

Office of Environmental Health & Radiation Safety

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Respiratory Protection Policy

Office of Environmental Health and Radiation Safety
Columbia University
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Introduction

In order to prevent potential occupational illnesses caused by exposure to airborne contaminants, and maintain compliance with the United States Department of Labor Occupational Health and Safety Administration (OSHA) Respiratory Protection Standard 29 CFR 1910.134, the following written Respiratory Protection Plan has been developed by the Columbia University Office of Environmental Health and Radiation Safety (EH&RS).

Respiratory protection approved by the National Institute of Occupational Safety and Health (NIOSH), shall be provided to all employees subject to, but not limited to, concentrations of dusts, gases, fumes, mists, toxic materials, or atmospheres deficient in oxygen. If deemed necessary respiratory protection will also be made available to employees who handle laboratory animals.

It is the Office of Environmental Health & Radiation Safety's position that respirators will be used only when all feasible engineering and administrative control methods have been exhausted.

The Columbia University Respiratory Protection Plan consists of the following elements:

- a written plan explaining how the respiratory protection plan will be administered.
- a complete assessment of potential respiratory hazards that may be encountered in the workplace.
- procedures and equipment to control respiratory hazards, including the use of engineering controls and work practices designed to limit or reduce employee exposure to such hazards.
- guidelines for the proper selection of appropriate respiratory protective equipment.
- employee training which will include: limitations of air purifying respirators, hazard recognition, the dangers associated with respiratory hazards, proper care, use, and storage of respiratory protective equipment.
- inspection, cleaning, and repair of respiratory equipment.
- evaluation of respirator protection plan.
- medical surveillance of employees.

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Purpose

The purpose of this written plan is to establish a basis for an effective respiratory protection plan for all Columbia University Morningside Campus employees. This plan will establish the minimum standard for respirator training, selection, and use, during the performance of all work requiring such protection. This plan will apply to all Columbia University Morningside Campus personnel required to wear respiratory protection.

References

- CFR 1910.134 Respiratory Protection and 29 CFR Parts 1910 and 1926 Respiratory Protection; Final Rule.
- NIOSH Guide to the Selection and Use of Particulate Respirators (Certified under 42 CFR 84)
- NIOSH Guide to Industrial Respiratory Protection (1987).
- ANSI Z88.2 - 1969
- The Industrial Environment - Its Evaluation and Control (NIOSH 1973).

Authority

Any respiratory equipment distributed to a Columbia University employee, for use on the Morningside Campus, will be authorized by the EH&RS office. Any use of respiratory protection without documented approval from the Columbia University EH&RS office will be considered unauthorized use.

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Protocol

All Columbia University personnel who are required to wear respiratory protection on the Morningside Campus will be properly trained; fit tested, and will receive a medical examination prior to wearing any protective respiratory equipment. Medical clearance will be given upon examination from a doctor located at the Columbia Presbyterian Medical Center at the Columbia University Health Sciences Campus. Employee training and subsequent respirator fit testing will be conducted by the EH&RS office. All of the above mentioned testing will be documented and kept on file at the EH&RS office located at 398 Engineering Terrace.

If a situation arises, in which there is uncertainty as to whether or not the use of respiratory protection is necessary, it will be brought to the attention of the EH&RS office. EH&RS will investigate and assess any existing or potential respiratory hazards. The determination as to whether or not respiratory protection is necessary will be made the EH&RS office.

When a suspected hazard is reported to EH&RS, any necessary engineering and/or administrative controls will be employed to reduce exposure. If these control methods are not feasible, then the use of respiratory protection may be necessary.

It will be the responsibility of the employee's supervisor to notify EH&RS of any adverse conditions prior to employee entry into the questionable work area. This notification should be communicated prior to the scheduled work date in order for EH&RS to accurately assess the hazards associated with the job. This would also include any non-routine tasks and change in work procedures.

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Medical Examinations

OSHA 29 CFR 1910.134 states that no individual shall be assigned to a task that requires the use of respiratory protection unless found physically able to do the work while wearing respirator. The standard also states that a physician will make the determination of an employee's fitness. This medical evaluation will be conducted prior to any respirator fit testing or usage. Employees refusing to undergo a medical exam cannot be assigned to work areas where they are required to wear a respirator.

Medical Examination Procedures

Once it has been determined by the EH&RS office that an individual will need to wear respiratory protection, a medical examination will be scheduled. All medical examination arrangements will be scheduled through the EH&RS office. The medical examinations are conducted at the Presbyterian Hospital in the City of New York located at the Harkness Pavilion on 168th street (Health Sciences Campus). Exams are typically conducted on Thursdays at 9:00 a.m. and 1:30 p.m.

The purpose of the physical exam is to insure that the employee has adequate respiratory and cardiovascular fitness to wear respiratory protection. This examination is not a general health exam and is not intended to replace an annual physical exam provided by a personal doctor.

The employee will be initially sent a "Patient Information Form" which the employee has to complete and return to the EH&RS office upon completion. Once the EH&RS office receives this form, it will be passed along to the Columbia Presbyterian Hospital Occupational Health Office.

At that point, the physical exam is scheduled and the employee will receive a packet in the mail that will include the following documents: the date, time, and location of the medical exam, a Health Sciences Campus Map, an Inter-campus shuttle schedule, a "Medical Disease Questionnaire" (medical history information), and a "Medical Clearance Form" to be completed by the doctor at the time of the physical exam.

The "Medical Disease Questionnaire" should be completed and given to the doctor at the time of the physical exam. The "Medical Clearance Form" will be completed by the examining physician upon the completion of the exam. Copies of these forms will be on file at the Columbia University EH&RS office.

It is important to note that all employees will be required to go for pre-exam blood work and PPD (Tuberculosis Skin Test), testing two days prior to the exam, (Tuesdays between 8:30 a.m. and 4:00 p.m.). No appointment has to be made for this pre exam testing but must be conducted during the Occupational Health Offices hours.

Some employees, based upon potential job-related health hazards, will need other special testing and/or immunizations. Employees requiring other health services, (Hepatitis B and/or tetanus vaccinations), will receive these services on the date of the actual physical exam. All individual records will be kept on file at the EH&RS office.

The employees department will pay for fees for the medical exam. Employees will

not be responsible for any fees associated with this medical exam.

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Components of the Medical Examination

The basic employee examination will consist of the following:

- Medical Examination: (including medical and work history, physical examination, completion of standardized respiratory disease questionnaire, clearance to wear respirator if appropriate).
- Complete Blood Count.
- Pulmonary Function Test (including FEC and FEV), with interpretation.

Based upon specific job related hazards the following may also be part of the exam:

- Liver Profile
- Chest Roentgenogram
- Tetanus/Diphtheria booster
- Hepatitis B virus vaccine

The decision as to what specific tests will be run will be determined by the Columbia University EH&RS office prior to the exam date based upon the occupational hazards associated with the employees daily activities.

Training

Training is a very important aspect of an effective respiratory protection program. Training of all involved individuals is necessary. This means that in addition to the employee wearing the respirator, the employee's supervisor and the person issuing the respirators must be trained. The employee's supervisor needs to know about the respirator being used and why it is being used. The supervisor also needs to be able to monitor for proper usage by the employees.

The person issuing the respirator needs to be able to insure that he/she is providing the employee with the appropriate respirator for the hazard. Therefore, he or she shall be trained and certified to provide these services.

In addition to initial respirator training the users of respirators must undergo periodic retraining. All training must be documented and kept on file. These files will be kept in the EH&RS office located at 398 Engineering Terrace.

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Fit Testing of Air Purifying Respirators

Following the training the employees will be fit tested utilizing the isoamyl acetate (banana oil), qualitative fit test method. The fit testing will be conducted by a competent representative from the EH&RS office. The fit testing will be conducted according to the protocol set forth by OSHA for the isoamyl acetate qualitative fit testing method. All fit testing records will be kept in the EH&RS office located at 398 Engineering Terrace.

Guidelines for Proper Respiratory Protection Selection

The respirator type and make provided to Columbia University Morningside employees will be selected by the EH&RS office department based upon the nature

of the hazard. Only respirators approved by NIOSH will be selected for use. It is important to note that different jobs may pose different hazards, therefore, the type of cartridge and/or filter will not be the same for every task. Determination of the appropriate cartridge and/or filter will also come from the EH&RS office.

Types of Respiratory Protection Devices

The basic purpose of any respirator is to protect the respiratory system from hazardous atmospheres. Respirators provide protection by either purifying the air prior to inspiration or by supplying air that is independent of the hazardous air. A respirator that removes contaminants from the ambient air is called an *air-purifying respirator*. A respirator that provides air from a source independent of the surrounding atmosphere is called an *atmosphere-supplying respirator* or *air-supplying respirator*. Both of these types of respirators are further subdivided depending on the inlet covering and the mode of operation.

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1. Inlet Coverings:

Inlets to the human respiratory system are the nose and mouth. In order for a respirator to be effective, it must prevent contaminants from entering these orifices. The types of inlet coverings are classified as tight or loose fitting.

Tight fitting coverings include a quarter mask, half mask, and a full-face mask. All three of these respirator types are designed to create a tight seal between the person's face and the respirator. Quarter masks seal from the bridge of the nose to below the lips. Quarter face respirators will not be issued on the Columbia University Morningside Campus. A half facemask provides a seal from the bridge of the nose to underneath the chin (half the face). A full face mask covers from above the eyes (but below the hairline) to underneath the chin (covers the full face).

The quarter, half, and full-face respirators can exist as an air purifying or supplied air respirator.

Loose fitting inlet coverings, as suggested by their name, do not rely on sealing the surface to protect the worker's respiratory tract. Instead, they cover the face, head, or head and shoulders, to provide protection. Also included in this group are totally encapsulating suits which cover the entire body. Because they do not provide a seal to the face, loose fitting systems only operate on systems that provide a positive flow of air. The flow of air must be greater than the air required for breathing to prevent the contaminant from outside the respirator to leak to the inside.

- 2. Air-Purifying Respirators:** Air purifying respirators (APR's), utilize an air purifying element to remove contaminants before the air reaches the two respiratory inlets of the human body. Air is passed through the APR element by means of breathing (negative pressure respirators) or by a blowing mechanism (powered air purifying respirators or PAPR's).

APR's can be subdivided into *particulate filtering respirators* and *vapor and gas removing respirators*. Particulate filtering respirators are used in atmospheres in which dusts, fumes, and/or mists are of

concern. Particulate filtering respirators utilize filters to trap contaminants before they enter the lungs. Manufacturers try to produce the most efficient filter with the lowest amount of resistance to breathing. As the particulate filtering respirator is used particulates collect on it and the pores become smaller. This decrease in pore size actually increases the filters efficiency but creates more resistance to breathing.

3. **Supplied Air Respirators:** Atmosphere supplying respirators are a class of respirators that supply clean air which is independent of the hazardous work atmosphere. One type is commonly referred to as an air line respirator and operates in one of three modes: demand, continuous flow, or pressure demand. Demand and pressure demand respirators can be equipped with either half face or full facepiece inlet coverings. The continuous flow type can also be equipped with a helmet/hood or a loose fitting facepiece.

Another type of supplied air respirator is the self-contained air supply. This referred to as the self-contained breathing apparatus or SCBA. It may be used for escape or for entry into and escape from a hazardous atmosphere. The air is supplied from a compressed gas air cylinder.

Some SCBA units use a supplemental supplied air bottle which provides the person a means of escaping if the main unit fails.

4. **Combination Units:** Some specialized respirators operate both in a supplied air mode and in an air-purifying mode. They are called combination units. The way they function depends on the mode of operation, air purifying or supplied air as are described above.

Only air purifying respirators will be issued by the EH&RS office. The brand currently being issued is the 3M 7300S which is a half-face APR. In special situations, in which a proper fit cannot be achieved with the half face respirator a full-face respirator will be used.

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Respirator Use Under Special Conditions

The following are special situations, which may be encountered while wearing respiratory protective equipment:

- *Facial Hair*

: Facial hair that lies along the sealing area of the respirator, such as beards, sideburns, mustaches, or even a few days growth of stubble, will not be permitted on employees who are required to wear respirators. Facial hair between the wearer's skin and the sealing surfaces of the respirator will prevent a good seal. A worker should not enter an area, in which it has been determined that respiratory protection is necessary, when conditions prevent a good seal of the respirator facepiece to the face.

- *Eye Glasses:* Ordinary eyeglasses should not be used with full-facepiece respirators. Eye glasses with temple bars or straps that pass between the sealing surface of a full - facepiece and the worker's face will prevent a good seal. Special spectacle kits can be ordered and mounted inside a full

- facepiece respirator through the employee's supervisor.

Eyeglasses or goggles may interfere with the half facepieces. When interferences occur, a full-facepiece with special corrective lenses may be necessary.

- *Contact Lenses:* Several factors may restrict or even prohibit the use of contact lenses while wearing any type of respiratory device. This is especially true of atmosphere-supplying respirators. With full-facepieces, incoming air directed toward the eye can cause discomfort from dirt, lint, or other debris lodging between the contact lens and the pupil.

Contact lenses should not be worn in hazardous environments. Instead the appropriate form of eye protection should be donned. This may come in the form of goggles or safety glasses.

- *Communication:* Verbal communication while wearing respiratory protection can be very difficult and may also contribute to a poor respirator seal. Therefore, hand signals may be an easier alternative. These hand signals should be worked out with the person you are working with prior to entry into a hazardous environment.
- *Temperature Extremes:* Low temperatures may cause respirator lenses to become fogged. Coating the inner surface of the lens with the anti-fogging compound should prevent this problem. Full-facepieces with nose cups that direct warm, exhaled air through the exhalation valve without its touching the lens, are available. At very low temperatures, exhalation valves may freeze due to moisture.
- *Physiological Response to Respirator Use:* Wearing any respirator, alone or in conjunction with other types of protective equipment, will impose some physiological stress on the wearer. Weight of the equipment, for example, increases the energy requirement for a given task. Selection of respiratory protective devices should be based on the breathing resistance, weight of the respirator, the type and amount of protection needed as well as the individual's tolerance of the given device.

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Use of respirators in conjunction with personal protective equipment (PPE) can greatly affect the human response and endurance, especially in hot environments. Normally, in hot environments or during heavy work, the body relies a great deal on heat loss through the evaporation of sweat. With impermeable clothing, the heat loss due to water evaporation is not possible. Additionally, the weight of the respirator adds to the metabolic rate of workers, increasing the amount of heat the body produces. The net effect is one of heat stress.

When employees are wearing PPE the implementation of a work rest regimen should be implemented. This time spent working as opposed the time spent resting will be contingent upon the PPE being worn, temperature conditions, and physical demand of the work.

Voluntary Employee Respirator Usage

Under normal circumstances, voluntary use of respirators is in the form of a *filtering*

facepiece, commonly referred to as a *dust mask*. EH&RS will only condone NIOSH approved filtering facepieces for voluntary usage. Voluntary users of filtering facepieces are not required to undergo fit testing. It will be the employees supervisors responsibility to inform the EH&RS office of any voluntary respirator usage prior to use.

Eh&RS will conduct inspections of users voluntarily using filtering facepieces to insure the following:

1. The employee is not jeopardizing his/her health by wearing the respirator.
2. The respirator is clean.
3. Respirators are not being shared.

If a Columbia University Morningside Campus employee voluntarily chooses to wear an air purifying respirator (not a filtering facepiece), and air monitoring conducted by the EH&RS office indicate that there is no occupational respiratory exposure problems, the employee will be required to abide by all of the terms of this policy.

The selection of respirators for voluntary respiratory usage will be conducted through the EH&RS office. All other voluntary respiratory usage not condoned or approved by the EH&RS office is prohibited. The EH&RS office will not be responsible for problems associated with unauthorized respirator usage.

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Cleaning and Sanitizing of Respirator's

Maintaining and caring for the respirator insures that the respirator will provide optimum efficiency over an extended period of time. When respirators are issued, cleaning and inspecting procedures will be covered. In addition, each respirator user will be provided with the manufacturer's instructions for respirator care.

Respirators used on a daily basis should be cleaned and disinfected after every use. Those that are used on a non-routine basis shall be cleaned and sanitized after every use. A general cleaning procedure is found in the manufacturer's booklet that accompanies every respirator.

The following steps should be followed when manually cleaning respirators:

- Remove canisters, filters, valves, straps and speaking diaphragms from the facepiece.
- Wash facepiece and excessories in warm soapy water or a commercially available cleaner, following the manufacturer's instructions. Gently scrub respirator.
- Rinse parts thoroughly in clean water.
- Air dry in a clean place or wipe dry with a lintless cloth.

Machine cleaning respirators is sometimes used to expedite the cleaning, sanitizing, rinsing, and drying of large numbers of respirators. Read the machine-cleaning manual and follow any manufacturer recommendations.

Disinfection is required when the respirator is used by more than one person. All employees needing respiratory protection on the Morningside Campus will receive

his or her own respirator; therefore, sharing or respirators will not take place.

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Inspection, Maintenance, and Repair

All users of respiratory protection must know how to clean and inspect the respirator. This important information will be addressed in the annual respirator training. Regular inspection, cleaning, and repair information is provided by the respirator manufacturer.

Respirators need to be cleaned and sanitized after every use. It is not a good practice to share respirators. Each Columbia University employee needing respiratory protection shall receive his or her own respirator. It will be the individual's responsibility to routinely clean and inspect their own respirator.

Inspection of the respirator shall include checking for tightness of connections; the condition of the respiratory inlet covering, head harness, valves, any connecting tubes, harness assemblies, hoses, filters, cartridges, canisters, end of service life indicators, shelf life dates; and for the proper function of regulators, alarms, and other warning systems (if applicable).

Respirators should be inspected before and after each use to insure that the respirator is providing maximum efficiency. Particular care needs to be given in the inspection of the elastomers and plastic parts commonly found on respirators. Rubber or other elastomeric parts should be inspected for pliability, puncture holes, or any other signs of deterioration. This would include stretching and bending the rubber looking for signs of cracking or wear. The 3M respirators currently being issued are made of silicone.

The inspection must also include the accumulation of soaps or other cleaning materials on the sealing surfaces of valve seats. Damage or build up would cause undue leakage through the valve. Plastic parts need to be inspected for damage, such as having the threads stripped or broken on a cartridge.

If a respirator is found to be defective it should be taken out of service. Contact your supervisor and do not use the respirator under any circumstances. EH&RS should be contacted so they can provide advice as to how to repair and/or replace the damaged respirator.

If a new respirator is issued the individual must undergo another fit testing for that particular respirator.

Respirators need to be stored properly. Damage can occur if they are not protected from physical and chemical agents such as vibration, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Respirators should not be stored in such places as lockers and toolboxes unless they are protected from contamination or damage. A good practice is to store your respirator in a plastic bag in a place that does not undergo temperature extremes.

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Respirator Storage

Respirators should be stored in a convenient, clean and sanitary location. The purpose of good respirator storage is to insure that the respirator will function

properly when used. Respirators shall be stored in a manner that will protect them against dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Respirators should be stored in plastic bags that have the capability of being sealed. All respirators distributed from the EH&RS office will be issued with a protective plastic bag.

Workplace Exposure Control Plan and Methods

It is important to remember that the use of respiratory protection or any personal protective equipment (PPE) on the Morningside Campus will be used only after all other *engineering* and/or *administrative controls* have been attempted. This fundamental principle has been clearly stated in the standards adopted under the Occupational Safety and Health Act (OSHA). This policy will be the mindset of the Columbia University EH&RS staff as they assess the need for respiratory protection.

Evaluation of Respiratory Protection Plan

If respirators must be used, there will be regular inspections and evaluations to determine the effectiveness of the respiratory protection program. The need for respiratory protection along with any changes (upgrade or downgrade) of respiratory protection will be made by the EH&RS office.

Wearing PPE of any type can cause undue stress on the individual wearing it. Therefore, if there are any other means of reducing employee exposure they will be implemented before utilizing PPE.

The first means of employee exposure reduction will be *engineering controls*. These types of control methods may include, but are not limited to, enclosure or confinement of a hazardous operation, general and local ventilation, or substitution of a less toxic material.

Administrative controls involve, but are not limited to, the rotation of workers to achieve lower employee exposure. An example of an administrative control is interchanging different employees in and out of a specific task that is causing an exposure problem. Which means that employees typically exposed for an 8 hour shift can reduce their exposure by sharing the shift with other employees therefore, avoiding a full shift exposure.

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