-19 pandemic has caused the state to mandate the use of masks in public buildings. Whether there is a state mandate or a dust mask is used for nuisance dust after the mandate is rescinded, there are a few things to remember about dust masks:

- A dust mask shall not be used when a true respirator is necessary.
- If a dust mask is worn voluntarily, the wearer should be informed that the use of a mask can exacerbate respiratory issues such as asthma and emphysema.
- Dust masks are meant to be used once (over the course of a day unless they are soiled in that time) before being disposed of (paper type) or washed (cloth type).

3.2.1.2 N/P/R95, 99 and 100 (disposable)

N, R and P are NIOSH certification categories for air-purifying respirators. These types of respirators are used only for protection against aerosols (biological) and particulates. They are not used for protection against chemical hazards. Inhalation is through the material of the respirator. Exhalation is either through the mask material or through a valve in the middle of the mask. Each designation indicates the type of atmosphere in which the respirator can be used. The designations mean the following:

- N is for atmospheres that contain no oil.
- R is for atmospheres that have oil, but limited use (up to 8 hours).
- P is for atmospheres that have oil, but the manufacturer provides information on how long the respirator can be used.

N and P are the most commonly used because they can filter aqueous (water-containing) aerosols.

While half-face and full-face (tight-fitting) respirator filters can technically have one of these designations as well, this section focuses on the disposable respirators like the ones pictured below. The number designations are indications of the efficiency of the filtering of the respirator.

- 95 means the respirator will stop 95% of particles, if worn properly.
- 99 means the respirator will stop 99% of particles, if worn properly.

- 100 means the respirator will stop 99.97% of particles (same efficiency as a HEPA filter), if worn properly.

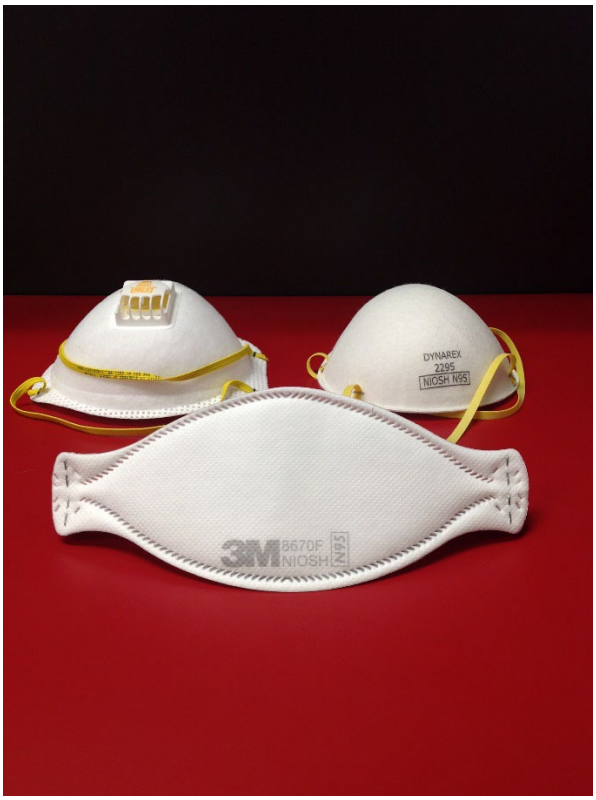

Figure 1: Various disposable respirators

According to OSHA, the assigned protection factor (APF) for a mask in this category is 10.

3.2.1.3 Tight-Fitting Respirator

A respirator with a tight-fitting facepiece is different from a disposable respirator (N/R/P 95, 99 or 100 listed above) in that inhalation in this type of respirator is through a set of cartridges or filters that are selected based on the hazard from which the user needs to be protected. Exhalation is typically though a valve in the middle of the mask. A tight-fitting respirator can protect from particulates or from different categories of chemicals including organic vapors, acid gases, ammonia, mercury and others. Tight-fitting respirators can be half-face or full face.

3.2.1.3.1 Half-Face Respirator

A half-face respirator fits tightly around the nose and mouth of the user, similar to the fit of a disposable respirator. Below is a picture of a half-face respirator.

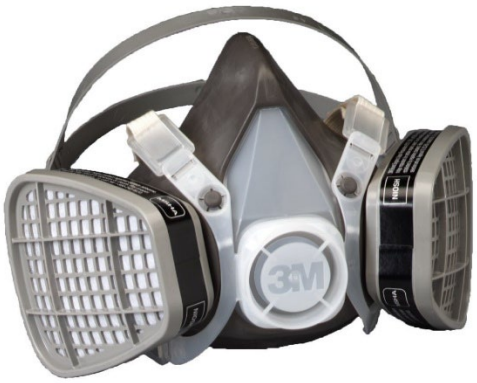

Figure 2: Half-Face respirator (image source: amazon.com)

According to OSHA, the APF for a half-face respirator is 10.

3.2.1.3.2 Full-Face Respirator

A full-face respirator fits tightly around the entire face of the user. Unlike a half-face respirator, a full-face respirator offers eye protection as well. Below is a picture various full-face respirators.

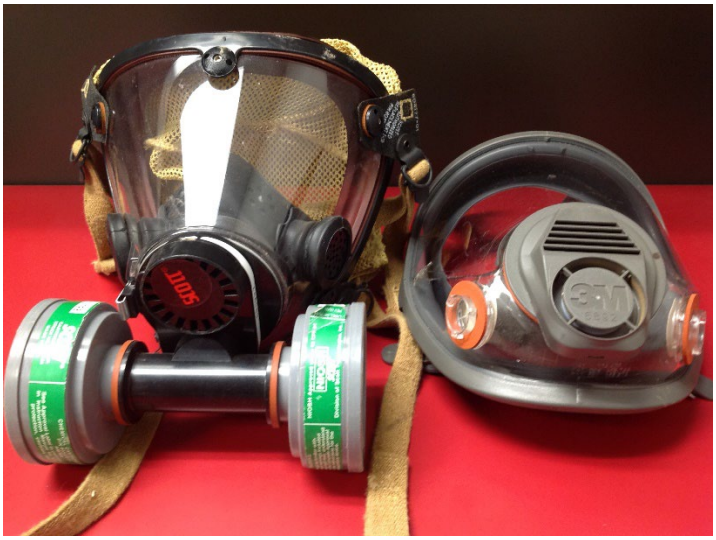

Figure 3: Full-face respirators. The respirator on the left has cartridges installed; the one on the right does not.

According to OSHA, the assigned protection factor (APF) for a mask in this category is 50.

3.2.1.4 Powered Air-Purifying Respirator (PAPR)

A powered air-purifying respirator (PAPR) is respirator that uses a blower (attached to a belt worn by the user) to blow ambient air, which has been filtered, into a hood or face-piece. Thus, this respirator does not depend on the breathing of the wearer to supply air to the inside of the respirator. Filters for these types of respirators are similar to those for tight-fitting respirators, but the filters are contained in

the blower housing. While these types of respirators are expensive relative to the other types of respirators, they have several advantages, which include:

- An assigned protection factor of 25 can be achieved without performing a fit test.
- Because they blow air into the face of the user, the feel more comfortable, particularly in warm atmospheres, than tight-fitting respirator or N95.
- While each individual user must have their own hood and tube, the blower/filter apparatus does not have to be assigned to a certain individual. The blower/filter can be used by several individuals (just not at the same time). This can be useful when multiple shifts use respirators.
- A tight-fitting hood can achieve a higher protection factor than any other air-purifying respirator.
- This type of respirator can be used by individuals that have facial hair. Other types of respirators will not fit properly if the user has a beard or a very long mustache.

A picture of a typical PAPR hood is below.

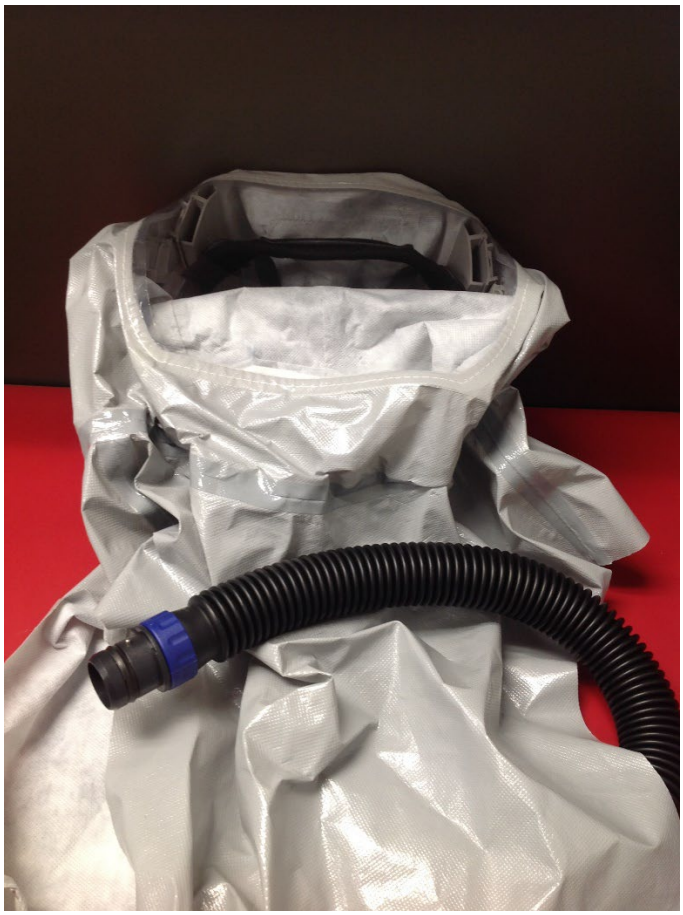

Figure 4: Powered air-purifying respirator hood. The hose from this hood attaches to a blower that contains a filter.

If there is not documentation that the PAPR manufacturer has tested to determine a workplace protection factor (WPF) or simulated workplace protection factor (SWPF) for the PAPR by the OSHA definition, then the assigned protection factor is 25. If the manufacturer has performed such testing, the APF is whatever is designated by the manufacturer. The maximum APF for each type of PAPRs is:

- 25 for a loose-fitting facepiece PAPR
- 50 for a tight-fitting half-mask PAPR
- 1000 for a tight-fitting full facepiece PAPR
- 1000 for a tight-fitting helmet/hood PAPR

3.2.2 Deciding on a Respirator

The selection of a respirator must be done as part of a thorough job hazard analysis. Environmental Health and Safety is responsible for conducting the job hazard analysis with substantial input for the employees and supervisors that will be doing the work. Factors that affect the type of respirator selected include:

- Type and amount of hazardous agent in the work environment (biological, chemical or physical)
- State of the contaminant (particulate, aerosol, vapor, gas)
- Exposure limit of the hazardous agent (PEL or TLV)
- Assigned protection factor for the respirator
- Potential for eye or skin irritation of the hazardous agent
- Nature and duration of the task

Environmental Health and Safety will do calculations based on the concentration of the hazardous agent to determine which respirator types are suitable to protect the user. Then, EHS and the employees performing the task will work together to determine which respirator type is the most appropriate for the task.

3.3 Medical Clearance

When EHS determines in the course of doing a job hazard analysis that respiratory protection is required for a task, then the appropriate respirator must be used when performing the task. Before an employee can use a respirator when required by the employer to perform a task, the employee must be medically cleared to wear a respirator. The employee must complete a medical evaluation form, provided by EHS, and make an appointment to have the form reviewed by an occupational health professional. Currently, A-State uses Occupation Health Partners of Jonesboro to review the form. The steps the employee must complete are:

1) Print a medical questionnaire supplied by EHS.
2) Call Occupational Health Partners of Jonesboro (870-802-0012) to make an appointment for fit testing and medical clearance. Let them know that this is for Arkansas State University.
3) Take a completed medical questionnaire and a respirator to the appointment.

The employee must take the respirator that will be used for the hazardous task or an identical respirator with them to the appointment so that they can be fit-tested. Fit testing is described below.

Any change in an employee's medical condition requires a new form to be completed and submitted to Occupational Health Partners.

3.4 Fit Testing

A fit test is the procedure performed to determine if the selected respirator provides the protection required for the employee working in a hazardous environment. Since most respirators require a tight fit on the face, facial hair, scars and other facial features can interfere with the fit of the respirator. An initial test (called a user seal check) where the user dons the respirator, holds the respirator on the face with both hands and forcefully blows out will typically reveal whether or not it is worth going ahead with a fit test. If air escapes around the seal rather than through the mask, the user will not pass a fit test. With every type of air-purifying respirator except some PAPRs, an individual with a beard will not pass a fit test. There are two types of fit tests; qualitative (QLFT) and quantitative (QNFT).

QLFT is a pass/fail test relies on the wearer's response to a test agent to determine the adequacy of the fit. The test agent uses the employee's senses to measure the fit. Test agents that could be used in a QLFT include:

- Isoamyl acetate- banana-like odor
- Saccharin- sweet taste
- Bitrex- bitter taste
- Stannic chloride- irritant smoke that causes a cough

If the user detects the agent while wearing the respirator, the fit of the respirator is not good. This is the type of fit testing that is done by Occupational Health Partners and by EHS.

QNFT is a test that measures the concentration of a contaminant inside and outside of the mask. An aerosol is generated outside of the mask and a machine monitors the level in the area and inside the mask. This type of test generates a number that is the fit factor for the respirator; this number is a true measure of how well the respirator filters the generated aerosol as the respirator is worn.

For both types of test, the respirator user must perform certain activities while wearing the respirator during the test. This ensures that the respirator will continue to protect when the employee is performing normal tasks. Exercises that may be performed during the fit test include:

- Normal breathing
- Deep breathing
- Moving head side to side
- Moving head up and down

- Talking
- Bending over
- Grimacing (QNFT only)

A fit test ensures a fit only for the respirator model that is used in the fit test. If a new model is used, then the employee will need to be fit-tested for the new model. Currently, the initial fit test is performed by Occupational Health Partners of Jonesboro at the same time that the medical evaluation form is reviewed. If an employee has already been medically cleared to wear a respirator and simply needs a fit test on a new model of respirator, then Environmental Health and Safety can perform the subsequent fit test(s). Also, any change to the facial features of the respirator user such as injury, surgery, substantial change in weight or an increase in facial hair requires a new fit test to be performed.

3.5 Respirator Use

Before a respirator is used by an employee, the following steps must be followed:

1) A job hazard analysis must be done by EHS to determine if a respirator is necessary.
2) The employee must be medically cleared to wear a respirator.
3) The employee must be fit-tested for the model of respirator that will be worn.

If a respirator is going to be worn by an employee in a situation where it is not required, refer to section 3.7 of this plan.

When donning the respirator, ensure that any long hair is pulled back away from the face. Follow the manufacturer's instructions for placement of straps; typically the lower strap is placed at or just below the base of the skull and the upper strap is placed on the crown of the head. Before entering a hazardous area, the employee must perform a user seal check. The procedure for this is in the manufacturer instructions for the respirator; this normally includes donning the respirator, holding the respirator on the face with both hands and exhaling sharply. If air is felt escaping around the eyes, cheeks or chin, then the fit is not good.

The respirator must be donned before entering a hazardous area where it is required. Prior to donning the respirator, the employee should inspect it for signs of damage. If damaged, the respirator must be replaced. While wearing the respirator, the employee must immediately stop work and leave the hazardous area if the wearer:

- Detects leakage in the respirator
- Notices a change in resistance (the respirator suddenly gets much harder to breathe through)
- Develops signs or symptoms of exposure to the hazardous agent
- Starts having difficulty breathing
- Is alerted to a low battery condition (PAPR)
- Needs to change a respirator filter or cartridge

If the respirator user is possibly exposed to a hazardous agent, the individual should notify the supervisor and seek medical attention. In the event of an emergency, dial 911 or go to the nearest emergency medical facility. If the exposure is not an emergency, follow the worker's compensation procedure. The incident should also be reported to EHS so that the reason for the exposure can be determined and corrected.

3.6 Cleaning, Disinfection, Inspection and Storage of Respirators

Procedures for cleaning/disinfection, inspection and storage of respirators will vary based on the type of respirator being used.

3.6.1 Cleaning/Disinfection of Respirators

Disposable respirators are meant for one-time use. While a disposable respirator may be used throughout the course of a day, if it becomes soiled or damaged, it must immediately be discarded. Disposable respirators cannot be cleaned or disinfected for reuse.

All other types of respirator must be cleaned by manufacturer's instruction. Cleaning methods generally use these steps:

1) Completely disassemble the respirator in accordance with manufacturer instructions including filters and cartridges.
2) Wash the components in warm water with a mild detergent or cleaner recommended by the manufacturer.
3) Rinse the components thoroughly in warm running water. Drain.
4) If the cleaner used does not have a disinfecting agent, respirators should be immersed in one of the following:
    a. A bleach solution of one milliliter of bleach to one liter of water for two minutes.
    b. Any other disinfecting agent recommended by the manufacturer.
5) Rinse the components thoroughly in warm running water. Drain.
6) Components should be hand dried with a lint-free cloth or air dried.
7) Reassemble the respirator by replacing cartridges and filters.

3.7 Voluntary Use of Respirators

While EHS will require the use of respirators where they are necessary, employees may wish to use a respirator in circumstances where they are not required. This is called voluntary use. Employees may use a disposable respirator (such as a N95 or N100) voluntarily, but the employee should review Appendix D to the OSHA Respiratory Protection standard (29CFR1910.134, Appendix D). EHS can provide this to any employee that wish to use such devices voluntarily.

4.0 Training

Training is required for all users of respirators. The following elements must be covered in the training session:

- The nature of the respiratory hazard (i.e., what specific chemical substances or microbiological species are present; what areas, operations, or conditions involve potentially hazardous exposures; and what effects (symptoms) may result, if respirators are not used).
- An explanation of why engineering controls are not immediately possible and a discussion of what efforts are being made to eliminate or minimize the need for respirators.
- An explanation of why the respirator type selected is the proper one and what factors affect selection.
- A discussion and demonstration on how to use the respirator; i.e., how to inspect, put on and remove, check the seals, etc.
- Instruction on the proper techniques and importance of cleaning, disinfection, inspection, maintenance, and storage of the respirator.
- A discussion of the capabilities and limitations of respirators (i.e., in what environments or under what circumstances (such as oxygen deficiency) the respirator does not offer adequate protection) and any warning signs (odor, etc.) that may indicate the respirator is not functioning properly.
- How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions.
- How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators.

Training should be conducted at least annually for all respiratory users. There are online modules for respirator use; these should be updated as changes are needed.

4.1 Training Records

Training records for online training are maintained in Taleo Learn. In person training shall be documented during the training session.