

## **The Role of EOHW in Duke’s Respiratory Protection Program**

Employee Occupational Health and Wellness plays a crucial role in Duke’s Respiratory Protection Program, namely to medically “clear” employees who are required to wear respirators. This means that EOHW is providing a medical opinion about whether or not the respirator will affect the employee’s ability to safely conduct their tasks requiring respirator use. This may include a judgment about the effect of the respirator itself on the employee, or a judgment about the effect that the respirator will have on the employee’s ability to work safely in a stressful or hazardous environment.

In performing this medical evaluation, it is important that EOHW providers have an understanding of the types of respirators used at Duke, the environments in which employees use each type of respirator, and the potential physiological impacts of those respirators. This document includes an overview of types of respirators used at Duke, followed by detailed descriptions of where these respirators are used and potential physiological impacts. There is also a section on use of portions of the medical clearance questionnaire to communicate with employees, supervisors, and OESO about medical clearance and any restrictions. A bibliography of medical references is also included.

## **Overview of Respiratory Protective Devices in Use at Duke**

There are two main types of respiratory protective devices: Atmosphere-Supplying and Air-Purifying.

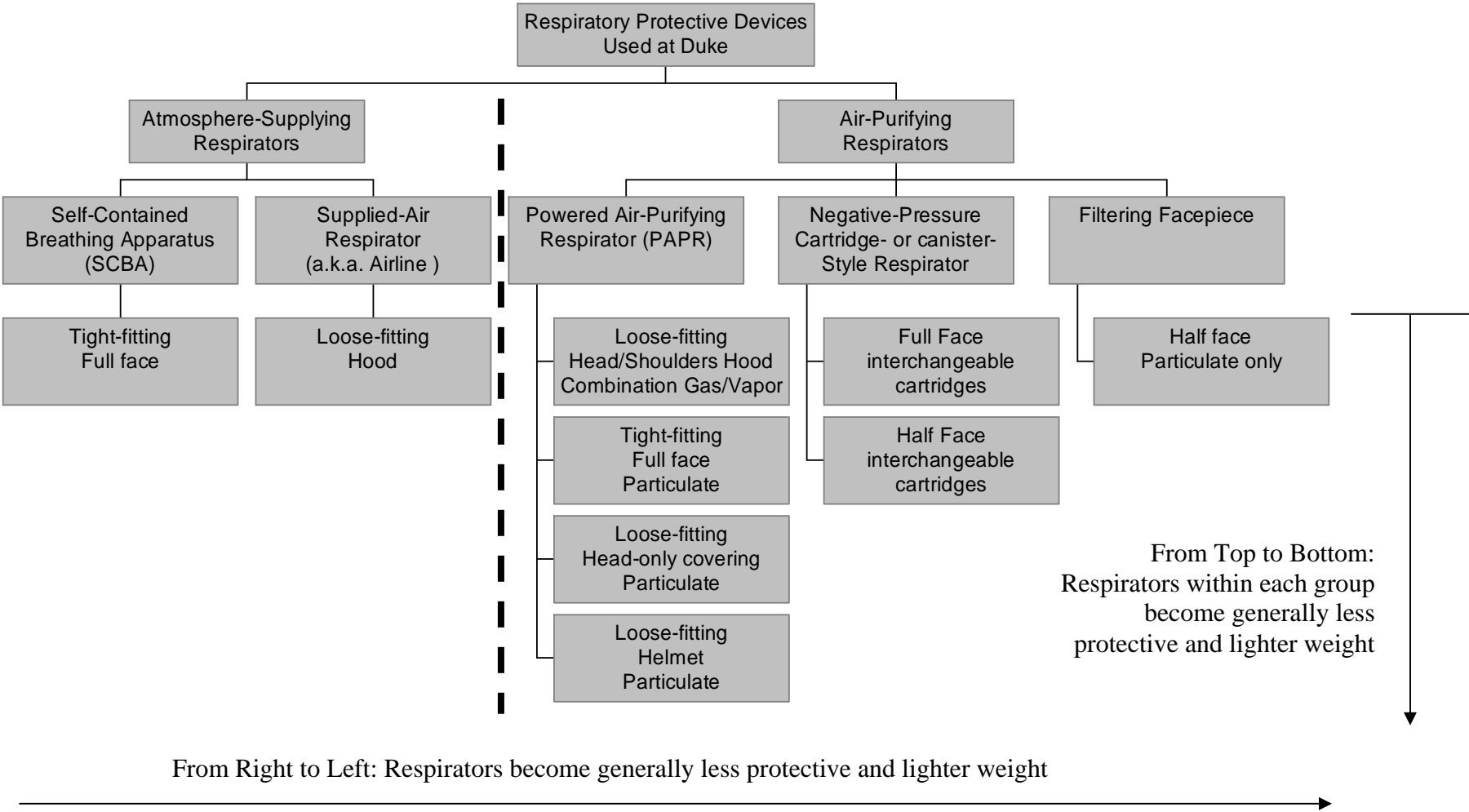
- *Atmosphere supplying respirators* are designed to provide the wearer with a supply of clean air, either from a pressurized cylinder that the wearer carries on his or her back, or from a compressor or pump located in an uncontaminated area.
- *Air-purifying respirators* are designed to clean certain contaminants out of the air, by use of a filter (for particulates) or adsorbing media (for gases and vapors). Air-purifying cartridges must be selected based on knowledge of contaminant identity and approximate concentration; therefore, this type of respirator is not appropriate for unknown air contaminants.

The figure on the following page shows the types of respirators used at Duke from each broad category.



## **Detailed information on Respiratory Protective Devices in Use at Duke**

This document includes a table (pages 3 – 8) showing pictures of specific types of respirators in use at Duke, the physiological burden associated with each, preventive conditions associated with each, and groups of employees at Duke who wear each type of respirator.



## Overview of Respiratory Protective Devices Used at Duke Categorized by Type of Respirator





### Detailed Information about Respirators Used at Duke

Type of Respirator	Example Photo	How the Respirator Works	Physiological stresses	Preventive conditions	Who wears this type of respirator at Duke
Self-Contained Breathing Apparatus – tight fitting full facepiece		<p>Uncontaminated pressurized air from the cylinder is released into the facepiece when the wearer breathes in. This is called “pressure demand”. Cylinders last approx 30 min.</p>	<p>Weight: 24 lbs, carried on waist, shoulders (or back, depending on position). Limits vision, may cause anxiety in claustrophobic individuals. Increased dead space. Some increase in breathing resistance.</p>	<p>Subject to annual fit test. No beards. People who need glasses must have a spectacle kit, wear contacts, or otherwise work without glasses.</p>	<p>~30 employees: HAZMAT team, High Voltage (They use a 30 – 35 lb SCBA), <i>Cape Hatteras</i> crew (Marine lab)</p>
Supplied Air Respirator – loose fitting hood		<p>Air is pumped continuously from an uncontaminated location via a plugged-in pump, through a high-pressure hose to a regulator, which reduces the air pressure. Air then travels through a tube into the hood.</p>	<p>Weight is minimal but “tethering” effect of breathing hose may limit ease of movement. Vision is somewhat limited. Sound of moving air may make it difficult to hear.</p>	<p>Beards and glasses are not a problem with this type of respirator.</p>	<p>~25 employees: HVAC personnel who enter fume hood exhaust plenums with unknown contaminants. E&amp;O electricians and after-hours mechanics who would deal with an EtO sterilizer emergency.</p>



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Type of Respirator	Example Photo	How the Respirator Works	Physiological stresses	Preventive conditions	Who wears this type of respirator at Duke
Powered Air-Purifying Respiator – Tight Fitting		<p>A battery-operated blower (on facepiece) pulls contaminated air through filters and adsorbent to remove many airborne particulates. Cleaned air is blown into facepiece. If blower stops working, would function as negative pressure respirator.</p>	<p>Weight: 3 pounds, supported on face (neck strain) and at waist. Vision is somewhat limited. Sound of blower may make it difficult to hear</p>	<p>Subject to annual fit test. No beards. People who need glasses must have a spectacle kit, wear contacts, or otherwise work without glasses.</p>	<p>Not currently used. Formerly - Asbestos inspectors (OESO).</p>
Powered Air-Purifying Respirator – Tight-Fitting RRPAS		<p>A battery-operated blower (mounted in vest) pulls contaminated air through filters and adsorbent to remove airborne particulates and some gas and vapor hazards. Cleaned air is blown into facepiece. The facepiece can be converted to a negative-pressure respirator and worn without the vest unit.</p>	<p>Weight: ~12 pounds, supported mostly at shoulders. Vision is somewhat limited. Sound of moving air may make it difficult to hear. Vest is very adjustable but is cumbersome for small people.</p>	<p>Subject to annual fit test. No beards. People who need glasses must have a spectacle kit, wear contacts, or otherwise work without glasses.</p>	<p>90 Duke Police and Security Officers each have their own mask, configured to wear as a full-face negative pressure respirator. They have ~10 vest units for use if respirators must be worn for an extended period of time.</p>


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Type of Respirator	Example Photo	How the Respirator Works	Physiological stresses	Preventive conditions	Who wears this type of respirator at Duke
<p>Powered Air-Purifying Respirator – Loose-fitting full hood, “First Responder” style</p>		<p>A battery-operated blower (on waist) pulls contaminated air through filters and adsorbent to remove airborne particulates and many gas and vapor contaminants. Cleaned air is blown up a breathing hose into the hood.</p>	<p>Weight: 10 pounds, supported at waist. Vision is somewhat limited. Sound of moving air may make it difficult to hear.</p>	<p>Beards and glasses are not a problem with this type of respirator, but the facepiece may push against eyeglasses, dislodging them from their normal place.</p>	<p>~200 employees: Duke Emergency department employees, OESO technically skilled employees who are not on the HAZMAT team.</p>
<p>Powered Air-Purifying Respirator for chemicals and particulates – Loose fitting hood or helmet</p>	 <p>One example is shown above. There are several styles in this category.</p>	<p>A battery-operated blower (on waist) pulls contaminated air through filters and adsorbent to remove airborne particulates and/or some gas and vapor contaminants. Cleaned air is blown up a breathing hose into a hood or helmet.</p>	<p>Weight: 10 - 12 pounds, supported at waist. Some headpieces will have minimal weight; others may weigh 1 pound or so. Vision is somewhat limited. Sound of moving air may make it difficult to hear.</p>	<p>Beards and glasses are not a problem with this type of respirator.</p>	<p>~ 5 employees: Botany Greenhouse pesticide sprayers, Employees who work with chemicals but can't wear a negative pressure respirator (currently and historically, employees from OESO, CCIF, and Gross Anatomy have worn this type of loose-fitting PAPR.)</p>



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<p>Powered Air-Purifying Respirator – 3M AirHat</p>		<p>A battery-operated blower (in helmet) pulls contaminated air through a filter to remove particulates from the air. Cleaned air is directed down over the face.</p>	<p>Weight: Approx 4-5 pounds, on head and waist. Vision is somewhat limited. Sound of moving air may make it difficult to hear.</p>	<p>Beards and glasses are not a problem with this type of respirator.</p>	<p>~15 Steam plant employees who may have to remain in the steam plant during an asbestos emergency.</p>
<p>Powered Air-Purifying Respirator – 3M HEPA AirMate</p>		<p>A battery-operated blower (on the waist) pulls contaminated air through a filter to remove particulates from the air. Cleaned air is directed over the head and face.</p>	<p>Weight: Approx 5 pounds, on waist. Vision is somewhat limited. Sound of moving air may make it difficult to hear.</p>	<p>Beards and glasses are not a problem with this type of respirator.</p>	<p>~680 employees: Pharmacy employees who raise chemo hood sash during cleaning. Employees with animal allergy. Also used for TB, SARS and other airborne pathogens.</p>

### Detailed Information about Respirators Used at Duke

<b>Type of Respirator</b>	<b>Example Photo</b>	<b>How the Respirator Works</b>	<b>Physiological stresses</b>	<b>Preventive conditions</b>	<b>Who wears this type of respirator at Duke</b>
<p>Negative Pressure Full Face</p>		<p>Respirator seals tightly to face, covering eyes, nose, and mouth. When wearer breathes in, air is pulled across air-purifying cartridges. Interchangeable cartridges can remove particulates and some gases and vapors. Cartridge type must be compatible with hazard.</p>	<p>Weight: Approx 1 – 2 pounds, on face. Vision is somewhat limited, especially for those using spectacle kits. Increased dead space, increased breathing resistance.</p>	<p>Subject to annual fit test for required users. No beards. People who need glasses must have a spectacle kit, wear contacts, or otherwise work without glasses.</p>	<p>~160 employees: HAZMAT teams (OESO, Clinical Labs), CCIF mechanics and CCIF ee's who work with peracetic acid. Duke Police. OESO (prep for mass influx of contaminated patients). E&amp;O plumbers who work in autopsy suite, E&amp;O employee who handles water treatment chemicals. Botany Greenhouse, Asbestos workers. Steam plant (voluntary).</p>

### Detailed Information about Respirators Used at Duke

Type of Respirator	Example Photo	How the Respirator Works	Physiological stresses	Preventive conditions	Who wears this type of respirator at Duke
Negative Pressure Half Face		<p>Respirator seals tightly to face, covering nose and mouth. When wearer breathes in, air is pulled across air-purifying cartridges. Interchangeable cartridges can remove particulates and some gases and vapors. Cartridge type must be compatible with hazard.</p>	<p>Weight: &lt;1 lb., on face. Vision minimally obstructed, but facepiece may interfere with proper fit of glasses. Increased dead space, increased breathing resistance.</p>	<p>Subject to annual fit test for required users. No beards.</p>	<p>~50 employees: OESO HAZMAT. Botany Greenhouse. Asbestos workers. Golf Course &amp; Grounds workers who spray pesticides. Painters. Some ee's with animal allergies. Lab workers weighing PHS powders.</p>
Negative Pressure "filtering facepiece"		<p>Respirator seals tightly to face, covering nose and mouth. When wearer breathes in, air is pulled across mask material, which filters out particles. Some models have exhalation valve; others do not.</p>	<p>Weight: minimal, on face. Vision is somewhat limited, especially for those wearing glasses (mask may interfere with proper fit of glasses). Increased dead space, increased breathing resistance, especially for models without exhalation valve.</p>	<p>Subject to annual fit test for required users. No beards.</p>	<p>~850 employees: Most (eventually all) DLAR employees, employees with animal allergies. Those exposed to TB, SARS, or other airborne pathogens.</p>

## **Making and Communicating Medical Clearance Decisions**

### Distribution and Use of the Questionnaire

All employees who will wear respirators at Duke (except those wearing filtering facepieces voluntarily) must fill out the OSHA-mandated questionnaire. Many employees will get this questionnaire from the Occupational and Environmental Safety Office (OESO) website or directly from the Occupational Hygiene and Safety Division. Some groups of employees will get the form from EOHW, including employees with animal allergies and employees who are being placed into a position requiring respirator use (HAZMAT, Emergency Department, Police and Security Officers, clinical staff exposed to Airborne Pathogens).

### Follow up to Questionnaire Responses

According to the OSHA Respiratory Protection Standard and interpretations, EOHW must follow up with any employee who gives a positive response to any of the medical questions on the questionnaire. This follow-up is at the discretion of the “Physician or Other Licensed Health Care Provider” (PLHCP), and can include an exam and/or telephone consultation. After all needed information is gathered, the PLHCP will make a decision about medical clearance, including any restrictions on respirator use.

### Determination of Medical Clearance Restrictions

Based on the employee’s questionnaire responses and additional information gathered through telephone consultation, the PLHCP may determine that a physical exam and/or further tests are necessary. In making these decisions, and in interpreting the results of any tests, the PLHCP can use medical judgment or turn to various resources within the medical literature. A list of some available resources is included at the end of this document. This list is not exhaustive.

### Medical Clearance Expiration and Reevaluation

The OSHA Respiratory Protection Standard does not specify a frequency for re-evaluation of medical clearance, but instead says that medical clearance must be re-evaluated under certain conditions:

- An employee reports medical signs or symptoms that are related to ability to use a respirator,
- A PLHCP, supervisor, or the respirator program administrator informs the employer that an employee needs to be reevaluated,
- Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for employee reevaluation, or
- A change occurs in workplace conditions (e.g., physical work effort, protective clothing, temperature) that may result in a substantial increase in the physiological burden placed on an employee.

Accordingly, EOHW has recently begun granting “indefinite” medical clearance to some employees, and OESO is administering a yearly questionnaire at the time of training to determine if the employee has had a change in medical status or workplace conditions. This “indefinite” clearance is essentially 20 years. Employees should NOT be granted

“indefinite” clearance if they will be wearing SCBA or if they have chronic medical conditions that could worsen and further restrict medical use. In these cases, the PLHCP will grant medical clearance for shorter periods of time, based on a schedule for SCBA or on medical judgment for chronic conditions.

#### Communicating Medical Clearance Restrictions and Expiration Date

Once the PLHCP has determined appropriate restrictions and the period of clearance, this information is noted on the bottom of the first page of the questionnaire. Copies of this page are sent to the employee and supervisor. (OSHA implies that the PLHCP is required to communicate the conditions of medical clearance restrictions to the employee.)

Copies of the first and second pages are sent to the Respiratory Protection Program Administrator in OESO. **If there is a Health Recommendation Form communicating information about the medical restriction, a copy of this should also be sent to OESO.**

Portions of the Medical Clearance Questionnaire that are important in communicating with employees, supervisors and OESO are listed below:

- Type of respirator: Usually this will be indicated by OESO, to make the PLHCP aware of the type of respirator that will be required (or worn voluntarily). In cases where respirator use is suggested by EOHW (animal allergies or pregnancy restrictions), EOHW should check *all possible* types of respirators that would be adequately protective. If there is a choice, the provider should indicate this next to the types of respirators or on the “Restrictions” line. For example: “N-95, half-face with HEPA filters, or HEPA filtered PAPR required when working with mice.” If the provider is not certain about the best type of respirator, he or she should consult with the OESO Respirator Program Administrator before completing the form.
- Required or Voluntary checkbox (near types of respirators): Usually this box will be checked by someone in OESO to make the PLHCP aware of whether or not use of the respirator is required. In cases where respirator use is suggested by EOHW (animal allergies or pregnancy restrictions), EOHW will need to check one of these boxes.
- Section below “**For Employee Occupational Health Services (EOHS) use only**”: This section allows the PLHCP to note what types of respirators the employee is cleared to wear. There is also a space for noting any restrictions. The PLHCP may check the standard restriction, “Employee may decline respirator-requiring assignments for temporary health-related difficulties”, or may write in a specific restriction. The PLHCP then writes in a date through which the clearance is valid (for employees with chronic health problems or anyone wearing an SCBA), or checks that the employee will fill out an annual questionnaire at the time of their training. Please note that this option can only be checked for required respirator users, as voluntary users are not trained annually. The PLHCP should put in a specific expiration date for voluntary users.

## **Additional Resources**

Book:

McLellan, RK and Schusler, KM. *Guide to the Medical Evaluation for Respirator Use*. OEM Press: 2000.

Journal Articles:

Johnson, A et al. "Effect of Respirator Inspiratory Resistance Level on Constant Load Treadmill Work Performance, *AIHA Journal*:60(4):474-479 (1999-July/Aug).

Martyny, J et al. "Current Concepts: Respiratory Protection", *New England Journal of Medicine*: 347 (11): 824-830, (2002-Sept).

Muhm, J. "Medical Surveillance for Respirator Users", *JOEM* 41(11):989-994 (1999-Nov).

Pappas, G et al. "Medical Clearance for Respirator Use: Sensitivity and Specificity of a Questionnaire", *Am J Ind Med*, 35:395-400 (1999).

Szeinuk, J et al. "Medical Evaluation for Respirator Use", *Am J Ind Med*, 37:142 – 157 (2000).