# Respiratory Protection Policy

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I. Purpose

This Policy is designed to help reduce employee and student exposure to occupational air contaminants such as: dust, fumes, mists, gasses, fibers, vapors, microorganisms, and radionuclides. Where feasible, exposure to contaminants will be eliminated by either engineering controls (i.e., general and local exhaust ventilation, enclosure, or isolation), or substitution of a less hazardous process or material. When effective engineering controls or substitution are not feasible, use of personal protective respiratory equipment may be required. The purpose of this program is to determine the following information:

• When respiratory protection is needed
• Which respirators are needed
• Which employees are required to wear respiratory protection
• How respirators are used in a correct and safe manner

II. Scope

This policy and the procedures outlined herein apply to all Albert Einstein College of Medicine (Einstein) faculty, staff, and students.

III. Policy

This program shall be administered pursuant to the requirements of the OSHA Respiratory Protection Standard, 29CFR 1910.134 (Revised July 1, 2013) attached to this document.

III.A. Responsibilities

III.A.1. Management

Einstein is committed to maintaining a healthy and safe work environment and is responsible for establishing this respiratory protection program to assist in reducing or eliminating workplace exposure to hazardous materials.

III.A.2. The Department of Environmental Health and Safety (EH&S)

EH&S is responsible for the management of this program. Specific employees in the Department have responsibilities as follows:

1. Director of Environmental Health and Safety is the Program Administrator.
2. The Industrial Hygienist is responsible for:
   a. Coordination and monitoring of the program.
   b. Evaluation of the need for respirators including surveillance of conditions and degrees of potential exposure.
   c. Modification of the program as appropriate.
   d. Identification of employees for participation in the program.
   e. Establishment/maintenance of medical surveillance.
   f. Coordination of respirator fit testing.
   g. Selection of NIOSH-approved respirators and maintenance of respirator inventory.
   h. Training sessions for participants regarding use, care, and storage of respirators.
i. Communication of changes in regulatory standards and/or the Einstein Respiratory Protection Program to supervisors and employees.

j. Maintenance of records for this program.

3. Supervisors are responsible for:
   a. Ensuring that all employees are knowledgeable of the respiratory protection requirements for the areas in which they work.
   b. Monitoring the proper use and care of respirators.
   c. Implementing a cleaning and inspection program for respiratory equipment, including designation of proper storage areas for respiratory equipment.
   d. Enforcing employee compliance with the Respiratory Protection Program.
   e. Monitoring employee compliance with this program. This includes assurance that:
      i. Employees who are required to wear a respirator because of potential exposure do so as a condition of employment.
      ii. Employees participate fully in all aspects of the program including medical surveillance and fit testing before wearing a respirator.
      iii. Employees follow instructions for use, care, storage, and maintenance as outlined herein.

4. Employees are responsible for:
   a. Being aware of respiratory protection requirements for their work area.
   b. Following all aspects of this plan including completion of training, medical surveillance, and fit test requirements, prior to using a respirator.

5. Procurement Services has the responsibility for ordering only those respirators approved by the program.

6. The Medical Exam contractor is responsible for:
   a. Evaluating physical ability of employees to wear respirators.
   b. Communicating written results to Einstein’s Industrial Hygienist, as appropriate.

7. Fit-Testing contractor is charged with the fit testing of most participants in the Respiratory Protection Program. EH&S performs some additional fit-testing as needed including employees working in the Biohazard Facility.

III.B. Selection of Respiratory Protective Equipment:

III.B.1. Evaluation of Potential Hazards

1. Operations and processes will be monitored for potential respiratory hazards, according to accepted industrial hygiene practices.

2. Personal sampling equipment may be used in accordance with accepted industrial hygiene standards to sample an area. Decisions regarding the use of respiratory protection may be based upon these results or by a reasonable and conservative estimate of these hazards.

3. Respirator use is mandatory in areas considered hazardous and will comply with 29 CFR 1910.134 or 1926.1101.
III.B.2. Types of Respirators

1. Air-purifying respirators clean the contaminated atmosphere through the use of filters, absorbents, or chemicals. Air-purifying respirators can only be used where there is sufficient oxygen to sustain life and the air contaminant level is within specified limitations of the respirator.
   a. Mechanical-filter, air-purifying respirators provide protection against airborne particulate matter including: dusts, mists, metal fumes, smokes, and microorganisms, but do not provide protection against gases, vapors, or oxygen deficiency.
   b. Chemical-cartridge air-purifying respirators provide protection against certain gases and vapors by using various chemical filters to purify the inhaled air.
   c. The Occupational Safety and Health Administration (OSHA) requires that NIOSH approved air-purifying respirators be used by workers.

2. Atmosphere or air-supplying respirators provide breathable air from a source of air which is independent from the ambient atmosphere. There are three classes of atmosphere-supplying respirators:
   a. Supplied-air respirators
   b. Self-contained breathing apparatuses (SCBA)
   c. Combination-SCBA and supplied-air respirators. The use of SCBA equipment may be required in specific areas for emergency use. Only appropriately trained employees may use SCBA.

3. Combination air-purifying and atmosphere-supplying devices have an auxiliary air-purifying attachment, which provides protection in the event the air supply fails.

WORKERS USING RESPIRATORS MUST BE SPECIFICALLY TRAINED FOR THE RESPIRATOR THEY ARE PLANNING TO USE.

III.B.3. Respirators Currently Approved by EH&S

1. Half-face respirator - (3M 6000 and 7500 series)
2. Full-face respirator - (3M 6000 and 7000 series)
3. PAPR respirator - (3M)
4. N95 respirators for TB
5. 3M 8247, 8271, 9210 and 9211

III.B.4. The Following Cartridges Are Available at EH&S.

Listed are their part numbers and usage:

1. 2091 - Particulates (dust, mist, fumes, asbestos, and radionuclides)
2. 6001 - Organic Vapor
3. 6002 - Acid Gas
4. 6003 - Organic vapor/Acid Gas
5. 6004 - Ammonia/Methylamine
6. 6005 - Formaldehyde/Organic Vapor
7. 6006 - Multi Gas/Vapor
8. 6009 – Mercury Vapor or Chlorine
9. Numbers vary (N95) - T.B. Exposure
Einstein shall ensure that all filters, cartridges, and canisters used in the workplace are labeled and number-coded with the NIOSH approval label and that the label is intact and legible.

### III.B.5. Selection of Respirators

1. Wherever respiratory protection is required, NIOSH-approved respirators, appropriate to the hazards, shall be selected by Einstein EH&S.
2. Selection is based upon physical and chemical properties of air contaminants and concentration levels likely to be encountered by employees.
3. Respirators will be made immediately available to each new hire or transfferee to a job where respiratory protection is required.

### III.B.6. Areas Where Respirators May Be Required

1. Respiratory protection shall be required in any work area that has the potential to create an environment where the atmospheric contamination levels exceed the OSHA permissible exposure limits (PELs) for the specific contaminant.
2. Respiratory protection shall be required in areas where there is a likelihood of exposure to tuberculosis, such as hospitals, healthcare programs and selected clinical research areas.
3. Respiratory protection is always required to be worn in accordance with 29CFR 1926.1101 in any area where workers’ tasks may disturb known or potential asbestos-containing material.
4. Self-contained breathing apparatuses may be required to be worn when filtered respirators are not adequate. These may include areas with insufficient oxygen, where contaminants are at a level Immediately Dangerous to Life or Health (IDLH), or the contaminant levels are unknown.

### III.C. Medical Evaluation

#### III.C.1. For N95 Respirator Users

1. Prior to the issuance of a respirator all employees shall complete a medical questionnaire (see 29 CFR 1910.134). This questionnaire must be approved by a Physician or Licensed Health Care Professional (PLHCP) before issuance of an N95 respirator.
2. Medical examinations will be given to any employee at the discretion of the PLHCP.

#### III.C.2. For Half-Face, Full-Face, PAPR, and SCBA Respirator Users

1. Prior to the issuance of a respirator all employees shall complete a medical questionnaire, (See 29 CFR 1910.134), and receive a medical exam to determine the employee's physical ability to wear a respirator. This exam shall be provided without cost to each eligible employee.
2. Content of Medical Evaluations:
   a. A complete occupational and medical history update
   b. A complete physical
   c. Pulmonary function testing to include Forced Expiratory Volume at one second (FEVI), Forced Vital Capacity (FVC), and the FEVI-to-FVC ratio.
d. Chest X-ray and GI evaluation for asbestos workers at the discretion of the PLHCP.
e. Any other test deemed medically appropriate by the examining PLHCP.

III.D. Fit Testing

1. The proper fit of respiratory equipment to the user is determined by a qualitative fit test procedure according to 29 CFR 1910.134.
2. Employees who take part in this program are not permitted to wear beards unless they provide:
   a. A documented religious reason
   b. A documented medical condition
3. Employees must provide EH&S with a written personal statement for a religious exemption and a written physician’s statement for a medical exemption. Respiratory protection for these employees will be evaluated on a case-by-case basis.
4. Fit testing shall be performed according to the following schedule:
   a. Prior to issuance of a respirator, but after medical clearance.
   b. Annually for asbestos workers, non-asbestos workers, and those workers requiring protection against tuberculosis.
   c. If any of the following conditions occur:
      i. Significant weight gain or loss
      ii. Dental changes
      iii. Facial scarring
      iv. Cosmetic surgery
5. Employees are responsible for checking their respirators for fit prior to each use by performing negative and positive seal checks as described in 29 CFR 1910.134. If these checks are not successful, the respirator should not be used.

III.E. Respirator Use

1. To wear a respirator, employees must be medically cleared to wear it and pass the fit test procedure.
2. Employees may not wear a respirator if they have facial hair which comes between the sealing surface of the facepiece and the face or any condition which interferes with the face to facepiece seal or valve function.
3. Employees who wear respirators are permitted to leave the regulated area to wash their faces and respirator facepieces as necessary. This may be done to prevent skin irritation associated with respirator use or to change the filter elements if a change in breathing resistance or chemical vapor breakthrough is detected.
4. Every employee is required to perform a negative and positive seal check prior to respirator use.

III.F. Voluntary Use of a Respirator

1. Employees may choose to wear a filtering respirator on a voluntary basis during activities that may involve exposure to low-level, non-hazardous nuisance dust, or other similar particulates or nothing at all.
2. Employees that voluntarily choose to wear a filtering respirator must still medically cleared to do so by OHS.
3. Employees that voluntarily choose to wear a respirator must read and sign the “Acknowledgment of Voluntary Use of a Filtering Respirator” form.
4. Employees must also be familiar with Appendix 3 from OSHA’s Respiratory protection, as it is outlined in the form and at the end of this document.

III.G. Maintenance of Respiratory Protective Equipment

All respirators shall be maintained using the procedures in 29 CFR 1910.134 or procedures recommended by the manufacturer, provided that such procedures are of equivalent effectiveness. The following methods shall be used to maintain the equipment.

III.G.1. Cleaning/Disinfecting

Respiratory equipment shall be washed thoroughly in warm water with detergent, using a soft brush. Detergents with a bactericide are preferable. If detergent with a bactericide is not used, the detergent wash shall be followed with a disinfecting rinse. Components shall be hand-dried with a clean lint free cloth or air dried before assembly.

III.G.2. Storage

Dry, clean, disinfected respirators shall be sealed in clean plastic bags out of direct sunlight with the facepiece and exhalation valve in a non-distorted position.

III.G.3. Repair

Repair and replacement of damaged parts must be done before the respirator can be used. Replacement parts must be those of the manufacturer of the equipment. Replacement parts are available at EH&S. Repairs or replacement must be performed by a qualified individual.

III.G.4. Inspection Procedures

All respirators shall be inspected by each user before and after each use and during cleaning. The following items will be examined during inspection:

1. Rubber Facepiece
   a. Cracked or broken air-purifying element holder(s), badly worn threads or missing gasket(s)
   b. Excessive dirt
   c. Cracks, tears, or holes
   d. Distortion
   e. Cracked, scratched, or loose-fitting lens (full face)
   f. Incorrectly mounted full facepiece lens or broken/missing mounting clips

2. Head Strap
   a. Breaks or tears
   b. Loss of elasticity
   c. Broken or malfunctioning buckles/attachments
   d. Excessively worn serrations on head piece
   e. Harness which might allow the facepiece to slip
3. Inhalation/Exhalation valves
   a. Detergent residue, dust particles, dirt, or hair on valve or valve seat.
   b. Cracks, tears, distortion in valve material or valve seat
   c. Improper insertion of the valve body in the facepiece
   d. Cracks, breaks, or chips in the valve body particularly in the sealing surface
   e. Improper installation of the valve in the valve body

4. Filter elements
   a. Incorrect cartridge, canister, or filter for the hazard
   b. Missing or worn gaskets
   c. Worn threads
   d. Cracks or dents in filter housing
   e. Incorrect installation, loose connections, or cross-threading in holder
   f. Evidence of prior use of sorbent, cartridge, or canister, indicated by absence of sealing material, tape foil, etc. over inlet

III.H. Training

All employees in the program will be trained annually in the proper use and care of their respiratory equipment that have been assigned to them.

1. Training will include the following elements:
   a. Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator
   b. What the limitations and capabilities are for the respirator
   c. How to use the respirator effectively in routine and emergency situations, including situations in which the respirator malfunctions
   d. How to inspect, doff and don, use, and check the seals of the respirator
   e. What the procedures are for maintenance and storage of the respirator
   f. How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators.

2. The training shall be conducted in a manner that is understandable to the employee.

3. The employer shall provide the training prior to requiring the employee to use a respirator in the workplace.

III.I. Program Evaluation

1. Surveillance of the workplace will be conducted by the EH&S Department on an ongoing basis to determine the necessity of respiratory protection.

2. This program will be reviewed and updated periodically via:
   a. Review of training rosters
   b. Review of medical evaluation records
   c. Review of fit testing rosters
   d. Observation of compliance with care, use, and storage
   e. Enforcement of the program
   f. Review and observation of the appropriateness and competence of the fit testing program
III.J. Record Keeping

1. Records will be maintained at EH&S and will include the following:
   a. Medical Evaluations
   b. Fit Testing
   c. A written copy of The Einstein Respiratory Protection Program


III.K. Contact Number

EH&S can be contacted at (718) 430-4152 for questions or clarifications regarding this Respiratory Protection Program.

IV. Definitions

None.

V. Effective Date

Effective as of: 9 April 2018

VI. Policy Management and Responsibilities

Einstein’s Department of Environmental Health and Safety is the Responsible Office under this Policy. Einstein’s Associate Dean for Finance and Administration is the Responsible Executive. Einstein’s Senior Director of Environmental Health and Safety is the Responsible Officer for the management of this Policy.

VII. Approved (or Revised)

[Signature]

Responsible Executive

Date: 7/9/18
Appendix 1: List and Locations of References and Safety Data Sheets (formerly known as MSDS)

The following reference materials are available in the Department of Environmental Health and Safety Office, Forchheimer bldg. room 800.

Code of Federal Regulations: 49 Transportation, Revised, October 1, 2013
29 Labor, Revised July 1, 2013
OSHA 2206, Revised July 1, 2013

The Condensed Chemical Dictionary, Van Nostrand Reinhold Company

CRC Handbook of Laboratory Safety, Norman V. Steere, CRC Press, Inc.

Degradation of Chemical Carcinogens, Milton W. Slein and Eric B. Sansone, Van Nostrand Reinhold Company

Federal Register: Hazardous Waste and Consolidated Permit Regulations

Guide for Safety in the Chemical Laboratory, The Manufacturing Chemist Association


Hazardous Chemical Safety, J.T. Baker, Inc., Phillipsburg, New Jersey

Hazardous Chemical Spill Response, J.T. Baker, Inc., Phillipsburg, New Jersey


The Health Servo Amplifier Card, Model EU-900-CB, Health Company, Benton Harbor, Michigan


Industrial Ventilation, A manual of Recommended Practice, Committee on Industrial Ventilation, American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio

J.T. Baker SAF-T-Training Manual, Hazardous Communication and Right-to-Know Training Program, Phillipsburg, New Jersey


National Fire Codes, Volumes 1-12, National Fire Protection Association, Subscription Service, Battery Park, Quincy, Massachusetts

NIOSH Intelligence Bulletins

NIOSH Manual of Analytical Methods, Volume 1, U.S. Department of Health & Human Services, Center for Disease Control, National Institute for Occupational Safety and Health, Division of Physical Sciences and Engineering, Cincinnati, Ohio

NIOSH/OSHA Occupational Health Guidelines for Chemical Hazards, Volume 1 A-H, & Volume 2 I-Z, U.S. Department of Health and Human Services, Center for Disease Control, National Institute for Occupational Safety and Health, U.S. Department of Labor, Occupational Safety and Health Administration, Cincinnati, Ohio

NIOSH Pocket Guide to Chemical Hazards, U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, Cincinnati, Ohio


Occupational Health Guidelines for Chemical Hazards, Two Volumes, NIOSH/OSHA,

Patty’s Industrial Hygiene and Toxicology, Volume 1, General Principles, John Wiley & Sons, New York, Chichester, Brisbane, Toronto


Prudent Practices for Handling Hazardous Chemicals in Laboratories, National Research Council, National Academy Press

The Safety Handling of Chemical Carcinogen in the Research Laboratory, National Institute of Health

Safe Handling of Chemical Carcinogens, Mutagens, Teratogens, and Highly Toxic Substances, 2 Volumes, Douglas B. Walters, Ann Arbor Science Publishers


The complete set of hard copies of all Safety Data Sheets (formerly MSDSs) for chemicals used at Einstein are in the Forchheimer Building, Room 800. SDSs are also stored on computer software and can be requested by calling (718) 430-4152. Additional copies can be found on the Ground floor and 4th floor of the Forchheimer, 3rd floor of the Kennedy, the basement, 1st, 4th and 5th floors of the Price
Building, the school library and on the internet at the following addresses: http://www.einsteinmed.org/ehs/msds or http://hazard.com.
Appendix 2: Acknowledgement of Voluntary Use of a Filtering Respirator

Acknowledgement of Voluntary Use of a Filtering Respirator

As an employee, you may choose to wear a filtering facepiece respirator, also referred to as an N95, N99, or disposable respirator, on a voluntary basis during activities that may involve exposure to low-level, non-hazardous nuisance dust, other similar particulates, or nothing at all. In accordance with the Albert Einstein College of Medicine Respiratory Protection Plan and the Occupational Safety and Health Administration (OSHA), this information must be provided to you if you choose to wear a filtering facepiece respirator VOLUNTARILY.

The following information has been copied directly from OSHA’s Respiratory Protection Standard, 29 CFR 1910.134, Appendix D. Please read the following section, complete the form at the bottom, and return it to the Industrial Hygienist, Environmental Health and Safety.

Information for Employees Using Respirators When Not Required Under the Standard

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 the respirator itself does not present a hazard.

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. The National Institute for Occupational Safety and Health (NIOSH) 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 to protect against. 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 you do not mistakenly use someone else’s.

Please remember the limitations of the filtering facepiece respirator you have chosen to wear voluntarily. If at any time you believe you could be exposed to a contaminant that your filtering facepiece respirator wouldn’t protect you from, contact Environmental Health and Safety immediately for hazard assessment and evaluation.

Name: ___________________________    Date: _________________
Signature: ________________________
EH&S: ___________________________
Appendix 3: OSHA 1910.134

§ 1910.134  29 C.F.R. Ch. XVII  (7-1-10 Edition)
Filter Lenses for Protection Against Radiant Energy

<table>
<thead>
<tr>
<th>Operations</th>
<th>Plate thickness— inches</th>
<th>Plate thickness— mm</th>
<th>Minimum* Protective Shade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Welding:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>Under 1 1/8</td>
<td>Under 3.2</td>
<td>4</td>
</tr>
<tr>
<td>Medium</td>
<td>1 1/8 to 1 3/8</td>
<td>3.2 to 12.7</td>
<td>5</td>
</tr>
<tr>
<td>Heavy</td>
<td>Over 1 3/8</td>
<td>Over 12.7</td>
<td>6</td>
</tr>
<tr>
<td>Oxygen cutting:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>Under 1</td>
<td>Under 25</td>
<td>3</td>
</tr>
<tr>
<td>Medium</td>
<td>1 to 6</td>
<td>25 to 150</td>
<td>4</td>
</tr>
<tr>
<td>Heavy</td>
<td>Over 6</td>
<td>Over 150</td>
<td>6</td>
</tr>
</tbody>
</table>

* As a rule of thumb, start with a shade that is too dark to see the weld zone. Then go to a lighter shade which gives sufficient view of the weld zone without going below the minimum in oxyfuel gas welding or cutting where the torch produces a high yellow light. It is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the arc spectrum operation.

** These values apply where the actual arc is clearly seen. Experience has shown that lighter filters may be used when the arc is hidden by the workplace.

(b) Criteria for protective eye and face protection. (1) Protective eye and face protection devices must comply with any of the following consensus standards:
(iii) ANSI Z87.1-1996, "American National Standard Practice for Occupational and Educational Eye and Face Protection," which is incorporated by reference in § 1910.30; or

(c) Protective eye and face protection devices that the employer demonstrates are at least as effective as protective eye and face protection devices that are constructed in accordance with one of the above consensus standards will be deemed to be in compliance with the requirements of this section.

§ 1910.134 Respiratory protection.

This section applies to General Industry (part 1910), Shipyard (part 1915), Marine Terminals (part 1917), Longshoring (part 1918), and Construction (part 1926).

(a) Permissible practice. (1) In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fumes, mists, gases, smoke, sprays, or vapors, the primary objective shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used pursuant to this section.

(b) A respirator shall be provided to each employee when such equipment is necessary to protect the health of such employees. The employer shall provide the respirators which are applicable and suitable for the purpose intended. The employer shall be responsible for the establishment and maintenance of a respiratory protection program, which shall include the requirements outlined in paragraph (c) of this section. The program shall cover each employee required by this section to use a respirator.

(b) Definitions. The following definitions are important terms used in the
Respiratory Protection Policy

Occupational Safety and Health Admin., Labor §1910.134

respiratory protection standard in this section.

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

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

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

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

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

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

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

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

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

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

Fitting facepiece (also known as a low-pressure Fit test) means a negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.

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

Fit test means the use of a protocol to quantitatively or qualitatively evaluate the fit of a respirator on an individual. (See also Qualitative fit test (QFT).) Holser means a rigid respiratory inlet covering that also provides head protection against impact and penetration.

High efficiency particulate air (HEPA) filter means a filter that is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter. The equivalent MSHA 6 CFR 84 particulate filters are the N90, R95, and P100 filters.

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

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

Interior structural firefighting means the physical activity of fire suppression, rescue or both, inside of buildings or enclosed structures which are involved in a fire situation beyond the incident stage. (See 29 CFR 1910.155)

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

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

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

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

Physician or other licensed health care professional (PLHCP) means an individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide, or be delegated the responsibility to provide, some or all of the health care services required by paragraph (e) of this section.

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

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

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

Qualitative fit test (QLFT) means a qualitative test to assess the adequacy of respirator fit that relies on the individual’s response to the test agent.

Quantitative fit test (QFT) means an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

Respirator inlet covering means that portion of a respirator that forms the protective barrier between the user’s respiratory tract and an air-purifying device or breathing air source, or both.

It may be a facepiece, helmet, hood, suit, or a mouthpiece respirator with nose clamp.

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

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

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

This section means this respiratory protection standard.

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

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

(1) Respiratory protection program. This paragraph requires the employer to develop and implement a written respiratory protection program with required worksite-specific procedures and elements for required respirator use. The program must be administered by a suitably trained program administrator. In addition, certain program elements may be required for voluntary use to prevent potential hazards associated with the use of the respirator. The Small Entity Compliance Guide contains criteria for the selection of a program administrator and a sample program that meets the requirements of this paragraph. Copies of the Small Entity Compliance Guide will be available on or about April 8, 1998 from the Occupational Safety and Health Administration's Office of Publications, Room N 311, 200 Constitution Avenue, NW, Washington, DC, 20210 (202-358-4567).

(1) In any workplace where respirators are necessary to protect the health of the employee or whenever respirators are required by the employer, the employer shall establish and implement a written respiratory protection program with worksite-specific procedures. The program shall be updated as necessary to reflect those changes in workplace conditions that
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affect respirator use. The employer shall include in the program the following provisions of this section, as applicable:

(i) Procedures for selecting respirators for use in the workplace;
(ii) Medical evaluations of employees required to use respirators;
(iii) Testing procedures for tight-fitting respirators;
(iv) Procedures for proper use of respirators in routine and reasonably foreseeable emergency situations;
(v) Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and otherwise maintaining respirators;
(vi) Procedures to ensure adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators;
(vii) Training of employees in the respiratory hazards to which they are potentially exposed during routine and emergency situations;
(viii) Training of employees in the proper use of respirators, including putting on and removing them, any limitations on their use, and their maintenance; and
(ix) Procedures for regularly evaluating the effectiveness of the program.

(2) Where respirator use is not required

(i) An employer may provide respirators at the request of employees or permit employees to use their own respirators, if the employer determines that such respirator use will not in itself create a hazard. If the employer determines that any voluntary respirator use is permissible, the employer shall provide the respirator users with the information contained in Appendix D to this section ("Information for Employees Using Respirators When Not Required Under the Standard"); and
(ii) In addition, the employer must establish and implement those elements of a written respiratory protection program necessary to ensure that any employee using a respirator voluntarily is medically able to use that respirator, and that the respirator is cleaned, stored, and maintained so that it does not present a health hazard to the user. Exception: Employers are not required to include in a written respiratory protection program those employees whose only use of respirators involves the voluntary use of filtering facepieces or dust masks.

(3) The employer shall designate a program administrator who is qualified by appropriate training or experience that is commensurate with the complexity of the program to administer or oversee the respiratory protection program and conduct the required evaluations of program effectiveness.

(4) The employer shall provide respirators, training, and medical evaluations at no cost to the employee.

(5) Selection of respirators. This paragraph requires the employer to evaluate respiratory hazards in the workplace, identify relevant workplace and user factors, and base respirator selection on these factors. The paragraph also specifies appropriately protective respirators for use in IDLH atmospheres, and limits the selection and use of air-purifying respirators.

(i) General requirements. (A) The employer shall select and provide an appropriate respirator based on the respirator hazard(s) to which the worker is exposed and workplace and user factors that affect respirator performance and reliability.

(B) The employer shall select a NIOSH-certified respirator. The respirator shall be used in compliance with the conditions of its certification.

(ii) The employer shall identify and evaluate the respiratory hazard(s) in the workplace; this evaluation shall include a reasonable estimate of employee exposures to respiratory hazard(s) and an identification of the contaminant's chemical state and physical form. Where the employer cannot identify or reasonably estimate the employee exposure, the employer shall consider the atmosphere to be IDLH.

(vi) The employer shall select respirators from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.

(2) Respirators for IDLH atmospheres.

(b) The employer shall provide the following respirators for employee use in IDLH atmospheres:

(i) A full facepiece pressure demand SCBA certified by NIOSH for a minimum service life of thirty minutes, or
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(B) A combination full facepiece pressure demand supplied-air respirator (SAR) with auxiliary self-contained air supply.

(ii) Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

(iii) All oxygen-deficient atmospheres shall be considered IDLH. Exception: If the employer demonstrates that, under all foreseeable conditions, the oxygen concentration can be maintained within the ranges specified in Table II of this section (i.e., for the altitudes set out in the table), then any atmosphere-supplying respirator may be used.

(5) Respirators for atmospheres that are not IDLH. (i) The employer shall provide a respirator that is adequate to protect the health of the employees and ensure compliance with all other OSHA statutory and regulatory requirements, under routine and reasonably foreseeable emergency situations.

(A) Assigned Protection Factors (APFs). Employers must use the assigned protection factors listed in Table I to select a respirator that meets or exceeds the required level of employee protection. When using a combination respirator (e.g., airline respirators with an air-purifying filter), employers must ensure that the assigned protection factor is appropriate to the mode of operation in which the respirator is being used.

Table 1—Assigned Protection Factors*  

<table>
<thead>
<tr>
<th>Type of respirator</th>
<th>Quarter mask</th>
<th>Half mask</th>
<th>Full facepiece</th>
<th>Helmet hood</th>
<th>Low-level breathing</th>
<th>assigned factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Air-Purifying Respirator</td>
<td>6</td>
<td>15</td>
<td>50</td>
<td>250</td>
<td>1500</td>
<td>10</td>
</tr>
<tr>
<td>2. Powered Air-Purifying Respirator (PAPR)</td>
<td>6</td>
<td>15</td>
<td>50</td>
<td>250</td>
<td>1500</td>
<td>10</td>
</tr>
<tr>
<td>3. Supplied Air Respirator (SAR) or Airline Respirator</td>
<td>6</td>
<td>15</td>
<td>50</td>
<td>250</td>
<td>1500</td>
<td>10</td>
</tr>
<tr>
<td>• Demand mode</td>
<td>6</td>
<td>15</td>
<td>50</td>
<td>250</td>
<td>1500</td>
<td>10</td>
</tr>
<tr>
<td>• Pressure-demand or other positive-pressure mode</td>
<td>6</td>
<td>15</td>
<td>50</td>
<td>250</td>
<td>1500</td>
<td>10</td>
</tr>
<tr>
<td>4. Self-Contained Breathing Apparatus (SCBA)</td>
<td>6</td>
<td>15</td>
<td>50</td>
<td>250</td>
<td>1500</td>
<td>10</td>
</tr>
<tr>
<td>• Demand mode</td>
<td>6</td>
<td>15</td>
<td>50</td>
<td>250</td>
<td>1500</td>
<td>10</td>
</tr>
<tr>
<td>• Pressure-demand or other positive-pressure mode (e.g., sprayer/paintfume)</td>
<td>6</td>
<td>15</td>
<td>50</td>
<td>250</td>
<td>1500</td>
<td>10</td>
</tr>
</tbody>
</table>

Notes:

* Employees may select respirators assigned for use in higher workplace concentrations of a hazardous substance for use at lower concentrations of that substance, or when respirators assigned for use at a lower concentration are not feasible.

** The assigned protection factors in Table I are only effective when the employer implements an effective respirator program as required by 29 CFR 1910.134, including training, fit testing, maintenance, and use requirements.

* The APF column includes breathing hoods and halides with an elastomeric facepiece.

* The employer must have evidence provided by the manufacturer that testing of these respirators demonstrates personal protective performance at the concentrations of the contaminant for which the performance was demonstrated by performing a NIOSH or OSHA study or equivalent testing. All other SARs and SCBAs with halides are to be treated as low-level breathing apparatus, and reviewed as APF 10.

* These APFs do not apply to respirators used solely for rescue. For rescue respirators used in association with specific substances reviewed by 29 CFR 1910.134.2, employers must select the appropriate substance-specific standards for the respirator. Rescue respirators for other IDLH atmospheres are specified by 29 CFR 1910.134(b)(3).

(B) Maximum Use Concentration (MUC). (i) The employer must select a respirator for employee use that maintains the employee's exposure to the hazardous substance, when measured outside the respirator, at or below the MUC.

(E) Employers must not apply MUCs to conditions that are immediately dangerous to life or health (IDLH); instead, they must use respirators listed for IDLH conditions in paragraph (d)(2) of this standard.

(2) When the calculated MUC exceeds the IDLH level for a hazardous substance, or the performance limits of the cartridge or canister, then employers must set the maximum MUC at that lower limit.

(ii) The respirator selected shall be appropriate for the chemical state and physical form of the contaminant.

(iii) For protection against gases and vapors, the employer shall provide:

(A) An atmosphere-supplying respirator, or

(B) An air-purifying respirator, provided that:

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(j) The respirator is equipped with an end-of-service-life indicator (ESLI) certified by NIOSH for the contaminant, or

(2) If there is no ESLI appropriate for conditions in the employer's workplace, the employer implements a change schedule for canisters and cartridges that is based on objective information or data that will ensure that canisters and cartridges are changed before the end of their service life. The employer shall describe in the respirator program the information and data relied upon and the basis for the canister and cartridge change schedule and the basis for reliance on the data.

(iv) For protection against particulates, the employer shall provide:

(A) An atmosphere-supplying respirator; or

(B) An air-purifying respirator equipped with a filter certified by NIOSH under 29 CFR part 11 as a high efficiency particulate air (HEPA) filter, or an air-purifying respirator equipped with a filter certified for particulates by NIOSH under 29 CFR part 96; or

(C) For contaminants consisting primarily of particles with mass median aerodynamic diameters (MMAD) of at least 2 micrometers, an air-purifying respirator equipped with any filter certified for particulates by NIOSH.

TABLE I: Assigned Protection Factors

<table>
<thead>
<tr>
<th>Atmospheric Conditions</th>
<th>Assigned Protection Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 0.01 ppm</td>
<td>16.3-19.6</td>
</tr>
<tr>
<td>0.01-4.00 ppm</td>
<td>16.4-19.5</td>
</tr>
<tr>
<td>4.01-8.00 ppm</td>
<td>17.1-19.5</td>
</tr>
<tr>
<td>8.01-16.00 ppm</td>
<td>17.4-19.6</td>
</tr>
<tr>
<td>16.01-32.00 ppm</td>
<td>18.5-19.5</td>
</tr>
<tr>
<td>Above 32.00 ppm</td>
<td>19.3-19.6</td>
</tr>
</tbody>
</table>

*Above 3,000 feet the assignment does not apply. Oxygen enriched breathing must be supplied above 14,000 feet.*

(e) Medical evaluation. Using a respirator may place a physiological burden on employees that varies with the type of respirator worn, the job and workplace conditions in which the respirator is used, and the medical status of the employee. Accordingly, this paragraph specifies the minimum requirements for medical evaluation that employers must implement to determine the employee's ability to use a respirator.

(1) General. The employer shall provide a medical evaluation to determine the employee's ability to use a respirator, before the employee is fit tested or required to use the respirator in the workplace. The employer may discontinue an employee's medical evaluations when the employee is no longer required to use a respirator.

(2) Medical evaluation procedures. (i) The employer shall identify a physician or other licensed health care professional (PLHCP) to perform medical evaluations using a medical questionnaire or an initial medical examination that obtains the same information as the medical questionnaire.

(ii) The medical examination shall obtain the information requested by the questionnaire in Sections 1 and 2, part A of appendix C of this section.

(3) Follow-up medical examination. (i) The employer shall ensure that a follow-up medical examination is provided for an employee who gives a positive response to any question among questions 1 through 8 in Section 2, part A of Appendix C or whose initial medical examination demonstrates the need for a follow-up medical examination.

(ii) The follow-up medical examination shall include any medical tests, consultations, or diagnostic procedures that the PLHCP deems necessary to make a final determination.

(4) Administration of the medical questionnaire and examinations. (i) The medical questionnaire and examinations shall be administered confidentially during the employee's normal working hours or at a time and place convenient to the employee. The medical questionnaire shall be administered in a manner that ensures that the employee understands its content.

(ii) The employer shall provide the employee with an opportunity to discuss the questionnaire and examination results with the PLHCP.

(5) Supplemental information for the PLHCP. (i) The following information must be provided to the PLHCP before the PLHCP makes a recommendation...
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concerning an employee's ability to use a respirator:
(A) The type and weight of the respirator to be used by the employee;
(B) The duration and frequency of respirator use (including use for rescue and escape);
(C) The expected physical work effort;
(D) Additional protective clothing and equipment to be worn, and
(E) Temperature and humidity extremes that may be encountered.

(ii) Any supplemental information provided previously to the PLHCP regarding an employee need not be provided for a subsequent medical evaluation if the information and the PLHCP remain the same.

(iii) The employer shall provide the PLHCP with a copy of the written respiratory protection program and a copy of this section.

NOTES TO PARAGRAPHS (a)(3)(i)–(ii): The employer must ensure that the new PLHCP obtains this information, either by providing the documents directly to the PLHCP or having the employer provide previously to the PLHCPs the employer the information and the PLHCP to the new PLHCP. However, OSHA does not expect employers to have employees medically evaluated solely because a new PLHCP has been selected.

(c) Medical determinations. In determining the employee's ability to use a respirator, the employer shall:
(1) Obtain a written recommendation regarding the employee's ability to use a respirator from the PLHCP. The recommendation shall provide only the following information:
(A) Any limitations on respirator use related to the medical condition of the employee, or relating to the workplace conditions in which the respirator will be used, including whether or not the employee is medically able to use the respirator;
(B) The need, if any, for follow-up medical evaluations; and
(C) Any statement that the PLHCP has provided the employee with a copy of the PLHCP's written recommendation.

(2) If the respirator is a negative pressure respirator and the PLHCP finds a medical condition that may place the employee's health at increased risk if the respirator is used, the employer shall provide a PAPR if

the PLHCP's medical evaluation finds that the employee can use such a respirator; if a subsequent medical evaluation finds that the employee is medically able to use a negative pressure respirator, then the employer is no longer required to provide a PAPR.

(3) Additional medical evaluations. At a minimum, the employer shall provide additional medical evaluations that comply with the requirements of this section if:
(i) An employee reports medical signs or symptoms that are related to ability to use a respirator;
(ii) A PLHCP, supervisor, or the respirator program administrator informs the employer that an employee needs to be reevaluated;
(iii) Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for employee reevaluation; or
(iv) A change occurs in workplace conditions (e.g., physical work effort, protective clothing, temperature) that may result in a substantial increase in the physiological burden placed on an employee.

(d) Fit testing. This paragraph requires that, before an employee may be required to use any respirator with a negative or positive pressure tight-fitting facepiece, the employee must be fit tested with the same make, model, style, and size of respirator that will be used. This paragraph specifies the kinds of fit tests allowed, the procedures for conducting them, and how the results of the fit tests must be used:
(1) The employer shall ensure that employees using a tight-fitting facepiece respirator pass an appropriate qualitative fit test (QFT) or quantitative fit test (QFT) as stated in this paragraph.
(2) The employer shall ensure that an employee using a tight-fitting facepiece respirator is fit tested prior to initial use of the respirator, whenever a different respirator facepiece (size, style, model or make) is used, and at least annually thereafter.
(3) The employer shall conduct an additional fit test whenever the employee reports, or the employer, PLHCP, supervisor, or program administrator
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makes visual observations of, changes in the employee's physical condition that could affect respirator fit. Such conditions include, but are not limited to, facial scarring, dental changes, cosmetic surgery, or an obvious change in body weight.

(4) If after passing a QLFT or QNFT, the employee subsequently notifies the employer, program administrator, supervisor, or PLHC that the fit of the respirator is unacceptable, the employee shall be given a reasonable opportunity to select a different respirator facepiece and to be retested.

(5) The fit test shall be administered using an OSHA-accepted QLFT or QNFT protocol. The OSHA-accepted QLFT and QNFT protocols and procedures are contained in Appendix A of this section.

(6) QLFT may only be used to fit test negative pressure air-purifying respirators that must achieve a fit factor of 100 or less.

(7) If the fit factor, as determined through an OSHA-accepted QNFT protocol, is equal to or greater than 100 for tight-fitting half facepieces, or equal to or greater than 500 for tight-fitting full facepieces, the QNFT has been passed with that respirator.

(8) Fit testing of tight-fitting atmosphere-supplying respirators and tight-fitting powered air-purifying respirators shall be accomplished by performing quantitative or qualitative fit testing in the negative pressure mode, regardless of the mode of operation (negative or positive pressure) that is used for respiratory protection.

(9) Qualitative fit testing of these respirators shall be accomplished by temporarily converting the respirator user's actual facepiece into a negative pressure respirator with appropriate filters, or by using an identical negative pressure air-purifying respirator facepiece with the same sealing surfaces as a surrogate for the atmosphere-supplying or powered air-purifying respirator facepiece.

(10) Qualitative fit testing of these respirators shall be accomplished by modifying the facepiece to allow sampling inside the facepiece in the breathing zone of the user, midway between the nose and mouth. This requirement shall be accomplished by installing a permanent sampling probe onto a surrogate facepiece, or by using a sampling adapter designed to temporarily provide a means of sampling air from inside the facepiece.

(11) Any modifications to the respirator facepiece for fit testing shall be completely removed, and the facepiece restored to NIOSH-approved configuration, before that facepiece can be used in the workplace.

(12) Use of respirators. This paragraph requires employers to establish and implement procedures for the proper use of respirators. These requirements include prohibiting conditions that may result in facepiece seal leakage, preventing employees from removing respirators in hazardous environments, taking actions to ensure continued effective respirator operation throughout the work shift, and establishing procedures for the use of respirators in IDLH atmospheres or in interior structural firefighting situations.

(13) Facepiece seal protection. (i) The employer shall not permit respirators with tight-fitting facepieces to be worn by employees who have:

(A) Facial hair that comes between the sealing surface of the facepiece and the face or that interferes with valve function; or

(B) Any condition that interferes with the face-to-facepiece seal or valve function.

(ii) If an employee wears corrective glasses or goggles or other personal protective equipment, the employer shall ensure that such equipment is worn in a manner that does not interfere with the seal of the facepiece to the face of the user.

(iii) For all tight-fitting respirators, the employer shall ensure that employees perform a user seal check each time they put on the respirator using the procedures in Appendix B-1 or procedures recommended by the respirator manufacturer that the employer demonstrates are no less effective than those in Appendix B-1 of this section.

(iv) Continuing respirator effectiveness. (d) Appropriate surveillance shall be maintained of work area conditions and degree of employee exposure or stress. When there is a change in work area conditions or degree of employee
exposure or stress that may affect respirator effectiveness, the employer shall reevaluate the continued effectiveness of the respirator.

(ii) The employer shall ensure that employees leave the respirator use area:
(A) To wash their faces and respirator facepieces as necessary to prevent eye or skin irritation associated with respirator use; or
(B) If they detect vapor or gas breakthrough, changes in breathing resistance, or leakage of the facepiece; or
(C) To replace the respirator or the filter, cartridge, or canister elements.

(iii) If the employee detects vapor or gas breakthrough, changes in breathing resistance, or leakage of the facepiece, the employer must replace or repair the respirator before allowing the employee to return to the work area.

(5) Procedures for IDLH atmosphere. For all IDLH atmospheres, the employer shall ensure that:
(i) One employee or, when needed, more than one employee is located outside the IDLH atmosphere;
(ii) Visual, voice, or signal line communication is maintained between the employee(s) in the IDLH atmosphere and the employer(s) located outside the IDLH atmosphere;
(iii) The employee(s) located outside the IDLH atmosphere are trained and equipped to provide effective emergency rescue;
(iv) The employer or designee is notified before the employee(s) located outside the IDLH atmosphere enter the IDLH atmosphere to provide emergency rescue;
(v) The employer or designee authorized to do so by the employer, once notified, provides necessary assistance appropriate to the situation;
(vi) Employee(s) located outside the IDLH atmosphere are equipped with:
(A) Pressure demand or other positive pressure SCBAs, or a pressure demand or other positive pressure supplied-air respirator with auxiliary SCBA; and either
(B) Appropriate retrieval equipment for removing the employee(s) who entered the hazardous atmosphere where retrieval equipment would contribute to the rescue of the employee(s) and would not increase the overall risk resulting from entry; or
(C) Equivalent means for rescue where retrieval equipment is not required under paragraph (q)(3)(vi)(B).

(6) Procedures for interior structural firefighting. In addition to the requirements set forth under paragraph (q)(3), in interior structural fires, the employer shall ensure that:
(i) At least two employees enter the IDLH atmosphere and remain in visual or voice contact with one another at all times;
(ii) At least two employees are located outside the IDLH atmosphere; and
(iii) All employees engaged in interior structural firefighting use SCBAs.

NOTES 1 TO PARAGRAPH (q): One of the two individuals located outside the IDLH atmosphere may be assigned to an additional role, such as incident commander in charge of the emergency or safety officer, so long as this individual is able to perform assistance or rescue activities without jeopardizing the safety or health of any firefighter working at the incident.

NOTE 2 TO PARAGRAPH (q): Nothing in this section is meant to preclude firefighters from performing emergency rescue activities before an entire team has assembled.

(b) Maintenance and care of respirators. This paragraph requires the employer to provide for the cleaning and disinfecting, storage, inspection, and repair of respirators used by employees.

(i) Cleaning and disinfecting. The employer shall provide each respirator user with a respirator that is clean, sanitary, and in good working order. The employer shall ensure that respirators are cleaned and disinfected using the procedures in Appendix B-2 of this section, or procedures recommended by the respirator manufacturer, provided that such procedures are of equivalent effectiveness. The respirators shall be cleaned and disinfected at the following intervals:

(1) Respirators issued for the exclusive use of an employee shall be cleaned and disinfected as often as necessary to be maintained in a sanitary condition;
(2) Respirators issued to more than one employee shall be cleaned and disinfected before being worn by different individuals;
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(III) Respirators maintained for emergency use shall be cleaned and disinfected after each use, and
(iv) Respirators used in fit testing and training shall be cleaned and disinfected after each use.
(2) Storage. The employer shall ensure that respirators are stored as follows:
(i) All respirators shall be stored to protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals, and they shall be packed or stored to prevent deformation of the facepiece and exhalation valve.
(ii) In addition to the requirements of paragraph (b)(2)(ii) of this section, emergency respirators shall be:
(A) Kept accessible to the work area;
(B) Stored in compartments or in boxes that are clearly marked containing emergency respirators; and
(C) Stored in accordance with any applicable manufacturer instructions.
(3) Inspection. (1) The employer shall ensure that respirators are inspected as follows:
(A) All respirators used in routine situations shall be inspected before each use and during cleaning;
(B) All respirators maintained for use in emergency situations shall be inspected at least monthly and in accordance with the manufacturer’s recommendations, and shall be checked for proper function before and after each use; and
(4) Emergency escape-only respirators shall be inspected before being carried into the workplace for use.
(3) The employer shall ensure that respirator inspections include the following:
(A) A check of respirator function, tightness of connections, and the condition of the various parts including the facepiece, head strap, valves, connecting tube, and cartridges, canisters or filters; and
(B) A check of elastomeric parts for pliability and signs of deterioration.
(III) In addition to the requirements of paragraphs (b)(2)(i) and (ii) of this section, self-contained breathing apparatus shall be inspected monthly. Air and oxygen cylinders shall be maintained in a fully charged state and shall be recharged when the pressure falls to 90% of the manufacturer’s recommended pressure level. The employer shall determine that the regulator and warning devices function properly.
(IV) For respirators maintained for emergency use, the employer shall:
(A) Certify the respirATOR by documenting the date the inspection was performed, the name (or signature) of the person who made the inspection, the findings, required remedial action, and a serial number or other means of identifying the inspected respirator; and
(B) Provide this information on a tag or label that is attached to the storage compartment for the respirator, is kept with the respirator, or is included in inspection reports stored as paper or electronic files. This information shall be maintained until replaced following a subsequent certification.
(4) Repair. The employer shall ensure that respirators that fail an inspection or are otherwise found to be defective are removed from service, and are discarded or repaired or adjusted in accordance with the following procedures:
(I) Repairs or adjustments to respirators are to be made only by persons appropriately trained to perform such operations and shall use only the respirator manufacturer’s NIOSH-approved parts designed for the respirator;
(II) Repairs shall be made according to the manufacturer’s recommendations and specifications for the type and extent of repair to be performed; and
(III) Recertification and admission valves, regulators, and alarms shall be adjusted or repaired only by the manufacturer or a technician trained by the manufacturer.
(I) Breathing air quality and use. This paragraph requires the employer to provide employees using atmosphere-supplying respirators (supplied-air and SCBA) with breathing gases of high purity.
(I) The employer shall ensure that compressed air, compressed oxygen, liquid air, and liquid oxygen used for respiration accords with the following specifications:
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(1) Compressed and liquid oxygen shall meet the United States Pharmacopeia requirements for medical or breathing oxygen, and

(2) Compressed breathing air shall meet at least the requirements for Grade D breathing air described in ANSIC-Compressed Gas Association Commodity Specification for Air, G-7.1–1986, to include:
   (A) Oxygen content (V/V) of 19.5–23.5%;
   (B) Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less;
   (C) Carbon monoxide (CO) content of 10 ppm or less;
   (D) Carbon dioxide content of 1,000 ppm or less; and
   (E) Lack of noticeable odor.

(2) The employer shall ensure that compressed oxygen is not used in atmosphere-supplying respirators that have previously used compressed air.

(3) The employer shall ensure that oxygen concentrations greater than 23.5% are used only in equipment designed for oxygen service or distribution.

(4) The employer shall ensure that cylinders used to supply breathing air to respirators meet the following requirements:
   (i) Cylinders are tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR part 173 and part 175);
   (ii) Cylinders of purchased breathing air have a certificate of analysis from the supplier that the breathing air meets the requirements for Grade D breathing air and
   (iii) The moisture content in the cylinder does not exceed a dew point of −56°F (−50°C) at 1 atmosphere pressure.

(5) The employer shall ensure that compressors used to supply breathing air to respirators are constructed and situated so as to:
   (i) Prevent entry of contaminated air into the air-supply system;
   (ii) Minimize moisture content so that the dew point at 1 atmosphere pressure is 10 degrees F (−5°C) below the ambient temperature;
   (iii) Have suitable in-line air-purifying sorbent beds and filters to further ensure breathing air quality. Sorbent beds and filters shall be maintained and replaced or refurbished periodically following the manufacturer's instructions.

(6) Have a tag containing the most recent changes and the signature of the person authorized by the employer to perform the change. The tag shall be maintained at the compressor.

(7) For oil-lubricated compressors, the employer shall use a high-temperature or carbon monoxide alarm, or both, to monitor carbon monoxide levels. If only high-temperature alarms are used, the air supply shall be monitored at intervals sufficient to prevent carbon monoxide in the breathing air from exceeding 10 ppm.

(8) The employer shall ensure that breathing air couplings are incompatible with outlets for nonrespirable ambient or other gas systems. No enriching substance shall be introduced into breathing air lines.

(9) The employer shall use breathing gas containers marked in accordance with the NIOSH respirator certification standard, 29 CFR part 84.

(1) Identification of filters, cartridges, and canisters. The employer shall ensure that all filters, cartridges and canisters used in the workplace are labeled and color coded with the NIOSH approval label and that the label is not removed and remains legible.

(2) Training and information. This paragraph requires the employer to provide effective training to employees who are required to use respirators. The training must be comprehensive, understandable, and recur annually, and more often if necessary. This paragraph also requires the employer to provide the basic information on respirators in Appendix D of this section to employees who wear respirators when not required by this section or by the employer to do so.

(1) The employer shall ensure that each employee can demonstrate knowledge of at least the following:
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(1) Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator;
(3) What the limitations and capabilities of the respirator are;
(iii) How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions;
(4) How to inspect, put on and remove, use, and check the seal of the respirator;
(v) What the procedures are for maintenance and storage of the respirator;
(iv) How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators; and
(vi) The general requirements of this section.
(2) The training shall be conducted in a manner that is understandable to the employee.
(3) The employer shall provide the training prior to requiring the employee to use a respirator in the workplace.
(4) An employer who is able to demonstrate that a new employee has received training within the last 12 months that addresses the elements specified in paragraph (k)(1) through (iii) shall not be required to repeat such training provided that, as required by paragraph (k)(1), the employer can demonstrate knowledge of these elements. Previous training not repeated initially by the employer must be provided no later than 12 months from the date of the previous training.
(5) Retraining shall be administered annually, and when the following situations occur:
(i) Changes in the workplace or the type of respirator render previous training obsolete;
(ii) Inadequacies in the employee's knowledge or use of the respirator indicate that the employee has not retained the requisite understanding or skill; or
(iii) Any other situation arises in which retraining appears necessary to ensure safe respirator use.
(6) The basic advisory information on respirators, as presented in Appendix D of this section, shall be provided by the employer in any written or oral format, to employees who wear respirators when such use is not required by this section or by the employer.
(1) Respirator fit testing. This section requires the employer to conduct evaluations of the workplace to ensure that the written respiratory protection program is being properly implemented, and to consult employees to ensure that they are using the respirators properly.
(i) The employer shall conduct evaluations of the workplace as necessary to ensure that the provisions of the current written program are being effectively implemented and that it continues to be effective.
(2) The employer shall regularly consult employees required to use respirators to assess the employees' views on program effectiveness and to identify any problems. Any problems that are identified during this assessment shall be corrected. Factors to be assessed include, but are not limited to:
(i) Respirator fit (including the ability to use the respirator without interfering with effective workplace performance);
(2) Respiratory protection selection for the hazards to which the employee is exposed.
(3) Respirator use under the workplace conditions the employee encounters;
(iv) Respirator maintenance.
(c) Recordkeeping. This section requires the employer to establish and maintain written information regarding medical evaluations, fit testing, and the respirator program. This information will facilitate employee involvement in the respirator program, assist the employer in auditing the adequacy of the program, and provide a record for compliance determinations by OSHA.
(1) Medical evaluation. Records of medical evaluations required by this section must be retained and made available in accordance with 29 CFR 1910.1029.
(2) Fit testing. (1) The employer shall establish a record of the qualitative and quantitative fit tests administered to an employee including:
(a) The name or identification of the employee tested;
(b) Type of fit test performed;
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(C) Specific make, model, style, and size of respirator tested;  
(D) Date of test; and  
(2) The essential results for QLMF and the fit factor and strip chart recording or other recording of the test results for QLMF.  
(3) Fit test records shall be retained for respirator users until the next fit test is administered.  
(4) A written copy of the current respirator program shall be retained by the employer.  
(5) Written materials required to be retained under this paragraph shall be made available upon request to affected employees and to the Assistant Secretary or designee for examination and copying.  

(b) Effective dates. Paragraphs (b)(3)(i)(A) and (b)(3)(i)(B) of this section become effective November 22, 2006.  
(5) Appendix A, Compliance with Appendix A, Appendix B-1, Appendix B-2, and Appendix C of this section is mandatory.  
(6) Appendix D of this section is non-mandatory and is not intended to create any additional obligations not otherwise imposed or to detract from any existing obligations.  

APPENDIX A TO §1910.134—FIT TESTING PROCEDURE (Mandatory)  
PART I. OSHA-ACTCEPTED FIT TEST PROCEDURE  
A. Fit Testing Procedure—General Requirements  
The employer shall conduct fit testing using the following procedure. The requirements in this appendix apply to all OSHA-accepted fit test methods, both QLMF and QLMF.  
1. The test subject shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.  
2. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to determine an acceptable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subject’s formal training on respirator use, because it is only preparatory.  
3. The test subject shall be informed that holds in being asked to select the respirator that provides the most acceptable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.  
4. The test subject shall be instructed to hold each chosen faceseal up to the face and eliminate those that obviously do not give an acceptable fit.  
5. The more acceptable faceseals are noted in case the one selected proves unacceptable; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in the following item A.8. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.  
6. Assessment of comfort shall include a review of the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:  
(a) Position of the mask on the nose  
(b) Room for eye protection  
(c) Room to talk  
(d) Position of mask on face and cheeks  
7. The following criteria shall be used to help determine the adequacy of the respirator fit:  
(a) Chin properly placed;  
(b) Adequate strap tension, not overly tightened;  
(c) Fit across nose bridge;  
(d) Respirator of proper size to span distance from nose to chin;  
(e) Tendancy of respirator to slip;  
(f) Self-observation in mirror to evaluate fit and respirator position.  
8. The test subject shall conduct a seal check, either the negative and positive pressure seal checks described in Appendix B-1 of this section or those recommended by the respirator manufacturer which provide equivalent protection to the procedures in Appendix B-1. Before conducting the negative and positive pressure checks, the subject shall be told to seat the mask on the face by moving the head from side-to-side and up and down slowly while taking in a few slow deep breaths. Another faceseal shall be selected and repeated if the test subject fails the seal check test.  
9. The test shall not be conducted if there is any hair growth between the skin and the faceseal sealing surface, such as stubble beard growth, beard, mustache or sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed.  
10. If a test subject exhibits difficulty in breathing during the test, he or she shall be referred to a physician or other licensed health care professional, as appropriate, to determine whether the test subject can wear
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a respirator while performing her or his duties.

12. If the employee finds the fit of the respirator unacceptable, the test subject shall be given the opportunity to select a different respirator and to be retested.

13. The fit test shall be performed while the test subject is wearing any applicable safety equipment that may be worn during actual respirator use which could interfere with respirator fit.

14. Test Exercises. (a) Employers must perform the following test exercises for all fit testing methods prescribed in this appendix, except for the CFF and quantitative fit testing protocol and the Cr EPD-10 quantitative fit testing protocol. For these two protocols, employees must ensure that the test subjects (i.e., employees) perform the exercise procedures specified in parts 1.0 and 2.0 of this appendix for the CFF quantitative fit testing protocol, or the exercise procedures described in part 1.0 of this appendix for the Cr EPD-10 quantitative fit testing protocol. For the remaining congressional testing methods, employees must ensure that employees perform the test exercises in the appropriate test environment in the following manner:

(i) Normal breathing. In a normal standing position, the subject shall breathe normally.

(ii) Deep breathing. In a normal standing position, the subject shall breathe slowly and deeply, taking caution as not to hyperventilate.

(iii) Moving head and shoulders. Standing in place, the subject shall slowly turn his head from side to side.

(iv) Moving head and shoulders. Standing in place, the subject shall slowly move his head in a circular motion.

(v) Talking. The subject shall talk out loud slowly and clearly.

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

(c) Grinning. The test subject shall grinme by smiling or frowning. This applies only to QNPT testing; it is not performed for QLFPT.

(d) Bending over. The subject shall bend to the waist as if looking to reach something on the floor. In some cases, this may substitute for the exercise in this section for that test environment or equipment that were type QNPT or QLFPT units that do not permit bending over at the waist.

(e) Normal breathing. Same as exercise 3.

(f) Each test exercise shall be performed for one minute except for the grinning exercise which shall be performed for 15 seconds.

(g) The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If the respirator has been unacceptable, another model of respirator shall be tried. The respirator shall be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

B. Qualitative Fit Test (QLFPT) Protocols

1. General

(a) The employer shall ensure that persons administering QLFPT are able to prepare test solutions, calibrate equipment and perform tests properly, recognize invalid tests, and ensure that test equipment is in proper working order.

(b) The employer shall ensure that QLFPT equipment is kept clean and well maintained so as to operate within the parameters for which it was designed.

2. Isocyanat Acetate Protocol

NOTE: This protocol is not appropriate to use for the fit testing of particulate respirators. If used to fit test particulate respirators, the respirator must be equipped with an organic vapor filter.

(a) Isocyanat Acetate Screen

This is a single test made up of a single test solution, which is used to detect the presence of isocyanates in the air. The test solution is prepared by mixing 1 part of a 1% solution of 85% isocyanate in water with 9 parts of water. The solution is then applied to a filter paper disk and placed in a test tube. The test tube is then exposed to the air containing isocyanates for a period of time, typically 15 minutes. After the exposure period, the filter paper disk is removed from the test tube and examined for the presence of isocyanate. If the filter paper disk is yellow or green, the presence of isocyanate is indicated. If the filter paper disk is white, the absence of isocyanate is indicated.
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laid and shaking for 30 seconds. A new solution shall be prepared at least weekly.

(7) The screening test shall be conducted in a room separate from the room used for actual fit testing. The two rooms shall be well-ventilated to prevent the odor of IAA from becoming evident on the general room air where testing takes place.

(8) The odor test solution is prepared in a separate jar by dissolving 0.6 ml of the stock solution into 500 ml of odor-free water using a clean dropper or pipette. The solution shall be shaken for 30 seconds and allowed to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution shall be used for only one day.

(9) A test blank shall be prepared in a third jar by adding 500 ml of odor-free water.

(10) The odor test and test blank jar lids shall be labeled (e.g., 1 and 2) for jar identification. Labels shall be placed on the lids so that they can be peeled off periodically and switched to maintain the integrity of the test.

(11) The following instruction shall be typed on a card and placed on the table in front of the two test jars (i.e., 1 and 2): "The purpose of this test is to determine if you can smell banana oil at a low concentration. The two bottles in front of you contain water. One of those bottles also contains a small amount of banana oil. Do the covers are on tight, then shake each bottle for two seconds. Unscrew the lid of each bottle, one at a time, and sniff at the mouth of the bottle. Indicate whether the test conductor which bottle contains banana oil." The mixture used in the IAA odor detection test shall be prepared in a separate area away from where the test is performed, in order to prevent olfactory fatigue in the subject.

(12) If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA qualitative fit test shall not be performed.

(13) If the test subject correctly identifies the jar containing the odor test solution, the test subject may proceed to the respirator selection and fit testing.

(14) Banamyl®, Acetate Fit Test

(15) The fit test chamber shall be a clear 35-gallon drum line suspended inverted over a 2-foot diameter frame so that the top of the chamber is about 6 inches above the test subject's head. A drum liner is not available, a similar chamber shall be constructed using plastic sheeting. The inside top center of the chamber shall have a small hook attached.

(16) Each respirator used for the fitting and fit testing shall be equipped with organic vapor cartridge or filter protection against organic vapors.

(17) After selecting, donning, and properly adjusting a respirator, the test subject shall re-enter the fit testing room. This room shall be separate from the room used for odor threshold screening and respirator selection, and shall be well ventilated, as to exhaust fan or lab hood, to prevent general room contamination.

(18) A copy of the test exercise and any prepared test from which the subject is to read shall be taped to the inside of the test chamber.

(19) Upon entering the test chamber, the subject shall be given a 6 inch by 6 inch piece of paper towel, or other perforate, absorbent, single-ply material, folded in half and wetted with 6.75 ml of pure IAA. The test subject shall hold the wet towel on the hook at the top of the chamber. An IAA test swab on ampule may be substituted for the IAA wetted paper towel provided it has been demonstrated that the alternative IAA source will generate an IAA test atmosphere with a concentration equivalent to that generated by the paper towel method.

(20) Allow two minutes for the IAA test concentration to stabilize before starting the fit test exercise. This would be an appropriate time to talk with the test subject, to explain the fit test, the importance of higher cooperation, and the purpose for the test exercise, or to demonstrate some of the exercises.

(21) If at any time during the test, the subject detects the banana-like odor of IAA, the test is failed. The subject shall quickly exit the test chamber and leave the test area to avoid olfactory fatigue.

(22) If the test is failed, the subject shall return to the selection room and remove the respirator. The test subject shall repeat the odor sensitivity test, select and put on another respirator, return to the test chamber, and again begin the fit test procedure described in (1) through (7) above. The process continues until a respirator that is well has been found. Should the odor sensitivity test be failed, the subject shall wait at least 5 minutes before resuming (odor sensitivity will usually have returned by this time).

(23) If the subject passes the test, the efficiency of the test procedure shall be demonstrated by having the subject break the respirator face seal and take a breath before exiting the chamber.

(24) When the test subject leaves the chamber, the subject shall remove the saturated towel and return it to the person conducting the test, so that there is no significant IAA concentration building in the chamber during subsequent tests. The used towels shall be kept in the self-sealing plastic bag to keep the test area from being contaminated.

3. Saccharin Solution Aerosol Protocol

The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

(a) Taste threshold screening. The saccharin taste threshold screening, performed
without wearing a respirator, is intended to determine whether the individual being tested can be evaluated as an occasional user.

(1) During threshold screening as well as during fit testing, the test subject shall wear an enclosure on the head and shoulders that is approximately 12 inches in diameter by 14 inches high with at least the front portion clear and that allows movement of the head when a respirator is worn. An enclosure substantially similar to the 3M hood assembly, pack 9 PT 14 and a PT 15 combined, is adequate.

(2) The test enclosure shall have a 1-inch (3.5 cm) hole in front of the test subject’s nose and mouth area to accommodate the nebulizer nozzle.

(3) The test subject shall don the test enclosure. Throughout the threshold screening test, the test subject shall breathe through his/her mouth with tongue extended. The subject is instructed to report when he/she detects a sweet taste.

(4) Using a DeVilbiss Model 48 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the threshold check solution into the enclosure. The nozzle is directed away from the nose and mouth of the person. This nebulizer shall be clearly marked to distinguish it from the fit test solution reservoir.

(5) The threshold check solution is prepared by dissolving 0.01 gram of sodium saccharin USP in 100 ml of warm water. It can be prepared by putting 0.3 ml of the fit test solution (see Section 5, below) in 100 ml of distilled water.

(6) To produce the aerosol, the nebulizer bulb is firmly squeezed so that it collapses completely, then released and allowed to fully expand.

(7) Ten squirts are repeated rapidly and then the test subject is asked whether the saccharin can be tasted. If the test subject reports tasting the sweet taste during the ten squirts, the testing is completed. The test threshold is noted as twenty regardless of the number of squirts actually completed.

(8) If the first response is negative, ten more squirts are repeated rapidly and the test subject is again asked whether the saccharin is tasted. If the test subject reports tasting the sweet taste during the second ten squirts, the testing is completed. The test threshold is noted as twenty regardless of the number of squirts actually completed.

(9) If the second response is negative, ten more squirts are repeated rapidly and the test subject is again asked whether the saccharin is tasted. If the test subject reports tasting the sweet taste during the third set of ten squirts, the testing is completed. The test threshold is noted as thirty regardless of the number of squirts actually completed.

(10) The test conductor will take note of the number of squirts required to solicit a taste response.

(11) If the saccharin is not tasted after 20 squirts, the test subject shall be asked not to taste the weak saccharin solution.

(12) If a taste response is elicited, the test subject shall be asked to note the taste for reference in the fit test.

(13) Correct use of the nebulizer means that approximately 1 ml of liquid is used as a test in the nebulizer body.

(14) The nebulizer shall be thoroughly rinsed in water, shaken dry, and refilled at least each morning and afternoon or at least every four hours.

(15) Saccharin solution aerosol fit test procedure.

(1) The test subject may not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.

(2) The fit test uses the same enclosure described in 3(a) above.

(3) The test subject shall don the enclosure while wearing the respirator selected in section 1.A. of this appendix. The respirator shall be properly adjusted and equipped with a particulate filter.

(4) A second DeVilbiss Model 48 Inhalation Medication Nebulizer or equivalent is used to spray the fit test solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution reservoir.

(5) The fit test solution is prepared by adding 0.01 gram of sodium saccharin to 100 ml of warm water.

(6) As before, the test subject shall breathe through the slightly open mouth with tongue extended, and report if he/she tastes the sweet taste of saccharin.

(7) The nebulizer is inserted into the nose in the front of the enclosure and an initial concentration of saccharin fit test solution is sprayed into the enclosure using the same number of squirts as required in 5, 20 or 30 squirts, based on the number of squirts required to elicit a taste response as noted during the screening test. A minimum of 10 squirts is required.

(8) After generating the aerosol, the test subject shall be instructed to perform the exercise in section 1.A. of this appendix.

(9) Every 30 seconds the aerosol concentration shall be reestablished using one half the original number of squirts used initially (e.g., 5, 30 or 60).

(10) The test subject shall indicate to the test conductor if at any time during the fit test the taste of saccharin is detected. If the
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test subject does not report aching the
mucosa, the test is passed.
(11) If the test subject is detected,
the test is deemed unsatisfactory
and the test is failed. A different respirator shall be tested, and
the entire test procedure is repeated
(taste threshold screening and fit testing).
(12) Since the nebulizer has a tendency
to close during use, the test operator must make
periodic checks of the nebulizer to ensure
that it is not closed. If clogging is found
at the end of the test session, the test is
invalid.

4. Brethalex OSM (Osmotic Nebulization Solution
Aerosol Test) Qualitative Fit Test Protocol

The Brethalex OSM (Osmotic Nebulized Solution
Aerosol) Qualitative fit test protocol uses the
published mucosa test protocol because that
protocol is widely accepted. Brethalex is
typically used as a taste aversion agent in
household liquids which children should not
be drinking and is endorsed by the American
Medical Association, the National Safety
Council, and the American Association of
Police Control Centers. The entire screening
and testing procedure shall be explained to
the test subject prior to the conduct of the
tasting test.
(a) Taste Threshold Screening.

The Brethalex taste threshold screening,
performed without wearing a respirator, is
intended to determine whether the individual
being tested can detect the taste of Brethalex.

(1) During the threshold screening as well as
during fit testing, subjects shall wear an
enclosure about the head and shoulders that is
approximately 12 inches in diameter
by 14 inches (35.6 cm) tall. The front portion
of the enclosure shall be clear from the
respirator and allow free movement of
the head when a respirator is worn. An enclosure
substantially similar to the 3M hood assem-
ly, parts 221 FT 14 and 221 FT 15 combining,
is adequate.

(2) The test enclosure shall have a 0.5 inch
(1.3 cm) hole in front of the test subject’s
nose and mouth area to accommodate the
nebulizer nozzle.

(3) The test subject shall don the test en-
closure. Throughout the threshold screening
test, the test subject shall breathe through
his or her slightly open mouth with tongue
extended. The subject is instructed to report
when he/she detects a bitter taste.

(4) Using a DeVilbiss Model 48 Inhalation
Medication Nebulizer or equivalent, the test
subject shall apply the Threshold Check
Solution into the enclosure. This Nebulizer
shall be clearly marked to distinguish it
from the fit test solution nebulator.

(5) The Threshold Check Solution is
prepared by adding 15.5 milligrams of Brethalex to
100 ml of 5% salt (NaCl) solution in distilled
water.

(6) To produce the aerosol, the nebulizer
bulb is firmly squeezed so that the bulb
collapses completely, and is then released
and allowed to fully expand.

(7) If the taste of mucosa is detected,
the test is deemed unsatisfactory
and the test is failed. A different respirator shall be tested, and
the entire test procedure is repeated
(taste threshold screening and fit testing).

(8) Since the nebulizer has a tendency
to close during use, the test operator must make
periodic checks of the nebulizer to ensure
that it is not closed. If clogging is found
at the end of the test session, the test is
invalid.

(9) If the test response is negative, ten
more squashes are repeated rapidly and the
test subject is again asked whether the
Brethalex is tasted. If the test subject reports
the bitter taste during the second
ten squashes, the screening test is completed.
The taste threshold is noted as thirty
taste of the number of squashes actually
completed.

(10) If the second response is negative, ten
more squashes are repeated rapidly and the
test subject is again asked whether the
Brethalex is tasted. If the test subject reports
the bitter taste during the third set of
10 squashes, the screening test is com-
pleted. The test threshold is noted as thirty
taste of the number of squashes actually
completed.

(11) If the third response is negative, ten
more squashes are repeated rapidly and the
test subject is again asked whether the
Brethalex is tasted. If the test subject reports
the bitter taste during the fourth set of
10 squashes, the screening test is com-
pleted. The test threshold is noted as thirty
taste of the number of squashes actually
completed.

(12) If the test conductor will take note of
the number of squashes required to solicit a
taste response.

(13) If the Brethalex is not tasted after 25
squashes (step 10), the test subject is unable to
taste Brethalex and may not perform the
Brethalex fit test.

(14) If a taste response is elicited, the test
subject shall be asked to take note of the
taste for reference in the fit test.

(15) Correct use of the nebulizer means
that approximately 1 ml of liquid is used at
a time in the nebulizer body.

(16) The nebulizer shall be thoroughly
rinsed in water, shaken to dry, and refilled
at least each morning and afternoon or
at least every four hours.

(b) Brethalex Solution Aerosol Fit Test Proce-
dure.

(1) The test subject may not eat, drink (ex-
cept plain water), smoke, chew gum for 15
minutes before the test.

(2) The fit test uses the same enclosure
that was used in item (a) above.

(3) The test subject shall don the enclosure
while wearing the respirator selected accord-
ing to section I. A. of this appendix. The
respirator shall be properly adjusted and
equipped with any type particular Brethalex.

(4) A second DeVilbiss Model 48 Inhalation
Medication Nebulizer or equivalent is used
to spray the fit test solution into the
enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution
nebulizer.

(5) The fit test solution is prepared by adding
375 mg of Brethalex to 200 ml of a 5% salt
(NaCl) solution in warm water.
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(6) As before, the test subject shall breathe through his or her slightly open mouth with tongue extended, and he instructed to report if he/she tastes the bitter taste of chlorine.

(7) The nozhk was inserted into the hole in the front of the enclosure and an initial concentration of the fit test solution is expelled into the enclosure using the same number of squirts (either 10, 20, or 30 squirts) based on the number of squares required to elicit a taste response as noted during the screening test.

(8) After generating the aerosol, the test subject shall be instructed to perform the exercises in section 1.1.14.1 of this appendix.

(9) Every 30 seconds the aerosol concentration shall be replenished using one half the number of aerosol used initially (e.g., 5, 10, or 15).

(10) The test subject shall indicate to the test instructor if at any time during the fit test the taste of Chlorine detected. If the test subject does not report tasting the Chlorine, the test is passed.

(11) If the taste of Chlorine is detected, the test is deemed unsatisfactory and the test is failed. A different respirator shall be tried and the entire test procedure is repeated (taste threshold screening and fit testing).

5. Irritant Smoke (Stannic Chloride) Protocol

This qualitative fit test uses the person's response to the irritating chemicals released in the "smoke" produced by a stannic chloride smoke tube to detect leaks in the respirator.

(a) General Requirements and Precautions

(1) The respirator to be tested shall be equipped with high-efficiency particulate air (HEPA) or P100-series filter(s).

(2) Only stannic chloride smoke tubes shall be used for this protocol.

(b) No form of test enclosure or hood for the test subject shall be used.

(4) The smoke can be irritating to the eyes, lungs, and nasal passages. The test conductor shall take precautions to minimize the test subject's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be taken when performing the sensitivity screening checks that determine whether the test subject can detect irritant smoke and use only the minimum amount of smoke necessary to elicit a response from the test subject.

(5) The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the build-up of irritant smoke in the general atmosphere.

(b) Sensitivity Screening Check

The person to be tested must demonstrate his or her ability to detect a weak concentration of the irritant smoke.

(1) The test operator shall break both ends of a ventilation smoke tube containing stannic chloride, and shall expel the smoke tube to a low flow air pump set to deliver 250 milliliters per minute, or a respirator square bell. The test operator shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.

(2) The test operator shall advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the subject to keep his/her eyes closed while the test is performed.

(3) The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he/she can detect the irritating properties of the smoke. The test operator shall carefully direct a small amount of the irritant smoke in the test subject's direction to determine that he/she can detect it.

(c) Irritant Smoke Fit Test Procedure

(1) The person being fit tested shall don the respirator without assistance and perform the required (user seal check).

(2) The test subject shall be instructed to keep his/her eyes closed.

(3) The test operator shall direct the stream of irritant smoke from the smoke tube toward the fascial area of the test subject, using the low flow pump or the square bell. The test operator shall stand at least 12 inches from the facepiece and move the smoke stream around the whole perimeter of the mask. The test operator shall gradually make two more passes around the perimeter of the mask, moving to within six inches of the respirator.

(4) If the person being tested has not had an involuntary response and/or detected the irritant smoke, proceed with the test exercises.

(5) The exercises identified in section 1.1.14.1 of this appendix shall be performed by the test subject while the respirator is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of six inches.

(6) If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being tested must repeat the entire sensitivity check and fit test procedure.

(7) Each test subject passing the irritant smoke test without evidence of a response (voluntary cough, irritation) shall be given a second sensitivity screening check, with the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she will still react to the smoke. Failure to evoke a response shall void the fit test.
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(8) If a response is produced during this second sensitivity check, then the fit test is passed.

C. Quantitative Fit Test (QNFT) Protocol

The following quantitative fit testing procedures have been demonstrated to be acceptable. Quantitative fit testing using a non-hazardous test aerosol (such as corn oil, polyethylene propylene glycol, PEG 400, di-2-ethyl hexyl sebacate (DEHS), or sodium chloride) generated in a test chamber, and employing instrumentation to quantify the fit of the respirator; Quantitative fit testing using ambient aerosol as the test agent and appropriate instrumentation (concentration monitor) to compare the respirator fit. Quantitative fit testing using controlled negative pressure and appropriate instrumentation to measure the volumetric leak rate of a facepiece to quantify the respirator fit.

1. General

(a) The employee shall ensure that persons administering QNFT are able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly and ensure that test equipment is in proper working order.

(b) The employer shall ensure that QNFT equipment is kept clean, and is maintained and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.

2. Generated Aerosol Quantitative Fit Testing Protocol

(a) Apparatus.

(1) Instrumentation. Aerosol generation, dilution, and measurement systems using particulate (corn oil, polyethylene glycol 4oo, PEG 400, di-2-ethyl hexyl sebacate (DEHS), or sodium chloride) as test aerosols shall be used for quantitative fit testing.

(2) Test chamber. The test chamber shall be large enough to permit all test subjects to perform freely all required exercises without disturbing the test agent concentration or the measurement apparatus. The test chamber shall be equipped and constructed so that the test agent is effectively isolated from the ambient air, yet uniform in concentration throughout the chamber.

(3) When testing air-purifying respirators, the normal filter or cartridge element shall be replaced with a high efficiency particulate air (HEPA) or P95-series filter supplied by the same manufacturer.

(4) The sampling instrument shall be selected so that a computer record or strip chart record may be made of the test showing the rise and fall of the test agent concentration with each inspiration and expiration at factors of at least 2,000. Integrators or computers that integrate the amount of test agent penetration leakage into the respirator for each exercise may be used provided a record of the readings is made.

(5) The combination of substitute air-purifying elements, test agent and test agent concentration shall be such that the test subject is not exposed to excess of an established exposure limit for the test agent at any time during the testing process, based upon the length of the exposure and the exposure limit duration.

(6) The sampling port on the test specimen respirator shall be placed and constructed so that no leakage occurs around the port (e.g., where the respirator is probed), and a free air flow is allowed into the sampling line at all times, and there is no interference with the fit or performance of the respirator. The intake sampling device (probe) shall be designed and used so that the air sample is drawn from the breathing zone of the test subject, midway between the nose and mouth and with the probe extending into the facepiece cavity at least 0.75 in.

(7) The test setup shall permit the person administering the test to observe the test subject inside the chamber during the test.

(8) The equipment generating the test atmosphere shall maintain the concentration of test agent constant within ±10 percent for the duration of the test.

(9) The time lapse between an event and the recording of the event on the strip chart or computer (integrator) shall be kept to a minimum. There shall be a clear indication of the occurrence of an event and its being recorded.

(10) The sampling line tubing for the test chamber atmosphere and for the respirator sampling port shall be of equal length and of the same material. The length of the test lines shall be equal.

(11) The exhaust flow from the test chamber shall pass through an appropriate filter (i.e., high efficiency particulate filters) before release.

(12) When sodium chloride aerosol is used, the relative humidity inside the test chamber shall not exceed 50 percent.

(13) The limitations of instrument detection shall be taken into account when determining the fit factor.

(14) Test respirators shall be maintained in proper working order and be inspected regularly for deficiencies such as cracks or missing valves and gaskets.

(b) Procedural Requirements.

(1) When performing the initial seal check using a positive or negative pressure check, the sampling line shall be clamped closed in order to avoid air pressure leakage during either of these pressure checks.

(2) The use of an abbreviated screening QNFT test is optional. Such a test may be utilized in order to quickly identify poor fitting respirators that passed the positive and negative pressure test and reduce the amount of QNFT time. The use of the CNS
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QNFT instrument in the count mode is another optional method to obtain a quick estimate of fit and eliminate poor fitting respirators before going on to perform a full QNFT.

(8) A reasonably stable test agent concentration shall be measured in the test chamber prior to testing. For canopy or shower curtain types of test units, the determination of the test agent's stability may be established after the test subject has entered the test environment.

(9) Immediately after the subject enters the test chamber, the test agent concentration inside the respirator shall be measured to ensure that the peak penetration does not exceed 5 percent for a half mask or 1 percent for a full facepiece respirator.

(10) A stable test agent concentration shall be obtained prior to the actual start of testing.

(11) Respirator restraining straps shall not be overtightened for testing. The straps shall be adjusted by the wearer without assistance from others to give a reasonably comfortable fit typical of normal use. The respirator shall not be adjusted once the fit test exercises begin.

(12) The test shall be terminated whenever any single peak penetration exceeds 5 percent for half masks and 1 percent for full facepiece respirators. The test subject shall be retested and retested.

(b) Calculation of fit factors.

(1) The fit factor shall be determined for the quantitative fit test by taking the ratio of the average chamber concentration to the concentration measured inside the respirator for each test exercise except the primate exercise.

(2) The average test chamber concentration shall be calculated as the arithmetic average of the concentrations measured before and after each test (i.e., 7 exercises) or the arithmetic average of the concentration measured before and after each exercise or the time average measured continuously during the respirator sample.

(3) The concentration of the challenge agent inside the respirator shall be determined by one of the following methods:

(A) Average peak penetration method

- The method of determining test agent penetration into the respirator utilizing a strip chart recorder, integrator, or computer. The agent penetration is determined by an average of the peak heights on the graph or by computer integration. For each exercise except the primate exercise, integrators or computers that calculate the actual test agent penetration into the respirator for each exercise will also be considered to meet the requirements of the average peak penetration method.

(B) Maximum peak penetration method

- The method of determining test agent penetration in the respirator as determined by strip chart recordings of the test. The highest peak penetration for a given exercise is taken to be representative of average penetration into the respirator for that exercise. Integration by calculation of the area under the individual peak for each exercise except the primate exercise. This includes computerized integration.

(C) The calculation of the overall fit factor using individual exercise fit factors involves first converting the exercise fit factors to penetration values, determining the average, and then converting that result back to a fit factor. This procedure is described in the following equation:

\[
\text{Overall Fit Factor} = \frac{\text{Number of exercises}}{1/f_1 + 1/f_2 + 1/f_3 + 1/f_4 + 1/f_5 + 1/f_6}
\]

Where \( f_1, f_2, f_3, \) etc. are the fit factors for exercises 1, 2, 3, etc.

(9) The test subject shall not be permitted to wear a half mask or quarter facepiece respirator unless a minimum fit factor of 100 is obtained, or a full facepiece respirator unless a minimum fit factor of 100 is obtained.

(10) Filters used for quantitative fit testing shall be replaced whenever increased breathing resistance is encountered, or when the test agent has altered the integrity of the filter media.

3. Ambient aerosol condensation model counter (CNC) quantitative fit testing protocol.

The ambient aerosol condensation model counter (CNC) quantitative fit testing protocol (Portacount™) protocol quantitatively fits respirators with the use of a probe. The probe respirator is only used for quantitatively tests. A probe respirator has a special sampling device, installed on the respirator, that allows the probe to sample the air from the mask. A probe respirator is required for each make, style, model, and size that the employer uses and can be obtained from the respirator manufacturer or distributor. The CNC instrument
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manufacturer, TSI Inc., also provides probe attachments (793 sampling adapters) that permit fit-testing in an employee's own respirator. A minimum fit factor pass level of at least 100 is necessary for a half mask respirator and a minimum fit factor pass level of at least 50 is required for a full facepiece negative pressure respirator. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

3. Portacount Fit Test Requirements.
   (1) Check the respirator to make sure the sampling probe and line are properly attached to the facepiece and that the respirator is fitted with a particulate filter capable of preventing significant penetration by the ambient particles used for the fit test (e.g., NIOSH 42 CFR 84 series 100, series 50, or series 65 particulate filters) per manufacturer's instruction.

   (2) Instruct the person to be tested to don the respirator for five minutes before the fit test starts. This purges the ambient particles trapped inside the respirator and permits the wearer to make certain the respirator is comfortable. This individual shall already have been trained on how to wear the respirator properly.

   (3) Check the following conditions for the adequacy of the respirator fit: (a) respirator is properly placed; (b) adequate unimpeded vision is not obstructed; (c) respirator is properly sized to fit oxygen from nose to chin; (d) no visible tightness of the respirator at the bridge of the nose or around the mouth; (e) no visible condensation in a mirror to evaluate fit and respirator position.

   (4) Have the person wearing the respirator do a nose pinch. If a fit is detected, determine the cause. If leakage is from a poorly fitting facepiece, try another size of the same model respirator, or another model of respirator.

   (5) Follow the manufacturer's instructions for operating the Portacount and proceed with the test.

   (6) The test subject shall be instructed to perform the exercises in section I. A. 14. of this appendix.

   (7) After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the test. If it has become unacceptable, another model of respirator shall be tried.

   (1) The Portacount will automatically stop and calculate the overall fit factor for the entire set of exercises. Each overall fit factor is weighted against the Pass or Fail message will indicate whether or not the test was successful. If the test was a Pass, the fit test passed.

   (2) Since the pass or fail criterion of the Portacount is user programmable, the test operator shall ensure that the pass or fail criterion meets the requirements for minimum respirator performance in this appendix.

   (3) A record of the test needs to be kept on file, assuming the fit test was successful. The record must contain the test subject's name; overall fit factor; make, model, style, and size of respirator used; and date tested.

   (4) Controlled ambient pressure (CAP) qualitative fit testing protocol.

The CAP protocol provides an alternative to aerosol fit test methods. The CAP fit test method technology is based on exhausting air from a temporarily sealed respirator facepiece to generate and then maintain a constant negative pressure inside the facepiece. The rate of air exhausted is controlled so that a constant negative pressure is maintained in the respirator during the fit test. The level of pressure is selected to replicate the mean inspiratory pressure that causes leakage into the respirator under normal use conditions. With pressure held constant, air flow out of the respirator is equal to air flow into the respirator. Therefore, measurement of the exhaust stream that is required to hold the pressure in the temporarily sealed respirator constant yields a direct measure of leakage air flow into the respirator. The CAP fit test method measures leak rates through the facepiece as a method for determining the facepiece fit for negative pressure respirators. The CAP instrument manufacturer Computational Health Dynamics of Birmingham, Alabama also provides attachments (sampling manifolds) that replace the filter cartridges to permit fit testing in an employee's own respirator. To perform the test, the test subject closes his or her mouth and holds his/her breath, and after which an air pump removes air from the respirator facepiece at a pre-selected constant pressure. The facepiece fit is expressed as the leak rate through the facepiece, expressed as milliliters per minute. The quality and validity of the CAP tests are determined by the degree to which the P–m pressure is provided and used to determine test validity and quality. A minimum fit factor pass level of 100 is necessary for a half mask respirator and a minimum fit factor of at least 50 is required for a full facepiece respirator. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

(a) CAP Test Requirements.

   (1) The instrument shall have a non-adjustable test pressure of 15.0 mm water pressure.

   (2) The CAP system defaults selected for test pressure shall be set at -5 mm of water (-4.98 inches of water) and the modeled inspiratory flow rate shall be 33.8 liters per minute for performing fit tests.
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NOTE: CNP systems have built-in capability to conduct fit testing that is specific to unique work rate, mask, and general situations that might apply in a specific workplace. Use of system default values, which were selected to represent respirator wear with minimum cartridge resistance at a low moderate work pace, will allow inter-test comparison of the respirator fit.

The individual who conducts the CNP fit testing shall be thoroughly trained to perform the test.

(4) The respirator filter or cartridge needs to be replaced with the CNP test manifold. The inhalation valve downstream from the manifold either needs to be temporarily removed or propped open.

(6) The employer must train the test subject to hold his or her breath for at least 10 seconds.

(8) The test subject must don the test respirator without any assistance from the test administrator who is conducting the CNP fit test. The respirator must not be adjusted once the fit-test exercises begin. Any adjustment voids the test, and the test subject must repeat the fit test.

(7) The CNP test shall be followed according to section 1.1, 1.1.1, of this appendix with an exception for the CNP test exercise.

(1) CNP Test Exercises.

(1) Normal breathing: In a normal standing position, without talking, the subject shall breathe normally for 1 minute. After the normal breathing exercise, the subject needs to hold breath straight ahead and hold his or her breath for 10 seconds during the test measurement.

(2) Deep breathing: In a normal standing position, the subject shall breathe slowly and deeply for 1 minute, being careful not to hyperventilate. After the deep breathing exercise, the subject shall hold breath slightly ahead and hold his or her breath for 10 seconds during the test measurement.

(3) Turning head side to side. Standing in place, the subject shall slowly turn his or her head from side to side between the extreme positions on each side for 45 seconds. The head shall be held at each extreme momentarily as the subject cannot intake air at each side. After the turning head side to side exercise, the subject needs to hold breath full and hold his or her breath for 10 seconds during the test measurement. Next, the subject needs to hold breath full and hold his or her breath for 10 seconds during the test measurement.

(4) Moving head up and down. Standing in place, the subject shall slowly move his or her head up and down for 45 seconds. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling). After the moving head up and down exercise, the subject shall hold his or her head full up and hold his or her breath for 10 seconds during the test measurement. Next, the subject shall hold his or her breath full down and hold his or her breath for 10 seconds during the test measurement.

(5) Bending over. The test subject shall bend at the waist as if he or she were to touch his or her toes for 2 minutes. After the bending over exercise, the subject shall hold his or her head straight ahead and hold his or her breath for 10 seconds during the test measurement.

(6) Normal Breathing: The test subject shall require to hold his or her breath slightly ahead and hold his or her breath for 10 seconds during the test measurement.

(7) CNP Test Instrument.

(1) The CNP test instrument must have an effective auditory warning device, or a visual warning device in the form of a screen tester, that indicates when the test subject fails to hold his or her breath during the test. The test must be terminated and restarted from the beginning when the test subject fails to hold his or her breath during the test. The test subject then may be retested and retested.

(2) A record of the test shall be kept on file, assuming the fit test was successful. The record must contain the test subject's name, overall fit factor, mask, model, style, size, and the respirator used; and date tested.

(8) Outside conditions. The test subject must comply with the weather conditions specified in paragraph (f) of this protocol, and the test subject will be retested if the conditions change.

(9) Gritman. The test subject shall гримась by sniffling or sniffing for 15 seconds.

(10) Breathing tests: The test subject shall come to rest at the waist so as to be supported for this exercise in those test environments such as should-type CNP units that prohibit bending at the waist. After the bending over exercise, the subject shall hold his or her breath slightly ahead and hold his or her breath for 10 seconds during the test measurement. After the normal breathing exercise, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the test.

If the test is not acceptable, another model of a respirator shall be tried.
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(b) Employers must ensure that each test subject being fit tested using this protocol follows the exercise and measurement procedures, including the order of administration, described below in Table A–1 of this appendix.

<table>
<thead>
<tr>
<th>Exercise 1</th>
<th>Exercise procedure</th>
<th>Measurement procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fitting Residual Exhalation</td>
<td>Stand and breathe normally, without talking, for 30 seconds.</td>
<td>Face toward while holding breath for 10 seconds.</td>
</tr>
<tr>
<td>Head Tilt</td>
<td>Send the subject, as if going to vomit his or her head back and forth.</td>
<td>Face toward while holding breath for 10 seconds.</td>
</tr>
<tr>
<td>Head Tilt 2</td>
<td>Vomit on several times while holding breath.</td>
<td>Face toward while holding breath for 10 seconds.</td>
</tr>
<tr>
<td>Respirator Check</td>
<td>Remove the respirator mask, lower the temperature wraps, and then add the respirator mask.</td>
<td>Face toward while holding breath for 10 seconds.</td>
</tr>
</tbody>
</table>

*Exercises are listed in the order in which they are to be administered.

(c) After completing the test, the test administrator must question each test subject regarding the comfort of the respirator. When a test subject states that the respirator is unacceptable, the employer must ensure that the test administrator repeats the protocol using another respirator model.

d) Employers must determine the overall fit factor for each test subject by calculating the harmonic mean of the fit testing exercises as follows:

$$ \text{Overall Fit Factor} = \left[ \frac{1}{FF_1} + \frac{1}{FF_2} + \ldots + \frac{1}{FF_n} \right]^{-1} $$

Where:

- $N$ = The number of exercises;
- $FF_i$ = The fit factor for the $i$th exercise.

PART III. NEW FIT TEST PROTOCOLS

A. Any person may submit to OSHA an application for approval of a new fit test protocol. If the application meets the following criteria, OSHA will initiate a rulemaking proceeding under section 3(b)(5) of the Occupational Safety and Health Act to determine whether to list the new protocol as an approved protocol in this Appendix.

B. The application must include a detailed description of the proposed new fit test protocol. This application must be supported by either:

1. A test report prepared by an independent governmental research laboratory (e.g., Lawrence Livermore National Laboratory, Los Alamos National Laboratory, the National Institute for Standards and Technology) stating that the laboratory has tested the protocol and had found it to be accurate and reliable; or

2. An article that has been published in a peer-reviewed industrial hygiene journal describing the protocol and explaining how test data support the protocol’s accuracy and reliability.

C. If OSHA determines that additional information is required before the Agency considers a rulemaking proceeding under this section, OSHA will so notify the applicant and afford the applicant the opportunity to submit the supplemental information. Initiation of a rulemaking proceeding will be deferred until OSHA has received and evaluated the supplemental information.

APPENDIX B–1 TO 1910.134: USER SEAL CHECK PROCEDURES (MANDATORY)

1. Facepiece Positive and Negative Pressure Checks

A. Positive pressure check. Close off the exhalation valve and inhale gently into the facepiece. The facepiece 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 first remove the exhalation valve cover 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 ten seconds. The design
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of the filter opening of some cartridges cannot be effectively covered with the palm of the hand. The test can be performed by covering the filter opening of the cartridge with a thin latex or nitrile glove. If the lacepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the test indicates 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 provided that the employer demonstrates that the manufacturer’s procedures are equally effective.

APPENDIX B-2 TO §1910.134: RESPIRATOR CLEANING PROCEDURES (MANDATORY)

These procedures are provided for employer use when cleaning respirators. They are general in nature, and the employer as an alternative may use the cleaning recommendations provided by the manufacturer of the respirators used by their employees, provided such procedures are as effective as those listed here in Appendix B-2. Equivalent effectiveness simply means that the procedures used must accomplish the objectives set forth in Appendix B-2, i.e., must ensure that the respirator is properly cleaned and disinfected in a manner that prevents damage to the respirator and does not cause harm to the user.

I. Procedures for Cleaning Respirators

A. Remove filters, cartridges, or canisters. Dissassemble facepiece by removing snap-in diaphragm, demand and pressure-demand valve assembly, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.

B. Wash components in warm (60 °C [140 °F]) maximum water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.

C. Rinse components thoroughly in clean, warm (60 °C [140 °F]) maximum, preferably running water, drain.

D. When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in one of the following:

1. Hypochlorite solution (8 ppm of active chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 25 °C (77 °F) or

2. Aqueous solution of iodine (3% iodine solution) of tincture of iodine 0.8 grams ammonium and/or potassium iodide/100 cc of 40% alcohol to one liter of water at 43 °C (110 °F) or

E. Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.

F. Rinse components thoroughly in clean, warm (60 °C [140 °F]) maximum, preferably running water, drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on facepieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.

G. Components should be hand-dried with a clean lint-free cloth or air-dried.

H. Reassemble facepiece, replacing filters, cartridges, and canisters where necessary.

I. Test the respirator to ensure that all components work properly.

APPENDIX C TO §1910.134: MEMORANDUM

To the employer: Answers to questions in Section I, and to question 8 in Section 2 of part A, do not require a medical examination.

To the employee:

Can you read (circle one): Yes/No

Your employer must allow you to answer this questionnaire during normal working hours, or at a time and place that is convenient to you. To maintain your confidentiality, your employer or supervisor must not look at or review your answers, and your employer must tell you how to deliver or send this questionnaire to the health care professional who will review it.

Part A. Section 1. (Mandatory) The following information must be provided by every employee who has been selected to use any type of respirator (please print).

1. Today’s date:

2. Your name:

3. Your age (to nearest year):

4. Sex (circle one): Male/Female

5. Your height: ___ ft. ___ in.


7. Your job title:

8. A phone number where you can be reached by the health care professional who reviews this questionnaire (please print):

9. The best time to phone you at this number:

10. Has your employer told you how to contact the health care professional who will review this questionnaire (circle one): Yes/No

11. Check the type of respirator you will use (you can check more than one category):
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a. ___ N, R, or P disposable respirator (filter mask, non-cartridge type only),  
b. ___ Other type (for example, half or full facepiece type, powered air purifying, supplied air, self-contained breathing apparatus).  
12. Have you worn a respirator (circle one):  
   Yes No  
7 If "yes," what type(s):  
  
Part A. Section 2. (Mandatory) Questions 1 through 9 below must be answered by every employee who has been selected to use any type of respirator (please circle "yes" or "no").  
1. Do you currently smoke tobacco, or have you smoked tobacco in the last month:  
   Yes No  
2. Have you ever had any of the following conditions?  
   a. Skin lesions (rash): Yes No  
   b. Earaches: Yes No  
   c. Allergic reactions that interfere with your breathing: Yes No  
   d. Claustrophobia (fear of closed places): Yes No  
   e. Trouble smelling or tasting: Yes No  
3. Have you ever had any of the following pulmonary or lung problems?  
   a. Asthma: Yes No  
   b. Emphysema: Yes No  
   c. Bronchitis: Yes No  
   d. Chronic bronchitis: Yes No  
   e. Pneumoconiosis: Yes No  
   f. Tuberculosis: Yes No  
   g. Silicosis: Yes No  
   h. Pneumoconiosis (collapsed lung): Yes No  
   i. Lung cancer: Yes No  
   j. Sore throat: Yes No  
   k. Any chest injuries or surgeries: Yes No  
4. Have you ever had any of the following symptoms of pulmonary or lung illness?  
   a. Shortness of breath: Yes No  
   b. Shortness of breath when walking on level ground or walking up a slight hill or incline: Yes No  
   c. Shortness of breath when walking more than 2 blocks or up 3 flights of stairs: Yes No  
   d. Shortness of breath when walking at your own pace on level ground: Yes No  
   e. Shortness of breath when walking or dressing yourself: Yes No  
5. Have you ever had any of the following symptoms of pulmonary or lung illness?  
   a. Wheezing that interferes with your job: Yes No  
   b. Chest pain when you breathe deeply: Yes No  
   c. Any other symptoms that you think may be related to lung problems: Yes No  
6. Have you ever had any of the following cardiovascular or heart problems?  
   a. Heart attack: Yes No  
   b. Stroke: Yes No  
   c. Angina: Yes No  
   d. Heart failure: Yes No  
   e. Swelling in your legs or feet (not caused by walking): Yes No  
   f. Heart arrhythmia (irregular heartbeat): Yes No  
   g. Black blood pressure: Yes No  
   h. Any other heart problem that you've been told about: Yes No  
7. Have you ever had any of the following cardiovascular or heart symptoms?  
   a. Frequent pain or tightness in your chest: Yes No  
   b. Pain or tightness in your chest during physical activity: Yes No  
   c. Pain or tightness in your chest that interferes with your job: Yes No  
   d. In the past two years, have you noticed your heart skipping or missing a beat: Yes No  
   e. Heartburn or indigestion that is not related to eating: Yes No  
   f. Any other symptoms that you think may be related to heart or circulation problems: Yes No  
8. Do you currently take medication for any of the following problems?  
   a. Breathing or lung problems: Yes No  
   b. Heart trouble: Yes No  
   c. Blood pressure: Yes No  
   d. Seizures (fits): Yes No  
9. If you've used a respirator, have you ever had any of the following problems? (If you've never used a respirator, check the following space and go to question #)  
   a. Eye irritation: Yes No  
   b. Skin allergy or rash: Yes No  
   c. Ankle, foot, or leg swelling: Yes No  
   d. General weakness or fatigue: Yes No  
   e. Any other problem that interferes with your use of a respirator: Yes No  
9 Would you like to talk to the health care professional who will review this questionnaire about your answers to this questionnaire: Yes No  

Questions 26 to 27 below must be answered by every employee who has been selected to use either a half-facepiece respirator or a self-contained breathing apparatus (SCBA). For employees who have been selected to use other types of respirators, answering these questions is voluntary.  
10. Have you ever lost vision in either eye (temporarily or permanently): Yes No  
11. Do you currently have any of the following vision problems?
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a. Wear contact lenses: Yes/No
b. Wear glasses: Yes/No
c. Color blind: Yes/No
da. Any other eye or vision problem: Yes/No
e. Have you ever had any injury to your ear, including a broken ear drum: Yes/No
f. Do you currently have any of the following hearing problems?
   a. Difficulty hearing: Yes/No
   b. Wear a hearing aid: Yes/No
c. Any other hearing or ear problem: Yes/No

14. Have you ever had a back injury: Yes/No
15. Do you currently have any of the following musculoskeletal problems?
   a. Weakness in any of your arms, hands, legs, or feet: Yes/No
   b. Back pain: Yes/No
c. Difficulty fully moving your arm and legs: Yes/No
d. Pain or stiffness when you lean forward or backward at the waist: Yes/No
e. Difficulty fully moving your head up or down: Yes/No
f. Difficulty fully moving your head side to side: Yes/No
g. Difficulty bending at your knees: Yes/No
h. Difficulty squatting to the ground: Yes/No

16. Climbing a flight of stairs or a ladder carrying more than 20 lbs: Yes/No
17. Any other muscle or skeletal problem that interferes with using a respirator: Yes/No

Part B: Any of the following questions, and other questions not listed, may be added to the questionnaire at the discretion of the healthcare professional who will review the questionnaire.

1. In your current job, are you working at high altitudes (over 5,000 feet) or in a place that has less than normal amounts of oxygen: Yes/No
   If "yes," do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you're under those conditions: Yes/No

2. At work or at home, have you ever been exposed to hazardous solvents, hazardous airborne chemicals (e.g., gases, fumes, or dust), or have you come into contact with hazardous chemicals: Yes/No
   If "yes," name the chemicals if you know them.

3. Have you ever worked with any of the materials, or under any of the conditions, listed below:
   a. Asbestos: Yes/No
   b. Silica (e.g., in sandblasting): Yes/No
c. Tungsten carbide (e.g., grinding or welding this material): Yes/No
d. Benzyl alcohol: Yes/No
e. Lead: Yes/No
f. Coal (for example, mining): Yes/No
g. Iron: Yes/No
h. Tobacco: Yes/No

1. Dusty environments: Yes/No
2. Any other hazardous exposure: Yes/No
   If "yes," describe these exposures.

4. List any second jobs or side businesses you have:

5. List your previous occupations:

6. List your current and previous hobbies:

7. Have you been in the military service? Yes/No
   If "yes," were you exposed to biological or chemical agents (either in training or combat): Yes/No

8. Have you ever worked on a HAZMAT team: Yes/No

9. Other than medications for breathing and lung problems, heart trouble, blood pressure, and seizures mentioned earlier in this questionnaire, are you taking any other medications for any reason (including over-the-counter medications): Yes/No

10. If "yes," name the medications if you know them.

11. Will you be using any of the following items with your respirator(s)?
   a. High Filtration: Yes/No
   b. Canisters (for example, gas masks): Yes/No
   c. Cartridges: Yes/No

12. How often are you expected to use the respirator(s)?
   a. Escape only (no reserve): Yes/No
   b. Emergency reserve only: Yes/No
   c. Less than 5 hours per week: Yes/No
   d. Less than 2 hours per day: Yes/No
   e. 2 to 4 hours per day: Yes/No
   f. Over 4 hours per day: Yes/No

13. During the period you are using the respirator(s), is your work either:
   a. Light (less than 100 kcal per hour): Yes/No
   b. Medium (100 to 350 kcal per hour): Yes/No
   c. Heavy (over 350 kcal per hour): Yes/No
   If "yes," how long does this period last during the average shift?
   ___________________________ hours, ___________________________ minutes

Examples of a light work effort are sitting while writing, typing, drafting, or performing light assembly work, or standing while operating a light machine (1-3 lbs) or controlling machinery.

b. Medium (350 to 500 kcal per hour): Yes/No
   If "yes," how long does this period last during the average shift?
   ___________________________ hours, ___________________________ minutes

Examples of a moderate work effort are sitting while nailing or filing; driving a truck or bus in urban traffic; standing while drilling,
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Making, performing assembly work, or transferring a moderate load (about 25 lbs.) at waist level, walking on a level surface about 2 mph or down a 5 degree grade about 3 mph; or pushing a wheelbarrow with a heavy load (about 100 lbs.) on a level surface.

c. Heavy (above 360 lb. per hour): Yes/No

If “yes,” how long does this period last during the average shift (in hours)?

Examples of heavy work are lifting a heavy load (about 50 lbs.) from the floor to your waist or shoulder: working on a loading dock; shoveling, standing while bricklaying; or ship; putting up an 8-degree grade about 3 mph; climbing stairs with a heavy load (about 50 lbs.).

13. Will you be wearing protective clothing and/or equipment (other than the respirator) when you’re using your respirator? Yes/No

If “yes,” describe this protective clothing and/or equipment:

14. Will you be working under hot conditions (temperatures exceeding 77 °F): Yes/No

15. Will you be working under humid conditions: Yes/No

16. Describe the work you’ll be doing while you’re using your respirator(s):

17. Describe any special or hazardous conditions you might encounter when you’re using your respirator(s) (for example, confined spaces, life-threatening gases):

18. Provide the following information, if you know it, for each toxic substance that you’ll be exposed to when you’re using your respirator(s):

   a. Name of the first toxic substance:

   b. Estimated maximum exposure level per shift:

   c. Duration of exposure per shift:

   d. Name of the second toxic substance:

   e. Estimated maximum exposure level per shift:

   f. Duration of exposure per shift:

   g. Name of the third toxic substance:

   h. Estimated maximum exposure level per shift:

   i. Duration of exposure per shift:

The name of any other toxic substances that you’ll be exposed to while using your respirator:

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39. Describe any special responsibilities you’ll have while using your respirator(s) that may affect the safety and well-being of others (for example, rescue, security, or first aid duties):

Appendix D to § 1910.135 (Mandatory Information for Employers Using Respirators When Not Required Under the Standards)  

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. This 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 to protect against. 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.


§ 1910.135 Head protection.

(a) General requirements. (1) The employer shall ensure that each affected employee wears a protective helmet when working in areas where there is a potential for injury to the head from falling objects.