

**Lawrence Berkeley National Laboratory
Environment, Health & Safety Division**

***Respiratory Protection
Program***

**Revision 2.1
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Respiratory Protection Program
for
Lawrence Berkeley National Laboratory

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I. Policy

It is the policy of Lawrence Berkeley National Laboratory (LBNL) to maintain work environments that will not adversely affect the health, safety, and well-being of LBNL workers. This document focuses on the implementation of the Respiratory Protection Program for employees, contract employees supervised by LBNL, and guests. Other onsite workers such as construction contractors are required to have similar programs to protect their employees. Information about the review and acceptance of these programs is conducted is included in Appendix A, Review of Subcontractor Respiratory Protection Programs.

Where possible, hazards will be reduced or eliminated through engineering controls, including elimination, substitution, general or local ventilation, and isolation; and following application of engineering controls, through administrative controls. Respiratory protection is used for control of hazards only after all feasible engineering controls and administrative controls have been applied, or while engineering controls are being implemented.

II. Purpose

The purpose of this Respiratory Protection Program is to establish the procedures and requirements necessary to ensure that all affected individuals are protected from exposure to respiratory hazards that may be present in the workplace. In addition to the use of respiratory protection equipment for control of hazardous exposures, some employees may choose to wear respirators under conditions where respiratory protection is not required to protect from a hazard. In these cases, if respirator use cannot jeopardize the health or safety of the employee, respiratory protection will be provided in accordance with regulatory requirements.

All activities involving the use of respiratory protective equipment shall be conducted in compliance with the requirements of the Code of Federal Regulations, Chapter 29 Part 1910.134, and the American National Standard for Respiratory Protection, Z88.2-1992. Where there may be a conflict, the more protective requirement will be followed.

III. Definitions

Aerosol: Airborne liquid droplets or solid particles.

ACGIH: American Conference of Governmental Industrial Hygienists

American National Standards Institute (ANSI): An organization that oversees the creation, promulgation, and use of voluntary consensus standards.

Air-purifying respirator (APR): A respirator with an air-purifying filter or cartridge that removes specific air contaminants by passing ambient air through the air-purifying element.

Assigned protection factor (APF): The workplace level of respiratory protection that a respirator or class of respirators is expected to provide to employees when those employees are properly fitted and trained and enrolled in the respiratory protection program. The protection factor is a measure of the degree of protection provided by a properly functioning respirator when used by a fully trained worker. For a list of APFs, refer to Appendix B, Assigned Protection Factors.

CFR: Code of Federal Regulations

Cartridge (air-purifying): A container with a filter, sorbent, or catalyst, or any combination thereof, which removes specific contaminants from the air drawn through it.

Cartridge change schedule: A calculation based on objective information and data to ensure that cartridges are changed before the end of their service life.

Ceiling Limit (C): The concentration that should not be exceeded during any part of the working exposure.

Contaminant: A harmful, irritating, or nuisance material that is foreign to the normal atmosphere.

Dust mask: The common name for a filtering facepiece respirator.

End of service life indicator (ESLI): An indicator on a respirator cartridge that is certified by NIOSH for a contaminant, to indicate when the cartridge service life is ended.

Exhalation valve: A device that allows exhaled air to leave a respirator and prevents outside air from entering through the valve.

Facepiece: That portion of a respirator that covers the wearer's nose and mouth.

Filter or air-purifying element: A media component used to remove solid or liquid particles from the inspired air.

Filtering facepiece (disposable dust mask): a negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium. These respirators are sometimes inaccurately referred to as N95 respirators, because that is the most common filter designation used in filtering facepiece respirators.

Fit test: The use of a protocol to qualitatively or quantitatively evaluate the fit of a particular respirator to a specific person. A fit test must be repeated annually.

Gas: A substance which is in the gaseous state at standard temperature and pressure.

Hazardous atmosphere: Any atmosphere, either immediately or not immediately dangerous to life or health, which is oxygen deficient or which contains a toxic or disease-producing contaminant exceeding Occupational Exposure Limits (OELs) adopted by LBNL.

High Efficiency Particulate Air (HEPA) Filter: A filter that is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter. The equivalent NIOSH 42 CFR Part 84 particulate filters are the N100, R100, and P100 filters. See P100 Filter.

Hood: A respiratory inlet covering that completely covers the head and neck and may also cover portions of the shoulders and torso.

Immediately Dangerous to Life or Health (IDLH): Any 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.

Inhalation valve: A device that allows respirable air to enter a respirator and prevents exhaled air from leaving the respirator through the valve.

Maximum use concentration (MUC): The maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected when wearing a respirator.

This is determined by the APF of that respirator and the exposure limit of the hazardous substance. The MUC can be determined by multiplying the APF specified for a respirator by the occupational exposure limit for the hazardous substance.

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

NIOSH: National Institute for Occupational Safety and Health. NIOSH provides a testing approval and certification program for respirators, filters and cartridges.

NIOSH Approved: Certified for use by the National Institute for Occupational Safety and Health (NIOSH) of the U.S. Department of Health and Human Services (DHHS).

Occupational Exposure Limits (OELs): Limits to airborne concentrations of chemical substances to which employees may be exposed in workplace air. OELs adopted by LBNL may include limits set by national authorities such as the Department of Energy, OSHA, or other relevant national institutions such as the ACGIH. Limits are defined for several categories: time-weighted average, short term exposure, and ceiling.

Oil: Any substance that is in a viscous liquid state ("oily") at ambient temperatures or slightly warmer, and is both hydrophobic and lipophilic.

Oxygen deficient atmosphere: An atmosphere containing less than 19.5% oxygen by volume.

P100 Filter: Filter that replaces the **HEPA** filter for half-mask and full-face mask non-powered respirators. P100 is the 99.97% efficient oil-proof filter. 42 CFR Part 84 provides for nine classes of filters (three levels of filter efficiency, with three categories of resistance to filter degradation). The levels of filter efficiency indicate minimum filter efficiency in removing particles of approximately 0.3 microns in diameter.

Particulate Filter Designations			
Nine designations based on: 3 filter efficiency ratings and 3 categories of resistance to degradation by oil mist			
	99.97% Efficient	99% Efficient	95% Efficient
Oil Proof	P100	P99	P95
Oil Resistant	R100	R99	R95
Not Oil Proof	N100	N99	N95

Particulate matter: A suspension of fine solid or liquid particles in air, such as dust, fog, fume, mist, smoke, or spray. Particulate matter suspended in air is commonly known as an aerosol.

Permissible Exposure Limit (PEL): The OSHA 8 hour time-weighted average (TWA) concentration of a contaminant that shall not be exceeded. OSHA may also establish ceiling limits (C) and short term exposure for contaminants.

Positive-pressure respirator: A respirator in which the air pressure inside the respiratory-inlet covering is designed to be positive relative to the air pressure of the outside atmosphere during exhalation and inhalation.

Powered air-purifying respirator (PAPR): An air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

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

Resistance: Opposition to the flow of air, as through a canister, cartridge, particulate filter, orifice, valve, or hose.

Respirator: A device designed to protect the wearer from the inhalation of harmful atmospheres.

Respiratory inlet covering: 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.

Respiratory Protection Program Administrator (RPPA): That individual designated to administer the LBNL Respiratory Protection Program.

Self-Contained Breathing Apparatus SCBA: An atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

Service Life: The period of time that a respirator, filter or sorbent, or other respiratory equipment, provides adequate protection to the wearer.

Short-Term Exposure Limit (STEL): A 15-minute TWA exposure that should not be exceeded at any time during a workday.

Time-Weighted Average (TWA): The average concentration of a contaminant in air during a specified time period.

Threshold Limit Value (TLV): Airborne concentration limit recommended by the American Conference of Governmental Industrial Hygienists (ACGIH). The time-weighted average concentration for a normal 8-hour workday and a 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

User Seal Check: An action conducted by the respirator user every time the respirator is put on, to determine if the respirator is properly seated to the face.

IV. Program Elements

The Respiratory Protection Program includes the following elements:

- identification of roles and responsibilities of individuals and groups at LBNL involved with implementation of the Program
- procedures for respirator selection
- requirements for respirator use, including medical qualifications, fit-testing, and maintenance of respirators
- training of employees in hazard characteristics and proper use of respirators
- provisions for the auditing of program compliance

V. Roles and Responsibilities

A. Employees

Any Laboratory employee who wears a respirator shall:

- maintain a close shave as necessary to ensure the proper fit of the respirator for health and safety purposes
- use the issued respirator in accordance with this document, the Respirator Training provided by EHS, and the Training Review Guidelines (Appendix I) provided at each respirator training
- inform his/her supervisor, Industrial Hygiene, or Health Services, of any medical signs or symptoms are experienced, that may be related to respiratory use
- inform his/her supervisor or Industrial Hygiene of changes in workplace conditions which may place an increased physical burden on the employee
- protect respiratory protective equipment from damage or modification and ensure that respirators are not disassembled or altered in any way other than for cleaning, or by changing cartridges or filters
- keep respirators clean to ensure they are free of contamination that could affect the fit and compromise personal protection
- if respirators become contaminated, assure that they are destroyed or cleaned before they are re-used or returned to the Respirator Program
- report any malfunction of respiratory protective equipment to the Respirator Program Administrator
- use only issued respirators for which he/she is trained and fitted
- use the correct type of respirator and filter cartridge for the hazard involved, and contact Industrial Hygiene or the Respirator Program Administrator if they have questions regarding cartridge selection
- stop work immediately and change filters/cartridges if breathing resistance increases due to filter loading or if chemical breakthrough is detected
- inform his/her supervisor and/or the EH&S Division Liaison when new situations arise where respiratory protective equipment may be necessary
- return respirator to the IH Lab in B75 in person or through the LBNL mail when respirator use is no longer required or upon leaving employment at Berkeley Lab

B. Supervisors/Work Leads

Supervisors or work leads, who direct the work of respirator wearers, shall:

- complete EHS 0318, Respirator Supervisor Training;
- ensure that employees assigned to wear respirators for a given task or job are clean-shaven before respirators may be worn

- identify, with the assistance of the EH&S Industrial Hygiene and Radiation Protection Groups, those employees who may need respiratory protective equipment
- ensure that employees required to wear respiratory protective equipment receive initial and subsequent medical evaluation, fit testing, and training, as required by this document;
- ensure that employees maintain respiratory equipment in a clean and sanitary condition
- ensure that respirators are returned to the Respiratory Protection Program Administrator when employees leave the Lab
- ensure that employees receive medical reevaluations if they report medical signs or symptoms that are related to ability to use a respirator
- ensure that employees receive medical reevaluations if the supervisor or principal investigator feels that the employee needs to be reevaluated
- ensure that employees receive medical reevaluations if a change in workplace conditions such as physical work effort, protective clothing, or temperature, may result in a substantial increase in the physiological burden placed on the employee

C. Respiratory Protection Program Administrator

The Respiratory Protection Program Administrator (Program Administrator) is responsible for managing the Respiratory Protection Program. Responsibilities include:

- perform or review Hazard Assessments for respirator users
- identify respiratory protection options
- provide respirator and expected work information to Health Services, to support their medical evaluation of respirator users
- conduct respirator training. This includes fit testing, respirator use, storage, and maintenance. Respirator training is required before an employee uses a respirator, and is repeated annually
- maintain records of respirator training
- inform Health Services of the need to medically reevaluate employees based on reports from employees, observations during fit testing or program evaluation, or changes in workplace conditions
- regularly evaluate the effectiveness of the Respirator Program

D. EH&S Industrial Hygiene Group

The Industrial Hygiene Group, of the Environment, Health and Safety (EH&S) Division, hosts the Respiratory Protection Program. The Industrial Hygiene Group shall:

- designate a Program Administrator who is qualified by training or experience to oversee the Respiratory Protection Program
- stock and issue respiratory protective equipment and supplies approved by NIOSH

- maintain equipment for respirator fit-testing and cleaning
- assure that the Respirator Protection Program is reviewed periodically by the RPPA,
- assure that the Respirator Protection Program is audited periodically by a knowledgeable person not directly associated with the program

E. EH&S Radiation Protection Group

The Radiation Protection Group (RPG), of the Environment, Health and Safety (EH&S) Division, assures that all radiological work activities at LBNL are conducted safely and in accordance with applicable DOE and other regulations. The EH&S Radiation Protection Group shall:

- perform appropriate hazard evaluations
- provide radiation safety training
- develop applicable radiation safety authorization documents
- provide all necessary field support services

This is accomplished through a formal documented program at LBNL that is designed to ensure that radiation exposures are maintained as low as is reasonably achievable (ALARA). The primary mechanisms for training personnel, monitoring the workplace, controlling work activities, and maintaining radiation exposures ALARA are implemented through the authorization system, worker awareness, and the RPG's monitoring (individual and area) and surveillance activities.

F. EH&S Health Services Group

The Laboratory Occupational Health Physician, or other Health Services licensed health care professional, provides the medical evaluations necessary to ensure that employees are medically qualified to use a respirator. Health Services shall:

- establish health standards which shall be met by all prospective respirator users, as required by 29 CFR 1910.134, ANSI Z88.2, and ANSI Z88.6
- require that respirator users complete a Medical Questionnaire Form, or obtain equivalent information (See Appendix D, Medical Questionnaire for Respirator Users)
- perform initial medical examinations on all persons who will wear respirators, with the exception of employees whose only use of respirators is voluntary use of filtering facepieces (dust masks)
- perform follow-up medical examinations, as needed, if:
 - a. an employee reports medical signs or symptoms that are related to their ability to wear a respirator
 - b. an employee is referred by the EH&S Respirator Program Administrator, a supervisor, or Health Care Professional for reevaluation

- c. information from the respiratory protection program, including observations made during fit testing and program evaluation indicates a need for employee reevaluation
 - d. changes in workplace conditions (e.g., physical work effort, protective clothing, temperature) may result in a substantial increase in the physiological burden placed on the employee
- perform annual medical examinations on all SCBA users
 - provide a signed approval for those individuals found to be capable of wearing a respirator
 - notify the Program Administrator of any restrictions on employee respirator use
 - maintain records of all required tests and medical history questionnaires

G. Waste Management Group

The Waste Management Group shall:

- perform and keep auditable records of monthly inspections of SCBA units in accordance with 29 CFR 1910.134 and ANSI Z88.2
- properly maintain, clean, and store SCBA units located at Building 85, in accordance with 29 CFR 1910.134, and ANSI Z88.2 standards

VI. Procedures for Respirator Issuance

A. Program Scope – Required and Voluntary Use

Respirator use by employees may be required or voluntary. Voluntary use is further categorized according to two types of respirator use: voluntary use of filtering facepiece respirators (dust masks), and voluntary use of all other respirators. The type of use is determined by the Hazard Evaluation, which is used to document respirator use.

Required use

Where the use of a respirator is required by LBNL, employees will be enrolled in the Respiratory Protection Program and will be subject to all programmatic requirements for respirator issuance, including hazard evaluation, exposure monitoring, cartridge change schedule (if applicable), medical evaluation, fit testing and training, and annual re-training.

Voluntary use

There may be instances where respirator use is required for a hazard, for example exposure to particulate, and the employee also wishes to have additional protection; for example, from nuisance odors. In this case the use of a respirator is required, but the employee may also choose to use the respirator on a voluntary basis. This is noted in the Hazard Evaluation.

Where the use of the respirator is not required by LBNL, employees may elect to use a respirator (other than a filtering facepiece respirator, or dust mask) on a voluntary basis, for an extra measure of protection or for personal comfort. In these cases the employee will also be enrolled in the Respiratory Protection Program and subject to applicable Program requirements, just as

when respirator use is required, except that a cartridge change schedule and exposure monitoring are not required.

Voluntary use – filtering facepiece respirator (dust mask)

In some cases where the use of a respirator is not required by LBNL, an employee may voluntarily use a filtering facepiece respirator (dust mask). In these cases the hazard will be evaluated by an Industrial Hygienist or the Program Administrator. When the Hazard Evaluation finds that the employee is not required to wear a respirator, voluntary use of a filtering facepiece respirator may be acceptable for personal comfort. In this case, the employee will not be enrolled in the Respirator Program, and will not be required to be medically evaluated or complete annual fit testing and training (EHS 0310). However the employee must be trained in the use of the filtering facepiece (EHS 0311), and provided with the information contained in Appendix D to the Federal Respirator Standard, 10 CFR 1910.134, before using this respiratory protection.

Clean rooms and laboratories may use NIOSH-approved filtering facepiece respirators to minimize contamination of equipment. When the respirator is used for product protection rather than for employee comfort, it is acceptable to use masks that are not approved by NIOSH.

B. Respirator Issuance Procedures Overview

Employees, Supervisors, EH&S, or Health Services may initiate the respirator issuance process. For all respirator issuance, this process includes a review of the work process by Industrial Hygiene, including determination of whether the use of a respirator is required or voluntary.

For issuance of respirators other than filtering facepieces (dust masks), the Industrial Hygienist, RPG representative (Health Physicist), or RPPA will complete a Hazard Evaluation Form for the employee to take to Health Services. The employee makes an appointment with Health Services for a Respirator Medical Evaluation. Upon successful completion of the Respirator Medical Evaluation, the employee contacts the Respirator Program Administrator to schedule the Respirator Training (including fit testing).

For voluntary issuance of filtering facepieces, the employee enrolls in EHS 0311 for training.

For additional information on respirator issuance, employees and supervisors should contact the Respiratory Protection Program Administrator at 495-2826.

C. Hazard Evaluation

Before respiratory protective equipment is issued, a Hazard Evaluation is performed by an Industrial Hygienist, and/or a Health Physicist if radiation hazards are present. Hazard Evaluations may be completed for ongoing programs, where the hazards for specific operations may be reasonably predicted for the tasks performed. Hazard Evaluations may also be completed for specific projects. Hazard Evaluations may be completed for a group of employees with similar exposures, or for individual workers.

If the hazards identified by the Hazard Evaluation cannot be sufficiently reduced or eliminated through engineering or administrative controls, a Hazard Evaluation may find that respiratory protection is necessary for employee protection. Respirator use may be required by LBNL:

- when the employee exposure may reasonably be expected to exceed an established exposure limit,

- when the Hazard Evaluation determines that the added measure of protection of a respirator is desirable due to the variable nature of the work and expected hazards,
- during exposure assessment for a task or process, when the exposure may reasonably be estimated not to be IDLH, or
- for any other reason specified in the Hazard Evaluation

Due to the changing nature of the work at LBNL, and the high number of projects which are unique in nature, some groups may prefer to have employees maintain their training in respirator use, even when there is no specific project which would require respiratory protection. The Hazard Evaluation Forms for those employees will note that no project requiring respirator use has been identified at the time of respirator issuance. However, the potential employee exposure and determination of appropriate respiratory protection for these employees will be evaluated before any use of respiratory protection.

Employees supporting the Hazardous Waste Handling Facility are trained in emergency response and maintain their training in SCBA use. While an event which would require use of the SCBA is never expected, this use is also described in the Hazard Evaluations for these employees.

Hazard Evaluations are documented using the LBNL Hazard Evaluation Form - Respirator (Appendix H), or an equivalent hazard evaluation. Hazard Evaluations shall:

- include identification of the respiratory hazards that may be present in the workplace
- include sampling or objective data to estimate the employee exposures in the workplace. The objective data will represent the highest contaminant exposures likely to occur under reasonable foreseeable conditions of processing, use or handling. Since workplace operations may vary greatly at LBNL these objective data may be most important for unique operations. Where possible, and for on-going routine operations, sampling will be the preferred method of hazard evaluation
- include information on the chemical state and physical form of the contaminant(s) in the workplace, including regulatory limits for the contaminant(s)
- be included in the employee's respirator file and reviewed when there is a change in work. Hazard evaluations may reference LBNL's Comprehensive Tracking System (CTS) of exposure tracking
- indicate whether respiratory protection is required or voluntary

For required and voluntary (except dust masks) respirator use: upon completion of the Hazard Evaluation, the Industrial Hygienist will refer the employee to LBNL Health Services for evaluation. The Hazard Evaluation will be provided to Health Services.

For voluntary filtering facepiece (dust mask) respirator use: the employee completes EHS0311, Respirator Awareness (Dust Mask) Training, prior to use of filtering facepiece respirators.

D. Medical Evaluation

Prior to being fitted and trained for respirator use, employees required to wear a respirator, and voluntary users (excluding employees who are voluntary users of filtering facepiece respirators only) must be medically evaluated to ensure they are capable of wearing a respirator.

Following completion of a Hazard Evaluation, employees contact Health Services (ext. 6266) at Building 26 for a Respirator Medical Evaluation.

Upon successful completion of the Respirator Medical Evaluation, Health Services will provide a medical determination of the employee's ability to wear a respirator, including any restrictions. A copy of the signed medical approval will be issued to the employee to bring to their scheduled fit test.

Annual medical evaluations are not required for most respirator wearers, except as noted below for SCBA wearers. However, should the wearer experience difficulty in respirator use at any time, he or she would be referred to Health Services for reevaluation before being allowed to continue respirator use. Conditions which would indicate a need for reevaluation, as noted elsewhere in this plan, include:

- The employee exhibits difficulty breathing, shortness of breath, dizziness, or a severe psychological reaction during any phase of annual fit testing.
- The employee reports signs or symptoms that are related to respirator use
- The Respiratory Protection Program Administrator or Health Services representative finds any indication that the employee may need reevaluation
- The employee, or his/her Supervisor or Principal Investigator, finds any indication that the employee may need reevaluation. This would include any change in employee exposure or stress, physical difficulty in respirator use, or change in work conditions such as physical work effort, protective clothing, or temperature
- The employee reports, or the Supervisor or Line Manager, Health Services, or Respiratory Protection Program Administrator makes visual observations of changes in the employee's physical condition that could affect respirator fit. This includes facial scarring, dental changes, cosmetic surgery, or a change in body weight

Medical evaluations for SCBA users shall be repeated on an annual basis.

E. Fit Testing

The safe and effective use of respirators with tight-fitting facepieces requires that the respirator be properly fitted to the employee. Respirator Training, EHS 0310, is provided on an as-needed basis, following completion of a Hazard Evaluation by an Industrial Hygienist or a Health Physicist, and successful completion of the Respirator Medical Evaluation by the employee. EHS 310 includes fit testing on an appropriate respirator. The employee should arrange with the Respirator Protection Program Administrator (495-2826) for an appointment for Respirator Training. This Training, also known as "fit testing," is provided in B75, Room 112A. The initial and annual refresher trainings do not differ in content, but the initial training session normally requires more time to complete. Employees should allow about an hour to complete the initial EHS 0310 Respirator Training. This training is repeated annually.

Fit testing is provided for the type of respiratory protection determined necessary by the Hazard Evaluation. Additional information on respirator selection is contained in the Procedures section of this document. Details on the respirator training, which is also included in EHS 310, are contained in the Training section of this document.

The following requirements apply to respirator fit testing:

- Prior to issuing a tight-fitting respirator to any employee, the employee must successfully pass a quantitative fit test on that respirator
- Fit testing is done using a PortaCount Plus Respirator Fit Tester. An exception may be made on occasions when the PortaCount fit testing equipment is temporarily unavailable, for example when this equipment is undergoing manufacturer calibration. Qualitative fit testing using isoamyl acetate may be used for fit testing on an interim basis
- In most cases the employee will be tested with the mask that is issued to them, using an adaptor supplied by the respirator manufacturer for use with the PortaCount instrument
- Fit testing may be conducted using a surrogate mask, having the same facepiece size and style as the mask to be used. Use of a surrogate mask is required when the respirator to be used is an airline respirator. Surrogate masks may be negative pressure respirators fitted with adapters, or they may be probed facepieces
- Poorly fitted respirators may leak and fail to provide the required degree of protection. It may be necessary to don and test several models and sizes in order to identify the best-fitting respirator
- It is LBNL's Policy that employees who have facial hair that intrudes into the area where the negative or positive pressure respirator seals against the face, or interferes with valve function, shall not be fitted with a respirator. LBNL does not accommodate employees who wish to maintain facial hair that interferes with respirator fit, unless there is a health issue. Employees with facial hair who are required to wear a negative- or positive-pressure tight-fitting respirator will need to shave so that a respirator can be worn
- If an employee exhibits any difficulty breathing or has a severe psychological reaction during any phase of the fit testing, they shall be referred to Health Services for medical reevaluation
- Fit testing shall be repeated whenever necessary, based on physical changes such as:
 - weight changes of 20 pounds or more
 - significant facial scarring in the area of the face seal
 - significant dental changes occur (e.g., multiple extractions without prosthesis, or dentures)
 - reconstructive or cosmetic surgery occurs, or
 - any other condition that may affect the facepiece seal

For more information about the quantitative fit testing procedure utilizing the PortaCount, refer to Appendix C, Quantitative Fit Testing Procedure Using the PortaCount Plus: Operator Guidelines.

VII. Procedures for Respirator Selection and Use

A. General

This section describes details of the procedures for respirator selection and use at LBNL.

B. Respirator Selection

Based on identified hazards, the Program Administrator shall maintain and issue respiratory protective equipment when required by LBNL or used voluntarily (except filtering facepieces).

Respirators, cartridges, and filters shall be NIOSH-certified. A variety of models and sizes of respirators shall be available to offer employees a choice of equipment, so that the respirator they select is comfortable and provides an acceptable fit.

Details on the standard respiratory protection equipment issued by the LBNL Respirator Program may be found in Appendix G, Selection of Respirators.

In addition to the standard respiratory protection equipment maintained for routine use, respirators may be used during hazard assessment or other situations, when the exposure cannot be identified or reasonably estimated. In these situations the atmosphere shall be considered IDLH. Two types of equipment may be used for IDLH atmospheres:

- A full facepiece pressure demand SCBA with a minimum service life of 30 minutes
- A combination full facepiece pressure demand airline respirator with auxiliary escape self-contained air supply

C. Assigned Protection Factors

Selection of filters and cartridges shall be based on identified hazards, the APFs and MUCs of the respirators selected.

Assigned protection factors (APFs) are the expected workplace level of respiratory protection that a respirator is expected to provide to an employee. The Respirator Program uses the APFs established by OSHA, except for those established for the use of filtering facepiece respirators. Filtering facepiece respirators are assigned a protection factor of 1 for use at LBNL. For helmets and hoods used with PAPR and supplied-air or airline respirators, where manufacturer documentation for an APF of 1,000 has been obtained, the LBNL will use this APF. For equipment for which this documentation has not been provided, an APF of 25 will be used. APFs for the most commonly used respirators are summarized.

Along with the APF, maximum use concentration (MUC), or the maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected when wearing a respirator, can be used to describe the level of protection provided to the employee.

D. Filter and Cartridge Service Life

Filters and cartridges must be used according to certain conditions in order to ensure that they continue to provide the intended protection.

Particulate filters

Particulate filter change in the absence of oil aerosols will be required when the user detects increased breathing resistance, or the filter becomes soiled or damaged. Where a particulate filter is used in an environment with oil aerosols, the manufacturer's recommended service life for their P-series filters will be used. Should R-series filters be used in an oil aerosol environment, the filter will be discarded after 8 hours of use.

End-of-Service Life Indicators (ESLI)

When appropriate NIOSH-certified cartridges with ESLI are available to protect against a workplace contaminant, the ESLI may be used as an indication that the cartridge is no longer adequate for employee protection.

Cartridge Change Schedules

Industrial Hygiene will assess workplace contaminant concentrations as part of the Hazard Evaluation. When the contaminants include gases and vapors, the Industrial Hygienist will provide cartridge change information to the respirator user or group of users, for each task requiring respiratory protection. Cartridge change schedules will be created based on calculated cartridge service life, taking into consideration the nature of the contaminant or mixture of contaminants, the accuracy of the workplace concentration measurements, the presence of other organic vapors, the possibility of high relative humidity, potential for cartridge bed migration, warning properties of the contaminant, and any other factors found to be important in the hazard assessment. Where possible, cartridge change schedules will be developed using the manufacturer's service life calculators. Service life will be calculated using the following guidelines:

- **Exposure Level:** The established OELs, usually OSHA PELs, or ACGIH Threshold Limit Values (TLVs) when they are more restrictive, will be used for calculation of the cartridge service life.
- **Breakthrough Level:** In using the manufacturers' service life calculators the allowable breakthrough concentration shall be 50% of the exposure limit, unless the contaminant concentration is less than ten times the exposure limit, in which case the allowable breakthrough concentration shall be 10% of the concentration.
- **Safety Factor:** A safety factor of 50%, or as determined by the Industrial Hygienist, shall be employed for calculations.
- **Work Environment:** Additional parameters such as work rate, temperature, and relative humidity, shall be entered according to the work and the work environment.
- **Low Boiling Point Organic Vapors:** Cartridge bed migration may result in contaminant desorption and migration, even when there is no additional exposure to the contaminant. Where the contaminant's boiling point is less than 65 degrees Celsius, cartridges should be changed after every work shift where exposure occurs, or more frequently if the service life calculation indicates this is necessary. Workers should be educated about the chemical properties of contaminants they work with. For contaminants with boiling points slightly greater than 65 degrees Celsius, cartridge change frequency may be determined in consultation with the Industrial Hygienist, based on the nature of the contaminant and the work environment.
- **Warning Properties:** Contaminant warning properties are not a reliable measure of cartridge functioning and should not be used to determine the cartridge service life. However, workers should be educated about the contaminant warning properties for the contaminants to which they may be exposed. Warning properties include odor, taste, irritation, burning and any other indication the contaminant may be present in the air. Workers should be instructed to replace cartridges and contact the industrial hygienist when contaminant odor or any other indicator is detected inside the mask. Where the

contaminant has poor warning properties, the cartridge change schedule may be modified to provide a greater safety factor.

E. Respirator Use

The Program requires that employees use and care for respirators issued to them, according to requirements listed in the Training Review Guidelines (Appendix I). A copy is provided to each employee during the annual Respirator Training. This training includes inspection prior to each use and seal checks (See Appendix I, Training Review Guidelines) to make sure that the valves and face seal are working properly. Respirators that are damaged or fail to fit properly should not be used, but should immediately be removed from service and returned to the EH&S Industrial Hygiene Group for evaluation.

When not in use, respirators shall be stored to protect against dust, sunlight, extremes of temperature, excessive moisture, or damaging chemicals. Respirators should be decontaminated if necessary, and allowed to dry before being stored in sealed plastic bags or other sealed containers. Respirator cleaning and decontamination may be accomplished by the employee if facilities are available, or at any time by bringing the respirator to the Respiratory Protection Program Administrator for decontamination in the respirator washer.

Respirators shall be stored in a manner that the facepiece shape is not deformed. When installing new chemical cartridges the user should mark the date on the side of the new cartridge. Users will follow instructions as detailed in this program and any additional specific guidance provided to them, for cartridge replacement.

An employee may wear their own prescription contact lenses while wearing a half mask or full facepiece respirator if they choose this option. This option should be evaluated to assure that the respirator does not interfere with the eyewear, make it uncomfortable, or force the employee to remove the eyewear. The employee may also be fitted with prescription lenses that fit inside a full face mask.

F. Respirator Return

Respirator return to the Industrial Hygiene Group should be in accordance with the following requirements:

- The respirator must be returned to the industrial hygiene lab if the respiratory protective equipment:
 - malfunctions or is damaged
 - becomes grossly contaminated; or
 - becomes too dirty or difficult to wipe down or self-clean
- Respirators shall be returned in plastic bags and labeled accordingly if contaminated with toxic material
- Respirators used for radioisotope protection shall not be returned through the mail system and must be decontaminated prior to return. If decontamination is not possible, the mask should be disposed of in accordance with Waste Management Procedure

- Respirators used by LBNL employees shall be returned to the Industrial Hygiene Lab on an annual basis during fit testing. Respirators will be reissued after cleaning and the employee successfully completes the fit test and training

To return a respirator through the mail system, employees are instructed to put the respirator into a sealed zip-lock bag and then into a large manila envelope addressed to: "IH Lab, MS75R0123". Employees may also drop masks off at B75, Room 112A.

G. Maintenance and Care - Inspection, Cleaning, and Sanitizing

In addition to the employee's inspection prior to each use, every respirator shall be routinely inspected by the EH&S Industrial Hygiene Group when it is returned to the Industrial Hygiene Lab. This involves examining the straps, hoses, valves, gaskets, mask body, and filters/cartridges, as required. Defective or worn parts will be replaced. Parts will not be interchanged between different brands of respirators, as this would void their NIOSH approval.

Field cleaning of respirators shall be performed by the user by washing the entire respirator (after removing cartridges and filters) with soap and warm water in a clean area on a regular basis. When the respirator requires a thorough cleaning and sanitizing, it shall be returned to the EH&S Industrial Hygiene Group and exchanged for a sanitized mask. Sanitary wipes can be used for additional cleaning before each use.

The cleaning and sanitizing by the EH&S Industrial Hygiene Group shall be performed with the use of a respirator washer/dryer system manufactured by Steel Case. This system is specifically designed for washing, drying and sanitizing a high volume of respirators. The washing agent is Masklenze MK-1 (Alkaline Detergent); its major ingredient is potassium metasilicate. The sanitizing agent is regular household bleach (5.25% sodium hypochlorite). 7-8 ml of bleach and 15-17 ml of the Masklenze detergent are automatically added to the 2 gallons of water in the washing machine.

Respirators that are used for quantitative fit testing are cleaned with sanitizing wipes between uses and are cleaned at the end of each day with the automatic respirator washer/dryer system. Respirators that are tried for size but not issued to employees may also be cleaned with alcohol wipes but are sanitized with the automatic respirator washer/ dryer system before re-use.

H. Breathing Air

Compressed air cylinders including SCBA tanks, and breathing air supplied by a compressor, may be used at LBNL. Use of compressed air is subject to the following requirements:

- Compressed air shall meet the requirements of CGA Type 1-Grade D breathing air
- Cylinders of breathing air shall meet DOT requirements and have a certificate of analysis that the breathing air meets the requirements for Type 1-Grade D breathing air
- Compressors that supply breathing air shall be constructed to prevent entry of contaminated air into the air-supply system
- Breathing air supplied by compressors shall be tested to verify quality

VIII. Training

Employees required to wear respiratory protective equipment must be trained in the selection, care, use and limitations of that equipment. This annual training will be completed for tight-fitting and loose-fitting facepiece respirators, in EHS 310, Respirator Training. EHS 310 includes fit testing, as described in the Fit Testing section of this document. In addition to EHS 310, there are separate training classes for airline and SCBA use. EHS 310 is a prerequisite for the airline and SCBA trainings, since EHS 310 includes the required respirator fit testing.

Training of voluntary users of filtering facepiece respirators is provided in EHS 0311, Respirator Awareness. This training is required one time only.

EHS 310 training may vary depending on the type of respirator to be issued and the nature of the airborne hazard. At a minimum, the training shall include:

- the purpose of respiratory protective equipment
- the prerequisites for respirator use, including medical qualification, training, and fit testing
- the different types of respirators, their specific application, selection, and limitations
- the issuance procedure for respirators
- the use of respirators, including field seal checking procedures;
- cleaning and sanitizing procedures
- the proper storage of respirators
- inspection and maintenance procedures
- a review of the LBNL Respiratory Protection Training Review Guidelines (Appendix I) and
- viewing a respiratory protection training video/DVD, or equivalent instruction

Supervisors of respirator wearers are required to complete EHS 318, Respirator Supervisor Training. This is a web-based training and must be taken every three years.

Training completion is documented in the EHS Training Database.

IX. Program Effectiveness

A. Respirator Program Evaluation

Regular reviews of respirator use and program effectiveness will be conducted by the RPPA or designated reviewer, to ensure that respirator use is in accordance with these requirements, and to assess the employees' views on Program effectiveness and to identify employee concerns. These reviews will also ensure that the Program is being properly implemented.

Applicable lessons learned will be communicated to respirator wearers. If necessary, respirator wearers will be required to repeat their respirator training.

In addition, the supervisors of employees who wear respirators shall periodically audit respirator storage locations and proper use.

Any problems found will be corrected. If non-compliances are identified, and they are not immediately corrected, they will be entered into the Corrective Action Tracking System.

B. Program Audits

In addition to reviews by the RPPA and supervisors, periodic reviews of the LBNL Respiratory Protection Program will be performed by a knowledgeable person not directly associated with the program.

C. Recordkeeping

Records of Hazard Evaluations, Training, and Fit testing are maintained in files in the Respirator Program Training Room. Electronic records of the Fit testing are maintained in the EH&S Fit Test Database.

APPENDICES

APPENDIX A

REVIEW OF SUBCONTRACTOR RESPIRATORY PROTECTION PROGRAMS

All subcontractors that perform work at LBNL are required to have equivalent respiratory protection program, in accordance with 10 CFR 851, the “Worker Safety and Health Rule.” This is accomplished by several means, including the following:

1. Procurement packages are sent to all subcontractors, prior to bidding, that indicate the compliance expectations and requirements for subcontractors
2. Prior to the issuance of a “notice to proceed” for a project, any contractor that will be utilizing respiratory protection is required to submit a copy of their written respiratory protection program as well as documentation of fit testing and medical qualification for each worker
3. Documentation is routed through the Construction Safety Manager for review by the Construction Health Manager (or another Industrial Hygienist).
4. Incomplete or inadequate documentation is rejected and returned to the contractor with a description of the areas needing correction.
5. If these causes of rejection are related to medical approval of workers and can not be worked out with the employer, they will be referred to the LBNL Health Services group to coordinate resolution with the subcontractor’s physicians or other licensed health care professionals (PLHCPs).

APPENDIX B

ASSIGNED PROTECTION FACTORS

LBNL uses the Assigned Protection Factors (APFs) adopted by OSHA, with the exception of the APF for filtering facepiece respirators. The following chart includes all APFs, including APFs for respirator types that are not typically used at LBNL. This chart includes the LBNL-adopted APF for filtering facepiece respirators. These APFs supersede the respirator selection provisions of existing substance-specific standards, except for the respirator selection provisions of the 1,3 butadiene Standard.

Assigned Protection Factors⁶						
Type of Respirator^{1,2}	Quarter mask	Half mask (filtering facepiece)	Half mask (elastomeric)	Full facepiece	Helmet/hood	Loose-fitting facepiece
Air-Purifying Respirator	5	³ 1	⁴ 10	50		
Powered Air-Purifying Respirator (PAPR)			50	1,000	⁵ 25/1,000	25
Supplied-Air Respirator (SAR) or Airline Respirator						
• Demand mode			10	50		
• Continuous flow mode			50	1,000	⁵ 25/1,000	25
• Pressure-demand or other positive-pressure mode			50	1,000		
Self-Contained Breathing Apparatus (SCBA)						
• Demand mode			10	50	50	
• Pressure-demand or other positive-pressure mode (e.g., open/closed circuit)				10,000	10,000	

Notes:

¹ Employers may select respirators assigned for use in higher workplace concentrations of a hazardous substance for use at lower concentrations of that substance, or when required respirator use is independent of concentration.

² The assigned protection factors in Table 1 are only effective when the employer implements a continuing, effective respirator program as required by this section (29 CFR 1910.134), including training, fit testing, maintenance, and use requirements.

³ LBNL does not issue filtering facepiece respirators when respiratory protection is required for hazard control, and LBNL assigns a protection factor of 1 to filtering facepiece respirators.

⁴ This APF category includes half masks with elastomeric facepieces.

⁵ The employer must have evidence provided by the respirator manufacturer that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000. This level of performance can best be demonstrated by performing a WPF or SWPF study or equivalent testing. Absent such testing, all other PAPRs and SARs with helmets/hoods are to be treated as loose-fitting facepiece respirators, and receive an APF of 25.

⁶ These APFs do not apply to respirators used solely for escape. For escape respirators used in association with specific substances covered by 29 CFR 1910 subpart Z, employers must refer to the appropriate substance-specific standards in that subpart. Escape respirators for other IDLH atmospheres are specified by 29 CFR 1910.134 (d)(2)(ii).

APPENDIX C

QUANTITATIVE FIT TESTING PROCEDURE USING THE PORTACOUNT PLUS: OPERATOR GUIDELINES

A. Fit-testing Protocol

Fit testing is performed according to the OSHA 29 CFR 1910.134, Appendix A, Mandatory Fit Testing Procedures. The TSI PortaCount software is set to automatically use the OSHA 29 CFR 1910.134 fit test protocol.

Required forms are located in the front of the file of employee fit testing records. These include: the Respiratory Fitting and Issue Record (see Appendix E), the Training Review Guidelines, and the Course Completion Form. The employee must provide a signed copy of the Medical Approval from Health Services prior to the initial fit test.

B. Portacount Operation

1. Turn on the computer and monitor. Open the TSI FitPlus software.
2. Start the PortaCount instrument and complete the 60-second warm-up cycle.
3. Do the Daily Checks to verify PortaCount functioning.
4. From the People Database that appears on the screen, select the name of the individual to be fit-tested. If necessary, enter a new employee in the database. Fields in the TSI Fit Plus database are populated as follows: COMPANY is Berkeley Lab Division; LOCATION is the employee Mailstop; CUSTOM 1 is the employee's Supervisor's Last Name; CUSTOM 2 is the Supervisor's First Name; CUSTOM 3 is Program Status, where CU indicates a current user and OP indicates the individual is off the program.
5. Finish entering fit test data.
6. Once a respirator has been selected, press COUNT on the PortaCount to view real-time particle concentration inside the mask. When a suitable particle concentration is achieved with the mask being tested, press FIT TEST and begin the test.
7. At completion of the test, the computer automatically saves the fit test data in the TSI program software, and prints a copy of the completed fit test. After the printing is completed, press CANCEL to close the People Database screen.
8. At the end of each day when fit-testing is performed, it is necessary to update the LBNL FitTest Access Database. Close the TSI FitPlus software and open the FitTest Access Database. Upon opening this database from the computer where the TSI software is located, the FitTest Access automatically copies the updated TSI records.

APPENDIX D

MEDICAL QUESTIONNAIRE FOR RESPIRATOR USERS

Name (Last, First, Middle initial): _____ Employee# _____ Work # _____
Division _____ Mail Stop: _____ Job Title _____ Date of Birth _____

RESPIRATOR TYPE:

AIR PURIFYING

SUPPLIED AIR

Filtering face piece (dusk mask)

Full-Face Mask

Airline (Continuous Flow)

Half-Mask

PAPR

Airline (Pressure Demand)

Have you worn a respirator? Yes / No

SCBA

In order to satisfy Federal OSHA requirements, each individual must be medically approved prior to performing a task while wearing respiratory protective equipment. This questionnaire must be completed even if you have had a recent physical examination in the Health Services Department.

Contaminant(s): _____

The employee listed above is medically able to wear respiratory protection. A copy of this approval has been provided to the employee.

Medical approval: _____ Date: _____

Medical restrictions: _____ Date: _____

Employee's signature: _____ Date: _____

Questions 1 through 12 below must be answered by every employee who has been selected to use any type of respiratory (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
 - e. Trouble smelling odors: Yes / No
3. Have you **ever had** any of the following pulmonary or lung problems?
 - a. Asbestosis: Yes / No
 - b. Asthma: 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 that 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'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 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 answers to this questionnaire: Yes / No
 10. 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 these exposures: _____
 11. List any second jobs or side businesses you have related to chemical use: _____
 12. List your current and previous hobbies related to chemical use: _____
- Questions 13 through 18** must be answered by every employee who has been selected to use either a full-face 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.
13. Have you ***ever lost*** vision in either eye (temporarily or permanently) Yes / No
 14. 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
 15. Have you ***ever had*** an injury to your ears, including a broken ear drum: Yes / No
 16. 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
 17. Have you ***ever had*** a back injury: Yes / No

18. 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 respiratory: Yes / No

APPENDIX E

LAWRENCE BERKELEY NATIONAL LABORATORY RESPIRATOR FITTING & ISSUE RECORD

I. EMPLOYEE INFORMATION

Name: _____ Phone: _____
(Last) (First) (MI)
 Division: _____ Job Title: _____ Medical review date: _____
 Mail stop: _____ DOB: _____ Employee No.: _____
 Supervisor: _____ Phone: _____
(Last) (First)

II. BRIEF HAZARD DESCRIPTION

Comments: _____

III. QUANTITATIVE FIT TESTING RESULTS

(Minimum fit factor = 1000 for half mask & 1500 for full facepiece negative pressure respirators)

(Brand)	(Model #)	(Half or Full face)	(Size)	(Overall fit factor)	(Pass/Fail)

Fit Test Operator: _____ Filters/Cartridges Issued: _____

IV. RESPIRATOR USE STATUS

High use Moderate use Infrequent use Off program Date off program: _____
 Does the employee report medical signs or symptoms related to respirator use (shortness of breath, dizziness, chest pains, wheezing)? (Yes/No)
 Has Health Services or a Supervisor informed Industrial Hygiene that the employee needs to be reevaluated? (Yes/No)
 Is there any information from the Respiratory Protection Program, including any indication during fit testing and Program evaluation, that the employee needs to be reevaluated? (Yes/No)
 Has there been a change in workplace conditions (e.g., physical work effort, protective clothing, temperature) that might result in a substantial increase in the physiological burden placed on the employee? (Yes/No)
 Comments: _____

If **Yes** is circled on any of the questions above, **Date referred** to Health Services for Medical Reevaluation _____

V. TRAINING

The employee named has been trained in the selection, use, storage, limitations, cleaning, and other requirements for the respirator specified in Section III as per 29 CFR 1910.134 and Z88.2. If additional medical review is indicated, the employee has been reevaluated and approved by Health Services.

Employee Signature: _____ Date: _____

EH&S Signature: _____ Date: _____

APPENDIX F

RESPIRATOR CARTRIDGE AND FILTER COLOR DESIGNATIONS

Color-coded cartridges are available for a variety of air contaminants. In addition to the color-code convention, the specific contaminant groups are printed on the side of the cartridge or filter. The most common cartridge and filter colors are described here:

- **HEPA or P100 Filter (Magenta):** For filtration of particulates, including asbestos, lead, and silica. The “P” indicates the filter media is “oil-Proof”, and the “100” indicates the filter efficiency is 99.97% of particles at the 0.3 micron size. “Magenta” color may range from pink to purple
- **Organic Vapor Cartridge (Black):** For certain organic vapors. These cartridges are not useful against natural gas, propane, or vapors with poor warning properties. IH will determine service life based on the specific contaminants
- **Acid Gas Cartridges (White):** For use in atmospheres with acid gas, such as chlorine, hydrogen chloride, sulfur dioxide, hydrogen fluoride
- **Organic Vapor and Acid Gas Combination Cartridge (Yellow):** For use in atmospheres with organic vapors and acid gas in combination, or atmospheres with either organic vapors or acid gas
- **Mercury Vapor and Chlorine Gas Cartridge (Orange or olive):** Useful for protection against mercury vapor and chlorine gas
- **Organic Vapor/Acid Gas (Yellow):** For certain organic vapors, and acid gases
- **Multi Contaminant (Olive):** For multiple contaminant types. This can include certain organic vapors, acid gases, formaldehyde, ammonia, and methylamine. Olive may be used for other cartridges such as mercury/chlorine. Care should be taken to check the side of the cartridge to verify its approved use

APPENDIX G

SELECTION OF RESPIRATORS

A. General Discussion

LBNL offers the respirator types discussed in this appendix. Several different manufacturers' products are available for the most commonly-used respirators. The uses of each respirator are listed. Assigned Protection Factors (APFs) are noted here and are also listed in chart form in Appendix I. These APFs supersede the respirator selection provisions of existing substance-specific standards, except for the respirator selection provisions of the 1,3 butadiene Standard.

B. Filtering Facepiece (Dust Mask) Respirators

Description: A filtering facepiece respirator, also known as a dust mask, is one with the filter media forming the facepiece itself, or as an integral part of the facepiece. Most filtering facepiece respirators are rated N95, which means the filter media is not oil-proof or oil-resistant, and it removes a minimum of 95% of 0.3 micron-sized particles.

The Laboratory offers filtering facepiece respirators for protection against nuisance particulates only. The use of these masks, commonly known as dust masks, is restricted to work where the mask is not needed to protect against workplace hazards but is for employee comfort. These masks may also be worn where protection is desired to protect equipment or work areas, where there is no hazardous atmosphere present.

Unlike other respirators, filtering facepiece respirators may be worn on a voluntary basis. For voluntary use, a hazard assessment must show that respiratory protection is not required for the work operation. Voluntary use of filtering facepiece respirators does not require a Respirator Medical Evaluation or enrollment of the employee in the LBNL Respirator Program. However, voluntary users of filtering facepiece respirators must complete EHS0311, Respirator Awareness Training. This training is available to individuals or groups who use these masks, through special arrangement with the RPPA.

Advantages: These respirators are lightweight, disposable, comfortable, and inexpensive. They provide protection from nuisance dust. A filtering facepiece may be re-used if desired, until the filter media becomes degraded or until there is a noticeable increase in difficulty breathing. Several different styles are used, typically the filter efficiency is N95. The "N" designation indicates the filter media is "Not oil-proof," and the "95" efficiency indicates the filter media removes 95% of particles at the 0.3 micron size.

Limitations: Dust masks offer minimal protection, compared to other types of respirators. Even though the filter media may be rated to remove 95% of 0.3 micron size particles, this does not mean that the wearer is protected from 95% of the particulate. Any air which leaks in around the sides of the mask is not filtered at all. The effectiveness of this mask is also compromised when it is worn by an employee with facial hair that interferes with the skin-to-mask seal. offer no protection against oxygen deficient atmospheres or organic vapors.

Applications: Low concentrations of nuisance dusts such as pollen, gypsum dry wall, sawdust, and animal dust. These masks may also be worn voluntarily when it is desirable to protect

processes (clean rooms), rather than the individual wearing the mask. Groups who use the filtering facepiece respirator for voluntary protection from nuisance dust include the Facilities Division's Carpenters, Custodians, Labor Shop, Plant Maintenance Technicians, and Plumbers; the Engineering Division's Electronics and Instrumentation and Mechanical Engineering employees; the IT Division's Archivists; and employees who have expressed concern about seasonal allergies.

Assigned Protection Factor: 1 LBNL does not issue filtering facepiece respirators for environments where a hazard is found to be present. Since these masks are not issued to protect from a hazard, and are not fit-tested, they are not assigned a protection factor higher than one.

C. Negative Pressure Air-Purifying Half-Mask Respirators

Description: The half-mask facepiece has a silicone or other rubber face seal which fits over the nose and under the wearer's chin. The half-mask air-purifying respirators normally used at LBNL are negative pressure respirators.

This respirator is fitted with filters or cartridges that purify the air as the wearer breathes. Color-coded cartridges and filters are available for a variety of air contaminants. The most common cartridge and filter colors are described in Appendix F.

Advantages: These respirators can provide a better seal than the filtering facepiece respirators. Because the filters and cartridges can be changed easily, the respirator can be re-used, and can be used to protect from a variety of contaminants. Prescription eyewear and safety glasses can usually be worn with the half-mask respirator without compromising the fit. Half-mask respirators are relatively comfortable, and are the most commonly selected type of air-purifying respirator.

Limitations: Air-purifying respirators cannot be used for all types of air contaminants, including contaminants whose concentration cannot be reliably estimated, those for which a suitable cartridge is not available, or in oxygen deficient atmospheres. They cannot be used where facial hair interrupts the facial sealing surface. They do not protect the eyes from irritating contaminants.

Applications: Groups who use the half mask respirator include the Facilities Division's Carpenters (wood dust, some organic vapors from cabinetry work), Labor Shop (various contaminants depending on work needs, including organic vapors, mercury, and crystalline silica), Plant Maintenance Technicians (asbestos), Plumbers (asbestos, lead, soldering fumes); the Engineering Division's Electronics and Instrumentation and Mechanical Engineering employees (metals, including lead; radionuclides); EHS Radiation Protection Group (lead, radionuclides), Industrial Hygiene Group (various, including lead, asbestos, mercury, chlorinated hydrocarbons); Waste Operations (bulk packing of chemicals); and the Materials Science Division (micron sized particulates, metals); Earth Sciences Division (crystalline silica).

Assigned Protection Factor: 10

D. Negative Pressure Air-Purifying Full Facepiece Respirators

Description: Air-purifying full face-piece respirators are similar to the half-mask respirators described above in that ambient air is filtered as the wearer breathes. The same cartridges that are used with half-masks are available for use with full facepiece respirators, to protect against specific

hazards. The full facepiece extends around the entire face, covering the wearer's eyes in addition to the nose, chin, and mouth. These air-purifying respirators are negative pressure respirators.

Advantages: Full facepiece respirators are rated to provide more protection than half-mask air-purifying respirators. When the appropriate cartridge is used, they also protect the eyes from particulates, irritating vapors, mists, and chemical splashes. Newer styles of full facepiece respirators provide ANSI-rated eye and face protection. Some older full facepieces are not rated with this impact protection, so a faceshield must be used in addition to the full facepiece mask when impact protection is required. A full facepiece respirator may provide a better fit for some individuals.

Limitations: Air-purifying respirators cannot be used for all types of air contaminants, including contaminants whose concentration cannot be reliably estimated, those for which a suitable cartridge is not available, or in oxygen deficient atmospheres. They cannot be used where facial hair interrupts the facial sealing surface. The wearer's field of vision may be compromised. When prescription lenses are required by a wearer, a spectacle kit may be provided for wearer to take to the Lab's optician to have the proper prescription lenses installed. Use of spectacles may require additional time to don and doff the respirator.

Applications: A full facepiece respirator is recommended where a greater degree of respiratory protection is needed or where eye protection from irritants is desirable. Groups who use the full facepiece respirator include the Facilities Division's Labor Shop (various contaminants depending on work needs, including organic vapors, mercury, and crystalline silica); Engineering Division's Mechanical Engineering employees (metals, including lead, radionuclides); EHS Radiation Protection Group (lead, radionuclides), Industrial Hygiene Group (various, including lead, asbestos, mercury, chlorinated hydrocarbons); Waste Operations (bulk packing of chemicals); and the Earth Sciences Division (crystalline silica).

Assigned Protection Factor: 50

E. Powered Air-Purifying Respirators (PAPRs)

Description: This class of respirators features a battery-powered motor-blower that draws air through a particulate or chemical filter and blows it to the facepiece. The fan/filter unit may be mounted on the wearer's back or belt, or may be integral to the facepiece. Full facepieces and hoods are available. PAPRs may be used with tight-fitting full facepieces, with loose-fitting facepieces, or with hoods or helmets.

Advantages: The major advantage of this type of respirator is the positive pressure provided to the facepiece or hood. This type of respirator may be used during exposure assessment, when contaminant concentration is unknown but reasonably expected to be below IDLH concentrations.

Limitations: These units are relatively expensive to purchase and maintain. The battery adds additional weight, and must be carried on the wearer's belt. The battery must be charged up prior to use. The filters and cartridges can bulky and awkward to wear. This class of respirator cannot be used in IDLH atmospheres or atmospheres deficient in oxygen. Heavy exertion may create negative pressure reducing the respirator's effectiveness.

Applications: These units are useful for work that is more physically demanding; the air blown into the helmet, hood or tight fitting facepiece cools the wearer. Because some PAPR units are rated with an APF of 1000, this respirator can be used when a high level of protection is required.

Assigned Protection Factor: **1000** (Tight-fitting full facepiece, Hood, or Helmet, with manufacturer documentation of performance); **APF 25** when manufacturer documentation of performance is not provided; **25** (Loose-fitting facepiece); **50** (Half-facepiece);

F. Airline Respirators (Continuous Flow or Pressure-Demand Mode)

Description: An airline respirator provides fresh air to the wearer from a compressor or from compressed-air cylinders. The respirator may be a half mask, full facepiece, helmet or hood, or loose-fitting facepiece. Breathing air must meet the requirements of Compressed Gas Association (CGA) Commodity Specification for Air, G-7.1-1989, Grade D. When oil-lubricated compressors is used to provide breathing air, the air is monitored with a carbon monoxide alarm set at 10 ppm.

Advantages: This class of respirator provides a high degree of protection against all varieties of air contaminants. Hood models may be worn by personnel with facial hair if required and necessary as outlined in LBNL's Respiratory Protection Facial Hair Policy. Airline respirators operated in the continuous flow mode can be used in atmospheres that require supplied-air.

Limitations: Air is delivered to the mask or hood through a breathing air hose. This hose can be awkward and heavy, and may become tangled and crimped. The length of the hose is limited to 300 feet. Breathing air supplied by cylinders or by a compressor must be tested. Continuous flow use: the cost involved in equipping an air compressor can be prohibitive. Pressure-demand use: the air is supplied by a series of cylinders containing breathing air. The system must be maintained, and the MSA Hip-Air Pressure Demand Breathing Apparatus used at LBNL must be regularly tested and inspected.

Applications: Continuous flow airline systems may be used by employees when the hazard has not been evaluated; by Facilities Division painters in the paint spray booth, and Engineering Division Paint Shop employees for sandblasting. Pressure-demand airline systems may be used by EHS Waste Operations for special processes, when the exposure has not been determined.

Assigned Protection Factor: **1000** (full facepiece, hood or helmet; **continuous flow or pressure-demand**) with manufacturer documentation of performance for hoods and helmets. **APF 25** when manufacturer documentation of performance is not provided.

Note: **25 (continuous flow** with loose-fitting facepiece)

Note: **50 (continuous flow** with half mask)

Note: Hood or helmet must ensure the maintenance of a positive pressure inside the facepiece during use.

Note: **Pressure demand or other positive pressure SAR**, with auxiliary SCBA (escape bottle) may be used for IDLH environments.

G. Self-Contained Breathing Apparatus (SCBA)

Description: This type of respirator provides the user with clean air from a high pressure cylinder carried on the wearer's back. A full face mask is worn. These units are operated in the pressure-demand mode. Air in SCBA units shall meet CGA-Type 1 Grade D air requirements.

Advantages: The SCBA offers the greatest degree of protection against all airborne contaminants, including atmospheres deficient in oxygen and IDLH atmospheres.

Limitations: SCBA units are expensive to purchase and maintain, require the wearer to carry 20 to 30 pounds of equipment, and provide a limited supply of air, usually 30 minutes. Personnel with facial hair which comes between the respirator sealing surface and the wearer's face cannot use SCBA equipment.

Applications: For emergency response use by the Waste Operations Group for responding to chemical spills, fires, radiation leaks, etc.

Assigned Protection Factor: 10,000 Maximum (Pressure-demand or other positive pressure mode).

APPENDIX H

HAZARD EVALUATION FORM - RESPIRATOR USER

EMPLOYEE NAME _____ EMPLOYEE ID _____ PHONE _____
 SUPERVISOR: _____ DIVISION: _____ EMPLOYEE JOB TITLE: _____
 WORK LOCATION BLDG: _____ ROOM _____ VOLUNTARY USE

RESPIRATOR TYPE AND WEIGHT (check all that apply):

AIR PURIFYING		SUPPLIED AIR
<input type="checkbox"/> Half-Mask < 5 lbs	<input type="checkbox"/> Full-Face Mask < 5 lbs	<input type="checkbox"/> Airline (Continuous Flow) < 5 lbs
<input type="checkbox"/> Emergency use	<input type="checkbox"/> PAPR < 10 lbs	<input type="checkbox"/> Airline (Pressure Demand) < 15 lbs
<input type="checkbox"/> Other (describe)		<input type="checkbox"/> SCBA 25 lbs

DURATION AND FREQUENCY OF RESPIRATOR USE:

<input type="checkbox"/> Full shift (4-8 hours/day)	<input type="checkbox"/> Moderate use (1-4 hours/day)	<input type="checkbox"/> Low use (< 1 hour/day)
<input type="checkbox"/> High use (daily or weekly)	<input type="checkbox"/> Moderate use (monthly)	<input type="checkbox"/> Infrequent use (less than monthly)

TYPICAL WORK ACTIVITIES AND HAZARDS

<input type="checkbox"/> Routine laboratory or shop operations.	<input type="checkbox"/> Potential exposure to reduced oxygen environments
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EXPECTED PHYSICAL WORK EFFORT:

<input type="checkbox"/> Heavy work	<input type="checkbox"/> Moderate work	<input type="checkbox"/> Light work
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ADDITIONAL PROTECTIVE CLOTHING AND EQUIPMENT TO BE WORN:

Eye and Face	<input type="checkbox"/> safety glasses	<input type="checkbox"/> goggles	<input type="checkbox"/> faceshield	<input type="checkbox"/> filter lenses (shade #)
Head	<input type="checkbox"/> hardhat			
Foot	<input type="checkbox"/> safety shoes (protective toe)	<input type="checkbox"/> metatarsal	<input type="checkbox"/> rubber boots (protective toe)	
Hand	<input type="checkbox"/> gloves, leather	<input type="checkbox"/> gloves, nitrile	<input type="checkbox"/> gloves, other	
Clothing	<input type="checkbox"/> protective suit (i.e., Tyvek®)	<input type="checkbox"/> lab coat	<input type="checkbox"/> apron	<input type="checkbox"/> clothing, other

TEMPERATURE AND HUMIDITY EXTREMES THAT MAY BE ENCOUNTERED:

<input type="checkbox"/> Outside work (summer)	<input type="checkbox"/> Outside work (winter)	<input type="checkbox"/> Routine laboratory or shop environment
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HAZARDOUS MATERIAL(S) Include contaminant physical state and physical form: _____

OPERATION / DESCRIPTION: _____

HAZARD CONTROLS: _____

MONITORING NEEDED: _____

RECOMMENDATIONS (Include monitoring results, any modifications to controls, and status of on-going work.): _____

Industrial Hygienist Signature: _____ Date: _____

APPENDIX I

TRAINING REVIEW GUIDELINES

This respirator has been issued to you for a specific airborne contaminant. **IT WILL NOT PROTECT YOU FROM OTHER CONTAMINANTS.** The following are reminders of the instruction you have received:

- **MAINTENANCE** check before each use:
 - a) Sealing surface clean and free of cracks and holes.
 - b) Inhalation and exhalation valves are clean and seated properly.
 - c) Straps are sufficiently elastic and free of worn areas.

- **CHECK OF PROPER FIT** prior to each use:
 - a) Positive pressure check (Close off exhalation valve and exhale).
 - b) Negative pressure check (Close off cartridges and inhale).

- **CLEAN MASK ON A REGULAR BASIS** with a mild soap and warm water solution and allow it to air dry overnight. (Make sure the cartridges / filters are removed from the respirator before cleaning).

- **STORE** respirators and filter cartridges in zip-lock storage bags, or other protective enclosure, away from excessive heat sources.

- **DO NOT STORE** items on top of respirator which could deform the facepiece shape.

- **CHANGE CARTRIDGES/FILTERS** as required. (**IMPORTANT** - change cartridges/filters if you experience an increased resistance in breathing or when you detect contaminant odors or taste while wearing your respirator).

- **MASK TO FACE SEAL** must be unobstructed by facial hair. You must be clean-shaven to obtain an effective seal.

- This respirator has been assigned to you only - **DO NOT LOAN** it to anyone else.

- **RETURN MASK** to the Industrial Hygiene Lab at your next fit test or when the job is finished.

- Be familiar with **CHEMICAL PROPERTIES** of the substance you are using the respirator to protect yourself from. Some chemicals require the cartridges to be changed every 4-8 hours, regardless of exposure level. Consult the **MSDS** or **EH&S** for this information.

- **QUANTITATIVE FIT TESTING** must be repeated immediately when any of the following has taken place:
 - a) Weight change of 20 lbs. or more
 - b) Facial scarring in the area of the face-piece seal
 - c) Significant dental changes (Multiple extractions without prosthesis, or acquiring dentures)
 - d) Reconstructive or cosmetic surgery
 - e) Any other condition that may interfere with the facepiece seal

Employee Signature: _____ Date: _____

EH&S Signature: _____ Date: _____