

Selection and Use of Respiratory Protection Equipment

Nuclear Secured / Radiation Safety

NS-RS-PR-601, 0

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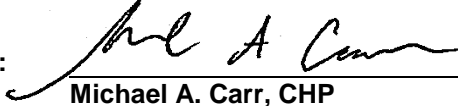
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History and Approvals

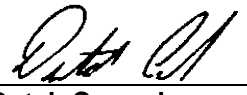
History

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Approvals

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1. Purpose and Scope

1.1. Purpose

The purpose of this procedure is to describe the process by which respiratory protection equipment is selected and used for personnel protection. Measures shall be implemented in order to determine the necessary respiratory protection requirements to ensure personnel exposures are maintained as low as reasonably achievable (ALARA). It should be noted that this procedure only addresses airborne radioactive hazards, most commonly particulate. When addressing non-particulate airborne radiation hazards such as gases (e.g., ⁸⁵Kr and ¹²⁹I) or vapours (e.g., tritium ³H), consult the PHP for any additional requirements to this procedure.

1.2. Scope

This procedure is for the exclusive use of Nuclear Secured (NS) personnel and subcontractors who may be required to wear respiratory protection at the project site where the NS Radiation Protection Program (RPP) has been implemented and NS has the primary role in controlling exposures to on-site personnel.

2. References

- 2.1. ANSI/ASSE Z88.2, *Practices for Respiratory Protection*, 2015
- 2.2. 29CFR1910.134, *Labor – Respiratory Protection*
- 2.3. 10CFR20 Subpart H, *Energy – Standards for Protection against Radiation; Respiratory Protection and Controls to Restrict Internal Exposure in Restricted Areas*
- 2.4. US NRC, NUREG-0041, *Manual of Respiratory Protection against Airborne Radioactive Materials*, 2001
- 2.5. US NRC, Regulatory Guide 8.15, *Acceptable Programs for Respiratory Protection*, 1999
- 2.6. AE-SH-PR-002, *Incident Reporting and Notification*
- 2.7. NS-RS-PG-001, *Radiation Protection Program*
- 2.8. NS-RS-PG-002, *Respiratory Protection Program*
- 2.9. NS-RS-PR-102, *Project Records Management*
- 2.10. NS-RS-PR-600, *Respirator Fit Testing*
- 2.11. NS-RS-PR-602, *Inspection, Maintenance and Control of Respiratory Protection Equipment*
- 2.12. NS-RS-PR-501, *Air Sampling and Analysis*

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3. General

3.1. Definitions

- 3.1.1. *Air Purifying Respirator (APR)* – A respirator with an air purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air purifying element.
- 3.1.2. *Assigned Protection Factor (APF)* - The expected workplace level of respiratory protection that would be provided by a properly functioning respirator or a class of respirators to properly fitted and trained users.
- 3.1.3. *Clean Shaven* - No facial hair between the individual's face and the respirators facepiece seal.
- 3.1.4. *Derived Air Concentration (DAC)* - The concentration of a given radionuclide in air which, if breathed by the reference man for a working year of 2,000 hours under conditions of light work (i.e., breathing rate of 1.2 m³/hr), would result in an intake of one ALI.
- 3.1.5. *Dust Mask* – A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.
- 3.1.6. *Fit Factor* - A quantitative estimate of the fit of a particular respirator to an individual estimating the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when it is worn.
- 3.1.7. *Fit Test* - A protocol used to either quantitatively or qualitatively evaluate the fit of a respirator to an individual.
- 3.1.8. *High-Efficiency Particulate Air (HEPA) Filter* – A filter that is at least 99.97% efficient in removing monodispersed particles of 0.3 micrometers in diameter. The equivalent NIOSH approved particulate filters include the N100, R100 and P100 filters.
- 3.1.9. *Immediately Dangerous to Life or Health (IDLH)* – An atmosphere which poses an immediate hazard or threat to life or produces immediate irreversible debilitating effects on health.
- 3.1.10. *Negative Pressure Respirator* - A respirator in which the air pressure inside the facepiece is negative with respect to the ambient air pressure outside the respirator during inhalation.
- 3.1.11. *Oxygen Deficient Atmosphere* – An atmosphere with oxygen content that is less than 19.5% by volume.
- 3.1.12. *Positive Pressure Respirator* - A respirator in which the pressure inside the respirator exceeds the ambient air pressure outside the respirator.

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- 3.1.13. *Powered Air Purifying Respirator (PAPR)* - An air purifying respirator that uses a blower to force the ambient air through the air purifying element for which inhalation and exhalation resistance is negligible similar to a continuous flow air-line device.
- 3.1.14. *Self-Contained Breathing Apparatus (SCBA)* - An atmosphere supplying respirator for which the breathing air source is designed to be carried by the user.
- 3.1.15. *Supplied Air Respirator or Air-Line Respirator* – At atmosphere supplying respirator for which the source of breathing air is not designed to be carried by the user.
- 3.1.16. *Tight Fitting Facepiece* - The respirator covering forming a complete seal with the face.

3.2. Responsibilities

Depending on personnel qualifications and the size of the project, project personnel may be assigned multiple roles and/or responsibilities.

3.2.1. NS Radiation Safety Officer

The NS Radiation Safety Officer (RSO) maintains and oversees the implementation of the NS RPP and Respiratory Protection Program. The RSO shall ensure that radiation safety, radioactive materials management, and radiological operations procedures and programs are kept up to date such that they comply with current regulations and incorporate current and relevant industry practices and regulatory guidance. The RSO is also responsible for the review of all personnel exposure records and to ensure exposures are maintained below regulatory and NS administrative limits as applicable.

The specific RSO responsibilities relative to the Respiratory Protection Program include:

- Review of any ALARA evaluations,
- Approval of the use for respiratory protection,
- Approval of the type of respiratory protection equipment, and
- Evaluation of the Respiratory Protection Program as implemented through records review and/or site inspection.

3.2.2. Project Manager

The Project Manager (PM) is responsible for ensuring that the proper procedures and programs are implemented on the project site as required by customer agreements and contracts. The PM is responsible for ensuring that these programs and procedures are properly incorporated into project specific plans and procedures. The PM is responsible for ensuring that the NS RPP and client programs and procedures, as applicable, are available for use by project personnel. The PM shall also ensure that

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anyone donning respiratory protection equipment meets the minimum requirements to wear a respirator in accordance with NS-RS-PG-002, *Respiratory Protection Program*.

3.2.3. Project Health Physicist

The Project Health Physicist (PHP) is responsible for assisting the RSO with the review of personnel exposure records and providing health physics support to the PM and Radiation Protection Supervisor (RPS). This includes technical support to ensure procedural and regulatory compliance. The PHP is also responsible for evaluating the need for respiratory protection and obtaining approval from the RSO for the type and use of respiratory protection equipment.

3.2.4. Radiation Protection Supervisor

The Radiation Protection Supervisor (RPS) manages and oversees the project personnel in regards to radiation and respiratory protection and reports directly to both the PM and the RSO. The RPS is responsible for implementing the NS RPP at the project location. The RPS manages and oversees the project personnel in regards to radiation and respiratory protection and reports directly to both the PM and the RSO. The RPS shall in conjunction with the PM, shall ensure that all personnel donning respiratory protection equipment are qualified. The RPS is also responsible for ensuring that the proper respiratory protection equipment is available and provided as needed.

3.2.5. Project Personnel

Project personnel that wear respiratory protection are responsible for complying with the requirements of NS-RS-PG-002, *Respiratory Protection Program* and the associated implementing procedures. They are responsible to ensure their training, medical evaluation and fit test are current and that they properly don and wear respiratory protection equipment as required. In the event of any personal medical condition that may arise, the wearer is responsible to notify the PM and the RPS such that the proper evaluations may be performed to ensure they are still fit to wear respiratory protection equipment.

3.3. Precautions and Limitations

3.3.1. Reasonable limits should be established for the length of time or duration that individuals may continuously work while wearing respiratory protection. Specific consideration shall be taken for working in hot and humid atmospheres to ensure personnel protection from heat stress and exhaustion.

3.3.2. Air purifying respirators shall not be used in areas that are determined to be IDLH or Oxygen deficient.

3.3.3. The presence of other hazards such as irritants, vapors and fumes shall be considered when evaluating the use of contact lenses.

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- 3.3.4. Personnel may wear contact lenses rather than using a spectacle kit as approved by the PHP and/or Health and Safety provided the wearer has demonstrated successful experience in wearing such lenses during training and fit testing.

4. Pre-Requisites / Requirements

- 4.1. Individuals shall have a current medical evaluation specifying that they can wear respiratory protection and have current respiratory protection training prior to donning any respiratory for fit-testing.
- 4.2. Only respirators and associated equipment that has been tested, certified and approved by the National Institute for Occupational Safety and Health (NIOSH) and as approved by the RSO shall be used for respiratory protection.
- 4.3. Respiratory protection equipment shall be used in accordance with the manufacturer's instructions and NS-RS-PG-002, *Respiratory Protection Program*.
- 4.4. Respirator fit testing shall be performed for each respirator including the manufacturer, model and size respirator that will be worn in accordance with NS-RS-PR-600, *Respirator Fit Testing*.
- 4.5. Nothing shall interfere with the face to facepiece seal including facial hair. Personnel wearing respiratory protection shall be clean shaven and meet the facial hair policy as illustrated in Attachment 7.1.
- 4.6. Ensure that personnel are issued the proper respiratory protection and APF as required based on the type and concentration of the airborne hazards.
- 4.7. Ensure an adequate air sampling plan has been implemented in accordance with NS-RS-PR-501, *Air Sampling and Analysis* to properly monitor personnel.
- 4.8. If the airborne hazard cannot be identified or reasonably estimated, the atmosphere shall be considered to be Immediately Dangerous to Life or Health (IDLH).
- 4.9. Respiratory protection equipment shall be provided as required. Use of personal respirators is prohibited.

5. Procedure

5.1. Respirator Selection

- 5.1.1. Identify and evaluate the airborne and respiratory hazards in the workplace in order to properly select the appropriate respiratory protection equipment and APFs as necessary. This shall include, to the maximum extent practical, a review and understanding of the following:

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- Contaminants of concern,
- Type of respiratory hazard(s) (e.g., particulate, gases, fumes, etc.),
- Anticipated or measured airborne concentrations,
- Chemical form or respiratory hazard class (Class D, W or Y),
- Protection factors as provided for the various types of respirators and air filtering media, and
- IDLH or oxygen deficient atmosphere.

5.1.2. Assess the work environment which may impact respirator selection including the following factors:

- Anticipated duration of use,
- Type of work activities and work effort,
- Worker mobility and safety,
- Communications,
- Temperature and humidity, and
- Performance limitations and benefits of respiratory protection equipment and filter media.

5.1.3. As applicable, an ALARA evaluation shall be performed in accordance with NS-RS-PG-002, *Respiratory Protection Program* for High Radiation Areas to determine if respiratory protection equipment should be worn.

5.1.4. Select appropriate respiratory protection based on the airborne hazards, concentrations, and work conditions. The following provides some guidance on the selection of the appropriate respiratory protection equipment.

5.1.4.1. For IDLH and oxygen deficient atmospheres, an atmosphere supplying respirator shall be used such as an SCBA or air-line. An APR shall not be used for IDLH or oxygen deficient atmospheres.

5.1.4.2. For air-line use, an auxiliary escape bottle shall be provided.

5.1.4.3. For airborne particulate less than 10 DAC, a full face APR or PAPR should be used with a HEPA filter. Half-face respirators may be used on a case by case basis as approved by the RSO depending on safety concerns, etc.

5.1.4.4. For airborne particulate greater than 10 DAC but less than 50 DAC, a full face APR or PAPR should be used.

5.1.4.5. For airborne particulate greater than 50 DAC, specific consideration shall be given to the duration of exposure in determining the respiratory protection equipment and the implementation of a bioassay program.

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- 5.1.4.6. For gases and vapors, full face respiratory protection with hazard specific or combination filters shall be considered.
- 5.1.4.7. For extended wear, PAPRs and hoods should be considered as these help minimize the stresses placed on the employees.
- 5.1.5. Submit a request to use respiratory protection to the PHP and/or RSO. This shall include a list of the type of respiratory protection equipment such as the manufacturer and model, copies of the NIOSH certifications and justification for respirator use.
- 5.1.6. The RSO shall approval all respiratory protection use.

5.2. Filter Media (Cartridge) Selection

- 5.2.1. Cartridge selection shall be based on the type of radiological hazards present, (i.e., particulate, gases or vapors).
- 5.2.2. Cartridge types are designated by color with their intended use as specified on the cartridge and packaging. Combination filters are designated by multiple colors on the cartridge.
- 5.2.3. HEPA filter cartridges shall be used for airborne particulate and are typically designated by a magenta color.
- 5.2.4. For airborne gases and fumes, the PHP shall be consulted and specific cartridges shall be selected based on the radionuclides of concern.
- 5.2.5. Respirator cartridges are typically intended for one-time use; however they may be re-used as specified by the PHP depending on such factors such as the dose rate on the filters, filter loading or time of use.

5.3. Respirator Use

- 5.3.1. Maintain positive control over the issuance of respiratory protection equipment to ensure personnel are qualified and authorized to wear respiratory protection.
- 5.3.2. Prior to respirator issue, the RPS shall ensure that the individual has a current medical evaluation, respiratory training and proper fit test.
- 5.3.3. The RPS shall post or maintain a Respirator Use Authorization form, Attachment 7.2, at the point of equipment issue documenting those personnel who are authorized to wear respiratory protection equipment, the type, model and size respirator they may wear and when their qualifications expire or re-evaluation is required for continued use.

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- 5.3.4. The wearer shall verify that they are still authorized to wear respiratory protection and select the appropriate respiratory protection equipment from the respirator inventory provided. Respirator use shall be documented on the Respirator Issue Log or Sign-out Sheet, Attachment 7.3 indicating the type, model, size and date of use.
- 5.3.5. The wearer shall inspect the respiratory protection equipment in accordance with NS-RS-PR-602, *Inspection, Maintenance and Control of Respiratory Protection Equipment* prior to donning to ensure the equipment is in operating condition. Specific attention should be given to the face to facepiece seal, straps, filtering media, inhalation and exhalation valves and gaskets.
- 5.3.6. Don the respirator in accordance with the manufacturer's instructions and as instructed during respiratory protection training.
- 5.3.7. Perform a daily seal check in accordance with Section 5.5 to ensure a good face to facepiece seal.
- 5.3.8. The RPS and PHP shall assign the appropriate respiratory protection factor in accordance with NS-RS-PG-002, *Respiratory Protection Program* depending on the type of respiratory protection equipment issued and used.
- 5.3.9. Any voluntary use of respiratory protection equipment shall be approved by the PHP and/or RSO and performed in accordance with the Respiratory Protection Program requirements as provided NS-RS-PG-002, *Respiratory Protection Program*.

5.4. Corrective Lenses

- 5.4.1. If corrective lenses are required, a spectacle kit shall be issued and used to secure the corrective lenses inside the respirator unless the PHP and/or Health and Safety have approved the use of contact lenses.
- 5.4.2. The spectacle kit and corrective lenses shall be fitted to provide good vision and shall be worn in a manner such that they do not interfere with the face to facepiece seal.
- 5.4.3. When doffing the respirator, ensure that the corrective lenses and spectacle kit are removed from the respirator, surveyed and released for re-use.

5.5. Daily Seal Check

- 5.5.1. On each time a tight fitting full-face or ½ face respirator is donned, a face to facepiece seal check shall be performed to ensure a good fit.
- 5.5.2. Cover the filter inlet using the palms of your hands.
- 5.5.3. Inhale slightly to partially collapse the respirator and hold your breath for 5 to 10 seconds.

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- 5.5.4. If the respirator remains partially collapsed for the duration that your breath is held, there is a good face to facepiece fit. If not, readjust the respirator and re-perform.
- 5.5.5. Cover the exhalation valve with the palm of your hand.
- 5.5.6. Slightly exhale and hold your breath to cause a slight positive pressure within the respirator.
- 5.5.7. If the respirator remains inflated, there is a good face to facepiece fit. If not, readjust the respirator and re-perform both the negative and positive seal check until a good fit is obtained.
- 5.5.8. If a good fit cannot be obtained, exchange the respirator or select a different size that you have been fit tested to and perform the seal check.

5.6. Supplied Air

- 5.6.1. All supplied air shall be at least Grade D quality.
- 5.6.2. Air intakes should be positioned and protected to prevent any airborne contaminants from being drawn into the system.
- 5.6.3. Suitable in-line air purifying sorbent beds and filters shall be used on air intakes for breathing air compressors and they shall be maintained and replaced or refurbished in accordance with the manufacturer's instructions.
- 5.6.4. Both high temperature and carbon monoxide alarms shall be placed on the discharge for oil lubricated breathing air compressors.
- 5.6.5. Any breathing air supply manifolds located inside a contaminated area should be equipped with covers or caps to protect them from becoming contaminated.
- 5.6.6. Stand-by rescue personnel shall be immediately available whenever air supply lines or hoods are used in the event of equipment failure or any other reason that necessitates relief.
- 5.6.7. Stand-by personnel shall maintain direct line of site or direct communications with workers using supplied air and shall have the training and qualification commensurate with the hazards.

5.7. Respirator Relief

- 5.7.1. Personnel shall leave the work area while working in respiratory protection following normal exiting procedures and immediately contact the RPS or PM if any of the following are experienced:

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- Equipment malfunction,
- Physical or emotional distress,
- Procedural or communications failure,
- Significant deterioration or change in working condition, or
- Any other condition that may require relief.

5.7.2. If necessary, immediate relief from respiratory protection may be taken for medical reasons. Immediately leave the area following normal exiting procedures and contact the RPS or PM and the RSO.

5.7.3. For areas which are considered IDLH, the individual must leave or be removed from the area prior to respirator relief.

6. Records

- 6.1. Respirator Use Authorization
- 6.2. Respirator Issue Log or Sign-out sheet

7. Appendices and Forms


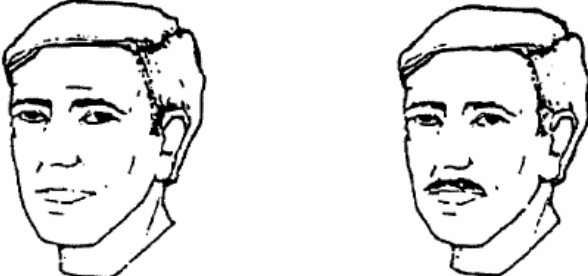






- 7.1. Facial Hair Policy Illustrations
- 7.2. Respirator Use Authorization
- 7.3. Respirator Issue Log or Sign-out Sheet

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Attachment 7.1

Facial Hair Policy Illustrations

Respirators will not be issued to individuals unless the indicated sealing surfaces are clean-shaven.

 <p>The shaded portions are the respirator seal areas. Facial hair is not permitted on these portions of the face.</p>	 <p>Acceptable</p>	
<p>Unacceptable</p>		
 <p>Full Beard</p>	 <p>Goatee & Narrow Mustache</p>	 <p>Goatee & Wide Mustache</p>
 <p>Extended Side Burns</p>	 <p>Fu Manchu Mustache</p>	 <p>Wide Mustache</p>

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Attachment 7.2

Respirator Use Authorization

Name	ID ^a	Respirator Info		Training and Qualifications (Due Date) ^b		
		Model	Size	Med. Eval.	Training	Fit Test

- a** The personnel ID is typically the last 4 digits of their social security number. The ID may also be the employee ID number.
- b** There is a 90 day grace period in order to schedule and perform the medical evaluation, respiratory protection training and fit testing

Reviewed by: _____ Date: _____

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Attachment 7.3

Respirator Issue Log or Sign-out Sheet

Name	ID ^a	Respirator Issue		Initial	Date
		Model	Size		

a The personnel ID is typically the last 4 digits of their social security number. The ID may also be the employee ID number.

Reviewed by: _____ Date: _____