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Emergency Responder Health and Safety

Chapter 4

Respiratory Protection Program

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LIST OF ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
APF	Assigned protection factor
APR	Air-purifying respirator
ASR	Atmosphere-supplying respirator
CBRN	Chemical, biological, radiological, and nuclear
CFR	Code of Federal Regulation
CGA	Compressed Gas Association
CO	Carbon monoxide
CO_2	Carbon dioxide
DOT	Department of Transportation
ESLI	End-of-service-life indicator
EPA	U.S. Environmental Protection Agency
FF	Fit factor
FID	Flame ionization detector
HASP	Health and safety plan
HAZWOPER	Hazardous Waste Operations and Emergency Response (OSHA standard)
HEPA	High efficiency particulate air (filter)
HQ	Headquarters
IDLH	Immediately dangerous to life or health
mg/m^3	Milligrams per cubic meter
MUC	Maximum use concentration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NIOSH	National Institute for Occupational Safety and Health
O&M	Operation(s) and maintenance
OLEM	Office of Land and Emergency Management (formerly called Office of Solid Waste and Emergency Response (OSWER))
OSC	On-Scene Coordinator
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor)
PAPR	Powered air-purifying respirator
PEL	OSHA's permissible exposure limit
PID	Photo ionization detector
PLHCP	Physician or other licensed health care professional
PNOR	Particles not otherwise regulated
PPE	Personal protective equipment
ppm	Parts per million
QLFT	Qualitative fit test
QNFT	Quantitative fit test
RAM	Peal-time aerosol monitor
REL	NIOSH's recommended exposure limit
SCBA	Self-contained breathing apparatus
SHEMP	Safety, Health, and Environmental Management Program
SSD	Safety and Sustainability Division (formerly called Safety, Health and Environmental Management Division (SHEMD))
TLV	ACGIH's threshold limit values
WMD	Weapons of mass destruction

1.0 INTRODUCTION

1.1 Background Information and Regulatory Basis

The U.S. Environmental Protection Agency (EPA) provides respiratory protection to employees who enter atmospheres that contain unhealthy concentrations of contaminants, are suspected to be deficient of oxygen, or where toxic agents could be released. This chapter provides specific requirements that all EPA organizations must meet in order to implement a respiratory protection program for emergency responders. These requirements have been established to ensure that:

- Emergency responders who wear respirators are covered by an OSHA-compliant written respiratory protection program that addresses the topics listed below.
  - Selecting respirators (Section 3.1)
  - Providing appropriate medical evaluations (Section 3.2)
  - Fit-testing (Section 3.3)
  - Using respirators properly (Section 3.4)
  - Cleaning, storing, inspecting, and maintaining respirators (Section 3.5)
  - Managing breathing air for air-supplying respirators (Section 3.6)
  - Training (Section 3.7)
  - Informing voluntary users of respirators (Section 3.8);
- Nationally consistent recordkeeping practices are implemented (Section 4.0); and
- Evaluations are performed to assess the effectiveness of EPA's respiratory protection program for emergency responders and to foster continual improvement (Section 5.0).

The following standards, guidance, mandates, and consensus standards provide the legal authority and establish the applicability and requirements for a respiratory protection program:

- 29 CFR 1910.134, OSHA's Respiratory Protection Standard.
- EPA Safety, Health, and Environmental Management (SHEM) Guideline No. 46, Respiratory Protection, dated October 2004.
- 29 CFR 1910.120, OSHA's Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard.
- 29 CFR 1910 Subpart Z and 1926 Subpart Z, OSHA's Toxic and Hazardous Substances Standard.
- ANSI Z88.2-1992, American National Standards Institute (ANSI), Standard Practices for Respiratory Protection.
- Compressed Gas Association G-7.1-1997, Commodity Specification for Air.
- ANSI Z88.10-2001, ANSI, Respirator Fit Testing Methods.
- 42 CFR 84, National Institute for Occupational Safety and Health's (NIOSH's) Respiratory Protective Devices.
- NIOSH Respirator Selection Logic, Publication No. 2005-100.
- EPA Order 1460.1, Occupational Medical Surveillance Program, June 18, 1996.
- 40 CFR 300, et seq., EPA's National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

- 29 CFR 1960, Basic Program Elements for Federal Employees, OSHA.
- 49 CFR 173 and 178, the Department of Transportation's General Requirements for Shipping and Packaging.
- ANSI Z48.1-1954, American National Standards Institute (ANSI) Method for Marking Portable Compressed Gas Containers to Identify the Materials Contained.
- 40 CFR 750, EPA's Procedures for Rulemaking under Section 6 of the Toxic Substances Control Act.
- 10 CFR 20, Standards for Protection against Radiation, NRC.

The procedures presented in this chapter represent the minimum requirements that EPA organizations must meet to use respiratory protection safely.

1.2 Instructions for Users

In accordance with OSWER Directive 9285.3-12, this chapter must be implemented across all EPA regions, the Environmental Response Team (ERT), the Consequence Management Advisory Team (CMAT), and Headquarters (HQ). This means each EPA organization must adopt the minimum Agency requirements and management practices listed in the chapter and produce a customized version of the chapter which is reviewed and updated on an annual basis.

To customize the chapter, users must (1) complete Appendix A and (2) insert organization-specific information into the blank spaces (highlighted in yellow) that appear throughout the chapter. If organizations advocate additional policies and procedures exceeding the minimum agency requirements, they must document them in Appendix B. Tools have been developed to support this chapter, including a glossary (Appendix C) and a consolidated list of Internet resources (Appendix D).

EPA emergency responders must produce individual respiratory protection programs containing worksite-specific information, including a hazard evaluation, for each site where respirators are used. The hazard evaluation performed for the site-specific health and safety plan (HASP) may be used to support the site-specific respiratory protection program. To avoid requiring two separate documents, OSHA allows information about respiratory protection equipment selection, use, and care to be incorporated into the HASP (Text Box 1). Appendix E provides a summary site-specific respiratory protection program worksheet for field activities that is suitable for incorporating into a HASP. To use this summary, users must complete the summary with organization and site information, and then attach the summary to the HASP.

Text Box 1
Site-Specific Written Respiratory Protection Programs

OSHA has clarified that in the case of emergency response activities, simply referencing a HASP in a generic respiratory protection program does not constitute a site-specific program. However, if specific information regarding respirator use is included in the HASP, the HASP itself can satisfy the requirement for a site-specific written respiratory protection program [Reference: *Clarification on the New Respiratory Protection Standard (1910.134) for EPA/Labor Superfund Health and Safety Task Force*].

See the Introduction to this manual for details on customizing and posting an organization's respiratory protection program to EPA's Web site (http://www.epaosc.org/_HealthSafetyManual).

2.0 ROLES AND RESPONSIBILITIES

The Director of EPA's Safety and Sustainability Division (SSD) has been designated as the Respiratory Protection Program Administrator. The Program Administrator has, in turn, delegated specific roles and responsibilities for implementing the Agency's respiratory protection program to Health and Safety Program Contacts (HSPCs) and Safety, Health, and Environmental Management Program (SHEMP) Managers. Removal Managers and individual emergency responders also have responsibilities. Appendix A details the tasks that these key personnel must perform. If an organization wishes to delegate a task to someone other than the default assignment in the appendix, users can do so when they customize Appendix A and when they fill in the yellow-highlighted areas that appear throughout the chapter's text.

3.0 RESPIRATORY PROTECTION PROGRAM

The remaining sections of this chapter are organized as a respiratory protection program and reflect provisions of OSHA's Respiratory Protection standard, 29 CFR 1910.134(c)(1), and EPA SHEM Guideline No. 46, Respiratory Protection.

3.1 Procedures for Selecting Respirators

3.1.1 Conducting a Hazard Evaluation

Emergency responders must perform task-by-task hazard evaluations to determine whether control measures and respirators are needed to address airborne contaminants at a particular site. In cooperation with other onsite personnel, emergency responders must obtain details regarding hazardous contaminants, work areas, work activities, and related site-specific information. (See Appendix E-2 for a site/tool specific hazard evaluation form and Appendix E-3 for a list of things to consider when performing a hazard evaluation). If this information is incorporated into a HASP, the HASP can serve as the hazard evaluation for the respiratory protection program. In addition, if a work area has been occupied by another organization that developed a respiratory protection program, HASP, or hazard evaluation, EPA employees may find it helpful to obtain and review these documents.

3.1.2 Using Controls to Minimize Hazards

Once the hazards have been identified, emergency responders must determine which types of control measures are required to minimize the hazard (Table 1). OSHA requires that engineering, work practice, or administrative controls be used to minimize hazards whenever feasible. Worker rotation should not be used as a means to avoid the use of respiratory protection in areas with elevated airborne contaminants. If control methods do not reduce the hazard to an acceptable level, emergency responders must use respiratory protection to supplement these control efforts.

Table 1
Examples of Control Measures Used to Reduce Hazards

- Substituting hazardous materials or operations for safer ones.
- Enhancing ventilation of enclosed areas.
- Isolating hazardous operations from workers.
- Using wet methods for dust suppression.
- Decontaminating the work area.
- Implementing other methods that control the contaminant source.

3.1.3 Who Chooses Which Type of Respirator to Use?

When respiratory protection is needed, EPA employees, their contractors, or other responsible parties involved with the site must suggest the appropriate level of respiratory protection. The SHEMP Manager (or another designated person) must then confirm that the selection is appropriate, based on the available information.

Regardless of who makes the selection, the individual emergency responder must review the selection and decide whether he or she accepts the selection before entering a hazardous environment. If inadequate information is available to make a respirator selection, EPA employees may make the decision not to enter a hazardous environment.

3.1.4 Parameters to Consider When Choosing Respirators

There are many types of respirators available to cover the full range of exposure situations that might be encountered by emergency responders. Table 2 provides a summary of the types and characteristics of respirators.

Table 2
Respirator Types and Characteristics

Inlet Covering - Every respirator has an inlet covering, the part of the respirator between the user's respiratory tract and the air-purifying device or breathing air source. Inlet covering types and examples include:			
Tight-fitting • Quarter-mask • Half-mask • Full-facepiece • Mouthbit/nose clamp		***Loose-fitting*** • Hood • Helmet • Loose-fitting facepiece	
Respirator Types	**Typical Inlet Covering**	**Details**	**Example(s)**
Air-purifying			
Filtering facepieces	Tight-fitting	As user inhales, air passes through a facepiece made of filter material.	Dust masks
Air-purifying respirators (APR)	Tight-fitting	As user inhales, air passes through air-cleaning filters, cartridges, or canisters.	Half- or full-facepiece respirator with particulate filters (non-powered)
Powered air-purifying respirators (PAPR)	Tight- or loose-fitting	A fan passes air through air-cleaning filters or cartridges.	Full-facepiece PAPR

Air-supplied			
Atmosphere-supplying respirators (ASR)	Tight- or loose-fitting	Supplies air from a source independent of the ambient atmosphere (e.g., via an airline or using a compressed gas tank containing an acceptable quality of breathing air (Grade D). A *regulator* controls the rate at which air flows to the inlet covering.	• Supplied-air respirator (SAR), also called an airline respirator • Self-contained breathing apparatus (SCBA)
Escape			
Escape-only respirators are intended for employees whose only action is to leave the area immediately and take no part in the response Can be either negative or positive pressure and either APR or ASR	Tight- or loose-fitting	• Sole function is to allow a person working in a normally safe environment sufficient time to escape from suddenly occurring respiratory hazards. • May use an air cleaning device or provide air from a small compressed gas tank (bottle). • Usually single use.	• Emergency life support apparatus (ELSA) • Mouthbit
Standard issue configuration for Emergency Responders			
Standard issue respirator	Tight-fitting full-facepiece	Configured as: • APR • PAPR (regulator in continuous flow mode) • SCBA (regulator in positive-pressure open-circuit mode) • Airline (connected to appropriate cascade system)	OSC standard issue respirator brand, including full facepiece and configured as indicated

Escape devices have a single function: to allow a person working in a normally safe environment sufficient time to escape from suddenly occurring respiratory hazards. Given this function, selection does not rely on assigned protection factors. Instead, these respirators are selected based on the time needed to escape and the likelihood of immediately dangerous to life or health (IDLH) or oxygen deficiency conditions.

3.1.4.1 Acceptable Respirators EPA's Standard Issue for Emergency Responders

To promote consistency and interchangeability among emergency responders, EPA has selected the Scott (Scott Health & Safety, a unit of Tyco International Ltd.) brand as the standard issue respirator. Appendix F contains information about the brand, model, acceptable configurations, and specific care instructions for the standard issue respirator.

Emergency responders primarily use tight-fitting full facepieces as either negative-pressure air-purifying respirators (APRs) or atmosphere-supplying respirators (ASRs).

When selecting a respirator, emergency responders must choose from the EPA-designated standard issue equipment unless the individual cannot achieve an acceptable fit using the standard issue facepiece. In these instances, the emergency responder should try another model full facepiece of the standard brand. If an acceptable fit cannot be achieved, then another brand or style of respirator may be substituted for the standard issue respirator. Appendix F-1 lists alternate respirator brands and models for emergency responders. For information on what constitutes an acceptable fit, see Section 3.3.

EPA emergency responders must receive permission from the SHEMP Manager (or another designated person) to use other (non-standard issue) respirators during emergency or hazardous operations. In all cases, alternate respirator types must be approved by NIOSH and the make and model must be listed in Appendix B.

3.1.4.2 A Word about Facepieces

The standard issue respirator configurations listed in Appendix F include only tight-fitting full facepieces. These full facepieces meet the current definition of respiratory protection for *Level C personal protective equipment (PPE)* (for additional information on Level C PPE, see the manual's PPE Program chapter).

Employees may use half-mask respirators only where a need has been identified and an appropriate hazard evaluation has been conducted and approved by the SHEMP Manager (or another designated senior health and safety person). The decision to use a half-mask respirator is made case-by-case, based on specific criteria including the presence of physical and respiratory hazards or eye hazards, and availability of personnel monitoring results, predictable contaminant levels, and an appropriate fit test (see Appendix E-4 for details).

Half-mask and quarter-mask respirators may be used on a voluntary basis outside of an exclusion zone during low hazard operations. Selection and use of half- and quarter-mask respirators must be in accordance with OSHA's 29 CFR 1910.134. Section 3.8 of this chapter outlines requirements for voluntary respirator use.

3.1.5 Determining the Level of Protection Needed

Decisions regarding the level of respiratory protection for EPA employees are based on the NIOSH Respirator Selection Logic and information on the worksite conditions (developed during a hazard evaluation). Decision-makers (e.g., OSC, Onsite Safety Officer, SHEMP Managers, HSPCs, or another designated person) must be familiar with this selection process. To assist them, the following procedures, guides, tools, links, and Table 3 – Respirator Selection Logic for EPA Emergency Responders are provided (other respirator selection tools may also be used):

Step	Condition / Hazard	Selected Respirator
1	Will respirator be used for firefighting?	If yes, only use a full-facepiece, pressure-demand SCBA meeting the requirement of the NFPA 1981. If no, go to Step 2.
2	Will respirator be used in an oxygen-deficient atmosphere, (i.e., less than 19.5 percent oxygen)?	If yes, use any type of SCBA (other than escape only) or supplied-air respirator (SAR) with an auxiliary SCBA. If no, go to Step 3.
3	Does situation involve entry into unknown or IDLH atmospheres (e.g., an emergency situation)?	If yes, use a pressure-demand SCBA with a full facepiece or a pressure-demand SAR with a full facepiece in combination with an auxiliary pressure-demand SCBA. If no, go to Step 4.

Step	Condition / Hazard	Selected Respirator
4	Is exposure concentration(s)[a] less than 0.5 the limit (NIOSH REL, OSHA PEL, ACGIH TLV or other applicable limit)?	If yes, a respirator is not required for routine work.[b] If yes, but an escape respirator is being considered, go to step 5. If no, a respirator is needed – go to Step 6.
5	If respirator fails, or situation changes unexpectedly, can worker escape from the work area without suffering loss of life or irreversible health effects (immediate or delayed)?	If yes, go to Step 6. If no, return to Step 3 to select a respirator for IDLH conditions. OR If appropriate, choose an escape respirator following guidelines in the 2004 NIOSH Respirator Selection Logic - Section IV- Escape Respirators
6	Is the contaminant an eye irritant or can it cause eye damage at the workplace concentration?	If yes, a respirator equipped with a full facepiece is recommended. Go to Step 7. If no, with SHEMP Manager approval, a half-mask respirator may be an option, depending on the exposure concentration and other criteria listed in Appendix E-4. Go to Step 7.
7	Calculate the maximum use concentration (MUC)[c,d]	MUC = 0.5 PEL X APF APF = 10 for half-mask, 50 for full-facepiece. If particulates are present go to Step 8, if vapor/gases are present go to Step 9, and if both are present go to Step 10.
8	Particulate contaminant(s)?	Use P-100 cartridge only[e,f]
9	Gas/vapor contaminant(s)?	Use an air-purifying chemical cartridge/canister respirator suitable for the chemical properties of the anticipated gas/vapor contaminant(s) and for the anticipated exposure level(s)[e,f]
10	Combination of particulate and gas/vapor(s)?	Use P-100 / appropriate gas-vapor combination cartridge.[e,f] For multi-component mixtures calculate the sum: $C_1/MUC_1 + C_2/MUC_2 + \ldots C_n/MUC_n = X$ The respirator is acceptable if sum of ratios (X) is <1; unacceptable if sum of ratio is >1.

[d] Cap the MUC below the IDLH.
[e] Do not exceed the MUC calculated for the respirator selected.
[f] If an escape respirator is also needed, refer back to Step 5.

- Conduct work area monitoring as part of the hazard evaluation and consult generic action levels.
- Follow the NIOSH Respirator Selection Logic. Consult the other resources in this list for tips, background information, and guidance on completing key steps in the NIOSH Respirator Selection Logic.
- Have information on exposure levels and the possibility of an oxygen deficient environment (less than 19.5 percent), eye irritants, and/or an environment that is immediately hazardous to life or health.
- (IDLH). (See CDC - NIOSH Publications and Products - NIOSH Respirator Selection Logic 2004 (2005-100) Chapter V – Additional Information on Hazards and Exposure and NIOSH IDLH values.)

- Consult OSHA assigned protection factors (APFs). (See OSHA's Table 1 listing APFs in 29 CFR 1910.134(d)(3)(i)(A).)
- Calculate maximum use concentrations (MUCs) and ensure these values do not exceed the anticipated airborne contaminant concentrations. A conservative approach to calculating the MUC is MUC = APF x 0.5 PEL, where APF is the assigned protection factor and PEL is OSHA's permissible exposure limit. Any variation from this approach will be subject to the approval of the SHEMP Manager (or another designated person). (See Appendix F for more information on calculating MUCs.)
- Consult OSHA substance-specific standards for a list of required levels of respiratory protection (Appendix F).
- Consider the need for a respirator that is approved for chemical, biological, radiological, and nuclear (CBRN) contaminants. See NIOSH Web sites for CBRN approved respirators: air-purifying respirators (APR) and air-purifying escape respirators (APER) or self-contained breathing apparatus (SCBA).
- Consider the availability of an approved chemical cartridge for a given contaminant and the suitability of that cartridge for the contaminant concentrations anticipated at the worksite (contact the respirator manufacturer for assistance and see Appendix F).
- Select an escape respirator, if one is needed. (See NIOSH Respirator Selection Logic Chapter IV Escape Respirators)

3.1.6 Atmosphere-Supplying Respirators (ASRs)

An ASR is required for protection against contaminants of unknown identity or concentration, or in an environment containing hazardous levels of an air contaminant for which no NIOSH-approved air-purifying cartridge is available. An ASR is required for highly hazardous environments, including those that are oxygen deficient (less than 19.5 percent oxygen) or contain high concentrations of air contaminants that create an IDLH atmosphere. Under IDLH conditions, the ASR must be configured as either a full-facepiece pressure-demand SCBA (minimum service life of 30 minutes), or as a full-facepiece pressure-demand supplied-air respirator (SAR) with an auxiliary self-contained air supply. For more information on working in IDLH atmospheres, see Section 3.4.4.

3.1.7 Air-Purifying Respirators (APRs)

An APR may be used when the concentration of the hazardous contaminant does not exceed the limitations of the APR respirator. Specifically, the ambient air must contain adequate oxygen (19.5 percent oxygen or greater); a NIOSH-approved filter or cartridge must be available to remove the contaminant (contact the respirator manufacturer's Web site or technical information telephone service for more information [Appendix F]); and the airborne concentration of the contaminant must not exceed the MUC.

The standard issue and alternate APRs used by EPA emergency responders are tight-fitting negative-pressure respirators. If, however, emergency responders find themselves working at a site where powered air-purifying respirators (PAPRs) are available (with tight-fitting facepieces, hoods, or helmets), they may wear these respirators if all respiratory protection program criteria continue to be met.

3.1.7.1 Selecting Filters, Cartridges, and Canisters

Particulate filters and chemical cartridges or canisters for APRs must be selected based on the type of airborne contaminant present. All filters, cartridges, and canisters must be NIOSH-approved and identified with a color-coded label.

Particulates: The P-100 or high efficiency particulate air (HEPA) filter is EPA's designated filter for standard issue equipment. If the SHEMP Manager approves, emergency responders may use filters with lower efficiencies (e.g., N-95) during long-term site removal activities. Appendix F contains additional information on alternate NIOSH-approved particulate filter types and the environments in which each is approved for use.

Gases and Vapors: Chemical cartridges or canisters for APRs are selected on a case-by-case basis, dependent on the contaminant present and on information that NIOSH and the manufacturer have issued on the ability of cartridges to capture contaminants. Contaminant exposures must not exceed the performance limits determined by the manufacturer for each chemical cartridge or canister, or be used beyond the rated shelf-life date. Appendix E contains information on how to contact the manufacturer of standard issue respirators. Note that cartridges for APRs have a small sorbent capacity compared to canisters.

3.2 Medical Evaluation of Employees Who Are Required to Use Respirators

3.2.1 Overview of Program

29 CFR 1910.134 stipulates that prior to fit testing and using a respirator in the workplace, employees must be medically evaluated to determine whether they are eligible to wear a selected respirator. Wearing a respirator can cause physical stress to emergency responders so it is important to determine whether employees are fit to wear a respirator and perform their job functions in the field. Medical eligibility is determined by a physician or other licensed health care professional (PLHCP).

3.2.2 OSHA Respirator Medical Evaluation Questionnaire

To assess an employee's medical eligibility to use a respirator, the PLHCP must perform a medical evaluation that addresses all the questions found in 29 CFR 1910.134 Appendix C, *Respirator Medical Evaluation Questionnaire*. The medical evaluation for respirator use may be conducted at the same time as other evaluations performed under EPA's Occupational Medical Surveillance Program (i.e., during the baseline exam and during annual exams). (See the Medical Surveillance Program chapter of this manual.)

3.2.3 Medical Factors and Conditions

The SHEMP Manager must provide the following information to the PLHCP:

- A copy of the organization's respiratory protection program (including any updated versions).
- Type and weight of the respirator to be worn.
- Duration and frequency of respirator use.
- Expected physical work effort.
- Use of protective clothing and equipment to be worn.
- Temperature and humidity extremes that may be encountered.

3.2.4 Medical Clearance Statements/Identification of Limitations

The PLHCP must develop an opinion regarding whether the employee is medically cleared to wear a given type of respirator, whether it is necessary to place restrictions on the employee's assigned workload, or whether a follow-up medical examination is needed to assist the PLHCP in making a recommendation. (The Medical Surveillance Program chapter of this manual provides additional details about the forms that the PLHCP should use to communicate this information.) The PLHCP must submit an opinion to EPA's Medical Review Officer, who in turn, will issue a written *Medical Clearance Statement* to the SHEMP Manager. The employee and the employee's supervisor must also receive a copy of this statement. If information from the medical evaluation indicates that the employee can use a PAPR but not a negative-pressure respirator, a PAPR will be provided to the employee.

3.2.5 Medical Re-evaluation

A repeat medical evaluation is required *annually* for all EPA employees who wear respirators. The annual evaluation may be conducted at the same time as other evaluations conducted under the medical surveillance program. Although this requirement is more stringent than the OSHA standard, the annual evaluation provides employees with an additional level of assurance that they are medically qualified to wear the indicated types of respirators. A re-evaluation may be performed after a shorter period if the need arises (e.g., due to employee health status, changes in working conditions, or need to use another respirator type).

3.2.6 Medical Records

The PLHCP must store medical records related to employee medical evaluations for respiratory protection. The baseline and subsequent medical examination records must be maintained by the PLHCP, as they are considered confidential medical records and subject to customary patient-physician confidentiality restrictions. The PLHCP will provide access to these medical records to employees and the Medical Clearance Statement (page 10 of 10 of the EPA Medical Evaluation Form) to the SHEMP Manager, employee's supervisor, and employee in accordance with 29 CFR 1910.1020 (OSHA standard on "Access to employee exposure and medical records").

3.3 Fit Testing Procedures for Tight-Fitting Respirators

Fit testing is required for all negative- and positive-pressure tight-fitting facepiece respirators that are used by EPA emergency responders. The SHEMP Manager, HSPC and/or the Region 4 Readiness Center Contractors must conduct initial and annual fit testing for each emergency responder and for each type of respirator (e.g., same make and model) that is worn by that individual. The person performing fit testing must check for any problems with wearing a respirator and reinforce respirator training by having wearers review the proper methods of donning and wearing the respirator. As discussed in Section 3.2.4, employees must be medically qualified to wear the style of respirator with which they will be fit tested.

The fit of tight-fitting respirators is evaluated by quantitative fit testing (QNFT) with a PortaCount® system and procedures contained in Appendix A of 29 CFR 1910.134. The QNFT must be completed before the individual wears the respirator in the field and annually thereafter. Additional testing will be required if an employee or Removal Manager reports changes that could influence respirator fit.

Although 29 CFR 1910.134 requires a QNFT fit factor (FF) at least 10-fold higher than the APF, emergency responders are expected to achieve a fit factor of 1,000 (20 times the APF) for tight-fitting full facepieces. For example, an APF of 50 can be assumed for an employee's full-face, tight-fitting, air-purifying respirator if the wearer achieves a FF of 1,000 or higher. As an interim measure, a fit factor of

500 (10-fold higher than the APF) may be permitted on a case-by-case (site-by-site) basis for employees wearing the standard issue equipment, provided that the SHEMP Manager (or another designated senior health and safety person) approves. For employees wearing a tight-fitting full-facepiece PAPR, an APF of 1,000 is acceptable as long as a hazard evaluation has been performed and a senior level safety person (e.g., a SHEMP Manager) has signed off on the decision to use the APF of 1,000. The FF of 100 (10-fold above the APF of 10) remains acceptable for emergency responders who wear a half-mask respirator.

Fit testing must not be conducted if facial hair interferes with the mask seal. If an employee cannot achieve a good fit with an appropriate size of the standard issue respirator, EPA must provide an alternate respirator. Standard issue and priority alternate respirators are discussed in Section 3.1.4.1 and in Appendix F-1. Without a well-fitting respirator, employees are not permitted to work in situations where an exposure might take place.

In emergency situations only, a stannic chloride (irritant smoke) qualitative fit test (QLFT) may be temporarily substituted for a QNFT in the field. This test is not a permanent substitute for the QNFT requirement and must be followed by a QNFT as soon as feasible. Until the QNFT is performed, APRs will be assumed to have a lower protective value than indicated by the APF (e.g., with a QLFT, EPA assumes an employee's full-face, tight-fitting, air-purifying respirator has a protective value of 10, instead of the APF of 50 allowed with a successful QNFT). As an exception, an SCBA facepiece may be tested with either QLFT or QNFT and then allowed the higher APF assigned to SCBAs, provided that the SCBA is operated in pressure-demand or positive-pressure mode.

A template for conducting QLFTs (the PortaCount® QNFT fit test software automatically generates a completed record of the fit test) is found in the "Forms" section of the manual's website. All records associated with fit testing procedures must be retained by the SHEMP Manager (or another designated person).

3.4 Procedures for Proper Use of Respirators in Routine and Reasonably Foreseeable Emergency Situations

Emergency responders are expected to wear the selected respiratory protection whenever they enter areas that contain hazardous atmospheres. They must don (put on) respirators outside the hazard area and remove them only after returning to an area where airborne hazards are within acceptable limits. They also must perform a user seal check every time they don a tight-fitting respirator. Appendix G provides procedures for performing a user seal check.

The following sections outline some of the considerations governing respirator use, including cartridge-change schedules.

3.4.1 Issuing Respiratory Protection Equipment

Respirators are issued by the SHEMP Manager and/or the HSPC and are individually assigned to employees for their exclusive use. An organization's emergency response staff may also store and maintain additional respirators that are not assigned to an individual.

3.4.2 Using Corrective Lenses in Respirators

Contact lenses are permitted for use with full-facepiece respirators, which protect the eyes. If other corrective lenses are used, they must not interfere with the face-to-facepiece seal. If needed, EPA must provide approved spectacle kits (with ANSI Z87.1 certified lenses) designed by the respirator

manufacturer. In this case, the facepiece and lenses must be fitted by a qualified individual to provide good vision, comfort, and proper sealing.

3.4.3 General Requirements for Respirator Use

Emergency responders must immediately leave the hazardous atmosphere when problems with the respirator, its fit, or its effectiveness arise, or when conditions could affect the wearer's ability to use the respirator. Responders must also leave the hazardous area as necessary to wash their respirator facepieces to minimize skin irritation, to change APR components when needed, and to take periodic breaks in an uncontaminated area. For example, emergency responders must leave a hazardous environment if: (1) there is a significant change in contaminant profile or concentration; (2) the respirator malfunctions; (3) a contaminant is detected inside the facepiece; or (4) the wearer experiences increased breathing resistance, dizziness, difficulty breathing, illness, or discomfort.

Additionally, emergency responders must NOT:

- Mix parts, cartridges, or tanks from one manufacturer or model of respirator with those of another. As an exception, OSHA's HAZWOPER standard allows for sharing similar, approved tanks under emergency situations. (See 29 CFR 1910.120[q][3][x]).
- Exceed the expiration dates or designated pressure limits of the equipment.
- Enter an area where respiratory protection is required unless they are medically qualified, fit-tested, and using approved equipment.
- Remove respirators in hazardous environments.
- Wear a respirator when conditions prevent the proper seal of the respirator to the face of the wearer (e.g., working in hot environments [see Text Box 2] the presence of facial hair can come between the sealing surface of the facepiece and the face); if an ear drum is perforated; or while using gum, tobacco, or other chewing products.

Text Box 2
Working in Hot Environments

Wearing respirators and other PPE in high temperature environments puts the worker at risk of developing heat stress. Excessive sweating may cause a break in the face to facepiece seal, reducing respiratory protection. Emergency responders must determine safe work/rest regimens. Refer to the Physical Stress Management Program chapter of this manual.

3.4.4 Special Considerations for IDLH Atmospheres

Sites with IDLH atmospheres require the highest level of respiratory protection. OSHA requires that these atmospheres only be entered with: (1) a full-facepiece pressure-demand SCBA with a minimum service life of 30 minutes, or (2) a combination full-facepiece pressure-demand supplied-air respirator (SAR) with an auxiliary self-contained air supply. Emergency responders must also ensure additional OSHA requirements are met before entering an IDLH atmosphere, including:

- At least one employee (referred to as the "standby employee") who is trained and equipped to provide emergency rescue located outside the IDLH atmosphere. This standby employee must maintain visual, voice, or signal communication with the employee(s) in the IDLH atmosphere.

The standby employee must be in a position to recognize a situation in which the employee in the IDLH environment needs assistance, even if that employee is unable to call for help.

- Standby employees are equipped with appropriate retrieval equipment in situations where retrieval equipment would contribute to rescue efforts and would not increase the overall risk resulting from entry. *(Note: As stipulated under 29 CFR 1910.134(g)(3)(vi)(C), in situations where retrieval equipment is not called for, EPA must provide an equivalent means of rescue.)*
- Standby employees are equipped with: (1) pressure-demand or other positive-pressure SCBA or (2) pressure-demand or other positive-pressure supplied-air respirator with auxiliary SCBA.
- Standby employees must notify designated personnel (e.g., the OSC, Onsite Safety Officer, supervisor, or other responsible individual located outside the IDLH environment) before the standby employee(s) enter an IDLH environment to provide emergency rescue.
- Upon notification of standby employee(s) entry into an IDLH environment for emergency rescue, the designated personnel (e.g., the OSC, Onsite Safety Officer, supervisor, or other responsible individual located outside the IDLH environment) must provide necessary assistance appropriate to the situation.
- The buddy system must be used so that emergency responders are not making an entry alone.

If an organization chooses to place additional restrictions on entering an IDLH environment, they must record them in Appendix B.

3.4.5 Filter and Cartridge Change Schedules

3.4.5.1 Particulate Filters

As a rule, emergency responders must change particulate filters at the end of each work shift or if they notice an increase in breathing resistance (e.g., breathing becomes more difficult).

3.4.5.2 Gas or Vapor Cartridges

As a minimum safe practice, emergency responders must discard respirator cartridges at the end of the workday regardless of whether the service life has been reached. However, an organization may choose a more frequent cartridge charge schedule if site-specific conditions (i.e., air concentrations) indicate the need to do so. For example, some organizations might indicate that cartridges must be replaced every time a respirator is removed. Record any variation in cartridge change-schedules in Appendix B. Under highly contaminated scenarios, an SCBA is generally the preferred choice of respirator for EPA emergency responders.

If the concentration of a contaminant could cause the cartridge to reach the end of its service life before the shift is over, the cartridge must be covered by a change schedule or have an end-of-service-life indicator (ESLI). Cartridge change schedules can be determined by consulting the cartridge manufacturer (see contact information for the standard issue respirator manufacturer in Appendix F) or using other OSHA-recommended methods (see OSHA's Respiratory Protection e-Tool).

Specific change schedules apply to the air contaminants asbestos, formaldehyde, acrylonitrile, and butadiene. Emergency responders must consult the OSHA standard for that substance if respiratory protection is used for the substances (see Appendix F for links to standards with specific requirements for respiratory protection).

3.4.6 Monitoring the Work Area and Comparing Results to Pre-Established Action Levels

In the field, emergency responders must perform air monitoring to confirm that the selected level of respiratory protection is sufficient. Air monitoring results must be compared to the OSHA PEL, the MUC, or other standard criteria, such as *action levels*, which guide responders to take certain steps if air contaminants reach certain levels. Responders then adjust their PPE (or take other actions) as necessary to ensure they are adequately protected. Appendix F lists criteria for establishing action levels to which emergency responders can compare air monitoring results.

3.5 Cleaning, Storing, Inspecting, and Maintaining Respiratory Protection Equipment

Emergency responders are responsible for the proper handling, cleaning, inspection, maintenance, and storage of any respiratory protection equipment that has been issued directly to them. Centrally stored respiratory protection equipment, including that related to breathing air, is the responsibility of the Region 4 Readiness Center Contractors and the HSPC (or another designated person).

3.5.1 Cleaning, Disinfecting, and Storing Respiratory Protection Equipment

Emergency responders must clean and disinfect respiratory protection equipment following the manufacturer's recommended procedures and the minimum OSHA requirements specified in Appendix B-2 of 29 CFR 1910.134.

3.5.1.1 Cleaning and Disinfecting Respiratory Protection Equipment

Emergency responders are responsible for cleaning and disinfecting their personally issued respirator(s) as often as necessary to maintain them in a sanitary condition (see Text Box 3). Typically, respirators being used for heavy service need to be cleaned and disinfected at the end of each shift using the manufacturer's recommended cleaning solutions (or equivalent). In cases of heavy use in contaminated environments, it might be necessary to wipe the face seal several times per day. Visible accumulation on the facepiece triggers a *thorough* cleaning (typically a soap and water wash, then clean water rinse, followed by a disinfectant treatment). Although sharing facepieces and regulators is unusual, they must be disinfected between each user.

3.5.1.2 Storing Respiratory Protection Equipment

All respirators (including facepieces and components) must be stored in a manner that protects against dust, harmful chemicals, sunlight, excessive heat or cold, moisture, and distortion (typically in a sealed plastic bag and crush-resistant box or cubby). Breathing air cylinders must be stored fully charged (at least 90 percent full), with the cylinder valve closed and protected from damage. Store empty cylinders separately and labeled as being empty. **Do not hang respirators by their harness straps.**

Text Box 3
Cleaning Your Respirator

Some cleaning products damage or shorten the service life of respirators or their components. Several different respirator disinfection solutions are commercially available (e.g., solutions of iodine, isopropyl alcohol, or quaternary ammonium compounds). However, no single solution is compatible with all respirator types. An incompatible solution can degrade or prematurely age the respirator and damage some components.

IMPORTANT: The manufacturer's instructions provide information on the appropriate type of cleaning/disinfectant solution for each respirator and its components. Employees are responsible for knowing which cleaning and disinfection solutions are acceptable for standard issue respirators (see the "Forms" section of the manual's website) or alternate respirators, if used. Minimize the use of alternate cleaning/disinfectant products, including moist towelettes, if they contain other solutions, not specified for use by the manufacturer.

3.5.2 Inspecting Respiratory Protection Equipment

All respiratory protection devices used by EPA employees must be inspected before and after each use, during cleaning, and on a monthly basis. Although this frequency is greater than required by OSHA for some respirators, EPA has determined that this requirement must be applied to all respirators that emergency responders use (including APRs). Additionally, escape respirators must be inspected prior to bringing them into the workplace for use. All routine inspections of respiratory protection devices must be documented in accordance with EPA's minimum requirements described below.

Inspections of respiratory equipment must be conducted by the individual to whom the equipment is issued. The HSPC (or another designated person) is responsible for inspecting respiratory protection equipment that is stored and managed in a central location. Inspections of all equipment (both individually issued and centrally stored) must be documented on the *Monthly Respirator Inspection Checklist* (see the "Forms" section of the manual's website). The inspection record for a respirator must be kept where the individual responsible for the respirator can access it. A recommended practice is to store the latest inspection record with the respirator, which would allow an employee to instantly confirm the respirator's suitability for immediate use in an emergency (use Appendix B to document the process used to maintain inspection records). On a quarterly basis, all of the monthly checklists must be provided to the HSPC (or another designated person), who in turn, will maintain a log (see the "Forms" section of the manual's website) that tracks receipt of the checklists and will retain hard copies of the checklists for one year.

In addition to maintaining the above inspection schedules, employees are responsible for conducting inspections of new respiratory protection equipment. The inspection must be conducted upon receipt of the equipment and prior to placing the equipment into service.

3.5.2.1 General Inspection Procedures

During each inspection, all surfaces of respirator facepieces and components must be checked for condition, functional integrity, cleanliness, and expiration dates. SCBA systems must be checked for leaks and to be sure cylinders are full. Faulty equipment must be either repaired immediately or red-tagged and removed from service. **Always check the presence and condition of inhalation and exhalation valves during inspections.**

3.5.2.2 Periodic Manufacturer Testing of SCBAs

In addition to normal operational checks and inspections, SCBAs must be periodically inspected/tested by the manufacturer or the manufacturer's authorized agent. The HSPC (or another designated person) must ensure that this testing is conducted at a frequency recommended by the equipment manufacturer and maintain a log of this testing.

3.5.2.3 Inspection of SCBA Tanks

In accordance with the provisions of 49 CFR Part 173, SCBA tanks must be hydrostatically tested either every 3 or 5 years, depending on their construction and associated Department of Transportation (DOT) approval number.

As part of the monthly inspection, check the hydrostatic test date on tanks stored with the SCBA and document the check on the *Monthly Respirator Inspection Checklist* (Appendix F). Appendix G provides the specific hydrostatic test frequencies required for the available tanks. Centrally stored spare tanks must be inspected on a quarterly basis, with the dates of these inspections logged by the HSPC (or another designated person). A sample *Quarterly Tank Inspection Log for Breathing Air Cylinders* is provided in Appendix F. Remove, red-tag, and send for re-testing any tanks that are out of compliance (or will become so by the next inspection date). Out-of-compliance tanks issued to individual EPA emergency responders must be returned immediately to the Region 4 Readiness Center Contractors (or another designated person).

3.5.2.4 Special Inspection Requirements for Centrally Stored Respiratory Protection Equipment

All inspection requirements and procedures noted in the previous sections also apply to centrally stored equipment with the following exceptions:

- APRs, PAPRs, and SCBAs that are found to be in good operational condition must be tagged with a green tag that bears the equipment serial number (or other identifying number), date of inspection, and inspector's signature. Centrally stored negative-pressure respirators that have not been used since they were cleaned, inspected, and sealed in a labeled container only need to be inventoried (not re-inspected each month).
- The expiration dates of APR canisters and cartridges must be inspected on a quarterly basis. An example *Quarterly Inspection Log for APR Canisters and Cartridges* is included in the "Forms" section of the manual's website. Discard expired items.

3.5.3 Maintaining, Repairing, and Retiring Respiratory Protection Equipment

Emergency responders are responsible for the overall care of their individually issued respiratory protection equipment. Emergency responders must be trained to use NIOSH-approved parts to make minor repairs as described in the equipment owner's manual (e.g., replacing inhalation/exhalation valves, harness straps, and O-rings on air hose connections).

All adjustment or repairs to SCBA regulators and valves must be made by an authorized agent of the manufacturer. The HSPC (or another designated person) is responsible for facilitating contact with the manufacturer regarding repairs, for documenting any inspections or repairs performed, and for coordinating the manufacture's evaluation of equipment being considered for retirement.

3.6 Breathing Air for ASRs

3.6.1 Obtaining Breathing Air

Some EPA organizations maintain compressors capable of producing breathing air that can be used in SCBA breathing air cylinders. Other organizations purchase breathing air. In the field, circumstances might require that emergency responders obtain breathing air through a variety of sources, such as vendor service agreements, direct purchase from local vendors (e.g., dive shops), or via other emergency response agencies (e.g., local fire departments, HAZMAT teams). The individual obtaining the breathing air must confirm that the source is reliable and document that the air quality meets standard requirements (as described below).

Information about local sources of breathing air and the organization compressor capabilities must be noted in Appendix B. Also, include information on local procedures and any breathing air cascade systems operated by the organization.

3.6.2 Acceptable Breathing Air Grades and SCBA Cylinders

Breathing air for ASRs must, at a minimum, meet the requirements for Compressed Gas Association (CGA) Grade D breathing air specified in CGA G-7.1-1997 (Text Box 4). When producing or obtaining breathing air, emergency responders must also obtain documentation that the air meets Grade D standards. Appendix H describes other equipment and documentation requirements associated with operating a breathing air compressor or obtaining air from outside sources.

All cylinders used for breathing air must meet the specifications and testing requirements of DOT's Shipping Container Specification Regulations as described in 49 CFR parts 173 and 178. Breathing air cylinders must also be marked in accordance with 49 CFR 178 and the NIOSH respirator certification standard 42 CFR part 84.

Text Box 4
Compressed Gas Association Grade D Breathing Air (CGA G-7.1-1997)

- Oxygen (volume/volume) between 19.5 % to 23.5%;
- Hydrocarbon (condensed) content of 5 milligrams per cubic meter (mg/m^3) of air, or less;
- Carbon monoxide (CO) content of 10 parts per million (ppm), or less;
- Carbon dioxide (CO_2) content of 1,000 ppm, or less; and
- Lack of noticeable odor.

Additionally, the moisture content of compressed air in cylinders cannot exceed a dew point of -50° F (-46.6° C) at 1 atmosphere of pressure.

3.6.3 Producing Breathing Air with an In-house Compressor

EPA organizations that operate an air compressor to supply breathing air must ensure that the compressor is designed to provide breathing air, is carefully installed and maintained by qualified individuals according to manufacturer's recommendations, is tested at least yearly to confirm that it produces Grade D breathing air, and that all inspection and maintenance activities are documented. Specifically, OSHA requires that the compressor be designed and located to prevent contaminants from entering the air supply system, maintain acceptable moisture content (Text Box 4), use filters and sorbent beds to maintain breathing air quality, ensure carbon monoxide levels do not exceed 10 ppm (oil-lubricated compressors

must be fitted with alarms), and prevent coupling with other gas systems (including non-respirable worksite air or asphyxiants). Compressor and filter/sorbent bed maintenance must be performed only by authorized individuals following procedures outlined in Appendix H, which also describes how compressor installation, use, and maintenance must be documented.

3.7 Training

Respiratory protection training consists of a combination of classroom lectures, field exercises, and field safety briefings. The SHEMP Manager is responsible for making sure that all emergency responders receive this training, for ensuring that appropriate proof is obtained to document the successful completion of training requirements, and for documenting employee training using the Field Readiness Module (see Section 5.3 of the Introduction). The "Forms" section of the manual's website provides a sample training roster that may be used to record employee attendance.

3.7.1 Initial Respirator Training

This training must cover information that will allow employees to use respirators safely. The training must be completed before an employee is allowed to wear a respirator and enter a potentially hazardous environment. This training requirement can be fulfilled as a component of the employee's 40-hour HAZWOPER initial training. Attendance must be documented.

Initial training must be adequate to ensure that employees can demonstrate knowledge of the following topics:

- Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator.
- What the limitations and capabilities of the respirator are.
- How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions.
- How to inspect, put on and remove, use, and check the seals of the respirator.
- What the procedures are for maintenance and storage of the respirator.
- How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators.
- The general requirements of OSHA's Respiratory Protection standard (29 CFR 1910.134).

3.7.2 Annual Refresher Respirator Training

This training must be repeated at least annually to refresh employees' knowledge of potential respiratory hazards, the written respiratory protection program, and the proper use, limitations, care, and maintenance of respirators. Time spent in refresher respirator training may be credited towards an employee's annual 8-hour HAZWOPER refresher training requirement per 29 CFR 1910.120(e)(8) and attendance must be documented. Additionally, at least once a year, each emergency responder must participate in an exercise on the use of a negative-pressure APR and a PAPR by conducting an inspection, tear-down, cleaning, reassembly, and donning/doffing the respirator. In addition, on at least an annual basis, each emergency responder who uses a SCBA must practice using the equipment by conducting an inspection, donning/doffing, breathing down a tank of air (20 minutes minimum), cleaning, and reassembling the SCBA. To maintain Level A, B and C readiness, responders must also exercise two or more times per year wearing full Level A, Level B, or Level C equipment. The Removal Manager, HSPC, and Training

Personnel must determine the appropriate number of PPE and Respirator Exercises that will meet the needs of the emergency response program. These exercises may be held in conjunction with SCBA practice sessions. These exercises must be documented in the Emergency Management Portal.

3.7.3 Breathing Air Compressor/Cascade System Training

Before emergency responders are allowed to use in-house air compressors or cascade systems, they must receive appropriate training from the manufacturer and demonstrate proficiency in using these systems to fill air bottles. Organizations that possess this equipment must ensure that employees who use the systems demonstrate adequate proficiency in areas such as (but not limited to) powering up and checking compressor function, making connections to the compressor, cylinder pressure specifications, the organization's inspection and tag-out system (e.g., for compressor filters, system maintenance, and cylinder expiration dates), correctly reading compressor dials and indicators, identifying and correcting possible circumstances that would diminish air quality, recordkeeping, and understanding user limitations in system maintenance (when to contact the manufacturer). The R4 Readiness Center Contrators must maintain training records for all employees who are authorized to operate or maintain air compressors or cascade systems.

3.8 Procedures for Voluntary Respirator Use

EPA employees may choose to wear respirators to guard against nuisance odors or respiratory/eye irritation when exposures are below OSHA regulated levels. These voluntary users must be aware of certain information contained in OSHA's Appendix D of 29 CFR 1910.134. Additionally, respiratory protection must not create a hazard to the user (i.e., the user must be trained and medically qualified to use respiratory protection safely). Because EPA emergency responders' respiratory protection program already prepares them with this information (through training and medical qualifications), voluntary respirator use by these employees is acceptable if a hazard evaluation is conducted and shows that respiratory protection is not required.

If other employees (e.g., visitors to the site) do not already have this preparation, they may use a filtering facepiece (dust mask) voluntarily provided that they are given the information contained in OSHA's Appendix D of 29 CFR 1910.134. The SHEMP Manager is responsible for providing this information to those EPA employees who need it. If these other employees wish to wear any other style of respirator voluntarily, they will need training and medical qualification and in addition to the information contained in OSHA's Appendix D.

EPA emergency responders must re-evaluate the potential for exposures associated with the specific activity or area where they are working whenever conditions change that might also change the level or type of airborne hazard.

4.0 RECORDKEEPING

Proper recordkeeping is an essential component of a respiratory protection program to ensure that nationally consistent, readily accessible records are maintained in each EPA organization. Table 3 provides a summary of the recordkeeping requirements discussed throughout this chapter.

All documentation for the organization's emergency responders (with the exception of medical records) must be retained in a permanent repository that is accessible to the Respiratory Protection Program Administrator, SHEMP Manager, Removal Manager, HSPC, and emergency responders.

Table 3
Respiratory Protection Record Retention Requirements

Required Record	Specified Form	Completed By[a]	Retained By[b]
Organization's written respiratory protection programC information on roles, policies, and procedures	Customized version of this chapter	Program Administrator SHEMP Manager Removal Manager HSPC Emergency Responders	Program Administrator SHEMP Manager
Site-specific written respiratory protection program[c]	Appendix E Combined with site-specific HASP	SHEMP Manager Emergency Responders Removal Manager	Emergency Responders Designated contractor
Documents related to medical evaluations[c]	OSHA Respirator Medical Evaluation Questionnaire	Emergency Responders PLHCP	PLHCP
	Medical Clearance Statement (template presented in the *Medical Surveillance Program* chapter)	EPA's Medical Review Officer	EPA's Medical Review Officer SHEMP Manager Removal Manager[b] Emergency Responders
	Medical records generated during employee medical evaluations	PLHCP	PLHCP
Training records	Employee training roster documenting who has taken respiratory protection classes and participated in field exercises (see the "Forms" section of the manual's website)	SHEMP Manager	SHEMP Manager Removal Manager[b]
	Records documenting that air compressor and cascade system operators have received training on these systems	Compressor Manufacturer HSPC	HSPC Removal Manager[b]
Fit test records	PortaCount® QNFT printout/QLFT records (see the "Forms" section of the manual's website)	SHEMP Manager HSPC Region 4 Readiness Center Contractors	SHEMP Manager HSPC Removal Manager[b]
Respiratory protection equipment issuance, maintenance,	Respirator Issuance form (see the "Forms" section of the manual's website)	SHEMP Manager HSPC	SHEMP Manager HSPC
	Monthly Respirator Inspection Checklist form[d] (see the "Forms" section of the manual's website)	Region 4 Readiness Center Contractors Emergency Responders	Region 4 Readiness Center Contractors Emergency Responders

Required Record	Specified Form	Completed By[a]	Retained By[b]
and inspection records	Log documenting the receipt of the *Monthly Respirator Inspection Checklist* forms (see the "Forms" section of the manual's website)	HSPC	HSPC
	Logs documenting quarterly inspections of centrally stored cartridges, canisters, and breathing air cylinders (see the "Forms" section of the manual's website)	Region 4 Readiness Center Contractors	Region 4 Readiness Center Contractors
	Records documenting respirator maintenance performed locally and documentation of periodic evaluations or repairs performed by the manufacturer.[d]	Region 4 Readiness Center Contractors	Region 4 Readiness Center Contractors
Records related to obtaining or generating breathing air	Documentation that any breathing air purchased from an outside source meets *Compressed Gas Association Grade D criteria*	HSPC Emergency Responders	HSPC
	Records related to in-house breathing air compressor systems: • Breathing Air Compressor Operations and Maintenance Plan • Installation records (including qualifications of the installer) • Air compressor operations and maintenance logs that document the date and type of maintenance performed and include service and repair records[c] • Test results (annual and historic) documenting that the breathing air being generated in-house meets Grade D criteria	Region 4 Readiness Center Contractors	Region 4 Readiness Center Contractors
Respiratory Protection Program Evaluation Form	Checklist (see the "Forms" section of the manual's website)	SHEMP Manager (with assistance of Removal Manager and HSPC)	SHEMP Manager

[a] Recommended delegation of recordkeeping responsibilities.
[b] Removal Managers need only retain sufficient documentation (such as a list or a spreadsheet) to allow them to quickly confirm an employee's current medical evaluation, training, and fit testing status.
[c] Recordkeeping required by OSHA 29 CFR 1910.134.
[d] Although OSHA 29 CFR 1910.134 requires these records only for specific types of respirators (e.g., a respirator used for emergency response, or SCBA), EPA requires them for all respirators.

5.0 PROGRAM EVALUATIONS

An evaluation of each organization's program must be performed to ensure that EPA's respiratory protection program is being implemented properly and performing satisfactorily across the Agency.

5.1 Internal Evaluations

As noted in Section 5.4.1 of the manual's Introduction, EPA organizations must assess their health and safety programs at least annually. The purpose of the internal program-level evaluation is to ensure that the organization's program is (1) being implemented in accordance with OSHA requirements and EPA minimum requirements, as identified in this chapter and (2) minimizing the risk of injuries and illnesses that can result from exposure to hazardous levels of airborne contaminants. As part of the review process, OSHA requires that emergency responders who wear respirators be asked to provide their views on the EPA program's effectiveness and that their feedback is documented and addressed. A checklist that will help program reviewers evaluate their respiratory protection program is found in the "Forms" section of the manual's website.

5.2 External Evaluations

Once a year, representatives from the Core ER Audit Team evaluate each EPA organization to examine the elements of the organization's health and safety program, including the respiratory protection program, to ensure that the program is being implemented in a consistent fashion across the Agency. EPA organizations must provide the Core ER Audit Team members with the information they require to complete their evaluation.

5.3 Field Audits

Field audits must be performed to ensure that the protective measures required in the Agency's health and safety program are being properly implemented in the field. Section 5.4.2 of the manual's Introduction provides additional information on the intent of the field audits, including the individuals who will be responsible for performing them and how many must be completed each year.

APPENDIX A

Respiratory Protection Program: Designation of Roles and Responsibilities

Instructions for Users

Appendix A provides a place for users to insert organization-specific information into the Respiratory Protection Program chapter. This appendix presents a list of tasks that must be performed to ensure the smooth operation of a respiratory protection program. The tasks are listed in rows. EPA position titles (e.g., the Removal Manager or the Health and Safety Program Contact) are listed in columns. Each task has been assigned to a default position. For some of the tasks, check marks have been placed in two or more columns to indicate that more than one person assumes responsibility for that task. **Please note that users can re-delegate tasks**.

Users must take the following steps to customize Appendix A:

- Fill in the background information requested at the top of page A-3. For example, indicate when the table is being updated and who is doing the updating.
- Fill in actual names under the position titles.
- Add columns to include additional key players (if necessary).
- Add rows to the end of the table (if necessary) to provide information about activities that exceed the minimum requirements already included in Appendix A. (See Appendix B for a list of your organization's additional policies and procedures related to respiratory protection.)
- Determine whether any of the recommended task assignments must be delegated to another person. (If so, move the check marks to re-assign the task.)
- Ensure that each task has been assigned to a specific person.

ATTENTION ERT, CMAT, and HQ Users: The tasks and position titles that appear in Appendix A have been written with regional audiences in mind. ERT, CMAT, and HQ users should modify the language that appears in the rows and column headers to reflect the needs of their organization.

APPENDIX A
Task Chart for Implementing the Respiratory Protection Program Chapter

This table has been customized for: Region 4.
Last updated on: March 3, 2017.
Updated by Kevin Eichinger.

TASKS ▼ / ROLES ►	Who is Responsible for Each Task or Action?						
	Respiratory Protection Program Administrator	**Removal Manager**	**SHEMP Manager**	**Health and Safety Program Contact**	**Emergency Responders***	**Supervisors**	**Regional Readiness Center Contractors**
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.						
General Tasks							
1. Maintain Agency-wide responsibility for the operation of EPA's respiratory protection program. (*Note: This responsibility may not be delegated to someone else.)*	✓						
2. Ensure that a nationally consistent respiratory protection program exists across the Agency.	✓						
3. Ensure that the Agency's respiratory protection program complies with all applicable laws, regulations, orders, rules, standards, and guidance.	✓						
4. Customize this chapter with organization-specific information and review/update the customized version at least annually. Post the customized chapter to the manual's Web site and inform stakeholders of its availability.		✓	✓	✓			
5. On a regular basis, the major stakeholders involved in implementing the organization's respiratory protection program must discuss the status of the program and determine whether it is necessary to update organization-specific information on policies, procedures, and task assignments in the customized version of the chapter. Ensure that any other written procedures related to the respiratory protection program are kept current and that copies are provided to the appropriate individuals.			✓				
6. Ensure that the tasks and procedures outlined in this respiratory protection program are being followed by employees who have been identified as responsible parties. Support any respiratory-protection-related initiatives that the respiratory protection program Administrator or the SHEMP Manager establishes. Provide the necessary personnel, resources, and equipment to support the proper and safe implementation of the respiratory protection program.		✓					

TASKS ▼ / ROLES ►	Who is Responsible for Each Task or Action?						
	Respiratory Protection Program Administrator	**Removal Manager**	**SHEMP Manager**	**Health and Safety Program Contact**	**Emergency Responders***	**Supervisors**	**Regional Readiness Center Contractors**
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.						
7. Oversee the day-to-day operation of EPA's respiratory protection program at the organization level.			✓				
8. Encourage communication between the managers who administer the respiratory protection program and the emergency responders subjected to the program.				✓			
9. Develop a HASP with site-specific information about respiratory-protection-related procedures that emergency responders must follow.					✓	✓	
10. Review and approve HASPs to ensure that they include adequate information to satisfy OSHA's requirements for a written respiratory protection program that contains worksite-specific procedures.		✓	✓				
11. Ensure that all respiratory-protection-related components of the HASP are actually implemented in the field.		✓	✓		✓		
Tasks Associated with Respirator Selection and HASP Development (Section 3.1)							
12. Conduct task-by-task hazard evaluations to determine what level of respiratory protection is needed at a particular site and document the process. (See Appendix E for an example *Hazard Evaluation form*).					✓		
13. Identify and implement engineering, work practice, or administrative controls to minimize airborne hazards whenever feasible. Determine whether respiratory protection will be needed to supplement these mitigation efforts. Consult with the SHEMP and Removal Managers as necessary.		✓	✓		✓		

TASKS ▼ / ROLES ►	Who is Responsible for Each Task or Action?						
	Respiratory Protection Program Administrator	**Removal Manager**	**SHEMP Manager**	**Health and Safety Program Contact**	**Emergency Responders***	**Supervisors**	**Regional Readiness Center Contractors**
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.						
14. Determine which type of respirator (e.g., APR or ASR) is needed to perform tasks at a particular site using a combination of the following tools: • Conduct air monitoring. • Use NIOSH's Respirator Selection Logic, APFs, and MUCs. • Consult OSHA's substance-specific standards. • Consider generic action levels. • Consider special needs associated with chemical, biological, radiological, and nuclear contaminants. • Review HASPs developed by other (non-EPA) entities who have performed work at the site. *Note: In most cases the respirator selected must fall under EPA's standard issue classification as specified in Appendix F of this Respiratory Protection Program. (An alternative brand may be substituted if an employee is unable to achieve an acceptable fit with the standard issue respirator. Other respirator models and configurations may be used only with approval of the SHEMP Manager.)*					✓	✓	
15. Approve the respirator selections that emergency responders identify as appropriate for each site. If a request is made to use alternate (i.e., not standard issue) respirators/filters in the exclusion zone, determine whether this request should be approved or denied.			✓	✓			
Tasks Associated with Procedures for Proper Use of Respirators in the Field (Section 3.4)							
16. Ensure that all emergency responders receive a copy of the Quick Reference Guide.		✓	✓	✓			
17. Conduct field monitoring activities to assess field conditions (Section 3.4.6). Compare the results to pre-established action levels to determine whether it is necessary to increase the level of respiratory protection or to shut down activities.				✓	✓		

TASKS ▼ / ROLES ►	Who is Responsible for Each Task or Action?						
	Respiratory Protection Program Administrator	**Removal Manager**	**SHEMP Manager**	**Health and Safety Program Contact**	**Emergency Responders***	**Supervisors**	**Regional Readiness Center Contractors**
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.						
18. Adhere to the guidelines presented in this chapter regarding: • **When to don/doff respirators**. For example, don them outside hazard areas and remove them only after returning to an area where airborne hazards are within acceptable limits. • **General requirements for respiratory use as detailed in Section 3.4.3**. For example, do not mix equipment parts from different brands and do not wear a respirator while chewing gum or when conditions prevent a proper seal between the wearer's face, etc. • **When to leave hazardous environments**. For example, exit a site if a respirator does not perform as expected or if site conditions change significantly. • **Special considerations for IDLH environments**. For example, use the highest level of respiratory protection and ensure that a standby employee is appropriately equipped. • **When to change filters and cartridges (Section 3.4.5)**. For example, discard filters/cartridges if breathing resistance increases significantly, when the service life has been reached, at the end of each workshift (whichever occurs first), or according to the organization's policy.					✓		
Tasks Associated with Preparing Employees to Wear Respirators in the Field (Sections 3.2, 3.3, 3.4, 3.7, and 3.8)							
19. Ensure that policies are in place regarding who has the authority to issue equipment, which equipment is issued, and how consumable supplies are issued and tracked.			✓	✓			
20. Issue respiratory protective equipment for individual use to qualified personnel (Section 3.4).			✓	✓			
21. Ensure that emergency responders demonstrate proper ability/knowledge before being allowed to work in environments that require respiratory protection. (For example, ensure that their medical clearance, fit testing, and training requirements are all in order.)		✓					
22. Participate in baseline and annual medical evaluations and answer all respirator-related questions that are asked during the exam (Section 3.2).					✓		

TASKS ▼ / ROLES ►	Who is Responsible for Each Task or Action?						
	Respiratory Protection Program Administrator	**Removal Manager**	**SHEMP Manager**	**Health and Safety Program Contact**	**Emergency Responders***	**Supervisors**	**Regional Readiness Center Contractors**
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.						
23. Provide the following respirator-related information to physicians who perform medical evaluations on EPA emergency responders: (1) the type and weight of the respirator the employee wears, (2) the duration and frequency of respirator use, (3) the expected physical work effort, (4) the use of protective clothing and equipment to be worn, and (5) the temperature and humidity extremes that the employee might encounter.			✓				
24. On an annual basis, obtain *Medical Clearance Statements* from EPA's Medical Review Officer for each employee issued a respirator.			✓				
25. Provide initial and annual QNFT for each emergency responder and for each type of respirator that he/she uses (Section 3.3). (As part of this effort, ensure that the fit testing equipment is properly calibrated. Also, check for problems with the respirator during the test and ask employees to review the proper methods for donning and wearing their respirator.)			✓	✓			✓
26. Perform a user seal check whenever donning a tight-fitting respirator.					✓		
27. Keep records of PortaCount® QNFT printouts and completed QLFT records.			✓	✓			✓
28. Participate in initial (and annual refresher) respiratory protection training courses (Section 3.7). At least once a year, participate in an exercise on the use of a negative-pressure APR and a PAPR by conducting a respirator inspection, tear down, cleaning, reassembly, and donning/doffing. Participate in an SCBA exercise once a year that involves inspecting, donning/doffing, cleaning, and reassembling a respirator, as well as breathing down a tank (20 minutes minimum). (*Note: The SCBA exercise only applies to SCBA users.)*					✓		
29. Ensure that emergency responders receive respiratory protection training, including a combination of classroom lectures and field exercises. Maintain log sheets documenting who has received training.			✓	✓			
30. Provide information contained in OSHA's 29 CFR 1910.134 Appendix D to EPA employees who wish to wear a respirator voluntarily but who have not been trained under the EPA emergency responder respiratory protection program (Section 3.8).			✓				
Tasks Associated with Cleaning, Storing, Inspecting, and Maintaining Respiratory Protection Equipment (Section 3.5)							

TASKS ▼ / ROLES ►	Who is Responsible for Each Task or Action?						
	Respiratory Protection Program Administrator	**Removal Manager**	**SHEMP Manager**	**Health and Safety Program Contact**	**Emergency Responders***	**Supervisors**	**Regional Readiness Center Contractors**
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.						
31. Ensure that all activities related to proper cleaning, storing, inspection, and maintenance of respiratory protection equipment have been delegated and that all involved understand their roles and responsibilities.		✓	✓	✓			
32. Ensure that proper cleaning, storing, inspection, and maintenance procedures are followed for all respirators that have been issued for your personal use. For example, maintain respirators in a clean and sanitized condition; inspect respirators before and after each use, during cleaning, and on a monthly basis; and document monthly inspections using the *Monthly Respirator Inspection Checklist* (see the "Forms" section of the manual's website). If any damage is detected, report this problem immediately and ensure that repairs are made or replacements are issued before using the equipment again in the field.					✓		✓
33. Maintain responsibility for the proper cleaning, storing, inspection, and maintenance of all centrally stored respiratory protection equipment.							✓
34. Inspect all centrally stored respiratory protection equipment and document inspection activities on the *Monthly Respirator Inspection Checklist*. On a quarterly basis, collect copies of all of the checklists that emergency responders have completed and maintain a log documenting the receipt of these checklists.							✓
35. Receive an appropriate level of training from the manufacturer to make minor repairs to respiratory protection equipment. Assist EPA emergency responders in making repairs to their equipment and/or obtaining replacement parts.							✓
36. Ship respiratory protection equipment to the manufacturer for major repairs and for regular equipment inspections.							✓
37. Properly tag equipment awaiting repair and appropriately discard equipment that is no longer serviceable.							✓
38. Maintain adequate supplies of spare parts and consumable supplies required for regular use and in-house maintenance of respirators. For example, maintain an adequate supply of breathing air and respirator cartridges.							✓
39. Ensure that SCBAs are periodically inspected by the manufacturer (or the manufacturer's authorized agent).							✓

TASKS ▼ / ROLES ►	Who is Responsible for Each Task or Action?						
	Respiratory Protection Program Administrator	Removal Manager	SHEMP Manager	Health and Safety Program Contact	Emergency Responders*	Supervisors	Regional Readiness Center Contractors
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.						
40. Ensure that SCBA cylinders are hydrostatically tested at required intervals (depending on cylinder composition).							✓
41. Maintain logs of quarterly inspections that are performed on cartridges, canisters, and breathing air cylinders (see the "Forms" section of the manual's website). Ensure that cartridges, canisters, and breathing air cylinders are inspected on a quarterly basis and that items are removed from service (tagged and stored separately) if they have expired or are scheduled to expire in the following quarter.							✓
42. Ensure that all equipment being considered for retirement is returned to the manufacturer for evaluation.							✓
43. Contact equipment manufacturers and technicians as the need arises to ask for assistance and/or recommendations. Maintain documentation of any evaluations, inspections, or repairs that the manufacturer (or a qualified representative) performs.							✓
Tasks Associated with Obtaining Breathing Air From an Outside Source or Operating and Maintaining an In-House Breathing Air Compressor (Section 3.6)							
44. Obtain and retain the following documentation whenever breathing air is obtained from an outside source: certification that the air meets Grade D (at a minimum) breathing requirements, information on the type and frequency of testing, and copies of recent air quality tests (if a certificate is not available).				✓	✓		
45. If your organization has an in-house air compressor, ensure that only properly qualified individuals are allowed to operate it.		✓					✓
46. Write a *Breathing Air Compressor Operation and Maintenance Plan* if your organization has (or plans to obtain) an in-house air compressor. Assume full accountability (a task that cannot be delegated) for the operation and maintenance of the air compressor system. Obtain training from the compressor manufacturer on the following: start-up operations and maintenance procedures, safe handling for compressed gas cylinders, and DOT Hazardous Materials Shipping Requirements.				✓			✓
47. Review and approve the organization's *Breathing Air Compressor Operation and Maintenance Plan* if the organization has an in-house air compressor.			✓				
48. Obtain training records from the technician who installed the air compressor for your organization.				✓			

TASKS ▼ / ROLES ►	Who is Responsible for Each Task or Action?						
	Respiratory Protection Program Administrator	**Removal Manager**	**SHEMP Manager**	**Health and Safety Program Contact**	**Emergency Responders***	**Supervisors**	**Regional Readiness Center Contractors**
Name of person in role ►	See Appendix A-2 in the Introduction chapter for the names of personnel that fill these roles.						
49. Maintain records documenting those employees who are allowed to operate/maintain the organization's in-house air compressor have received training from the system manufacturer.							✓
50. Conduct quality tests (once per year at a minimum) to ensure that the in-house air compressor provides Grade D breathing air. Maintain annual and historic records of the results.							✓
51. Maintain records documenting maintenance activities and repairs that are performed on in-house air compressor systems.							✓
Tasks Associated with Program Evaluations (Section 5.0)							
52. Assist in performing program evaluations to determine whether the respiratory protection program is: • Being implemented in accordance with the minimum requirements identified in this chapter. • Ensuring that employees are adequately prepared to enter sites that pose respiratory hazards; providing the means of detecting deficiencies in respirator selection, usage, or maintenance procedures; and ensuring that procedures are in place to address issues that require attention.		✓	✓	✓			
53. Fill out the *Respiratory Protection Program Evaluation Form* (see the "Forms" section of the manual's website) on an annual basis and retain copies of that form.			✓				
54. Take steps to correct program deficiencies identified during evaluations.		✓	✓				
55. Upon request, provide information about the respiratory protection program to the Core ER Audit Team when they visit the organization.		✓	✓	✓	✓		
Additional Tasks That Reflect Organization-Specific Procedures (Appendix B)							
Attention users: Add rows if necessary.							

*Note: A list of the organization's emergency responders is provided in Appendix A-2 of the Introduction chapter.

APPENDIX B

Respiratory Protection Program: Documentation of Additional Policies and Procedures

The procedures and tasks outlined in the Respiratory Protection Program chapter represent the **minimum requirements** that each EPA organization must meet to minimize the risk of being exposed to airborne hazards. If users advocate the use of additional policies and procedures, they must also:

- Add information about additional tasks into the rows at the end of Appendix A and ensure that each task is assigned to a specific individual; and
- Ensure that the additional policies and procedures are mentioned in the main text of the Respiratory Protection Program chapter. This can be accomplished by either (1) inserting the additional policies and procedures directly into the relevant portions of the main body of the chapter or (2) adding a sentence within the main text that directs readers to Appendix B for more information.

Topic	**Please document the additional elected policies and procedures required for Region 4here.**
Section 3.1 Procedures for Selecting Respirators	See R4 ERRB Standard Operating Guidelines at https://response.epa.gov/hsmanualregion4 1. SOG P102: Respiratory Protection Equipment Section and Special Procedures 2. SOG P103: Respiratory Protection Recommendations for Oil Spill Response 3. SOG T101: In-suit Emergencies and Mayday Procedures
Section 3.2 Medical Evaluation	
Section 3.3 Fit Testing	
Section 3.4 Procedures for Proper Use of Respirators	
Section 3.4.1 Issuing Respiratory Protection Equipment	
Section 3.4.4 Special Considerations for IDLH Atmospheres	
Section 3.4.5 Filter and Cartridge Change Schedules	
Section 3.5 Cleaning, Storing, Inspecting, and Maintaining Respiratory Protective Equipment	
Section 3.5.2 Inspecting Respiratory Protection Equipment	
Section 3.6 Breathing Air for ASRs	
Section 3.7 Training	
Section 3.8 Procedures for Voluntary Use	
Section 4.0 Recordkeeping	
Section 5.0 Program Evaluations	
Other topics _____ _____	

APPENDIX C

Glossary

GLOSSARY

Assigned protection factor (APF)
A rating assigned to a respirator style by OSHA or NIOSH. This rating indicates the level of protection most workers can expect from the properly worn, maintained, and fitted respirator used under actual workplace conditions. An APF of 1,000 indicates that the concentration of contaminant inside the facepiece would be 1,000 times lower than the concentration in the surrounding air. A respirator with an APF of 1,000 will provide greater protection than a respirator with an APF of 100. (*Note: The APF should not be confused with a similar measure, the "fit factor," obtained during quantitative fit testing. Fit factors, which tend to be higher numbers, provide a relative indication of how well a respirator fits an individual, but do not represent the level of protection the respirator would provide in the workplace.)*

Atmosphere-supplying respirator (ASR)
A respirator that provides clean air from an uncontaminated source to the facepiece. Examples include supplied-air (airline) respirators, SCBAs, and combination supplied-air/SCBAs.

CBRN
A chemical, biological, radiological, or nuclear agent or substance.

Doff
To take off or remove (e.g., PPE).

Don
To put on, in order to wear (e.g., PPE).

End-of-service-life indicator (ESLI)
A system that warns the respirator user of the approach of the end of adequate respiratory protection from a respirator filter or cartridge. For example, when the sorbent is approaching saturation or is no longer effective in removing the chemical from the inhaled air.

Fit factor (FF)
A quantitative measure of the fit of a particular tight-fitting respirator facepiece to a particular individual. Fit factor is usually measured as the ratio of the concentration of a substance (aerosol) in ambient air to its concentration inside the respirator when worn and tested according to a specific test protocol (e.g., PortaCount®). There is no correlation between the numeric value of the fit factor and the specific level of protection the respirator will provide in the workplace. This is due to the following factors: differences in the conditions of the fit test and the conditions in the workplace; variations in the position of the facepiece on a person's face after different donnings; and different face, head, and body movements by the respirator wearer during a fit test and during actual work. Typically, a minimum quantitative fit factor (e.g., 1,000 for a full-facepiece respirator used by EPA employees) is chosen for a particular class of respirator to ensure the respirator provides a minimum level of fit to the user's face when tested according to a specific protocol.

Gas
Any material in the gaseous state at 25º C and 760 mm Hg.

Grade D breathing air
Air (from a breathing air compressor) that meets the requirements of the Compressed Gas Association's Specification G-7, which indicates oxygen content of 19.5 to 23.5 percent by volume, hydrocarbon content of 5 mg/m^3 or less, carbon monoxide content of 10 ppm or less, carbon dioxide content of 1,000

ppm or less, moisture content that does not exceed a dew point of -50º F at one atmosphere of pressure, and lack of noticeable odor.

High-efficiency particulate air (HEPA) filter
A filter that is at least 99.97 percent efficient in removing monodispersed particles of 0.3 microns in diameter. (NIOSH has exclusive authority for testing and certification of respirators and filter media, with the exception of certain mine emergency devices as described in 42 CFR 84.) For respirators, the equivalent filter under the rule is the P100 filter.

Immediately dangerous to life or health (IDLH)
An atmospheric concentration of any toxic, corrosive, or asphyxiant substance that 1) poses an immediate threat to life, 2) would cause irreversible or delayed adverse health effects, or 3) would interfere with an individual's ability to escape from a dangerous atmosphere.

Maximum use concentration (MUC)
An estimate of the maximum airborne concentration of contaminant against which the respirator will adequately protect the wearer. The MUC is derived by multiplying the PEL (or one-half of the PEL for a more conservative approach) for the airborne contaminant by the APF for the specific type of respirator and facepiece.

Oxygen-deficient atmosphere
An atmosphere with oxygen content below 19.5 percent.

Permissible exposure limit (PEL)
The maximum average concentration of airborne contaminant exposure allowed by OSHA over a specified period of time (e.g., 8-hour time-weighted average, or 30-minute short term exposure limit). OSHA also sets *ceiling* concentration limits, which must not be exceeded at any time. In the absence of an OSHA limit, other exposure limits may be used. Examples of other exposure limits include NIOSH recommended exposure limits (RELs) and ACGIH threshold limit values (TLVs).

Personal protective equipment (PPE)
Examples include protective suits, gloves, foot coverings, respiratory protection, hoods, safety glasses, goggles, and face shields.

Powered air-purifying respirator (PAPR)
A respirator that uses a battery-powered blower to force air through a filter or purifying cartridge before blowing the cleaned air into the respirator facepiece.

Qualitative fit test
A pass/fail subjective fit test to assess the adequacy of respirator fit. This test relies on the individual's response to the test agent. Test agents may evoke eye, nose, or throat irritation, or have a characteristic odor or taste, if they leak inside the respirator.

Quantitative fit test
An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator. This is an objective test using analytical measuring equipment. The result of this test is called a fit factor.

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

Sorbent
A substance that removes certain vapors or gases (air contaminants) from air.

Supplied-air respirator (SAR)
A respirator that provides breathing air through an airline hose from an uncontaminated decompressed air source to the facepiece. The facepiece can be a hood, helmet, or tight-fitting facepiece.

Tight-fitting facepiece
A respirator inlet cover that forms a complete seal with the wearer's skin (usually the face).

User seal check (fit check)
A test conducted by the user of a tight-fitting respirator to ensure the facepiece is properly seated to the face. This test must be done each time a tight-fitting respirator is donned before entering the contaminated atmosphere. This check helps reduce or prevent air contaminant leakage between the user's face and facepiece seal.

Vapor
Gaseous phase of a substance ordinarily liquid or solid at 25ºC and 760 mm Hg. Vapors enter the air as liquids evaporate.

APPENDIX D

Consolidated List of Internet Resources

OSHA's Respiratory Protection Standard: 29 CFR 1910.134

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=12716

From this point, link to any of the mandatory appendices:

- 1910.134 App A - Fit Testing Procedures (Mandatory)
- 1910.134 App B-1 - User Seal Check Procedures (Mandatory)
- 1910.134 App B-2 - Respirator Cleaning Procedures (Mandatory)
- 1910.134 App C - OSHA Respirator Medical Evaluation Questionnaire (Mandatory)
- 1910.134 App D - (Mandatory) Information for Employees Using Respirators When Not Required Under Standard

OSHA's Respiratory Protection e-Tool

Includes information on developing cartridge change schedules

http://www.osha.gov/SLTC/etools/respiratory/index.html

OSHA's Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard: 29 CFR 1910.120

http://osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9765

OSHA's Toxic and Hazardous Substances Standard: 29 CFR 1019 Subpart Z (General Industry), 1926 Subpart Z (Construction)

- http://osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10147 (1019 Subpart Z)
- http://osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10951 (1926 Subpart Z)

OSHA's Standard on Air Contaminants: 29 CFR 1910.1000

Contains equation used to calculate the PEL for a chemical mixture (for use in MUC equation) and Tables Z-1 through Z-3 listing PELS

- http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9991
- Table Z-1, Limits for air contaminants http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9992
- Table Z-2, Highly hazardous/carcinogenic substances http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9993
- Table Z-3, Mineral dusts http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9994

OSHA's Standard on Access to Employee Exposure and Medical Records: 29 CFR 1910.1020

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10027

NIOSH Respirator Selection Logic (2004): Publication No. 2005-100

http://www.cdc.gov/niosh/docs/2005-100/

From this point, link to any of the publication contents:

Foreword
Acknowledgments
Chapter I. Background and Purpose
Chapter II. Information and Restrictions
  A. Criteria for Selecting Respirators
  B. Restrictions and Requirements for All Respirator Usage
Chapter III. Respirator Selection Logic Sequence
  Table 1. Particulate Respirators
  Table 2. Gas/Vapor Respirators

Table 3. Combination Gas/Vapor & Particulate Respirators
Chapter IV. Escape Respirators
Chapter V. Additional Information on Hazards and Exposures
Subparagraph 1: Oxygen-Deficient Atmosphere
Subparagraph 2: Exposure Limits
Subparagraph 3: Immediately Dangerous to Life or Health (IDLH)
Subparagraph 4: Eye Irritation
Chapter VI. Glossary of Respiratory Protection Terms
Appendix: NIOSH Policy Statement

NIOSH Pocket Guide
Provides IDLH levels
http://www.cdc.gov/niosh/npg/default.html

NIOSH Web Sites for CBRN Approved Respirators

- Air-purifying respirators (APR)
  http://www.cdc.gov/niosh/npptl/standardsdev/cbrn/apr/
- Air-purifying escape respirators (APER)
  http://www.cdc.gov/niosh/npptl/standardsdev/cbrn/escape/
- Self-contained breathing apparatus (SCBA)
  http://www.cdc.gov/niosh/npptl/respstandards/approvedstandards/scba_cbrn.html

Scott (Manufacturer of Standard Issue Respirator) Technical Support
Tel: 1-800-247-7257
e-mail: techsupport.scotths.us@tycoint.com
Internet: http://www.scotthealthsafety.com/Americas/en/Support/Support.aspx

DOT's Shippers – General Requirements for Shipments and Packaging: 49 CFR Parts 173 and 178
All cylinders used for breathing air must meet the specifications and testing requirements of DOT's Shipping Container Specification Regulations as described in 49 CFR 173 and 178; breathing air cylinders must be marked in accordance with 49 CFR 178

- 49 CFR Part 173
- 49 CFR Part 178

NIOSH Respirator Certification Standard: 42 CFR Part 84
See Part 84.74(a), breathing air cylinders marking requirements
http://www.ecfr.gov/cgi-bin/text-idx?SID=0c838afaf6f863416184bc3c1f040a2e&node=42:1.0.1.7.67&rgn=div5

NIOSH Suggested Respirator Cleaning and Sanitation Procedures
Guidance for selecting cleaning equipment and supplies, procedures for respirator maintenance
http://www.cdc.gov/niosh/npptl/cleaning.html
NIOSH Guide to the Selection and Use of Particulate Respirators Certified Under 42 CFR 84

- http://www.cdc.gov/niosh/docs/96-101/
- Description of particulate filter types and purposes (e.g., N-95, P-100)
  https://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/

APPENDIX E

Tools to Assist with Hazard Evaluations and HASPs

E-1 **Summary Site-Specific Respiratory Protection Program Worksheet for Field Activities**
E-2 **Site/Task-Specific Hazard Evaluation Form**
E-3 **Things to Consider When Performing a Hazard Evaluation**
E-4 **Criteria for Approving Use of a Half-Mask Respirator**

APPENDIX E-1

Summary of Site-Specific Respiratory Protection Program Worksheet for Field Activities

Use this worksheet to consolidate information and augment the HASP to meet the OSHA Respiratory Protection standard requirements. Complete one worksheet for each field worksite and incorporate into the site-specific Health and Safety Plan (HASP) for that site.

Note: The Respiratory Protection Quick Reference Guide contains tips and aids to help EPA emergency responders implement this HASP-based respiratory protection program (RPP).

Action Items

Step 1: Designate the person responsible for the RPP on this site. The following qualified individual has been designated by the SHEMP Manager as responsible for coordinating the RPP on this site:

□ Onsite Safety Manager □ Other_____[insert name and job title]

Step 2: Identify location of the hazard evaluation within HASP for this site. Available site characterization and information on airborne hazards are provided in the following section of the HASP:_____.
[fill in the blank with page or section identifiers]

As new information becomes available, it is added to Section _____ of the HASP.
The site hazard evaluation identifies the airborne hazard(s) listed below, for which respiratory protection is required.

Step 3: Select respirators. Emergency responders primarily use standard issue full-facepiece respirators configured as APR, PAPR, SCBA, or airline equipment. Other respiratory protection is permitted with approval from the SHEMP Manager. At this site, employees may use only the respirators 1) that are either part of the standard issue equipment or alternate equipment authorized by the SHEMP Manager, 2) for which the employees are medically qualified, 3) for which they have been successfully fit tested, and 4) that provide at least the level of protection indicated by EPA/NIOSH decision logic, the calculated maximum use concentration (MUC), the host organization, or the incident commander (whichever is more protective). Based on the HASP hazard evaluation, the required minimum levels of respiratory protection for activities at this site are:

Activity	Location	Hazard	Respirator Type/Facepiece/Air Source or Filter/Cartridge

[Note airborne chemical gas/vapor or particulate hazards and include any IDLH or low-oxygen situations (<19.5% at sea level). If additional sheets are attached, check here □.]

Step 4: Identify respirators that will be used on the site: In addition to the standard issue brand/model/configurations, certain employees working at this site have been authorized by the SHEMP Manager to wear the following respirators:

Alternate brand/model/configuration: _____ Approximate # of users: ____ . □-used as APR?
Alternate brand/model/configuration: _____ Approximate # of users: ____ . □-used as APR?
(Information on the numbers of employees that might use each brand of respirator at the site will help equipment managers plan to provide adequate numbers of appropriate cartridges/filters and replacement parts at the site.)

Step 5: Describe filter/cartridge change schedules. Filters will be changed if breathing resistance increases substantially or at the end of each workshift (whichever is sooner). Chemical cartridges will be changed at the end of each workshift, or sooner when indicated by an end-of-service-life-indicator (ESLI), or as determined by the SHEMP Manager in consultation with the cartridge manufacturer (based on cartridge capacity, chemical(s), exposure level(s), and environmental and workplace/work rate conditions).
Is a special change schedule in effect at this site? □-No □-Yes,
describe:_____.

Documentation of Additional Required Respiratory Protection Program Elements

- **Medical evaluation.** Respirator users complete periodic medical evaluations (as part of the routine medical surveillance program), which include an evaluation of the employee's ability to wear the respirators that the employee is qualified to use. These medical exams are scheduled to maintain emergency responders in a state of readiness for field work.

  If an employee's medical qualifications expire while the employee is in the field, the employee must rotate out. Prior to re-entering an area where respiratory protection is required, the employee must receive an evaluation that includes the elements of the respirator medical questionnaire, performed by a physician or other licensed health care professional (PLHCP).

- **Fit testing.** Respirator users are fit tested annually with the tight-fitting respirators they wear. Emergency responders must be fit tested before arriving in the field. Employees who have not been fit tested are not eligible to go to a field site where respiratory protection is required.
  Employees with facial hair are not permitted to wear tight-fitting respirators. Repeat fit testing is required for employees who experience changes in facial structure.

  In the event that employees unexpectedly find that they must wear tight-fitting respirators for which they have not been previously fit tested, an emergency qualitative fit test may be completed (using irritant gas) using accepted OSHA testing methods. After an emergency fit test, assume that a full-facepiece APR will have a lower assigned protection factor (APF) of 10 (rather than 50) until a quantitative fit test is performed.

- **Respirator use.** Respirators must be used correctly in routine and reasonably foreseeable emergency situations, including under conditions potentially immediately hazardous to life and health (IDLH), for which escape respirators or SCBAs and OSHA-prescribed special entry precautions will be used. Emergency responders must use respirators in accordance with their training and any additional site-specific instructions from the SHEMP Manager or designated alternate. Specifically, emergency responders must inspect respirators before use, use only with compatible NIOSH-approved equipment, avoid conditions that impair the face-to-facepiece seal (including facial hair, dirt, or inappropriate corrective eyewear), and perform user seal checks each time they don a respirator. The SHEMP Manager or designated alternate must ensure that employees use respirators as intended and leave the work area as necessary to ensure that the respirator functions properly (i.e., to wash or change filters) or if conditions change in a way that limits respirator effectiveness. Contact lenses are permitted with a full-facepiece respirator.

- **Respirator care.** Emergency responders must clean, disinfect, inspect, and store their personally issued respirators at the end of each day of use, following the methods in which they have been trained (dependent on the type of respirator(s) issued and based on the manufacturers'

recommendations). Additionally, employees must inspect their respirators monthly, document this inspection, and tag/turn in equipment needing repair.

- **Employee training.** Only emergency responders whose training is up-to-date are eligible to work at sites that require respiratory protection. Respiratory protection training must be included as part of standard annual training for these employees and complies with OSHA requirements for this training.
- **Evaluate the effectiveness of the program.** Emergency responders must notify the SHEMP Manager or designated alternate if employees experience adverse health effects so the level of protection can be adjusted. The SHEMP Manager or designate alternate periodically consult emergency responders to determine respiratory protection program effectiveness and inspect a sample of respirators for signs of proper maintenance, cleaning, storage, inspection, and documentation of inspections.

Note: Medical evaluation, fit testing, and training must be conducted in a manner that meets the requirements of OSHA's Respiratory Protection standard and EPA's Emergency Responder Health and Safety Manual Respiratory Protection Program chapter. The latter also includes expanded information on components of the Agency program, including the records that must be kept.

Supplemental Information for Users of Breathing Air Tanks and Air Compressors

- **Breathing air quality and tank care.** Breathing air obtained from outside sources must be documented in writing to meet at least ANSI/CGA G-7.1-1997 "Grade D" quality standards and contain low moisture. Breathing air tanks must be inspected monthly to ensure that each is properly marked, has met hydrostatic test criteria, and that tanks stored full retain 90 percent of full charge pressure or are recharged. All tanks must be appropriately marked and empty tanks must be stored separately from filled tanks.
- **Air compressor location and care.** Air compressors used to supply breathing air must be maintained and located in accordance with OSHA requirements to prevent breathing air contamination, minimize moisture, and incorporate air purification devices (changed as needed, with change documented on a tag with date and signature). All compressor installation and maintenance must be documented.
- **Carbon monoxide controls.** For breathing air, emergency responders must use only compressors designed or alarmed to ensure that carbon monoxide levels do not exceed 10 ppm.
- **Preventing cross-contamination.** Breathing air tanks must be labeled as described in NIOSH standards (42 CFR Part 84). Couplings on breathing air equipment are incompatible with non-respirable gas systems and asphyxiants. Emergency responders must avoid using oxygen concentrations greater than 23 percent in breathing air systems not specially designated or prepared for that purpose.

APPENDIX E-2

Site/Task-Specific Hazard Evaluation Form

Site Name/Location: _____

Operation or procedure where respirators are required:_____

_____

_____

_____

Air contaminants requiring the use of respiratory protection:

Contaminant	Estimated Air Concentration	PEL	IDLH	Chemical/Physical Form

Other considerations for respirator selection: _____

_____

_____

Type of respirator to be used: Air-purifying _____; Supplied-air _____;
SCBA:_____

If air-purifying respirator, specify type of filters/canisters and cartridge change schedule:

_____

_____

Conditions under which a respirator is to be used:_____

_____

_____

Type and frequency of area or personal air monitoring: _____

_____

_____

_____

Date of Preparation:_____Prepared by:_____

(This evaluation form may be used as an attachment to the site-specific Health and Safety Plan [HASP], but may not be used as a substitute for the HASP.)

APPENDIX E-3

Things to Consider When Performing a Hazard Evaluation

A hazard evaluation must be performed to determine what level of respiratory protection is required at a site. The following is a list of considerations that must be taken into account when conducting a hazard evaluation:

- The nature of the hazardous operation or process (process characteristics).
- Materials used or produced during the process.
- The nature of the respiratory hazard, such as:
  - Type (e.g., oxygen deficient or contaminated atmosphere)
  - Atmospheric stability (i.e., is the oxygen level expected to fluctuate or decrease, can the contaminant levels increase?)
  - Physical properties of the contaminant (i.e., physical state [gas, vapor, mist, dust, fume, fiber, biological hazard], particle size, molecular weight, and vapor pressure)
  - Chemical properties of the contaminant (i.e., solubility in water and other liquids, reactivity with other chemicals, and hazardous decomposition products)
  - Range of expected air contaminant concentrations, if known
  - Physiological effects (including synergistic) of the contaminants on the body (i.e., eye irritation, skin absorption, and adverse olfactory effects)
  - Whether multiple contaminants are present
  - Established permissible exposure limits, recommended exposure limits, and threshold limit values, or other recommended exposure limit for each contaminant present at the site
  - Whether IDLH conditions exist
  - Contaminant warning properties (e.g., threshold)
  - Flammability/lower explosive limits of contaminants
- Characteristics of the work environment (i.e., external physical factors such as entry/egress pathways, mobility, severe temperatures or humidity, prevailing winds, low-lying areas or other geographic concerns for outdoor work, etc.).
- The location of the hazardous area in relation to the nearest area having respirable air.
- The employee's activities in the hazardous area (work rate and degree of contact with contaminants).
- The length of time the respiratory protection will be needed (especially critical for atmosphere-supplying devices since the air supply is finite).
- Physical limitations/health of the employees.
- Potential for upset conditions or abnormal situations, such as emergency spills and air releases.
- The possibility to encounter unknown conditions.
- The physical characteristics, functional capabilities, protection factors, fit, and limitations of the respiratory protection devices (i.e., cartridge breakthrough time).
- End-of-service-life indicators and or cartridge change-out schedule.

APPENDIX E-4

Criteria for Approving Use of a Half-Mask Respirator

- Physical hazards for the specific activity exist (as evaluated by the SHEMP Manager or another designated senior health and safety official) and these outweigh the respiratory hazards and/or the benefits of using a full-facepiece respirator.
- Eye exposure hazards have been evaluated by the SHEMP Manager (or another designated senior health and safety official) and have been eliminated using methods that do not interfere with the successful fit/use of a half-mask respirator. When an eye irritant is present, employees must use a respirator that covers the eyes (e.g., a full-facepiece).
- Personnel monitoring (with laboratory analysis) has been conducted for the worst case scenario and results indicate that exposures to airborne contaminants can be controlled successfully with a half-mask respirator (i.e., exposure levels do not exceed the capacity of the respirator – see information on assigned protection factors [APFs] in Sections 3.1.5 and 3.3).
- Variations in airborne contaminant concentrations are predictable and anticipated to remain within limits for which a half-mask respirator is appropriate (this determination is based on knowledge of site conditions/activities).
- Whenever site conditions change, a reassessment is performed by the SHEMP Manager (or another designated senior health and safety official) to ensure that the use of a half-mask respirator can continue.
- Employee has been fit tested for the half-mask respirator.

APPENDIX F

Tools to Guide Respirator Selection

F-1 **Standard Issue Respirators, Components, and Care Instructions for Scott® Respirators**
F-2 **Technical Support for Scott® Respirators**
F-3 **Using Action Levels**
F-4 **Points to Consider When Selecting Respiratory Protection Equipment**
F-5 **Considering Filter and Cartridge Selection and Service Life**
F-6 **OSHA Substance-Specific Standards That Designate Respiratory Protection**
F-7 **Standard Levels of Personal Protective Gear, Including Respiratory Protection**

APPENDIX F-1

Standard Issue Respirators, Components, and Care Instructions for Scott7 Respirators

Standard Issue Respirators

To promote consistency and interchangeability among employees, EPA has designated the Scott7 brand AV-3000 full facepiece as the primary standard issue respirator for emergency responders. The AV-2000 (which is very similar) is also acceptable. Table F-1 lists configurations of standard issue equipment that are acceptable for emergency responders to use. Another brand or style of respirator may be substituted for standard issue equipment if the employee cannot achieve an acceptable fit with the Scott AV-3000 or AV-2000 (see below).

Table F-1
Acceptable Components and Configurations for Standard Scott7 Issue Respirators

Type	Facepiece and Configuration	Standard Issue Equipment
Air-Purifying		
Negative-pressure	• Full-facepiece	Scott7 AV-3000 facepiece and head harness with 1/4-turn adaptor for 742 series cartridges (or alternate Model 74 twin cartridge full-facepiece, also compatible with 742 series cartridges)
PAPR	• Tight-fitting full-facepiece • Continuous flow mode	Scott7 AV-2000 or AV-3000 (and 40 mm adapter) with C420 blower assembly
Atmosphere-Supplying		
SCBA	• Tight-fitting full-facepiece • Positive-pressure open-circuit mode	Scott7 AV-3000, with AirPack Fifty 4.5 unit (no adapter required), including 1-hour cylinder rated for 4,500 psi. Check configuration for NIOSH CBRN approval.
Airline	• Tight-fitting full-facepiece • Connected to an appropriate cascade system	Scott7 AV-3000, with Scott7 airline equipment

Information on Scott7 series 742 cartridges, approved for use with EPA's standard issue respirator for emergency responders, can be found at Scott's Web site or by contacting Scott7 Technical Support (Appendix F-2).

If the Standard Issue Respirator Does Not Fit

Another brand or style of respirator may be substituted for standard issue equipment only if the employee cannot achieve an acceptable fit with a Scott AV-3000 or AV-2000 respirator (see Table F-2). Employees must try the fit test with both Scott models and with a silicon seal before trying the alternative brand respirators. Organizations do not need to stock alternative brand respirators but can acquire them from the manufacturer as needed. Note that a proper respirator fit is preferred over Agency-wide consistency in selecting and fitting a respirator.

Table F-2
Primary Scott® Respirators and Alternate Brands for Employees Who Cannot Achieve an Acceptable Fit with a Scott® Respirator

Facepiece	Priority	Brand/Model
Full face	Primary	Scott/AV-3000/2000
	Secondary	MSA/Ultra
Half-face	Primary	Scott/XCEL
	Secondary	MSA/Comfo
	Tertiary	North/7700

APPENDIX F-2

Technical Support for Scott7 Respirators

Scott7 respirators are a product of Scott7 Health and Safety, a holding of Tyco. Technical support for Scott respirators may be obtained by phone, email, or through online bulletins.

Tel: 1-800-247-7257
e-mail: techsupport.scotths.us@tycoint.com
Internet: http://www.scotthealthsafety.com/Americas/en/Support/Support.aspx

APPENDIX F-3

Using Action Levels

Site action levels (i.e., thresholds that are used to help emergency responders decide when to implement respiratory protection, engineering controls, or site shut down) must be established prior to commencing site work. Action levels are established based on the contaminants expected or measured at a site, the possibility of encountering unidentified substances, the amount of control over processes or operations, and other factors.

Generic action levels: An accepted practice is to set the action level at one-half of the permissible exposure limit (PEL), although this practice can vary between organizations and between air contaminants. Typical actions include increasing the use of work practice, engineering, and/or administrative controls to reduce exposure levels and increasing monitoring to better characterize exposure levels and trends.

Tables G-3 and G-4 list some action levels that can be used to help responders determine what level of PPE is needed at a site. Consult the Radiation Safety Program chapter of this manual for guidance on radiological hazards. EPA organizations may have different or additional action level guidance. Appendix F-7 (Standard Levels of Personal Protective Gear, Including Respiratory Protection) presents background information on levels of PPE (e.g., Level A, Level D) and other information from HAZWOPER that will help with the interpretation of these tables. Also refer to the PPE Program chapter in this manual.

Table F-3
Action Levels for Oxygen Content [a]

Percent Oxygen	Action
< 19.5%	• Treat as IDLH environment. • Level B required. • Determine reason for the deviation from normal O_2 level.
19.5 - 22.0%	• Continue work in accordance with action levels for other contaminants. • Continue monitoring for oxygen content.
> 22.0%	• Evacuate area, eliminate ignition sources, and reassess conditions due to fire potential. • Determine reason for the deviation.

[a] Measured by use of a direct-reading oxygen meter/explosimeter.

Table F-4
Action Levels for Particulate Nuisance Dust and Contaminated Dust[a,b]

Dust Type	Concentration as milligrams per cubic meter (mg/m^3) [a]	Action
Uncontaminated *nuisance* dust/particles not otherwise regulated (PNOR)	<2.5 mg/m^3	• Level D PPE.
	>2.5 mg/m^3	• Evaluate health and safety measures • Consider Level C PPE (with full-facepiece respirator for eye protection).
	> 5.0 mg/m^3	• Exceeds PEL for respirable dust. • Use Level C PPE (with full-facepiece respirator for eye protection).
	> 10.0 mg/m^3	• Exceeds PEL for total dust. • Use Level C PPE (with full-facepiece respirator for eye protection).
Dust contaminated with a hazardous substance[b]	Any concentration	• Conduct substance-specific air monitoring to obtain an accurate characterization of the hazard.

[a] Measured by use of a direct-reading real-time aerosol monitor (RAM), Data RAM, or Mini-RAM. Assumes that a substantial percentage of the dust could be respirable size.
[b] If dust is contaminated, refer to the PEL for the specific contaminant.

APPENDIX F-4

Points to Consider When Selecting Respiratory Protection Equipment

As a first step in deciding which type of respiratory protection device to use, emergency responders must determine whether an air-purifying respirator (APR) is acceptable or whether the situation requires use of an atmosphere-supplying respirator (ASR) in the form of a SCBA. Emergency responders must use the NIOSH Respirator Selection Logic to make this and other decisions about respiratory protection. As discussed below, certain EPA-specific adaptations to the NIOSH Respirator Selection Logic are acceptable, such as using 0.5 of the PEL to calculate the maximum use concentration (MUC).

When to Use an ASR
An ASR is required for highly hazardous environments, including those that are oxygen deficient (less than 19.5 percent oxygen), contain high concentrations of air contaminants that create an atmosphere dangerous to life or health (IDLH), or when the concentration or identity of the hazard is unknown. An ASR is also required in environments that contain hazardous levels of an air contaminant for which no NIOSH-approved air-purifying cartridge is available.

When an APR Is Acceptable
An APR may be used when the concentration of the hazard does not exceed the limitations of the respirator. Specifically, ambient air must contain adequate oxygen, a filter or cartridge must be available to remove the contaminant, and the airborne concentration of the contaminant must not exceed the maximum use concentration (MUC), which represents the estimated level of contaminant against which the respirator and cartridges (if used) adequately protect the wearer.

Choosing Between a Negative-Pressure APR and a Powered APR (PAPR)
If emergency responders determine that an air-purifying respirator is acceptable, they can choose between an APR or a PAPR. Again, this decision might be based in part on the respirator's assigned protection factor (APF) and the MUC needed for the environment. If both respirator types offer an acceptable MUC, selection may be based on personal preference, comfort, or availability.

Calculating MUCs
The following sections provide a more detailed discussion of the use of MUCs, the respirator selection requirements of OSHA's substance-specific standards, and other tools EPA employees can use to guide respirator selection.

If airborne concentrations at emergency response or uncontrolled hazardous waste sites are not well quantified or stable, then an extra safety factor must be used when determining the MUC. A suggested conservative approach for these conditions involves multiplying the APF by *one-half* of the PEL when determining the MUC and considering whether the respiratory protection afforded by a specific device is adequate.

MUC = APF x 0.5 PEL

Definition of Terms Used in MUC Calculations

Permissible exposure limit (PEL): The maximum average concentration of airborne contaminant exposure allowed by OSHA over an 8-hour period. OSHA also sets short-term *ceiling* concentration limits, which must not be exceeded at any time. In the absence of an OSHA limit, other exposure limits may be used to determine the MUC, including NIOSH recommended exposure limits (RELs) and ACGIH threshold limit values (TLVs).

Assigned protection factor (APF): The APF represents a level of protection that most workers will achieve when correctly wearing a well maintained and properly fitted respirator under actual workplace conditions. APFs are set by NIOSH and OSHA for each style of respirator and facepiece. The higher the APF, the greater the degree of protection offered by the respirator (e.g., a respirator with an APF of 50 will reduce the amount of contaminant inside the facepiece 5 times more effectively than a respirator with an APF of 10). See Table F-5 for APFs for various types of respirators.

Respirator fit factor (FF): The FF obtained during quantitative fit testing, should not be confused with APFs. The FF should not be used to determine the upper limit of contaminant concentration in which the respirator can be used safely.

Maximum use concentration (MUC): An estimate of the maximum airborne concentration of contaminant against which the respirator will adequately protect the wearer. Calculated by multiplying the APF and the PEL, the value of the MUC is different for each combination of air contaminant and the respirator that will be worn as protection against that contaminant. This means that the MUC for a respirator must be calculated separately for each contaminant. The MUC cannot, however, be allowed to exceed the contaminant concentration that is IDLH. If the calculated MUC exceeds the IDLH level, the MUC is capped at the IDLH.

Sample MUC Calculation

Question: At an emergency response site, simple engineering controls have reduced the 8-hour time-weighted average (TWA) exposure level for chlorobenzene to 609 ppm. A responder obtained an acceptable PortaCount® fit test (QNTF) with a full-facepiece air-purifying respirator. Will that respirator, fitted with organic vapor (OV) cartridges, provide adequate protection?

Chlorobenzene PEL = 75 ppm
Chlorobenzene IDLH = 1,000 ppm
APF for full-facepiece APR = 50

Calculations: The PEL for chlorobenzene is 75 ppm. Table F-5 shows that a full-facepiece APR has an APF of 50. When considering a respirator with an APF of 50, the MUC would be 50 x 0.5 (75 ppm) = 1,875 ppm.[1] However, the NIOSH IDLH for chlorobenzene is 1,000 ppm, so the MUC must be capped at 1,000 ppm. The MUC of 1,000 exceeds the measured 8-hour TWA of 609 ppm, so the full-facepiece APR would appear to provide adequate protection at this response site; however, the suitability of the OV cartridges must still be considered.

Manufacturer's information on the OV cartridges indicates that at an airborne chlorobenzene concentration of 500 ppm the cartridges will have an estimated service life of just 6.4 hours, while at a concentration of 1,000 ppm the OV cartridges would have contaminant breakthrough in 4 hours (this does not take into consideration any safety factor, or the possibility that a humid environment or other factors could further reduce the cartridge service life).

[1] Note that if the responder had been fit tested only using QLFT irritant smoke methods, the EPA-assigned APF for the full facepiece respirator would have been 10 rather than 50 and the calculated MUC would have been 750.

Conclusion: The full-facepiece respirator provides adequate protection at the response site, but the cartridges would require a frequent change schedule. Options: 1) re-evaluate the engineering controls to see if the airborne concentration can be reduced, 2) work with the manufacturer to determine a frequent, but appropriate change schedule given the actual work rate and environmental conditions, 3) consider a full-facepiece respirator that uses a larger canister instead of cartridges (for longer service life), or 4) consider using an atmosphere-supplying respirator.

OSHA APF Classifications for Respirators

Table F-5 presents APF values for all the types of respiratory protection for which OSHA publishes APF values. Emergency responders who are medically qualified and fit tested to wear a respirator can look up the APF on this table and use the value to calculate the MUC for the respirator. They must select a respirator that meets or exceeds the required level of protection. This means that ***the MUC for the selected respirator must be greater than the worksite exposure level***. OSHA notes that when using a combination respirator (e.g., airline respirators with an air-purifying filter), responders must ensure that the APF is appropriate to the mode of operation in which the respirator is being used.

Table F-5
Assigned Protection Factors [a]

Type of Respirator[b, c]	Quarter - Mask	Half-Mask	Full-Facepiece	Helmet/ Hood	Loose-Fitting Facepiece
1. Air-Purifying Respirator	5	10[d]	50	.....	.....
2. Powered Air-Purifying Respirator (PAPR)	.....	50	1,000	25/1,000[e]	25
3. Supplied-Air Respirator (SAR) or Airline Respirator					
• Demand mode	.....	10	50	.....	.....
• Continuous flow mode	.....	50	1,000	25/1,000[e]	25
• Pressure-demand or other positive-pressure mode	.....	50	1,000	.....	.....
4. Self-Contained Breathing Apparatus (SCBA)					
• Demand mode	.....	10	50	50	.....
• Pressure-demand or other positive-pressure mode (e.g., open/closed circuit)	.....	.....	10,000	10,000	.....

NOTES

[a]APFs do not apply to respirators used solely for escape. For escape respirators used in association with specific substances covered by 29 CFR 1910 subpart Z, employers must refer to the appropriate substance-specific standards in that subpart. Escape respirators for other IDLH atmospheres are specified by 29 CFR 1910.134 (d)(2)(ii).

[b]Employers may select respirators assigned for use in higher workplace concentrations of a hazardous substance, for use at lower concentrations of that substance, or when required respirator use is independent of concentration.

[c]The assigned protection factors are only effective when the employer implements a continuing, effective respirator program as required by 29 CFR 1910.134, including training, fit testing, maintenance, and use requirements.

[d]This APF category includes filtering facepieces and half masks with elastomeric facepieces.

[e]The employer must have evidence provided by the respirator manufacturer that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000. This level of performance can best be demonstrated by performing a workplace protection factor (WPF) or simulated workplace protection factor (SWPF) study or equivalent testing. Absent such testing, all other PAPRs and SARs with helmets/hoods are to be treated as loose-fitting facepiece respirators, and receive an APF of 25.

WPF = The protection provided by a respirator during a study conducted under actual conditions of use in the workplace. The WPF is described by the ratio of the concentration of an airborne contaminant (e.g., hazardous substance) outside the respirator (Co) to the concentration inside the respirator (Ci) (i.e., Co/Ci) during the study period.
SWPF = The measured optimum performance of respirators in a controlled laboratory setting and described by the ratio of the concentration of an airborne contaminant (e.g., hazardous substance) outside the respirator (Co) to the concentration inside the respirator (Ci) (i.e., Co/Ci) while the respirator user performs a series of set exercises.

Excerpt from OSHA's Respiratory Protection standard.

Consideration for Environments Impacted by Chemical, Biological, Radiological, and Nuclear (CBRN) Events

In environments containing CBRN agents, emergency responders must wear a respiratory protection device that NIOSH has certified for CBRN environments. NIOSH has an ongoing program to certify respirators that are suitable in these environments and more respirators are added to the list each year. Supervisors must check the appropriate NIOSH CBRN respirator Web site and select approved respirators for incidents involving these substances. If a specific desired style of respirator is not yet covered by a NIOSH CBRN test method, supervisors must consult the respirator manufacturers to determine whether commercial laboratory testing has been conducted on their products to determine whether the respirator has the ability to protect the wearer from CBRN agents.

Decision Tools to Assist with the Respirator Selection Process

There are a number of guides and references available to assist with the respirator selection process. EPA emergency responders use the NIOSH Respirator Selection Logic. Other guides are published by EPA, OSHA, and the American National Standards Institute (ANSI). Some OSHA substance-specific standards designate required levels of respiratory protection (a list of these standards appears later in this appendix).

Tips for Using the NIOSH Respirator Selection Logic

Be prepared to answer the following questions about worksite air contaminants:

- Is there greater than 19.5 percent oxygen in the task environment?
- Are the task contaminants known?
- Are the task contaminant concentration(s) known?
- Are the task contaminant concentration(s) below IDLH?
- Are the task contaminant concentration(s) below the MUC?
  - If QNFT is performed, the MUC for a full-facepiece negative-pressure APR equals the APF of 50 X 0.5 PEL.
  - If QLFT is performed, the MUC for a full-facepiece APR equals 10 X 0.5 PEL.
  - Or, if the organization has established other more stringent requirements, these apply (Appendix B).
- Do the task contaminants have adequate warning properties?
- Do the task contaminants have high break-through qualities?
- Does a cartridge/canister exist that filters for the task contaminant(s)?

- Is the cartridge/canister rated for the task contaminant concentration(s)?

SCBAs must be worn when:

- Performing assessment activities at sites where the levels of airborne contaminants are not known and cannot be reasonably estimated by a qualified person.
- Opening containers or drums that contain: (1) unknown hazardous materials or (2) known materials for which SCBAs are required. (In cases where the contents are unknown, sampling can be performed to determine the hazard. If the data indicate that the hazard is low, then the level of respiratory protection that is required can be downgraded.)
- Operating in confined spaces where oxygen levels are low or toxic materials are present, such as in abandoned waste chemical storage buildings, manholes, storm drains, or drainage ditches.
- Any other condition involving an IDLH atmosphere. *Note: these conditions always require (1) a full-facepiece pressure-demand SCBA with a minimum service life of 30 minutes, or (2) a combination full-facepiece pressure-demand supplied-air respirator (SAR) with an auxiliary self-contained air supply.*

APRs may be worn when:

- Emergency responders, or another responsible person, determine that APRs are needed to prevent exposure to low ambient levels of toxic substances. (These substances might be generated during sampling, handling, decontamination, or other activities.)
- The duration of on-site use will not exhaust the capacity of the filter/sorbent.
- Emergency SCBA-escape respirators are carried by, or located in the immediate area of, APR users during activities in which an unexpected significant release of toxic chemicals is possible even if the risk is low. (Escape respirators must be donned immediately when experiencing any warning factor such as difficulty breathing, dizziness, change in taste or smell, or other adverse reactions. Escape respirators must only be used for escape; upon donning one, the user must leave the contaminated site immediately.)

APPENDIX F-5

Considering Filter and Cartridge Selection and Service Life

Particulate filters and chemical cartridges for APRs are selected based on the type of airborne contaminant present. All filters, canisters, and cartridges must be NIOSH-certified and contain a color coded label indicating the substance or chemical class for which NIOSH has certified the cartridge. Under no circumstances will EPA employees use cartridges for which the labels are not present and clearly legible. Additional information regarding labeling and the associated color codes (i.e., markings) for filters and cartridges are provided in Appendix G.

Choosing Particulate Filters

The P-100 or high efficiency particulate air (HEPA) filter cartridges (99.97 % efficient) will be the standard issue filter for use by emergency responders when particulate hazards are encountered. Use of respirator filters of different types or lower efficiencies may be allowed for use with negative-pressure respirators during long-term site removal activities, but only with the approval of the SHEMP Manager. Because some alternative filters become less effective in the presence of oils, emergency responders must use the following decision logic to select a filter when the SHEMP Manager indicates that an alternate filter is acceptable:

Select the Type of Filter - The selection of N-, R-, and P-series filters depends on the presence or absence of oil particles, as follows:

- Use a filter of any series (i.e., N-, R-, or P-series) if no oil particles are present in the work environment.
- Use an R- or P-series filter if oil particles (e.g., lubricants, cutting fluids, or glycerine) are present. *(Note: N-series filters cannot be used if oil particles are present.)*
- Use a P-series filter if oil particles are present and the filter is to be used for more than one work shift.

NIOSH Filter Designations

To remember the filter series, use the following guide:
N for Not resistant to oil.
R for Resistant to oil.
P for oil Proof.

Select the Filter Efficiency- Selection of filter efficiency (i.e., 95%, 99%, or 99.97%) depends on how much filter leakage can be accepted. Higher filter efficiency results in lower filter leakage. However, higher efficiency comes at the expense of higher breathing resistance and possible increased facepiece leakage.

Refer to NIOSH's description of particulate filter types and purposes (e.g., N-95, P-100).

Choosing Chemical Cartridges

Chemical cartridges for APRs are selected based on the contaminant present and on information that NIOSH has issued on effective cartridge capacity values. Information to assist with performing a hazard evaluation can be found in Appendix D or by consulting the respirator manufacturer. Most manufacturers offer information by phone or on the internet. In addition, information on cartridges for standard issue respirators can be found in the "Forms" section of the manual's website.

Cartridges for APRs have a small sorbent capacity. Contaminant exposures must not exceed the cartridge performance limits determined by the manufacturer and NIOSH for each chemical cartridge. For example, organic vapor cartridges are rated to a performance capacity of 1,000 parts per million (ppm) over an 8-hour day, while canisters, which are larger, are rated to 5,000 - 20,000 ppm. These values represent the *total* organic vapor capacity of the filtration element (from all sources combined). When APRs are used in atmospheres containing a mixture of organic substances, employees must ensure that the sum of all organic vapors does not exceed these capacity levels.

Chemical cartridge and canister elements should not be used beyond their rated shelf-life date.

Rules of Thumb for Adjusting Respirator Chemical Cartridge Service Life Estimates

Many factors influence how long an air-purifying respirator chemical cartridge will protect the wearer. Factors such as the cartridge size and amount of sorbent media in the cartridge are determined by the manufacturer and are constant for a specific model of cartridge. Other factors, such as how readily an air contaminant is removed from air by the cartridge and whether the contaminant migrates within the cartridge, are functions of the type(s) of contaminants and how they interact with the sorbent media and each other. Additional factors that influence how long a cartridge will clean air include humidity in the work environment and how hard the worker is breathing.

The rules of thumb presented in Table F-6 may be used together with manufacturer's cartridge service life information or baseline cartridge service life information determined by one of the other methods advocated by OSHA. For more information on determining service life, see the section on change schedules in OSHA's e-Tool on respiratory protection.

Table F-6
Excerpt from OSHA's e-Tool on Respiratory Protection:
Rules of Thumb for Adjusting Respirator Cartridge Service Life

Experimental work can allow for a generalization or "rule of thumb" that broadly defines the service life of cartridges exposed to chemicals. One such rule of thumb for estimating organic vapor cartridge service life is found in chapter 36 of the AIHA publication "The Occupational Environment – Its Evaluation and Control."
→ **If the chemical's boiling point is > 70 °C and the concentration is less than 200 ppm you can expect a service life of 8 hours at a normal work rate.** → **Service life is inversely proportional to work rate.** → **Reducing concentration by a factor of 10 will increase service life by a factor of 5.** → **Humidity above 85% will reduce service life by 50%**
These generalizations should only be used in concert with one of the other methods of predicting service life for specific contaminants.

When considering service life, keep in mind that combination cartridges/filters and combination cartridges that join two types of cartridges may not have the same capacity for a specific contaminant as a cartridge intended for just one type of contaminant. The more types of air-purifying media packed into one cartridge, the less of each individual media type will fit in the cartridge. For this reason, an individual cartridge for one type of contaminant (e.g., acid gas) sometimes can protect the wearer from that contaminant for a longer period than will a combination cartridge (e.g., acid gas + organic vapor; or acid gas + P-100 filter).

Also, keep in mind that canisters are substantially larger than cartridges. As a result, the canister holds more air-purifying media and will protect the wearer for a longer time at a given contaminant concentration than will a cartridge.

OSHA Substance-Specific Requirements for Filters and Cartridges

A few OSHA standards govern the use of respirator filters and cartridges for certain air contaminants:

- ***Asbestos*—**At a minimum, filters must be changed at the end of the work shift; after the respirator has entered the decontamination shower. 29 CFR 1910.1001.
- ***Formaldehyde*—**Cartridges must be replaced after 3 hours of use or at the end of the work shift, whichever occurs first, unless the cartridge contains a NIOSH-approved end-of-service-life indicator (ESLI). 29 CFR 1910.1048.
- ***Acrylonitrile*—**Cartridges must be replaced prior to the expiration of their service life or at the completion of each work shift, whichever comes first. A label must be attached to the cartridge to indicate the date and time at which it was installed on the respirator. 29 CFR 1910.1045.
- ***1,3-Butadiene*—**If NIOSH approves an ESLI, the cartridge must be used until the ESLI shows no further useful service life or the cartridge is replaced at the beginning of the next work shift, whichever comes first. If no ESLI is available, the change schedule must be based on 29 CFR 1910.1051. A label must be attached to each filter element to indicate the date and time it was first installed on the respirator. 29 CFR 1910.1051.
- ***Methylene chloride*—**APRs with chemical cartridges are not permitted in environments where methylene chloride levels exceed the PEL. Only ASRs are permitted, with one exception: a gas mask with an organic vapor cartridge may be used as an emergency escape respirator. 29 CFR 1910.1052.

APPENDIX F-6

OSHA Substance-Specific Standards That Designate Respiratory Protection

Some substance-specific OSHA standards contain respirator selection requirements. Any time that the site environment includes a contaminant covered by an OSHA substance-specific standard, the appropriate substance-specific standard must be consulted to determine its applicability. Substance-specific standards can be found on the OSHA Web site (scroll down to "Subpart Z"); the standards that contain specific respiratory protection requirements are summarized in Table F-7.

Please note that, except for the respirator selection requirements (and related cartridge change schedules), other provisions related to respiratory protection that appear within OSHA's substance-specific standards have now been superseded by the current respiratory protection standard.

Table F-7
OSHA Substance-Specific Standards

Substance	OSHA Standard
Asbestos[a]	1910.1001, 1915.1001, 1926.1101
13 Carcinogens[b]	1910.1003, 1926.1103
Vinyl chloride	1910.1017, 1926.1117
Arsenic, inorganic	1910.1018, 1926.1118
Lead	1910.1025, 1926.62
Cadmium	1910.1027, 1926.1127
Benzene	1910.1028, 1926.1128
Coke oven emissions	1910.1029, 1926.1129
Cotton dust	1910.1043
1,2-Dibromo-3-chloropropane	1910.1044, 1926.1144
Acrylonitrile[a]	1910.1045, 1926.1145
Ethylene oxide	1910.1047, 1926.1147
Formaldehyde[a]	1910.1048, 1926.1148
Methylenedianiline	1910.1050, 1926.60
1,3-Butadiene[a]	1910.1051
Methylene chloride	1910.1052, 1926.1152

[a]Includes requirements for filter/cartridge selection or change schedule.
[b]For alpha-naphthylamine, methyl chloromethyl ether, 3'-dichlorobenzidine (and its salts), bis-chloromethyl ether, beta-naphthylamine, benzidine, 4-aminodiphenyl, ethyleneimine, beta-propiolacetone, 2-acetylaminofluorene, 4-dimethylaminoazobenzene, and n-nitrosodimethylamine refer to 29 CFR 1910.1003, 13 carcinogens, for their substance-specific requirements.
Note: Open the link to the standard of interest and use the Web browser search function to find places where the word "respirator" occurs.

EPA has developed additional guidelines and requirements for a number of these regulated substances, including asbestos (SHEM Guideline No. 22 and the EPA document entitled, "*Safety and Health Guidelines for Asbestos Inspectors"*), bloodborne pathogens (*"EPA Guide for Infectious Waste Management,"* EPA/530-SW-86-014), and ionizing radiation (SHEM Guideline No. 38). EPA employees must consult agency radiological experts for recommendations regarding respiratory protection selection at sites where ionizing radiation is present.

APPENDIX F-7

Standard Levels of Personal Protective Gear, Including Respiratory Protection

Excerpt from OSHA's Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard, 29 CFR 1910.120, Appendix B - General Description and Discussion of the Levels of Protection and Protective Gear. Also, refer to the PPE Program chapter of this manual.

The more that is known about the hazards at the site, the easier the job of selecting PPE. As more information about the hazards and conditions at the site becomes available, the site supervisor can make decisions to up-grade or down-grade the level of PPE protection to match the tasks.

The following are guidelines that an employer can use to begin the selection of the appropriate PPE. As noted above, the site information may suggest the use of combinations of PPE selected from the different protection levels (i.e., A, B, C, or D) as being more suitable to the hazards of the work. It should be cautioned that the listing below does not fully address the performance of the specific PPE material in relation to the specific hazards at the job site, and that PPE selection, evaluation, and re-selection is an ongoing process until sufficient information about the hazards and PPE performance is obtained.

At-a-Glance – Levels of Personal Protection

- Examples of ***Level A*** clothing and equipment include positive-pressure, full-facepiece SCBA or positive-pressure supplied-air respirator with escape SCBA, totally encapsulated chemical- and vapor-protective suit, inner and outer chemical-resistant gloves, and disposable protective suit, gloves, and boots.
- Examples of ***Level B*** protection include positive-pressure, full-facepiece SCBA or positive-pressure supplied-air respirator with escape SCBA, inner and outer chemical-resistant gloves, face shield, hooded chemical resistant clothing, coveralls, and outer chemical-resistant boots.
- Typical ***Level C*** equipment includes full-facepiece air-purifying respirators, inner and outer chemical-resistant gloves, hard hat, escape mask, and disposable chemical-resistant outer boots. The difference between Level C and Level B protection is the level of respiratory protection.
- Appropriate ***Level D*** protective equipment may include gloves, coveralls, safety glasses, face shield, and chemical-resistant, steel-toe boots or shoes.

Part A. – Personal Protective Equipment

PPE is divided into four categories based on the degree of protection afforded. (See Part B of this appendix for further explanation of Levels A, B, C, and D hazards.)

Level A - To be selected when the greatest level of skin, respiratory, and eye protection is required.

1. Positive-pressure, full-facepiece self-contained breathing apparatus (SCBA), or positive-pressure supplied-air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH).
2. Totally encapsulating chemical-protective suit.
3. Coveralls.*
4. Long underwear.*
5. Gloves, outer, chemical-resistant.
6. Gloves, inner, chemical-resistant.
7. Boots, chemical-resistant, steel toe and shank.
8. Hard hat (under suit).*
9. Disposable protective suit, gloves, and boots (depending on suit construction, may be worn over totally encapsulating suit).

* Optional, as applicable.

Level B - The highest level of respiratory protection is necessary but a lesser level of skin protection is needed.

1. Positive-pressure, full-facepiece SCBA, or positive-pressure supplied-air respirator with escape SCBA (NIOSH approved).
2. Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit; disposable chemical-resistant overalls).
3. Coveralls.*
4. Gloves, outer, chemical-resistant.
5. Gloves, inner, chemical-resistant.
6. Boots, outer, chemical-resistant steel toe and shank.
7. Boot-covers, outer, chemical-resistant (disposable).*
8. Hard hat.*
9. [Reserved]
10. Face shield.*

_____
* Optional, as applicable.

Level C - The concentration(s) and type(s) of airborne substance(s) is known and the criteria for using air-purifying respirators are met.

1. Full-face or half-mask, air-purifying respirators (NIOSH approved).
2. Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls).
3. Coveralls.*
4. Gloves, outer, chemical-resistant.
5. Gloves, inner, chemical-resistant.
6. Boots (outer), chemical-resistant steel toe and shank.*
7. Boot-covers, outer, chemical-resistant (disposable).*
8. Hard hat.*
9. Escape mask.*
10. Face shield.*

_____
* Optional, as applicable.

Level D - A work uniform affording minimal protection: used for nuisance contamination only.

1. Coveralls.
2. Gloves.*
3. Boots/shoes, chemical-resistant steel toe and shank.
4. Boots, outer, chemical-resistant (disposable).*
5. Safety glasses or chemical splash goggles.*
6. Hard hat.*
7. Escape mask.*
8. Face shield.*

_____
* Optional, as applicable.

Part B. Types of Hazards for Which Levels A, B, C, and D Protection Are Appropriate

Level A - Level A protection should be used when:

1. The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates; or the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the skin;
2. Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible; or
3. Operations must be conducted in confined, poorly ventilated areas, and the absence of conditions requiring Level A has not yet been determined.

Level B protection should be used when:

1. The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection;
2. The atmosphere contains less than 19.5 percent oxygen; or
3. The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin.

Note: This involves atmospheres with IDLH concentrations of specific substances that present severe inhalation hazards and that do not represent a severe skin hazard; or that do not meet the criteria for use of air-purifying respirators.

Level C - Level C protection should be used when:

1. The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin;
2. The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove the contaminants; and
3. All criteria for the use of air-purifying respirators are met.

Level D - Level D protection should be used when:

1. The atmosphere contains no known hazard; and
2. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

Note: As stated before, combinations of PPE other than those described for Levels A, B, C, and D protection may be more appropriate and may be used to provide the proper level of protection.

APPENDIX G

Information on Respirator Use and Maintenance

G-1 **User Seal Check Procedures**
G-2 **A Review of Air-Purifying Respirator Cartridge and Canister Markings**
G-3 **Summary of Manufacturer's Cleaning and Disinfecting Instructions for Scott7 Standard Issue Respirators**
G-4 **Information for Voluntary Users of Respiratory Protection**

APPENDIX G-1

User Seal Check Procedures

Excerpts from Appendix B-1 of 29 CFR 1910.134: User Seal Check Procedures (Mandatory)

Employees who use a tight-fitting respirator must perform a user seal check to ensure that an adequate seal is achieved each time the respirator is put on. Either the positive and negative pressure checks provided below, or the respirator manufacturer's recommended user seal check method must be used. User seal checks are not substitutes for qualitative or quantitative fit tests.

I. Facepiece Positive and/or Negative Pressure Checks

A. *Positive pressure check.* Close off the exhalation valve and exhale gently into the facepiece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal. For most respirators this method of leak testing requires the wearer to remove the exhalation valve cover first before closing off the exhalation valve and then carefully replacing it after the test.

B. *Negative pressure check*. Close off the inlet opening of the canister or cartridge(s) by covering with the palm of the hand(s) or by replacing the filter seal(s), inhale gently so that the facepiece collapses slightly, and hold the breath for 10 seconds. The design of the inlet opening of some cartridges cannot be effectively covered with the palm of the hand. The test can be performed by covering the inlet opening of the cartridge with a thin latex or nitrile glove. If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

II. Manufacturer's Recommended User Seal Check Procedures

The respirator manufacturer's recommended procedures for performing a user seal check may be used instead of the positive and/or negative pressure check procedures if the organization demonstrates that the manufacturer's procedures are equally effective.

APPENDIX G-2

A Review of Air-Purifying Respirator Cartridge and Canister Markings

A properly worded label is the primary means of identifying an air-purifying respirator (APR) cartridge or canister. The secondary means of identifying an APR canister is by color code. Each employee who either issues or uses an APR must make sure that each APR canister purchased or used is properly labeled and color coded in accordance with the requirements specified in this appendix, and that the labels and colors are properly maintained at all times thereafter until the APR canisters have completely served their purpose.

The label must identify the contaminants for which the cartridge or canister is suitable and warn that APRs must be used only in atmospheres containing sufficient oxygen to support life.

Each APR cartridge or canister must be a distinctive color or combination of colors as indicated in the following table. All colors used must be such that they are clearly identifiable by the user and clearly distinguishable from one another.

APR Cartridge/Canister Color Table

Atmospheric Contaminants to Be Protected Against	Colors Assigned[a]
Acid gases	White
Hydrocyanic acid gas	White with 2 inch green stripe completely around the canister near the bottom
Chlorine gas	White with 2 inch yellow stripe completely around the canister near the bottom
Organic vapors	Black
Ammonia gas	Green
Acid gasses and ammonia gas	Green with 2 inch white stripe completely around the canister near the bottom
Carbon monoxide	Blue
Acid gases and organic vapors	Yellow
Hydrocyanic acid gas and chloropicrin vapors	Yellow with 2 inch blue stripe completely around the canister near the bottom
Acid gases, organic vapors, and ammonia gases	Brown
Radioactive materials, excepting tritium and noble gases	Purple (magenta)
Particulates (dusts, fumes, mists, fogs, or smokes) in combination with any of the above gases or vapors	Canister color for contaminant, as designated above, with 2 inch gray stripe completely around the canister near the top
All of the above atmospheric contaminants	Red with 2 inch gray stripe completely around the canister near the top

[a] Gray must not be assigned as the main color for a canister designed to prevent acids or vapors from entering the facepiece. Orange must be used as a complete body or stripe color to represent gases not included in this table. The user must refer to the canister label to determine the degree of protection the canister will afford.

APPENDIX G-3

Summary of the Manufacturer's Cleaning and Disinfecting Instructions for Scott7 Standard Issue Respirators

For all Scott7 respirator facepieces, breathing tubes (inside and outside), and harness assemblies (head and backpack) the manufacturer recommends washing the equipment in a warm (110° F. maximum) water solution that contains a mild detergent, rinsing with clean (potable) water, and drying thoroughly.

Use a soft cloth to wipe PAPR blower assemblies with the warm water solution, but do not submerge the blower. Scott7 Regulators, as well as facepieces that are not heavily soiled, may be wiped using a soft cloth and an iodine-based cleaning and disinfection solution (e.g., Scott7 Multi-Wash Mini). Heavily soiled regulators must not be submerged in cleaning solution, but rather must be returned to the manufacturer for cleaning.

Facepieces and regulators issued to individuals must be disinfected regularly (for example at the end of each shift). Shared facepieces and regulators must be disinfected between each user. The manufacturer's instructions say to spray generously with the iodine-based solution (e.g., 6 pumps from the spray bottle), swirl excess solution in the unit, shake out the excess liquid, and allow the facepiece or regulator to stand for 10 minutes (i.e., the required contact time for disinfection), rinse the device in clean (potable) water, and dry thoroughly.

Using Alternate Cleaning Products and Moist Towelettes

Some cleaning products may damage or shorten the service life of certain respirators or their components, but are safe for others. Examples include:

- Alcohol solutions (e.g., 70 percent isopropanol solution, also called rubbing alcohol)
- Quaternary ammonium compounds (e.g., ammonium chloride)

Alcohol-based cleaning products will damage Scott7 40 mm adaptors, but are safe for Scott7 facepieces and may be used to clean standard issue facepieces.

On the other hand, quaternary ammonium compounds will accelerate aging of Scott7 respirators. Therefore, it is desirable to minimize the use of alternate cleaning and disinfection products, including moist towelettes, if they contain this ingredient.

Instead, for interim cleaning, users are advised to wipe Scott7 equipment with an alcohol pad (carefully avoiding the regulator) or a pad dampened with water. Whenever it is feasible to rinse the respirator, use the manufacturer's cleaning solution.

Although safe for Scott7 facepieces, the alcohol-based products can deteriorate several other brands of facepieces (depending on the type of material with which the facepieces are made). Emergency responders who wear alternate brands of respirators (because they cannot achieve an acceptable fit with Scott7 equipment) must consult the manufacturer's literature to determine which cleaning products are safe for their respirators.

Acceptable Cleaning Solutions for Scott Respirator Components

Respirator Component	Alcohol-Based Cleaner (e.g., rubbing alcohol)	Quaternary Ammonium Compounds (e.g., ammonium chloride)	Manufacturer's Cleaning Solution	Soap and Water
Scott7 facepieces	Yes	No	Yes	Yes
Scott7 40 mm adaptors	No	No	Yes	Yes
Other brands[a]	??	??	Yes	Yes

[a] The appropriate choice for a cleaning solution depends on the material with which the respirator is made. Consult the respirator instruction manual or the manufacturer for recommendations.

APPENDIX G-4

Information for Voluntary Users of Respiratory Protection (29 CFR 1910.134 Appendix D)

Excerpt from Appendix D of 29 CFR 1910.134: (Mandatory) Information for Employees Using Respirators When Not Required Under the Standard

The following information must be provided to employees who wear a respirator on a voluntary basis.

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. If your employer provides respirators for your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

You should do the following:

1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirator's limitations.
2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.
3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.
4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

[63 FR 1152, Jan. 8, 1998; 63 FR 20098, April 23, 1998]

APPENDIX H

Supplemental Guidelines for Ensuring an Adequate Supply of Breathing Air

H-1 **Obtaining Breathing Air from an Outside Source**
H-2 **Procedures for Monitoring Breathing Air Compressors**
H-3 **Producing Breathing Air with an In-House Compressor**

APPENDIX H-1

Obtaining Breathing Air from an Outside Source

When obtaining breathing air from an outside source, EPA employees must obtain (and carefully review) the following air quality documents to confirm that the air is of suitable quality:

- A certificate stating that the air meets Grade D breathing air requirements (at a minimum), and
- Information about the type and frequency of testing that has taken place.

Alternatively, if a certificate is not available, the following documents will be considered an acceptable substitute:

- Copies of recent air quality testing, and
- Information about the type and frequency of testing that has taken place.

The text box lists points that EPA employees must keep in mind when trying to determine whether breathing air is of an acceptable quality. If an EPA employee obtains breathing air from an outside source, the employee will be held responsible for obtaining these records and providing them to the Health and Safety Program Contact, who is responsible for reviewing the documents and holding them for recordkeeping purposes. If, in an emergency, EPA employees obtain breathing air from a fire department, they must obtain an assurance that the air meets at least Grade D quality, documented by one of the methods above.

Guidelines to Consider When Obtaining Breathing Air from an Outside Source

- **Grade E air**, typically found at dive shops, meets the same or more stringent standards and may be substituted for Grade D air in ASRs.
- The terms "**medical air**" and "**breathing air**" often refer to air that would be of an acceptable quality for use in ASRs. However, the terms do not ensure a suitable product and air quality testing documents must be obtained to confirm that the air does indeed meet the minimum requirements for Grade D air.
- **Oxygen-enriched air** (above 23.5% oxygen), **compressed oxygen**, and **liquid oxygen** must NOT be used in respiratory protection equipment used by EPA employees.
- In cases where multiple cylinders are filled simultaneously through a manifold from tanks of oxygen and nitrogen, the oxygen/nitrogen ratio in individual containers might be inconsistent. Therefore, **when breathing air is produced in this manner (i.e., without a compressor), each cylinder must be tested individually to ensure that it contains the appropriate level of oxygen**. If EPA employees obtain breathing air produced in this manner, they must ensure that the entity supplying the air has tested each cylinder individually. If such testing has not been conducted, EPA will be expected to perform these tests before allowing its employees to use these cylinders.

APPENDIX H-2

Procedures for Maintaining Breathing Air Compressors

Compressor System Operator Qualifications and Responsibilities

In organizations that have in-house compressor systems, the Health and Safety Program Contact will be the single point of contact for that equipment and will have complete accountability for the operations and maintenance of that system. The Health and Safety Program Contact must receive training in the following areas, at a minimum, prior to operating or maintaining the system:

1. Start-up, operations, and maintenance procedures as provided by the compressor manufacturer;
2. Safe handling practices for compressed gas cylinders; and
3. DOT Hazardous Materials Shipping Requirements.

The Health and Safety Program Contact may further delegate his/her responsibilities to an assistant, alternate, or contractor; however, final accountability will remain with the organization's original designee. Any person that is designated to assist the Health and Safety Program Contact must receive all applicable training from the manufacturer prior to performing any system operation and maintenance. If a contractor is used to operate and maintain the compressor system, the Health and Safety Program Contact must be responsible for ensuring that all appropriate operation and maintenance procedures are followed by that contractor. The Health and Safety Program Contact must retain documentation of these individuals' training and qualifications.

Breathing Air Compressor Operation and Maintenance

Compressors used for supplying breathing air must be installed by a qualified technician who meets the appropriate training requirements as specified by the manufacturer. Documentation of the installer's training and qualifications must be obtained by the Health and Safety Program Contact and maintained on file. In most cases, the vendor will install the compressor, provide start-up services, and provide training on how to operate and maintain the system.

The compressor, whether stationary or mobile, must be constructed and located so that contaminated air cannot enter the air supply system. The compressor must also be fitted with appropriate alarms (e.g., high temperature and carbon monoxide) and filters (e.g., carbon monoxide, hydrocarbons, particulates, and moisture). On compressors used to fill cylinders, an automatic shut-off device (if available) must be installed in conjunction with the carbon monoxide alarm and the high temperature alarm.

In accordance with OSHA requirements, all breathing air couplings used to connect cylinders to the compressor must be designated for breathing air use only and be incompatible with couplings associated with non-respirable air or other gas systems.

Cylinders must be filled following accepted safety procedures, which are presented in Appendix F-3.

Elements of the Breathing Air Compressor Operation and Maintenance Plan

Each organization that operates a compressor for the supply of breathing air must develop a written *Breathing Air Compressor Operation and Maintenance Plan* that delineates specific procedures based on

model specifications, actual usage (operating hours and volume of air processed per unit period of time), and manufacturer's recommendations. The plan must be drafted by the Health and Safety Program Contact and submitted to the SHEMP Manager for approval prior to bringing the compressor on-line for normal operations. The written *Breathing Air Compressor Operation and Maintenance Plan* must include the following elements, at a minimum, and also meet the manufacturer's recommendations for maintenance:

1. Name of the Health and Safety Program Contact and any alternates;
2. Regular inspection procedures;
3. Schedule of regular inspections;
4. Frequency of sorbent-bed and filter changes;
5. Methods and procedures for periodic air quality testing;
6. Frequency of air quality testing (annually at a minimum);
7. Monthly startup during periods of disuse; and
8. Documentation procedures.

About Periodic Startups

It is expected that the demand for breathing air may fluctuate significantly due to variations in workloads and the type of site work being conducted within an organization at any given time. There may be extended periods when there is no significant need to utilize the compressor to generate a breathing air supply. Therefore, in order to maintain the compressor system at a high level of readiness, a stipulation for periodic system start-ups must be included in the *Breathing Air Compressor Operation and Maintenance Plan*. The compressor must be started, run to full pressure, and used to fill at least one SCBA bottle on a monthly basis, or as otherwise specified by the manufacturer.

APPENDIX H-3

Producing Breathing Air with an In-House Compressor

Use EPA Breathing Air Compressors to Fill Tanks

Air compressors operated by emergency responders must only be used to provide breathing air for filling SCBA cylinders or cylinder storage/cascade systems. EPA employees must use air compressors to supply air directly to airline respirators for immediate breathing. EPA-operated systems are typically not set up to provide air directly to a facepiece. As noted elsewhere, inline filters (e.g., carbon monoxide, hydrocarbons, particulates, and moisture) are required between a compressor and an airline respirator connection. Appropriate pressure regulators are also needed to ensure that any breathing air supplied to a respirator facepiece is within the respirator manufacturer's specified pressure range and consistent with the NIOSH approval for the respirator.

Compressed Breathing Air Quality

Compressed breathing air that is generated using an EPA compressor must be tested at least annually to ensure that the air meets requirements for Grade D quality (detailed in Compressed Gas Association G-7.1-1997 and listed in Section 3.6.2 of this chapter). The Health and Safety Program Contact is responsible for ensuring that this testing is conducted and for maintaining annual and historic records of the results.

SCBA Cylinder Filling Procedures

The following minimum procedures apply to the filling of SCBA cylinders:

1. Visually inspect each cylinder for damage prior to filling. Cylinders that are bulging, have large chips, show signs of fiber strand unwrapping, or show other signs of damage must not be filled.
2. Check the hydrostatic test date on the cylinder. Fiber-wrapped cylinders that are within 3 years of the test date can be filled. Aluminum tanks must be within 5 years of the hydrostatic test date. Cylinders that have not been tested within the required period must be red-tagged, removed from service, and sent for hydrostatic testing before restored to service.
3. Verify the pressure rating of the cylinder (cylinders may not be filled in excess of their specified operating pressure rating).
4. Ensure all couplings are properly tightened and secured prior to filling.
5. Place the cylinder to be filled in an explosion protection cage prior to filling.
6. Open the fill valve slowly and maintain a slow fill rate in order to avoid excessive heat build-up. (Tip: use a fill rate of 100 psi per minute to get a good fill, with a maximum rate of 300 psi when "jamming" bottles.)
7. After closing the SCBA cylinder valve and fill valve, depressurize the system before fully disconnecting couplings.
8. Leak test each cylinder after filling by applying a soapy water solution to the cylinder neck/valve assembly. If no leakage is detected, the cylinder is ready for use.