

**RESPIRATORY PROTECTION
FOR
EXPOSURE TO

AEROSOL TRANSMISSIBLE DISEASES
(ATDS)
INCLUDING TUBERCULOSIS (TB)**

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OCCUPATIONAL HEALTH PROGRAM
<http://insite.sdcountry.ca.gov/lueg/deh/ohp/Pages/OHP-Home.aspx>**

INTRODUCTION

For the protection of employee health, the County of San Diego has developed a comprehensive Respiratory Protection Policy. Each Department is responsible for administering their program for the staff that uses respirators. This information packet was prepared by Occupational Health Program (OHP) staff from the Department of Environmental Health as a supplement to training provided on the use of respiratory protective equipment for protection against Aerosol Transmissible Diseases (ATD's) including airborne tuberculosis (TB) bacilli. The use of respirators for protection against other potential hazards, such as chemicals, requires a different type of respirator design and more extensive training.

According to County policy, all employees who wear respiratory protection for TB, including supervisors are required to be part of a comprehensive Respiratory Protection Program (administered by their Department), and are required annually to complete a respirator class and receive respirator fit-testing. If you have any questions, contact your facility training staff or please call OHP at (858) 694-2888.

TYPES OF RESPIRATORY PROTECTION

There are two main types of respiratory protective equipment:

1. Air Purifying Respirators (APRs).
2. Atmosphere Supplying Respirators

APRs purify the air in the worker's breathing zone by using various air purifying materials to remove contaminants from the air. Atmosphere supplying respirators provide the worker with a source of air other than what is surrounding the worker. This air may come from a compressed air tank that is worn on the worker's back (self-contained breathing apparatus [SCBA], or from a compressor located at some distance from the worker and supplied through a hose [airline]). Atmosphere supplying respirators will not be discussed further.

TYPES OF APRs USED FOR TB PROTECTION

There are several types of respiratory protective equipment typically worn for protection against ATDs including airborne TB bacilli. These respirators purify the air in the worker's breathing zone by using a filtering material to remove particulates (including TB bacilli) from the air. The principals of size exclusion and electrostatic surface charge form the basis of filtration in these masks. All respirators must be approved by the National Institute for Occupational Safety and Health (NIOSH). In addition, the County of San Diego has approved several types of respirator for ATD use, these including:

N95 Disposable Respirators (also called disposable dust masks or filtering facepieces [FF]): The facepiece is made of a synthetic material capable of filtering particulates and has a filter efficiency rating of 95%. There are several styles of N95 disposable respirators.

P100 Disposable Dust Respirators: The facepiece is a multi-layer material capable of filtering particulates and has a filter efficiency rating of 100% (HEPA filter).

P100 (HEPA) Filter Cartridge Respirator: These respirators use cartridge elements attached to a pliable rubber or plastic facepiece. The cartridge elements contain a HEPA filter. HEPA cartridge respirators are discussed more comprehensively in another class.

The primary focus of this training and handout will be on disposable respirators or FFs for protection against TB. If you need other types of respirator training, contact OHP.

Note: It is important to distinguish between surgical masks and filtering facepieces (respirators). Although surgical masks have a use in infection control, they are not designed to protect an employee from TB bacteria or other bioaerosols and are not considered respiratory protection.

All of the respirators listed above operate under negative pressure. When you take a breath, a negative pressure is created inside your respirator allowing air to enter the respirator through the filtering material. This process tends to create increased breathing resistance and, therefore, puts a small, additional strain on your body.

It is extremely important that negative pressure respirators fit the wearer's face to prevent leakage of contaminants (see section on fit testing below). Some users may not be able to achieve a satisfactory face to mask seal, in which case, a different type of respirator may be appropriate.

RESPIRATORY HAZARDS

Your health depends, in part, on breathing "clean air" which is free of contaminants. Inhalation of contaminated air can cause damage to your lungs and other organs. In the case of TB, air-borne bacteria may enter your lungs and infect you. The County has reduced exposure to airborne contaminants by installing engineering controls, when feasible. However, certain job activities require that you wear respiratory protective equipment. Contact your Departmental Respirator Administrator for a list of these jobs/activities.

It is important that you know the limitations of your respirator, with respect to different types of respiratory hazards. Being familiar with these respiratory hazards will help you choose the proper respirator for your job. Using the wrong respirator can be very dangerous, and possibly life threatening.

"Clean air" consists of 78% nitrogen, 21% oxygen, and 1% various other gases. You normally breathe five quarts of air every minute. With work or exercise, you can breathe twice that amount. "Clean air" may contain various contaminants, but at very low levels. If the concentration of these contaminants increase or the concentration of oxygen decreases, you may experience adverse health effects. The three major types of respiratory hazards are described below:

- 1. Particulate (or aerosol) contaminants:** Particulates include solid or liquid particles suspended in air. Particulates range in size from small invisible particles to larger visible particles. The health effects associated with inhaling these particulates depend on the size and type of particulate. Dusts, fumes, sprays and mists, fibers, and TB bacilli suspended in small droplets of water, are all types of particulate contamination.

In order to protect your respiratory tract from particulate hazards, a particulate filter is needed. N95 and P100 (HEPA) rated respirators are special types of particulate filter respirators.

Particulate filters stop particulates as they pass through the filter. As a solid or liquid particulate enters a filter, it may be trapped by the fibrous filter media. Whether or not it is trapped depends on the size of the particulate (relative to the filter media), the velocity, composition, shape, and electrical charge of the particulate. It would be possible to have a filter that traps virtually all particulates, but breathing resistance would be unacceptable. Manufacturers try to produce the most efficient filter with the lowest breathing resistance. While a particulate filter respirator is worn, material collects on the filter and the spaces within the filter material becomes smaller. Although filter efficiency is improved (as material collects on the filter), breathing resistance will also increase until it becomes unacceptably high.

2. **Gaseous Contaminants:** Gaseous contaminants are not particles of solids or liquids, but are individual chemical molecules dispersed among the molecules of air. Gaseous contaminants occupy the space of an enclosure and include gases and vapors. In order to protect your respiratory system from gaseous contaminants, a chemical cartridge, specific for the removal of the chemical of concern, is needed. **The respirators selected for TB control are ineffective against gaseous contaminants and should not be used for this purpose.** If you are concerned about gaseous contaminants, contact OHP for assistance.
3. **Oxygen Deficiency:** Oxygen deficiency occurs whenever the percentage of oxygen in the air is too low. Remember that "clean air" contains 21% oxygen. An atmosphere containing less than 19.5% oxygen is considered an oxygen deficient atmosphere. If the oxygen concentration gets too low, it can cause brain damage possible heart problems, and death. Examples of potential oxygen deficient environments are tanks, underground sewers, storm drains, fires, and uncontrolled releases of compressed gases or liquids. **The types of APR respirators listed previously in this document for TB protection may not be used in oxygen deficient atmospheres.** If you are concerned about an oxygen deficient atmosphere, contact OHP for assistance.

LIMITATIONS OF USE

APRs can be an effective and useful means of personal protection. However, it is crucial that you understand the limitations and conditions of use. Failure to heed these limitations can place you in a life-threatening situation. If you have any questions regarding these limitations, please call the OHP.

1. APRs do not supply oxygen. Do not use in atmospheres containing less than 19.5% oxygen. Do not use for fire-fighting purposes.

2. Do not use APRs against unknown hazards.
3. Do not use any respirator when facial hair, eyeglass temple pieces, or any other condition precludes an adequate facepiece seal.
4. Do not use particulate filtering APRs against chemical contaminants.
5. Do not use your respirator if it is damaged in any way.
6. Do not use your APR unless that specific model and size of respirator has been fit tested to your face by OHP staff.

RESPIRATOR FIT

A respirator is only as good as its ability to create a good seal with the wearer's face. Most respirators are made to fit the average male face. But at least half of us are not males and some of us do not have average faces. Scars, dentures, high cheekbones, narrow nose bridges, etc., can make it difficult to get a properly fitting respirator. As a result, the California Occupational Safety and Health Administration (Cal/OSHA) requires that all employers ensure that their employees pass a respirator fit test. In complying with these requirements, the County has established procedures to ensure that all County employees use properly fitted respirators.

Fit Tests:

Prior to issuance of a respirator, and periodically thereafter, an employee should be fit tested.

A **qualitative** fit test consists of placing an employee into an enclosure and introducing a fit testing agent such as saccharin or Bitrex™ mist, or mist irritant smoke into the enclosure. If the respirator fits, the employee will **not** detect the fit testing agent. However, if the employee detects the fit testing agent (as is evidenced by tasting the saccharin or Bitrex™), an adequate facepiece was not achieved.

A **quantitative** fit test consists of measuring the concentration of a test agent (airborne dust can be used for this purpose) inside a respirator and comparing it with concentrations found immediately outside of the respirator. This quantitative fit test must be performed with specially constructed ported respirators and testing equipment to allow for this measurement.

If either of these tests is unsuccessful, the employee should readjust the mask on his face, choose a different size, or choose a different respirator model. The County is responsible for providing several different respirator models and sizes in order to achieve a satisfactory fit for each employee.

During the fit testing, you will be asked to breathe normally, turn your head, talk, and move around in order to simulate normal work activities.

If you are unable to achieve a satisfactory fit with one of the approved disposable TB respirators, it is not required that you attend another respirator class, but you must attend another fit-test session and successfully pass on another type of approved respirator.

A fit test should be repeated on a periodic basis (at least annually) to determine whether the size and model of your respirator still fits properly. Weight loss/gain, dental work, face surgery, etc., can also affect a respirator's fit

After your fit test, the size and model of the respirator for which you obtained a satisfactory fit must be documented by your Department. This information is necessary before ordering your respirator through a vendor.

CARE AND MAINTENANCE

Inspections:

Respirators should be inspected before and after each use. The facepiece and head straps should be inspected for any signs of deterioration. If your respirator has an exhalation valve, it requires special attention. If present, carefully inspect the valve and valve seat to ensure that they are clean, free of cracks, nicks, warps, and tears.

If any portion of the respirator appears damaged or defective, the respirator must be replaced with a new respirator of the same make, model, and size. **DO NOT USE THE RESPIRATOR.** Contact your supervisor, or a vendor to replace the respirator.

Maintenance / Disposal / Storage:

Filtering facepiece respirators typically be used many times on different days and are disposable. Some respirators models can be lightly cleansed using a moist towel or cloth around the portion of the respirator that forms a seal with the face, however, the filter material may not be cleaned. If the filter material becomes wet, it will greatly reduce the respirator's ability to filter out particulates. For this reason, filtering facepieces cannot be cleaned and disinfected.

Store the respirator dry, in a re-sealable bag (i.e., "Zip Loc's™"), a paper bag, or cardboard box. Store the respirator in an area protected from dust, sunlight, heat, extreme cold, excessive moisture, damaging chemicals, and mechanical damage.

