DISTRIBUTION:

Copies of all revisions, modifications, addenda, etc., must be forwarded to the following departments:

- Employee Health Office
- Affected departments listed in Reference 1
- Posted on Yale EHS Web Site (www.yale.edu/ehs)
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Yale University Respiratory Protection Program

1. Introduction
This document establishes Yale University’s written compliance program for respiratory protection, as required by the Occupational Safety and Health Administration (OSHA) under Title 29 Code of Federal Regulations Part 1910.134 (See Appendix A for a copy of the Standard). This Respiratory Protection Program addresses the use of respiratory protection as a method to protect Yale University employees from exposures to airborne biological, chemical, and physical agents to safe levels below exposure limits, as well as from oxygen deficient atmospheres (i.e. <19.5% O₂). Whenever feasible, engineering controls and work practice controls will first be used to maintain worker exposures below exposure limits and at a safe level. It is understood that respiratory protection shall only be required if these controls are not feasible or are not able to reduce exposures adequately.

The Senior Industrial Hygienist in the Yale Office of Environmental Health & Safety (EHS) is the Respirator Program Administrator.

2. Responsibilities
Various Yale University departments and employees have responsibilities under this program, including:

a. Office of Environmental Health & Safety - Respirator Program Administrator
   • Preparing, reviewing, and periodically revising this program.
   • Providing and/or overseeing respirator fit-testing and training.
   • Monitoring and evaluating respirable hazards in the workplace.
   • Providing guidance to supervisors in the selection and purchase of approved respirators.
   • Maintaining records of exposure assessments, training, and respirator fit testing.
   • Coordinating recordkeeping and notifications with the Employee Health Office.

b. Employee Health Office
   • Developing and implementing a medical surveillance program for approved respirator users.
   • Maintaining medical surveillance records.

c. Supervisors
   • Providing new employees with informal on-the-job training about potential respirable hazards, personal protective equipment requirements, and this Program.
   • Notifying Yale Environmental Health & Safety and the Employee Health Office about workplace conditions and potentially affected employees.
   • Making information and training materials available to potentially affected employees.
   • Ensuring that affected employees receive medical surveillance.
   • Ensuring that affected employees receive respirator training and fit-testing prior to working with the respirator, and annually thereafter.
   • Supplying approved respirators to affected employees free-of-charge.
   • Requiring affected employees to wear respirators.

d. Affected Employees
   • Observing the procedures and requirements outlined in this Program.
3. Exposure Assessments
Potential exposures to hazardous materials and conditions at Yale University are routinely evaluated through regular workplace inspections and upon employee or supervisor request. Environmental Health & Safety takes all practical efforts to ensure that engineering or other controls are available and implemented to eliminate the need for respiratory protection. Nevertheless, certain situations and operations continue to require the use of respirators where exposures cannot be otherwise managed below the applicable permissible exposure limit. Also, respirators may be required or desired because of the odor or irritation associated with chemical exposures, even though they may be well below all applicable exposure limits.

In the absence of a regulatory exposure limit, commonly accepted guidelines (i.e., TLVs, RELs, WEELs, or manufacturers’ suggested exposure limits) will be used to evaluate the exposure hazard from a particular operation or environment. Airborne concentrations of hazardous agents may be predicted on the basis of past experience, mathematical calculations, published results for similar work, or actual air sampling. Predicted airborne concentrations will be extended to all members of the same job title or function unless specific information indicates that exposures vary substantially, in which case more cross-sectional data will be obtained. Where air sampling is needed, measurements will be made with calibrated equipment operated by trained safety and health personnel from or under the direction of Yale Environmental Health & Safety. Monitoring will be repeated when changes occur which could render respiratory protective equipment inadequate or changes in job tasks will require new employees to be included in this Program.

4. Respirator Selection
Respirators are selected on the basis of workplace hazard assessments, as well as guidance from 29CFR1910.134, the American National Standard Practices for Respiratory Protection Z88.2-1992, the NIOSH Guide to Industrial Respiratory Protection, and the latest version of the National Institute for Occupational Safety and Health's Pocket Guide to Chemical Hazards. Final selection of any respiratory protective device must be made in consultation with senior staff from Environmental Health & Safety. Only respirators with approval from the National Institute of Occupational Safety and Health (NIOSH) may be used.

Respirators are selected on the basis of the anticipated health hazard(s), considering the following factors:

- Chemical, physical, or biological agent(s) present in the work environment;
- Physical state of contaminants (i.e., gas, vapor, dust, aerosol);
- Permissible exposure limit (PEL) and immediately dangerous to life and health (IDLH) levels for the agent. In the absence of a PEL, other suitable exposure guidelines (i.e., ACGIH Threshold Limit Value) or known toxicity of the agent will be considered;
- Anticipated airborne concentration of agent(s) based upon either past experience, mathematical predictions, published results from similar operations, or actual air sampling. If the concentration cannot be predicted or the contaminant(s) unknown, respiratory protection must be upgraded to self-contained breathing apparatus;
- Assigned protection factor (NIOSH) for the respirator type;
- Potential for skin absorption or severe eye irritation;
• Potential for oxygen deficiency;
• Nature and duration of the activity requiring respiratory protection.

Only respirators that can provide protection in excess of the anticipated airborne concentration will be selected (i.e., the assigned protection factor times the permissible exposure limit must exceed the anticipated airborne concentration). The respirator selection worksheet (Appendix B) can be used as a decision guideline for ensuring the adequacy of selected equipment.

At Yale University, negative pressure air purifying respirators (APR) and powered air purifying respirators (PAPR) are typically sufficient for routine work operations requiring respiratory protection. Cartridge selection is made in accordance with the filtration capabilities; the appropriate cartridge or filter can be verified by the Respirator Program Administrator. Cartridges for gases and vapors must either have an end-of-service-life indicator (ESLI), or must be changed in accordance with the cartridge change schedule described in Appendix C. Positive pressure-demand self-contained breathing apparatus (SCBA) is used for emergency response, unknown or oxygen deficient atmospheres, when there is no appropriate filtering cartridge available, or in other high hazard situations. A list of approved respirators and their typical uses appears in Appendix D.

5. Restrictions
Respirators requiring a tight face seal for proper performance may not be worn if certain physical or health conditions prevent obtaining the tight seal. These may include: eyeglasses (with tight fitting full facepiece respirators); missing denture(s); facial hair that interferes with the seal; punctured eardrum; articles of clothing that affect fit; other physical, health, or prosthetic conditions that interrupt or preclude an effective respirator fit test. Each of these conditions may be remedied as follows:

• Eyeglass Temple Pieces – Where a full-face negative pressure respirator must be worn, a spectacle kit that fit the respirator must be provided to the employee free-of-charge. The employee will then need to visit an optometrist during regular working hours to arrange for the lens to be fabricated to the required prescription. Although the practice is strongly discouraged, contact lenses may be worn provided the respirator is of full-face design.
• Missing Denture(s) – Will be addressed by the Employee Health Office and the reason for the missing dentures identified.
• Facial Hair Impeding Effective Seal – Where an employee is required to wear a tight-fitting negative-pressure respirator, and facial hair impedes an effective facial seal, the hair must be removed before that respirator can be worn.
• Clothing – Clothing, jewelry, or other personal items worn that prevent making an effective facial seal must be removed so that the respirator can be properly worn.
• Other Issues – Other issues (e.g., prosthetics, handicaps, facial malformations) that could prevent the effective use of a respirator will be addressed on a case-by-case basis with the Employee Health Office during the medical screening.

6. Equipment Acceptance Criteria
Respiratory protection devices, including cartridges for air purifying respirators, must be approved by the National Institute for Occupational Safety and Health (NIOSH), and Grade D or better compressed air\(^1\) used in all air supplying systems. The Yale Fire Marshal’s Office refills the SCBA

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\(^1\) Compressed Gas Association Commodity Specification G-7.1-1989
tanks through the New Haven Fire Department, and a certificate of analysis (CofA) verifying Grade D breathing air is available from them.

7. Fit Testing
Employees who are required to use a tight-fitting respiratory facepiece for protection against all contaminants must be fit-tested during initial equipment issuance and annually thereafter. In addition to the fit-testing, the employee should conduct a respirator seal check prior to each use. User seal check procedures as mandated by OSHA are outlined in Appendix E. Qualitative fit testing is performed by Environmental Health & Safety using irritant smoke, saccharin, bitrex, or isoamyl acetate (“banana oil”). Quantitative fit-testing is performed as necessary using the TSI Portacount Plus. This fit testing is performed following the procedures mandated by OSHA in Appendix A of 29CFR1910.134. Fit testing is repeated annually and must also be repeated if the user’s health/physical characteristics significantly change (e.g., surgery, accident, change or loss of dentures). Qualitative fit-testing verifies an assigned protection factor (APF) of 10 for the disposable N95 and N100 respirators. Qualitative fit-testing also verifies an APF of 10 for ½ mask and full face respirators. If an APF greater than 10 is desired, quantitative fit-testing will be conducted for full face air purifying respirators, for an APF up to 50. Users of the full face masks for the SCBAs used at Yale University are fit-tested annually using the quantitative fit test procedure. Records of fit testing are maintained by Environmental Health & Safety. See Appendix F for fit-testing procedures and record sheet.

8. Training
Employees and supervisors required to wear respirators during employment at the University receive initial and annual training in the proper use, care, and limitations of the selected respirator; details of this program; and on OSHA’s requirements under 1910.134. At a minimum, the following items will be covered during the training session:

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

See Appendix G for an outline of the respirator training program.
9. Voluntary Use
Under some circumstances, employees may wish to use respiratory protection equipment for their own comfort or sense of well being, even when there is no recognized hazard or overexposure. Respirator use in these circumstances would be considered “voluntary” and many elements of OSHA’s respiratory protection standard would not apply. For voluntary users, annual respirator fittesting is not required but we recommend initial fittesting to help ensure proper size selection. Voluntary users of filtering facepiece respirators (N95, N100) are also not required to undergo medical clearances. However, voluntary users of all other respirators are required to complete the medical clearance questionnaire and be medically cleared. Although not mandated, we strongly recommend that voluntary N95 and N100 respirator users also complete the medical clearance questionnaire to ensure that the respirator itself is not a hazard to the employee.

Those employees who are not required to wear respirators but do so on a voluntary basis are provided with the required information (from 29CRF1910.134, Appendix D) and are invited to attend respiratory training. See Appendix H for a copy of the required information given to voluntary respirator wearers. Copies of this information are posted and available in the stockrooms.

10. Equipment Inspection
Employees must inspect their respirator before and after each use, including face seals and shield (full face units), cartridge receptacles, straps, and inhalation and exhalation diaphragms. Components made of rubber, silicone, or another elastomer must be inspected for pliability and any signs of deterioration. If any parts are damaged, the unit must be immediately taken out of service and the area supervisor notified so that a suitable replacement or repair can be made. Respirators for emergency use and all self-contained breathing apparatus must also be inspected on a monthly basis (Appendix I). The most current inspection record is kept with the equipment. A record of the monthly inspection of the SCBAs and PAPRs available for emergency use by EHS is kept in the EHS office.

11. Equipment Use
When donning a respirator, hair must be pulled back and away from the seal area, and negative and/or positive pressure seal checks conducted to evaluate the facial fit and unit integrity. If an airtight seal cannot be made by adjusting the tightening straps, then the respirator must be inspected for damage and either repaired or replaced.

When using a respirator, employees must immediately stop work and leave the area if they:
• Detect vapor or gas breakthrough, changes in breathing resistance, or leakage of the facepiece,
• Develop any signs or symptoms of over-exposure,
• Are alerted to end-of-service life indicator or low air alarm (for SCBA),
• Need to wash their face and respirator facepiece as necessary to prevent eye or skin irritation associated with respirator use, or
• Need to replace the respirator or the filter, cartridge, or canister elements.

In the event that a possible exposure many have occurred during respirator use, notify the area supervisor, Environmental Health & Safety, and/or the Employee Health Office for assistance and possible medical follow-up. Remove the respirator from service and inspect it for damage or other problems. If the cause cannot be identified and corrected, contact Environmental Health & Safety for guidance.
12. Additional Requirements for Use of Self-Contained Breathing Apparatus (SCBA)
To prevent tampering or inadvertent damage, SCBAs must be stored in clearly identified emergency equipment areas (or bags) under the direct control of the users. Compressed air cylinders must be kept fully charged and the equipment inspected on a monthly basis. The inspection includes checking tank pressure, assuring that components are present and in working condition, and evaluating proper function of regulators and warning devices. In areas where a user could, upon respirator failure, be overcome by toxic materials or an oxygen-deficient atmosphere, at least one partner and two additional support or back-up persons must be present. Support personnel will be equipped with SCBAs and other emergency response equipment of equal or greater protection than that worn by the initial entrants. Prior to initial entry into such a work area, Environmental Health & Safety will conduct a pre-entry briefing to discuss the area, its potential hazards, and the actions to be taken in the event of an accident or emergency. Depending upon the work area, additional rescue equipment may be needed (e.g., safety harness and retrieval lines). Confined space entry is prohibited unless the requirements for Yale University's Confined Space Entry Program have been met.

13. Equipment Maintenance and Storage
Respirators should be cleaned with detergent and water after each use, and then air dried before storing. See Appendix J for respirator cleaning procedures. Shared respirators must be disinfected with either isopropanol or an elastomer-safe disinfectant such as benzalkonium chloride pads. Store respirators in sealable plastic bags away from sources of potential contamination, and never stack them under heavy items that could deform the elastomer facepiece.

In general, air purifying cartridges and canisters should be removed from the respirator after use and discarded. However, when used for only a short duration against relatively low concentrations of contaminants, cartridges may be sealed in an impermeable plastic bag and reused at a later date. See cartridge change schedule in Appendix C. Cartridges can be reused until an end-of-service life indicator activates, the time period indicated in the cartridge change schedule has elapsed, breakthrough has occurred (i.e., odor detected), or resistance to breathing is detected, whichever comes first. When storing cartridges for reuse, a written record showing the date, contaminant(s), and duration of use must be kept with the cartridges. Discard N-95 and other disposable respirators and dust masks at the end of your shift, or after use.

Repairs to respirators may only be made by the manufacturer, authorized equipment service contractor, or by University staff trained in such repair. No adjustments or modifications can be made beyond the manufacturer's recommendations. SCBA air cylinders must be regularly tested and maintained by a manufacturer-approved service contractor. Routine cylinder air refilling is typically performed by the New Haven Fire Department.

The entire respirator, including all parts, must be NIOSH or MSHA approved. The approval is for the entire unit, and any mixing of brands (i.e. North cartridges on an MSA respirator, or inhalation valves for a Survivair respirator on an AO respirator) voids the approval and is prohibited.

14. Medical Surveillance
The following medical services are available to affected employees free-of-charge, at reasonable

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times and places during the employees’ normal work hours, by or under the supervision of a physician or licensed health-care professional (PLHCP), and where applicable, according to recommendations made by OSHA. The Employee Health Office manages this surveillance work.

a. Medical evaluations are performed on all employees wearing respirators at Yale University prior to respiratory use (excluding voluntary use of filtering facepieces, where medical surveillance is recommended but not required). The PLHCP performs the initial evaluation using a medical questionnaire. (See Appendix K for the medical questionnaire required by 29 CFR 1910.134(e) for respirator medical surveillance.) 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 or whose initial medical examination demonstrates the need for a follow-up medical examination. This questionnaire is available from the Employee Health Office and is on the EHS web site at http://www.yale.edu/ehs.

b. Confidential post-exposure medical evaluation and follow-up is made after documented or suspected over-exposures. Employees must notify their supervisors of such incidents and assist Environmental Health & Safety in documenting all relevant conditions of the incident. This information will then be provided to the Employee Health Office to arrange for any required medical follow-up.

c. A written opinion from the healthcare professional will be obtained by the Employee Health Office after the initial medical qualification examination as well as after any over-exposure incidents. Copies of this information will be provided to the affected employee.

15. Respirator Program Evaluation
Workplace evaluations will be conducted during normal area walkthroughs and during respirator training classes. The Respirator Program Administrator will continually evaluate the work areas to ensure that this program is being properly implemented and that it continues to be effective. This evaluation will include maintaining an up-to-date list of departments and job titles that require or use respiratory protection (Appendix L). Affected employees shall be regularly consulted about the effectiveness of the respirator program during walkthroughs and during annual respirator training. This Respiratory Protection Program shall be updated as needed.
Appendices:

B. Respirator Selection Worksheet
C. Cartridge Change Schedule
D. Approved Respirator List and Typical Uses
E. User Seal Check
F. Respirator Fit Testing Exercises and Record Sheet
G. Respirator Training Program Outline
H. Voluntary Use of Dust Masks - Required Information
I. SCBA Inspection Record Sheet
J. Respirator Cleaning Procedures
K. Medical Qualification Questionnaire
OSHA’s Respiratory Protection Standard
(29 CFR Part 1910.134)

http://www.osha.gov/
Appendix B: Respirator Selection Worksheet

Respirator Selection Worksheet

Job Title/Employee(s) Affected:

Operation/Environment:

Airborne Contaminant(s):

Source of Contaminant(s):

Other Hazard(s) Present:

Control(s):

Anticipated Airborne Contaminant Level:

Basis: Exposure Monitoring

Calculations: (attach or show on reverse)

Other:

Acceptable Respirator Option(s):

<table>
<thead>
<tr>
<th>Respirator Type</th>
<th>Required Conditions of Use</th>
<th>PEL (lowest)</th>
<th>APF</th>
<th>PEL x APF</th>
</tr>
</thead>
</table>
| SCBA
O₂ deficiency (<19.5% O₂) | AACL > IDLH | Emergency, unknown, or non-quantifiable AACL |
| PAPR
Full face APR |
| Half face APR |
| Disposable nuisance dust mask |
| Other |

Is PEL x APF > AACL?
If Yes, respirator meets basic selection criteria
Appendix C: Respirator Cartridge Change Schedule

RESPIRATOR CARTRIDGE CHANGE SCHEDULE

All air-purifying respirators used for protection against gases and vapors must have an end-of-service-life indicator (ESLI) or have a cartridge change schedule that is based on objective information or data to ensure that canisters or cartridges are changed before the end of their service life. The following change schedule is determined based on OSHA standards, manufacturer’s recommendations, and the ACGIH “rule of thumb”.

<table>
<thead>
<tr>
<th>CONTAMINANT</th>
<th>CHANGE SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acrylonitrile</td>
<td>End of shift</td>
</tr>
<tr>
<td>Ammonia</td>
<td>Maximum 8 hours use total (up to 125 ppm)</td>
</tr>
<tr>
<td>Benzene</td>
<td>Beginning of shift</td>
</tr>
<tr>
<td>Butadiene</td>
<td>every 1, 2, or 4 hours dependent on concentration (according to 29CFR1910.1051 Table 1), and at beginning of each shift</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>3 hours or end of shift (whichever comes first)</td>
</tr>
<tr>
<td>HCl, SO₂, Chlorine</td>
<td>Maximum one shift</td>
</tr>
<tr>
<td>Methylene Chloride</td>
<td>No approved cartridges or canisters - must use supplied air</td>
</tr>
<tr>
<td>Nitric Acid</td>
<td>No approved cartridges or canisters - must use supplied air</td>
</tr>
<tr>
<td>Organic Vapors</td>
<td>Maximum 8 hours use total (up to 200 ppm)</td>
</tr>
<tr>
<td>Vinyl chloride</td>
<td>End of shift</td>
</tr>
<tr>
<td>All Cartridges for Emergency Use</td>
<td>Discard after use</td>
</tr>
<tr>
<td>HEPA filters</td>
<td>Restricted breathing or visibly dirty, wet, or compromised</td>
</tr>
<tr>
<td>Filtering dust masks</td>
<td>Visibly dirty/contaminated</td>
</tr>
</tbody>
</table>
# Appendix D: Approved Respirator List and Typical Uses

## Approved Respirator List and Typical Uses

**Respirators Approved for University Work**

<table>
<thead>
<tr>
<th>Type</th>
<th>Style</th>
<th>Intended Use(s)¹</th>
<th>Respirator Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Purifying</td>
<td>½ Face, Disposable (2-strap, NIOSH approved)</td>
<td>Nuisance particulates where concentration is anticipated to be below any applicable action limits</td>
<td>Disposable nuisance dust/particulate mask, NIOSH approved (N,R,P) 95</td>
</tr>
<tr>
<td></td>
<td>½ Face, Disposable (2-strap, NIOSH approved)</td>
<td>Animal dander, chemical particulates, or unidentified suspicious material where particulate respiratory protective is desired</td>
<td>NIOSH approved (N,R,P) 95, 99, and 100, filtering facepieces</td>
</tr>
<tr>
<td></td>
<td>½ Face, Disposable (2-strap, NIOSH approved)</td>
<td>Potential exposure to tuberculosis or other infectious aerosols in clinical/healthcare settings</td>
<td>NIOSH approved (N,R,P) 95, 99, and 100, filtering facepieces</td>
</tr>
<tr>
<td></td>
<td>½ Mask, Reusable</td>
<td>Asbestos, other toxic dusts/aerosols/mists/fumes, organic vapors, acid gases/mists, etc.</td>
<td>NIOSH/MSHA approved, form-fitting polymer facepiece mask with appropriate filters and/or cartridges</td>
</tr>
<tr>
<td></td>
<td>Full-Face Reusable</td>
<td>Asbestos, other toxic dusts/aerosols/mists/fumes, organic vapors, formaldehyde, acid gases/mists, etc., lachrymators</td>
<td>NIOSH/MSHA approved, form-fitting polymer facepiece mask with appropriate filters and/or cartridges or large capacity single canister</td>
</tr>
<tr>
<td></td>
<td>Powered air purifying respirator (PAPR)</td>
<td>Asbestos, other toxic dusts/aerosols/mists/fumes, organic vapors, acid gases/mists, etc.</td>
<td>NIOSH/MSHA approved, positive pressure, with battery, minimum 6cfm, with appropriate filters and/or cartridges</td>
</tr>
<tr>
<td></td>
<td>Powered air purifying respirator (PAPR)</td>
<td>Potential exposure to tuberculosis or other infectious aerosols in clinical/healthcare settings</td>
<td>NIOSH/MSHA approved, positive pressure, with battery, minimum 6cfm, with HEPA filters</td>
</tr>
</tbody>
</table>

| Air Supplying         | Self-contained breathing apparatus (SCBA) | Emergency conditions with unknowns, high concentrations of toxic materials, potential oxygen-deficient environments, back-up rescue/assistance teams. Normal operations when respiratory protection is required/desired and no approved air purifying cartridge/filter available. | Positive pressure-demand self-contained breathing apparatus with minimum 30 min. air supply cylinder, low air alarm. |

¹ Respirators may not be used in an environment that is anticipated to exceed its maximum use concentration
Appendix E: Respirator User Seal Check

RESPIRATOR USER SEAL CHECK

Persons using tight-fitting respirators must perform a user seal check to ensure that an adequate seal is achieved each time the respirator is put on. Either the positive and negative pressure checks listed in this appendix, or the respirator manufacturer's recommended user seal check method must be used. User seal checks are not substitutes for qualitative or quantitative fit tests.

I. Facepiece Positive and/or Negative Pressure Checks

A. Positive pressure check. Close off the exhalation valve and exhale gently into the facepiece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal. For most respirators this method of leak testing requires the wearer to 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 of the inlet opening of some cartridges cannot be effectively covered with the palm of the hand. The test can be performed by covering the inlet opening of the cartridge with a thin latex or nitrile glove. If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

II. Manufacturer's Recommended User Seal Check Procedures

The respirator manufacturer's recommended procedures for performing a user seal check may be used instead of the positive and/or negative pressure check procedures provided that the employer demonstrates that the manufacturer's procedures are equally effective.
QUALITATIVE RESPIRATOR FIT TESTING EXERCISES
AND RECORD SHEET

Respirator Fit Test Exercises
The test subject shall perform exercises, in the test environment, in the following manner:

(1) **Normal breathing.** In a normal standing position, without talking, the subject shall breathe normally.

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

(3) **Turning head side to side.** Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.

(4) **Moving head up and down.** Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).

(5) **Talking.** The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.

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 round 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.

(7) **Bending over.** The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments such as shroud type QNFT or QLFT units that do not permit bending over at the waist.

(8) **Normal breathing.** Same as exercise (1).

The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried. The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated. If the wearer smells the test odor, tastes the flavoring, or experiences irritation, the fit is faulty and another size or style mask must be obtained, or the unit adjusted until a fit is obtained.
<table>
<thead>
<tr>
<th>Last Name:</th>
<th>First Name:</th>
<th>NetID:</th>
<th>Signature:</th>
<th>Supervisor:</th>
<th>EHS Use</th>
<th>Brand/Type:</th>
<th>Size:</th>
<th>Fit Test Method:</th>
<th>Voluntary Use?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

### EHS Use
- **Brand/Type:**
- **Size:**
- **Fit Test Method:**
- **Voluntary Use?**

### Intended Use:
- Student
- Visiting Professional

### Daytime Telephone Number:

### Job Description:
- Full Time Paid Employee
- Casual
- Student
- Visiting Professional

---

**Yale Environmental Health & Safety**

135 College Street, Suite 100
New Haven, CT 06510-2411
203-785-3550 203-785-7588
Appendix G: Respirator Training Program Outline

Respirator Training Program Outline

1. Engineering Controls vs PPE
2. Routes of Exposure
4. Supplied Air Respirators (SARs) vs Air Purifying Respirators (APRs)
5. Air Purifying Respirators – Use, Limitations, Cartridge/filter Selection, Protection Factors
6. Cartridge/filter selection
7. Cartridge change out schedule: Appendix C of Respirator Program (handout)
8. Maintenance and Cleaning
9. Inspection of Respirator
10. Storage
11. Medical Surveillance
12. Seal checks
13. Fit-testing conducted
Appendix H: Voluntary Use of Dust Masks – Required Information

This information is provided to all voluntary users of respirators (including dust and N95 masks) at Yale University.

**TO ALL VOLUNTARY USERS OF RESPIRATORS (INCLUDING DUST MASKS):**

Information for Employees Using Respirators When Not Required Under the Standard (Appendix D to Sec. 1910.134)

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. 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 Yale University 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 and is effective.

You should:

1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirator’s limitations.

2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health, of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.

3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.

4. Keep track of your respirator so that you do not mistakenly use someone else's respirator. Keep it in a clean place, and discard or clean it when it becomes visibly dirty or you suspect it might be contaminated.
### SCBA CHECKLIST

Perform Inspection in Order Listed Below

<table>
<thead>
<tr>
<th>Test:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder Check: Cylinder Filled (&gt;30 min)</td>
<td></td>
</tr>
<tr>
<td>High Pressure Alarm (open cylinder valve, listen)</td>
<td></td>
</tr>
<tr>
<td>Valve Packing not leaking? (listen, close cylinder valve)</td>
<td></td>
</tr>
<tr>
<td>Regulator Pressure Gauge (reads same as cylinder?)</td>
<td></td>
</tr>
<tr>
<td>Low Pressure Alarm (open purge, close)</td>
<td></td>
</tr>
<tr>
<td>Straps: Complete Set</td>
<td></td>
</tr>
<tr>
<td>Not Frayed or Damaged</td>
<td></td>
</tr>
<tr>
<td>Buckles: Lock Correctly</td>
<td></td>
</tr>
<tr>
<td>Back Plate and Cylinder Lock:</td>
<td></td>
</tr>
<tr>
<td>No Missing Rivets or Screws</td>
<td></td>
</tr>
<tr>
<td>Strap Tightener and Lock Fully Engaged</td>
<td></td>
</tr>
<tr>
<td>Cylinder: Tightly Fastened to Backplate</td>
<td></td>
</tr>
<tr>
<td>Hydrostatic Test Date (within 5 years)</td>
<td></td>
</tr>
<tr>
<td>No Cuts in Fiberglass Wrap</td>
<td></td>
</tr>
<tr>
<td>Gauge Face Clear</td>
<td></td>
</tr>
<tr>
<td>High-Pressure Hose and Connector Condition:</td>
<td></td>
</tr>
<tr>
<td>Facepiece: Lens Clear</td>
<td></td>
</tr>
<tr>
<td>Overall Condition</td>
<td></td>
</tr>
<tr>
<td>Breathing Tube and Connector: Condition</td>
<td></td>
</tr>
<tr>
<td>Storage:</td>
<td></td>
</tr>
<tr>
<td>Re-check gauge - Cylinder Full (&gt;30 min)</td>
<td></td>
</tr>
<tr>
<td>Pressure Bled from Hose and Regulator</td>
<td></td>
</tr>
<tr>
<td>Cylinder, Purge Valves Closed</td>
<td></td>
</tr>
<tr>
<td>Straps, Facepiece Reset/ Stored Properly</td>
<td></td>
</tr>
</tbody>
</table>

**INSPECTION PERFORMED BY:** (initial)
Appendix J: Procedures for Cleaning Respirators

Procedures for Cleaning Respirators

A. Remove filters, cartridges, or canisters. Disassemble facepieces by removing speaking diaphragms, demand and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.

B. Wash components in warm (43 °C [110 °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, preferably running water. Drain.

D. 1 When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in one of the following:
   a. Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of warm water; or,
   b. Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45% alcohol) to one liter of warm water; or,
   c. Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.

   2. Rinse components thoroughly in clean, warm, 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.

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

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

G. Test the respirator to ensure that all components work properly.
Appendix K. Medical Qualification Questionnaire

Medical Qualification Questionnaire

Yale University Health Services
17 Hillhouse Avenue
PO Box 208237
New Haven, CT 06520-8237
(203) 432-0071

DEPARTMENT OF EMPLOYEE HEALTH
OSHA RESPIRATOR MEDICAL EVALUATION QUESTIONNAIRE

TO THE EMPLOYER:
Answers to questions in Section 1, and to question 9 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.
6. Your weight: __________ lbs.
7. Your job title: __________________________________________________________________
8. A phone number where you can be reached by the health care professional who reviews this questionnaire (including area code): _______________________________________
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):
   N, R or P disposable respirator (filter-mask, non-cartridge type only).
   Other type (for example, half-or full-face piece type, powered-air purifying, supplied-air, self-contained breathing apparatus).
12. Have you worn a respirator (circle one) Yes No
   - If “yes” what type(s): ___________________________________________________________________

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) Seizures (fits): ................................................................. Yes No
   b) Diabetes (sugar disease): ..................................................... Yes No
   c) Allergic reactions that interfere with your breathing: .................................................... Yes No
   d) Claustrophobia (fear of closed-in places): ................................................................. Yes No

For Employee Health Use Only

<table>
<thead>
<tr>
<th>Respirator Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N95/100</td>
<td>Full Face Neg Press</td>
</tr>
<tr>
<td>PAPR</td>
<td>SCBA</td>
</tr>
<tr>
<td>½ Face Neg Press</td>
<td>Airline Resp</td>
</tr>
</tbody>
</table>
3. Have you ever had any of the following cardiovascular or heart problems?
   a) Heart attack: ................................................................. Yes No
   b) Stroke: ........................................................................... Yes No
   c) Chronic bronchitis: .......................................................... Yes No
   d) Emphysema: .................................................................... Yes No
   e) Pneumonia: ..................................................................... Yes No
   f) Tuberculosis: .................................................................... Yes No
   g) Silicosis: .......................................................................... Yes No
   h) Pneumothorax (collapsed lung): ........................................ Yes No
   i) Lung cancer: ....................................................................... Yes No
   j) Broken ribs: ....................................................................... Yes No
   k) Any chest injuries or surgeries: ........................................... Yes No
   l) Any other lung problem that you’ve been told about: ............ Yes No
4. Do you currently have any of the following symptoms of pulmonary or lung illness?
   a) Shortness of breath: .......................................................... Yes No
   b) Shortness of breath when walking fast on level ground or walking up a slight hill or incline... Yes No
   c) Shortness of breath when walking with other people at an ordinary pace on level ground: .... Yes No
   d) Have to stop for breath when walking at your own pace on level ground: ......................... Yes No
   e) Shortness of breath when washing or dressing yourself: ...................................................... Yes No
   f) Shortness of breath that interferes with your job: ................................................................. Yes No
   g) Coughing that produces phlegm (thick sputum): ............................................................... Yes No
   h) Coughing that wakes you early in the morning: ................................................................. Yes No
   i) Coughing that occurs mostly when you are lying down: ..................................................... Yes No
   j) Coughing up blood in the last month: ................................................................................. Yes No
   k) Wheezing: ......................................................................... Yes No
   l) Wheezing that interferes with your job: .............................................................................. Yes No
   m) Chest pain when you breathe deeply: ................................................................................ Yes No
   n) Any other symptoms you think may be related to lung problems: ..................................... Yes No
5. 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 (heart beating irregularly): ...................................................................... Yes No
   g) High blood pressure: .......................................................... Yes No
   h) Any other heart problem that you’ve been told about: ..................................................... Yes No
6. 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
7. 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
8. If you used a respirator, have you ever had any of the following problems? If you never used a respirator, check the following space and go to question 9. _______
   a) Eye irritation: ................................................................. Yes No
   b) Skin allergies or rashes: ........................................................ Yes No
   c) Anxiety: ............................................................................. 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 answer to the questionnaire: ............................................................ Yes No

Questions 10 to 15 below must be answered by every employee who has been selected to use either a full-face piece respirator or a self-contained breathing apparatus (SCBA).

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?
   a) Wear contact lenses: ................................................................. Yes No
   b) Wear glasses: ........................................................................... Yes No
   c) Color blind: ............................................................................... Yes No
   d) Any other eye or vision problem: ............................................. Yes No

12. Have you ever had an injury to your ears, including a broken ear drum: .................................................. Yes No

13. 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 arms 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
   i) Climbing a flight of stairs or a ladder carrying more than 25 lbs: ................................. Yes No
   j) Any other muscle or skeletal problem that interferes with using a respirator: ................ Yes No

PART B

1. 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 skin contact with hazardous chemicals: ................................................................. Yes No
   - If “yes”, name the chemicals if you know them: ................................................................................
   ...........................................................................................................................................................

2. 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/cobalt (e.g., grinding or welding this material): ................................. Yes No
   d) Beryllium: .................................................................................. Yes No
   e) Aluminum: .................................................................................. Yes No
   f) Coal (for example, mining): .............................................................. Yes No
   g) Iron: .............................................................................................. Yes No
   h) Tin: .............................................................................................. Yes No
   i) Dusty environments: ........................................................................ Yes No
   j) Any other hazardous exposures: ......................................................................................... Yes No
   - If “yes” describe the exposures: .................................................................................................
   ...........................................................................................................................................................

3. List any second jobs or side business you have: .............................................................................................

4. List your previous occupations: .......................................................................................................................

5. List your current and previous hobbies: ............................................................................................................

.............................................................................................................................................................
6. Have you been in the military services? ................................................................. Yes  No
   - If “yes,” were you exposed to biological or chemical agents (either in training or combat): ............ Yes  No
7. Have you ever worked on a HAZMAT team? ......................................................... Yes  No
8. 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
   - If “yes,” name the medications if you know them: ________________________________

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

10. How often are you expected to use the respirator(s) (circle “yes” or “no” for all answers that apply to you?):
   a) Escape only (no rescue): ................................................................. Yes  No
   b) Emergency rescue 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

11. During the period you are using the respirator(s), is your work effort (check one):
    Light  Moderate  Heavy

12. When you’re using your respirator will you be wearing protective clothing and/or equipment (other than the respirator): Yes  No
    - If “yes” describe this protective clothing and/or equipment: ________________________________

13. Will you be working under hot conditions (temperature exceeding 77 degrees): Yes  No
14. Will you be working under humid conditions: Yes  No
15. Describe the work you’ll be doing while you’re using your respirator(s):

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

Signature: ________________________________  Date: ________________________________
Date of Birth: ________________________________  Net I.D. ________________________________

EMPLOYER’S INFORMATION

Type of respirator: ________________________________
Weight of respirator: ________________________________
Expected Physical work effort when respirator is in use: ________________________________
Additional protective equipment to be worn: ________________________________
Please note any extreme of temperature or humidity: ________________________________

PLEASE RETURN COMPLETED FORM TO:
Employee Health Clinician
University Health Services
17 Hillhouse Avenue
FAX: 432-7828
Section 3. References

References are located in the Office of Environmental Health & Safety

1. Departments with Respirator Requirements