Turbo Liner Products

Respiratory Protection Program

Helping make the coatings industry
A better and safer place to work.

RESPIRATORY PROTECTION

Contents:

I. INTRODUCTION.

A. Wearing respiratory protective devices to reduce exposure to airborne contaminants is widespread in industry. An estimated 5.0 million workers wear respirators, either occasionally or routinely. Although it is preferred industrial hygiene practice to use engineering controls to reduce contaminant emissions at their source, there are operations where this type of control is not technologically or economically feasible or is otherwise inappropriate.

B. Since respirators are not as consistently reliable as engineering and work practice controls, and may create additional problems, they are not the preferred method of reducing exposures below the occupational exposure levels. Accordingly, their use as a primary control is restricted to certain circumstances. In those circumstances where engineering and work practice controls cannot be used to reduce airborne contaminants below their occupational exposure levels (e.g., certain maintenance and repair operations, emergencies, or during periods when engineering controls are being installed), the use of respirators could be justified to reduce worker exposure. In other cases, where work practices and engineering controls alone cannot reduce exposure levels to below the occupational exposure level, the use of respirators would be essential for supplemental protection.

C. There are many variables that affect the degree of protection afforded by respiratory protective devices, and the misuse of respirators can be hazardous to employee safety and health. Selection of the wrong equipment, one of the most frequent errors made in respiratory protection, can result in the employee being exposed to increased concentrations of the harmful contaminant. This error may result in a broad range of health effects caused by the harmful contaminants, including silicosis, asbestosis, permanent lung damage, and cancer. Respirators

that are not maintained and inspected can be less effective at reducing exposure to the harmful contaminants, and can place a greater burden on the respiratory system. Respirators that are not clean can cause dermatitis or skin irritation. Because respirator use may give the employee a false sense of security and presumed protection, an improper respirator program can actually present a high degree of hazard for the employee.

D. Respirators can only provide adequate protection if they are properly selected for the task; are fitted to the wearer and are consistently donned and worn properly; and are properly maintained so that they continue to provide the protection required for the work situation. These variables can only be controlled if a comprehensive respiratory protection program is developed and implemented in each workplace where respirators are used. When respirator use is augmented by an appropriate respiratory protection program, it can prevent fatalities and illnesses from both acute and chronic exposures to hazardous substances.

E. The primary aim of this chapter is to give detailed instruction in the selection of the proper respirator and its use and maintenance. The emphasis is on the implementation of a respiratory protection program developed in a logical progression of steps, outlined below:

- A clear definition of the hazards that will be encountered and the degree of protection required;
- The selection and fitting of the respirator;
- Medical evaluation for respirator selection and use;
- The required training in the correct use and care of the respirator; and
- The implementation of a maintenance program that will ensure that a high level of respiratory protection is maintained.

II. HISTORY OF THE DEVELOPMENT OF RESPIRATORY PROTECTION.

A. **EARLY PRACTICES**. The concept of using respiratory protective devices to reduce or eliminate hazardous exposures to airborne contaminants first came from Pliny (circa A.D. 23-79) who discussed the idea of using loose fitting animal bladders in Roman mines to protect workers from the inhalation of red oxide of lead. (See proposed respiratory protection standard, 59 Federal Register 58885.) Later, in the 1700's, the ancestors of modern atmosphere-supplying devices, such as the self-contained breathing apparatus or hose mask, were developed. Although the devices themselves have become more sophisticated in design and materials, respirators' performance is still based on one of two basic principles: purifying the air by removing contaminants before they reach the breathing zone of the worker, or providing clean air from an uncontaminated source.

B. **DEVELOPMENT OF MODERN METHODS**. In 1814, a particulate-removing filter encased in a rigid container was developed -- the predecessor of modern filters for air-purifying respirators. In 1854 it was recognized that activated charcoal could be used as a filtering medium for vapors. During World War I, with the use of chemical warfare, improvements in the design of respirators was necessary. In 1930 the development of the resin-impregnated dust filter made available efficient, inexpensive filters that have good dust-loading characteristics and low breathing resistance.

C. **LATEST ADVANCES**. A more recent development was the high efficiency particulate filter made with very fine glass fibers. These extremely efficient filters are used for very small airborne particles and produce little breathing resistance. Some features that are currently being incorporated into respirator design include a smaller facepiece, which translates into a better field of vision and a low profile that permits the respirator to fit under other protective gear such as a welder's helmet. Over the years there have been continuing major developments in the basic design of respirators. Modern design improvements have created products that are both more comfortable to wear and more protective than earlier respirators.

III. GENERAL INFORMATION.

A. **PURPOSE**. The purpose of a respirator is to prevent the inhalation of harmful airborne substances and/or an oxygen-deficient atmosphere. Functionally, a respirator is designed as an enclosure that covers the nose and mouth or the entire face or head. Respirators are of two general "fit" types, *tight-fitting* and *loose-fitting.*

1. **The tight-fitting respirator** (Figure VIII:2-1) is designed to form a seal with the face of the wearer. It is available in three types: quarter mask, half mask, and full facepiece. The quarter mask covers the nose and mouth, where the lower sealing surface rests between the chin and the mouth. The half mask covers the nose and mouth and fits under the chin. The full facepiece covers the entire face from below the chin to the hairline.

2. **The loose-fitting respirator** (Figure VIII:2-2) has a respiratory inlet covering that is designed to form a partial seal with the face. These include loose-fitting facepieces, as well as hoods, helmets, blouses, or full suits, all of which cover the head completely. The best known loose-fitting respirator is the supplied air hood used by the abrasive blaster. The hood covers the head, neck, and upper torso, and usually includes a neck cuff. Air is delivered by a compressor through a hose leading into the hood. Because the hood is not tight-fitting, it is important that sufficient air is provided to maintain a slight positive-pressure inside the hood relative to the environment immediately outside the hood. In this way, an outward flow of air from the respirator will prevent contaminants from entering the hood.

FIGURE VIII:2-1. TIGHT-FITTING RESPIRATORS.

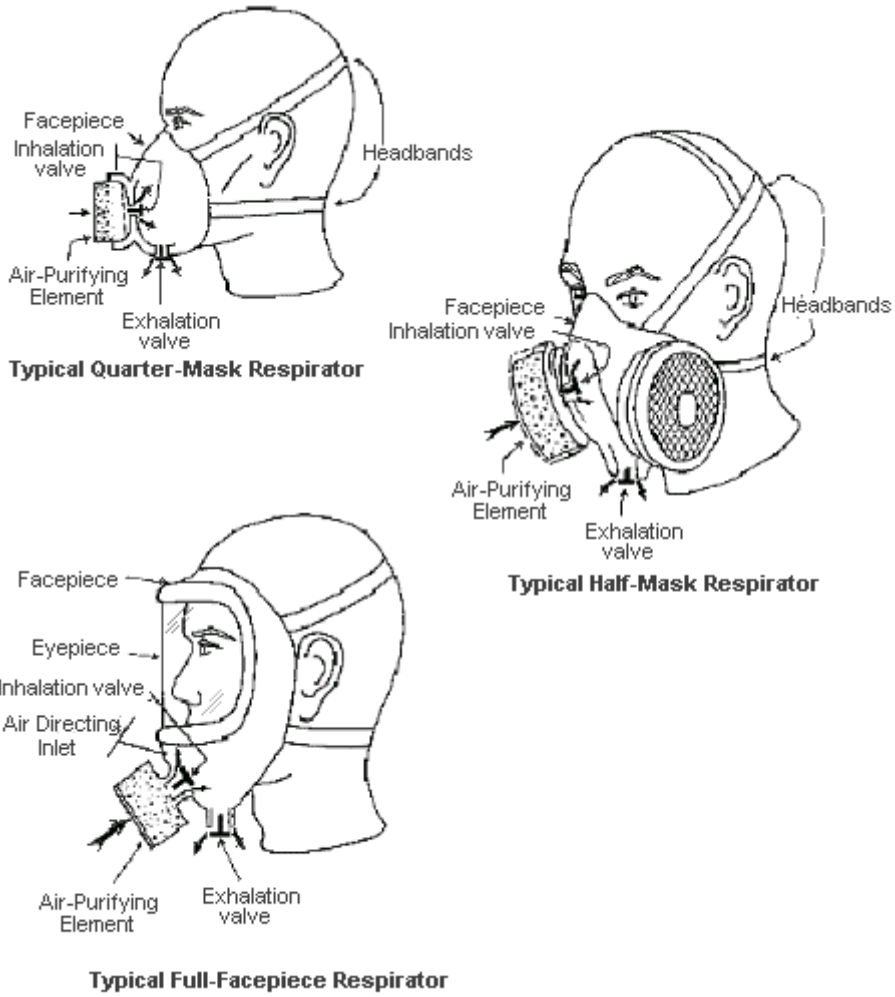
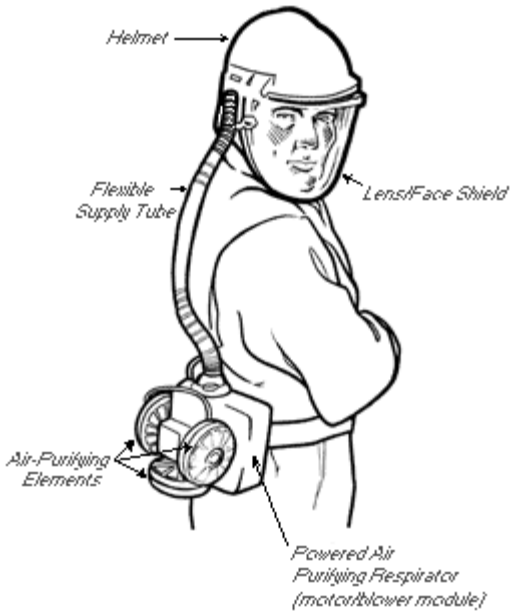
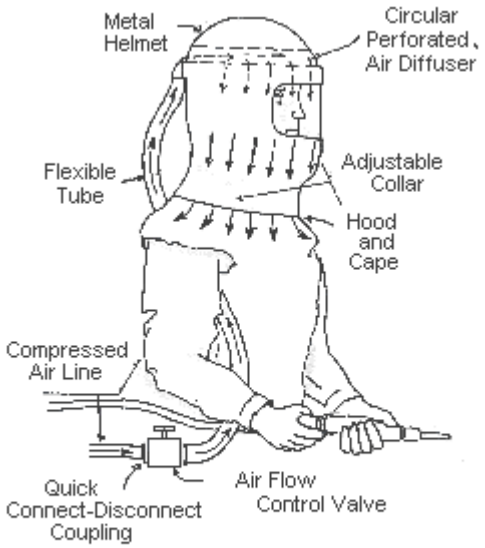


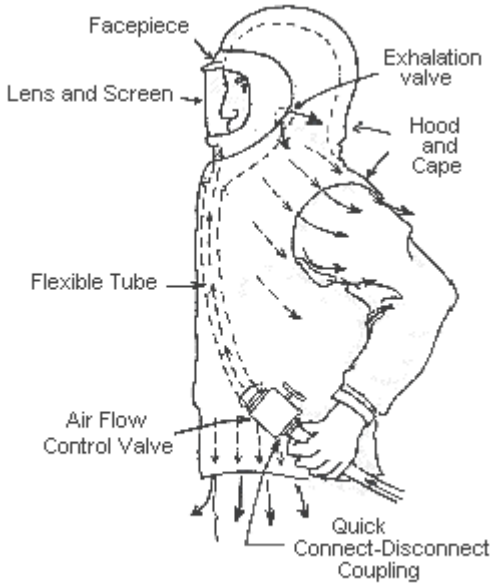
FIGURE VIII:2-2. LOOSE-FITTING RESPIRATORS.



Loose-Fitting Facepiece



Abrasive Blasting Respirator (Hood Respirator)



Loose-Fitting Hood with Blouse

IV. **AIRBORNE (OR RESPIRATORY) HAZARDS** may result from either an oxygen deficient atmosphere or breathing air contaminated with toxic particles, vapors, gases, fumes or mists. The proper selection and use of a respirator depend upon an initial determination of the concentration of the hazard or hazards present in the workplace, or the presence of an oxygen deficient atmosphere.

Airborne hazards generally fall into the following basic categories:

1. **Dusts**. Particles that are formed or generated from solid organic or inorganic materials by reducing their size through mechanical processes such as crushing, grinding, drilling, abrading, or blasting.

2. **Fumes**. Particles formed when a volatilized solid, such as a metal, condenses in cool air. This physical change is often accompanied by a chemical reaction, such as oxidation. Examples are lead oxide fumes from smelting, and iron oxide fumes from arc-welding. A fume can also be formed when a material such as magnesium metal is burned or when welding or gas cutting is done on galvanized metal.

3. **Mists**. A mist is formed when a finely divided liquid is suspended in the air. These suspended liquid droplets can be generated by condensation from the gaseous to the liquid state or by breaking up a liquid into a dispersed state, such as by splashing, foaming, or atomizing. Examples are the oil mist produced during cutting and grinding operations, acid mists from electroplating, acid or alkali mists from pickling operations, paint spray mist from spraying operations, and the condensation of water vapor to form a fog or rain.

4. **Gases**. Gases are formless fluids that occupy the space or enclosure and which can be changed to the liquid or solid state only by the combined effect of increased pressure and decreased temperature. Examples are welding gases such as acetylene, nitrogen, helium and argon; and carbon monoxide generated from the operation of internal combustion engines. Another example is hydrogen sulfide, which is formed wherever there is decomposition of materials containing sulfur under reducing conditions.

5. **Vapors**. Vapors are the gaseous form of substances that are normally in the solid or liquid state at room temperature and pressure. They are formed by evaporation from a liquid or solid, and can be found where parts cleaning and painting takes place and where solvents are used.

6. **Smoke**. Smoke consists of carbon or soot particles resulting from the incomplete combustion of carbonaceous materials such as coal or oil. Smoke generally contains droplets as well as dry particles.

7. **Oxygen deficiency**. An oxygen deficient atmosphere has an oxygen content below 19.5% by volume. Oxygen deficiency may occur in confined spaces, which include, but are not limited to, storage tanks, process vessels, towers, drums, tank cars, bins, sewers, septic tanks, underground utility tunnels, manholes, and pits.

V. **RESPIRATOR CLASSIFICATIONS**. Respirators provide protection either by removing contaminants from the air before they are inhaled or by supplying an independent source of respirable air. There are two major classifications of respirators:

0. Air purifying respirators (devices that remove contaminants from the air); and

1. Atmosphere-supplying respirators (those devices that provide clean breathing air from an uncontaminated source).

Each class of respirator may have tight-fitting and loose-fitting facepieces. An important

aspect of respirator operation and classification is the air pressure within the facepiece. When the air pressure within the facepiece is negative during inhalation with respect to the ambient air pressure, the respirator is termed a negative-pressure respirator. When the pressure is normally positive with respect to ambient air pressure throughout the breathing cycle, the respirator is termed a positive-pressure respirator. The concept of negative and positive pressure operation is important when considering potential contaminant leakage into the respirator.

VI. **AIR PURIFYING RESPIRATORS** are grouped into three general types: *particulate removing, vapor and gas removing,* and *combination.* Elements that remove particulates are called filters, while vapor and gas removing elements are called either chemical cartridges or canisters. Filters and canisters/cartridges are the functional portion of air-purifying respirators, and they can generally be removed and replaced once their effective life has expired. The exception would be filtering facepiece respirators (commonly referred to as "disposable respirators," "dust masks," or "single-use respirators"), which cannot be cleaned, disinfected, or resupplied with an unused filter after use.

0. **Particulate-removing** respirators are designed to reduce inhaled concentrations of nuisance dusts, fumes, mists, toxic dusts, radon daughters, asbestos-containing dusts or fibers, or any combination of these substances, by filtering most of the contaminants from the inhaled air before they enter the breathing zone of the worker. They may have single-use or replaceable filters. These respirators may be non-powered or powered air-purifying. A powered air-purifying respirator (PAPR) uses a blower to force the ambient atmosphere through air purifying elements to the inlet covering.

1. **Vapor- and gas-removing** respirators are designed with sorbent elements (canisters or cartridges) that adsorb and/or absorb the vapors or gases from the contaminated air before they can enter the breathing zone of the worker. *Combination* cartridges and canisters are available to protect against particulates, as well as vapors and gases.

VII. **ATMOSPHERE-SUPPLYING RESPIRATORS** are respirators that provide air from a source independent of the surrounding atmosphere instead of removing contaminants from the atmosphere. These respirators are classified by the method that is used to supply air and the way in which the air supply is regulated. Basically, these methods are: self-contained breathing apparatus (air or oxygen is carried in a tank on the worker's back, similar to SCUBA gear); supplied-air respirators (compressed air from a stationary source is supplied through a high-pressure hose connected to the respirator); and combination self-contained and supplied-air respirators.

VIII. **LIMITATIONS OF RESPIRATOR USE**. Not all workers can wear respirators. Individuals with impaired lung function, due to asthma or emphysema for example, may be physically unable to wear a respirator. Individuals who cannot get a good facepiece fit, including those individuals whose beards or sideburns interfere with the facepiece seal, will be unable to wear tight-fitting respirators. An adequate fit is required for a respirator to be effective. In addition to these problems, respirators may also be associated with communication problems, vision problems, fatigue, and reduced work efficiency.

In principle, respirators usually are capable of providing adequate protection. However, problems associated with selection, fit, and use often render them less effective in actual application; these problems prevent the assurance of consistent and reliable protection,

regardless of the theoretical capabilities of the respirator. Occupational safety and health experts have spent considerable effort over the years developing fit-testing procedures and methods of measuring respirator effectiveness, thereby improving protection for those employees required to wear them.

IX. RESPIRATOR PROTECTION PROGRAM.

0. **THE STANDARD**. Whenever respirators are required to be worn, a written respirator protection program must be developed and implemented in accordance with OSHA's respirator standard, 29 CFR 1910.134. (Additional program requirements may be found in the standards that regulate the hazards to which the employee is exposed.) Because workplaces differ substantially, each program must be tailored to the specific conditions of the workplace. The program must consist of worksite-specific procedures governing the selection, use, and care of respirators. The program must be updated as often as necessary to reflect changes in workplace conditions and respirator use.

1. **THE WORKSITE-SPECIFIC PROCEDURES** must contain all the information needed to maintain an effective respirator program to meet the user's individual requirements. These procedures are a set of step-by-step instructions written so that a task (i.e., respirator use, fit-testing procedures, cleaning and storage, etc.) can be performed by all personnel in a uniform and consistent way, while supplying the maximum protection for workers who use respirators in the workplace. The employer must anticipate both the routine and non-routine use of respirators, as well as any possible emergency use based on the conditions in the workplace in which they are to be used. Worksite-specific procedures must be written so as to be useful to those who are directly involved in the respirator program: the program administrator, those fitting the respirators and training the workers, respirator maintenance workers, and the supervisors responsible for overseeing respirator use on the job.

2. **ADMINISTRATION**. In addition, the respirator standard requires that the respiratory protection program be administered by one qualified individual to ensure that the integrity of the respiratory protection program is maintained through the continuous oversight of one responsible person. The program administrator must be qualified by appropriate training and/or experience in the proper selection, use, and maintenance of respirators, be responsible for implementing the respiratory protection program, and conduct regular evaluations of the program's effectiveness.

   Although responsibility for respirator program oversight rests with the program administrator, he or she may delegate responsibilities to other qualified individuals. For instance, a large facility may find it practical and economical to have a staff of personnel involved in the respirator program, each with their own area of responsibility. However, each of these people must report to the one administrator who has overall responsibility for the program. This approach promotes coordination of all facets of the program. The administrator should have the full support of higher level management; without it, an effective respirator program is difficult to initiate and maintain.

3. **ELEMENTS**. The respiratory protection program must cover the following basic elements, as applicable:

   - Procedures for selecting respirators for use in the workplace;
   - Medical evaluations of employees required to use respirators;

- Fit testing procedures for tight-fitting respirators;
- Use of respirators in routine and reasonably foreseeable emergency situations;
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, and otherwise maintaining respirators;
- Procedures to ensure adequate air quality, quantity and flow of breathing air for atmosphere-supplying respirators;
- Training of employees in the respiratory hazards to which they are potentially exposed;
- Training of employees in the proper use of respirators, including putting on and removing them, any limitations on their use, and maintenance procedures; and
- Procedures for regularly evaluating the effectiveness of the program.

X. **RESPIRATOR SELECTION**.

Respirator selection requires correctly matching the respirator with the hazard, the degree of hazard, and the user. The respirator selected must be adequate to effectively reduce the exposure of the respirator user under all conditions of use, including reasonably foreseeable emergency situations. Proper respirator selection involves choosing a device that fully protects the worker from the respiratory hazards to which he or she may be exposed and permits the worker to perform the job with the least amount of physical burden.

0. **SELECTION FACTORS**. Many factors must be considered carefully in respirator selection. In choosing the appropriate respirator, one must consider the nature and extent of the hazard, work requirements and conditions, and the characteristics and limitations of the respirators available. The following categories of information must be taken into account:

    - Nature of the hazard, and the physical and chemical properties of the air contaminant;
    - Concentrations of contaminants;
    - Relevant permissible exposure limit or other occupational exposure limit;
    - Nature of the work operation or process;
    - Time period the respirator is worn;
    - Work activities and physical/psychological stress;
    - Fit testing; and
    - Physical characteristics, functional capabilities and limitations of respirators.

    - **Nature of the hazard, and the physical and chemical properties of the air contaminant**. The nature of the hazard, whether it is in the form of a gas, dust, organic vapor, fume, mist, oxygen deficiency or any combination of hazards, needs to be taken into account. The physical and chemical properties of the contaminant that affect respirator selection, and the selection of respirator components such as cartridges, canisters, and filters must also be considered. Physical properties include such factors as particle size for dusts, and vapor pressure for gases and vapors. Chemical properties of the air contaminant that affect breakthrough times, and the

ability of the filter material to remove, adsorb, or absorb the contaminant must also be considered.

- **Concentrations of contaminants**. Sampling and analysis of the workplace air determines what degree of exposure is occurring, and thus what degree of protection is required. Where such sampling and analysis have been done, the results are to be used as a point of comparison with the occupational exposure level, i.e., to determine how much the concentration must be lowered by the respirator to reduce employee exposure to a safe level.

- **The relevant permissible exposure limit or other occupational exposure limit**. Respirators selected must be capable of protecting against overexposure by reducing and maintaining exposure to or below the relevant exposure limit. In addition to the OSHA limits, employers should refer to the ACGIH (American Conference of Governmental Industrial Hygienists) recommended Threshold Limit Values (TLV's), the NIOSH (National Institute for Occupational Safety and Health) Recommended Exposure Limits (REL's), or other occupational exposure limits.

- **Nature of the work operation or process**. The type of job operation, the equipment or tools that will be used, and any motion or travel the job requires can influence the type of respirator selected, particularly when supplied-air respirators, which require a connection to a clean air source, are used.

- **Time period respirator is worn**. The employer must also consider the period of time during which the respirator will be used by employees during a work shift. Breakthrough times for different chemicals can vary greatly, and are dependent on the concentrations of contaminants in the workplace air, patterns of respirator use, and environmental factors including temperature and humidity. A respirator that provides adequate protection for one chemical may be inadequate for another chemical with a different breakthrough time. In addition, employees wearing respirators for longer periods of time may need respirators that impose the minimum possible physical burden.

- **Work activities and stress**. The work activities of employees while wearing respirators are also a factor. Heavy work that is physically draining may affect an employee's capability of wearing certain types of respirators. Temperature and humidity conditions in the workplace may also affect the physical/psychological stress level associated with wearing a respirator, as well as the effectiveness of respirator filters and cartridges. These types of factors must be assessed in selecting the appropriate equipment for a particular work situation.

- **Fit testing**. Some employees may be unable to achieve an adequate fit with certain respirator models or a particular type of respirator -- such as half-mask air-purifying respirators -- so an alternative respirator model with an adequate fit or other type of respirator that provides adequate protection must be used. Therefore, it is necessary for employers to provide a sufficient number of respirator models and sizes from which employees can choose an acceptable respirator that fits correctly.

- **Physical characteristics, functional capabilities, and limitations of respirators**. The last category of information to be considered when selecting respiratory protection is the physical characteristics, functional capabilities, and limitations of the respiratory protection equipment itself. Respirators selected must not impair the worker's vision, hearing, communication, and physical movement necessary to perform jobs safely. For example, airline respirators should not be used by mobile employees around moving machinery to avoid entanglement of the respirator in the equipment.

1. **SELECTION**. Once the above factors have been taken into account, the employer must select a NIOSH-certified respirator. Where NIOSH has not specifically certified any respirator for use against the particular contaminant present in the workplace, the employer must select a NIOSH-certified respirator that has no limitation prohibiting its use for that contaminant. The respirator must be appropriate for the contaminant's physical form and chemical properties and the conditions under which it will be used. All respirators must be chosen and used according to the limitations of the NIOSH certification, which appears on the NIOSH certification label.

2. **ASSIGNED PROTECTION FACTORS**. Until such time as OSHA addresses the issue of assigned protection factors (APF's), employers may rely on APF's published by NIOSH and ANSI. Where there are conflicts between the NIOSH and ANSI APF's, the employer should apply the more protective APF.

3. **WARNING SYSTEM**. When an air-purifying respirator is selected for protection against gases and vapors, a system must be in effect that will reliably warn respirator wearers of contaminant breakthrough. These systems are: a respirator equipped with an end-of-service life indicator (ESLI) certified by NIOSH for the contaminant, or an established and enforced cartridge/canister change schedule that is based on objective information or data that will ensure that canisters and cartridges are changed before the end of their service life.

4. **ATMOSPHERES REQUIRING HIGHEST LEVEL OF PROTECTION**. For atmospheres that are immediately dangerous to life and health (IDLH), the highest level of respiratory protection and reliability is required. These atmospheres, by definition, are the most dangerous environments in which respirators are used. In these atmospheres, there is no tolerance for respirator failure. Consequently, only the following respirators must be provided and used: full-facepiece pressure demand self-contained breathing apparatus (SCBA) certified for a minimum service life of thirty minutes, or a combination full-facepiece pressure demand supplied-air respirator (SAR) with an auxiliary self-contained air supply.

XI. MEDICAL EVALUATION

0. **OVERVIEW**. Persons assigned to tasks that require the use of a respirator must be physically able to perform the work while using the respirator. Accordingly, employers have the responsibility of ensuring that employees are medically fit to tolerate the physical and psychological stress imposed by respirator use, as well as the physical stress originating from job and workplace conditions.

Employees must be medically evaluated and found eligible to wear the respirator selected for their use prior to fit testing or first-time use of the respirator in the workplace. Medical eligibility is to be determined by a physician or other licensed health care professional (referred to as a "PLHCP"). A variety of qualified health care providers, besides physicians, including occupational health nurses, nurse practitioners, and physician assistants, can perform the medical evaluations provided they are licensed to do so in the state in which they practice.

1. **QUESTIONNAIRE**. In assessing the employee's medical eligibility to use a respirator, the PLHCP must perform a medical evaluation using a medical questionnaire (Appendix C to 1910.134) or provide a medical examination that obtains the same information as the medical questionnaire. The medical evaluation must be administered confidentially and at a time and place, during working hours, that is convenient to the employee. Employers are free to provide respirator users with a medical examination in lieu of the medical questionnaire if they chose to do so, but they are not required by the standard to administer a medical examination unless the employee gives a positive response to specific questions on the questionnaire.

2. **MEDICAL FACTORS AND CONDITIONS**. The purpose of a medical evaluation program is to determine if employees can tolerate the physiological burden associated with respirator use, including: the burden imposed by the respirator itself (e.g., its weight and breathing resistance during both normal operation and under conditions of filter, canister, or cartridge overload); musculoskeletal stress (e.g., when the respirator to be worn is a SCBA); limitations on auditory, visual, and olfactory sensations; and isolation from the workplace environment. Since certain jobs and workplace conditions in which a respirator is used can also impose a physiological burden on the user, the medical evaluation must also consider the following factors: type and weight of the respirator to be worn; duration and frequency of respirator use; expected physical work effort; use of protective clothing and equipment to be worn; and temperature and humidity extremes that may be encountered. This information must be provided to the PLHCP before the PLHCP makes a recommendation regarding an employee's ability to use a respirator.

   The medical evaluation is designed to identify general medical conditions that place employees who use respirators at risk of serious medical consequences. Medical conditions known to compromise an employee's ability to tolerate respirator-, job-, and workplace-related physiological stress include: cardiovascular and respiratory diseases (e.g., a history of high blood pressure, angina, heart attack, cardiac arrhythmias, stroke, asthma, chronic bronchitis, emphysema); reduced pulmonary function caused by other factors (e.g., smoking or prior exposure to respiratory hazards); neurological or musculoskeletal disorders (e.g., ringing in the ears, epilepsy, lower back pain); impaired sensory function (e.g., perforated ear drums, reduced or absent ability to smell); and psychological disorders (e.g., claustrophobia and severe anxiety).

3. **STANDARD OF EVALUATION**. The employer must obtain a written recommendation from the PLHCP on whether the employee is medically able to wear a respirator. The recommendation must identify any limitations on the employee's use of the respirator, as well as the need for follow-up medical evaluations that are needed to assist the PLHCP in making a recommendation. The employee must also receive a copy of the PLHCP's written recommendations. A powered air-purifying respirator (PAPR) must be provided to an employee if information from the medical evaluation indicates that the employee can use a

PAPR but not a negative pressure respirator. If, subsequent to this evaluation, the PLHCP determines that the employee is able to wear a negative pressure respirator, the employer is no longer required to provide a PAPR to that employee.

In addition, the standard requires the employer to medically re-evaluate an employee when:

- That employee reports medical signs or symptoms that are related to the employee's ability to use a respirator;
- A PLHCP, supervisor, or the respirator program administrator observes that the employee is having a medical problem during respirator use and they inform the employer of their observation;
- Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for employee re-evaluation; or
- A change occurs in workplace conditions (e.g., physical work effort, type of respirator used, protective clothing, temperature) that may result in a substantial increase in the physiological burden placed on an employee.

XII. **FIT TESTING**.

It has long been recognized that respirators must fit properly to provide protection. To obtain adequate respiratory protection, there must be a proper match between respirator and wearer. Respirators that don't seal properly around the face offer only the illusion of protection. To accommodate the variability of face size characteristics among individuals, a number of manufacturers offer facepieces in several sizes and models.

0. **PURPOSE**. The primary purpose of fit testing is to identify the specific make, model, style, and size of respirator best suited for each employee. In addition, fit testing also provides an opportunity to check on problems with respirator wear, and reinforces respirator training by having wearers review the proper methods of donning and wearing the respirator.

1. **REQUIREMENT**. Fit testing is required for all negative or positive pressure tight-fitting facepiece respirators. The OSHA respiratory protection standard requires that fit testing be performed before an employee first starts wearing a respirator in the work environment, whenever a different respirator facepiece is used, and at least annually thereafter.

2. **METHOD**. Prior to the actual fit test, the employee must be shown how to put on a respirator, position it on the face, set strap tension, and determine an acceptable fit. Next, the employee must be allowed to choose a respirator from a sufficient number of models and sizes so that the employee can find an acceptable and correctly fitting respirator. Once an acceptable respirator has been found -- which takes into account the position of the mask on the face, nose, and cheeks; room for eye protection; and room to talk -- a user seal check must be conducted (refer to on "Use of Respirators").

3. **TYPES OF FIT TESTING**. Fit testing may either be *qualitative (QLFT)* or *quantitative (QNFT),* and must be administered using an OSHA-accepted QLFT or QNFT protocol. These protocols are described in mandatory Appendix A to 1910.134. Prior to the commencement of the fit test, the employee must be given

a description of the fit test and a description of the exercises that he or she will be performing during fit testing. The respirator to be tested must be worn for at least five minutes before the start of the fit test. The employee must be fit tested with the same make, model, style, and size of respirator that will be used in the workplace.

- **Qualitative fit testing (QLFT)**. Qualitative fit testing involves the introduction of a gas, vapor, or aerosol test agent into an area around the head of the respirator user. A determination is then made as to whether or not the wearer can detect the presence of the test agent through means such as odor, taste, or nasal irritation. If the presence of the test agent is detected inside the mask, the respirator fit is considered to be inadequate.

  There are four qualitative fit test protocols approved in OSHA's standard. The isoamyl acetate (IAA) test determines whether a respirator is protecting a user by questioning whether the user can smell the distinctive odor of IAA. Both the saccharin and Bitrex™ tests involve substances with distinctive tastes that should not be detected through an effective respirator. The irritant smoke (e.g., stannic chloride) test involves a substance that elicits an involuntary irritation response in those exposed to it.

  Before conducting a qualitative test, the worker must undergo a sensitivity test to determine if he or she can taste, smell or react to the substance. When performing the isoamyl acetate test, the protocol requires that separate rooms be used for the odor screening and fit tests, and that the rooms be sufficiently ventilated to ensure that there is no detectable odor of IAA prior to a test being conducted. This will prevent olfactory fatigue among workers being fit tested by preventing a buildup of IAA in the general room air.

- **Quantitative fit testing (QNFT)**. In a quantitative fit test, the adequacy of respirator fit is assessed by numerically measuring the amount of leakage into the respirator. This testing can be done by either generating a test aerosol as a test atmosphere, using ambient aerosol as the test agent, or using controlled negative pressure (CNP) to measure the volumetric leak rate. Appropriate instrumentation is required to quantify respirator fit.

4. **FIT TEST EXERCISES**. The following test exercises must be performed for all fit testing methods described in the OSHA standards, except the CNP method which has its own fit testing exercise regimen:

   - Normal breathing in a normal standing position, without talking;

   - Deep breathing in a normal standing position, breathing slowly and deeply, taking precaution not to hyperventilate;

   - Turning the head slowly from side to side, while standing in place, with the employee holding his/her head momentarily at each extreme so that the employee can inhale at each side;

- Moving the head up and down slowly, while standing in place, inhaling in the up position when looking toward the ceiling;
- Talking out loud slowly, reading from a prepared text such as the Rainbow Passage (see Appendix A of the standard), counting backward from 100, or reciting a memorized poem or song;
- Grimacing by smiling or frowning (only for QNFT testing);
- Bending at the waist as if to touch toes (jogging in place can be done when the fit test enclosure doesn't permit bending at the waist); and
- Normal breathing (as described above).

Each test exercise must be performed for one minute, except for the grimace exercise which must be performed for 15 seconds. The respirator must not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

The employee must perform exercises in the test environment while wearing any applicable safety equipment that may be worn during actual respirator use and that could interfere with respirator fit. If the employee exhibits breathing difficulty during the fit test, he or she must be referred to a physician or other licensed health care professional to determine whether the employee can wear a respirator while performing his or her duties.

5. **RETESTING**. If the employee finds the fit of the respirator unacceptable, he or she must be given a reasonable opportunity to select a different respirator and to be retested. In addition, retesting is required whenever an employee reports, or the employer, PLHCP, supervisor, or program administrator observe changes in an employee's physical condition that could affect respirator fit. Such conditions include, but are not limited to, facial scarring, dental changes (e.g., wearing new dentures), cosmetic surgery, or an obvious change in body weight.

XIII. USE OF RESPIRATORS.

0. **CONDITIONS**. Once the respirator has been properly selected and fitted, it is necessary to ensure that the respirator is used properly in the workplace. The following conditions may compromise the effective use of the respirator and jeopardize worker protection: facepiece seal leakage; removing the respirator at the wrong times in hazardous atmospheres; not properly performing user seal checks; or not properly repairing defective parts. In these circumstances, there is the danger that employees may have a false sense of security in feeling that they are protected when they are not.

   The employer must also be aware of the conditions in the work areas where employees are using respirators. Employers are required to routinely evaluate workplace conditions, the degree of employee exposure, and physical stress so that they can provide additional or different respiratory protection when necessary. By observing respirator use under actual workplace conditions,

employers can note problems such as changes in the fit of a respirator due to the use of other protective equipment, or conditions leading to skin irritation.

1. **FACEPIECE SEAL PROTECTION**.

   - **Seal of Tight-Fitting Respirators and Valve Function**. The employer must not permit respirators with tight-fitting facepieces to be worn by employees who have conditions that would compromise the facepiece-to-face seal. Examples of these conditions include facial hair that interferes with the facepiece seal or valve function, absence of normally worn dentures, facial deformities (e.g., scars, deep skin creases, prominent cheekbones), or the use of jewelry or headgear that projects under the facepiece seal.

   - **Corrective Glasses or Goggles**. Corrective glasses or goggles, or other personal protective equipment, must be worn in such a way that they do not interfere with the seal of the facepiece to the face. Since eye glasses or goggles may interfere with the seal of half-facepieces, it is strongly recommended that full-facepiece respirators be worn where either corrective glasses or eye protection is required, since corrective lenses can be mounted inside a full-facepiece respirator. In addition, the full-facepiece respirator may be more comfortable, and less cumbersome, than the combination of a half-mask and chemical goggles. OSHA's current standard on respiratory protection, unlike the previous one, allows the use of contact lenses with respirators where the wearer has successfully worn such lenses before.

   - **User Seal Check**. A user seal check (formerly known as a fit check) must be performed every time a tight-fitting respirator is put on or adjusted to ensure proper seating of the respirator to the face. The user seal check conducted must be either the positive and/or negative pressure checks described in Appendix VIII:2-2 of this chapter, or the manufacturer's recommended procedures (when equally protective). If the employee fails the user seal check test, another facepiece must be selected.

     The employee must not have any hair growth (e.g., beard stubble, sideburns, or beard) that comes between the sealing surface of the respirator facepiece and the face, as well as hair that interferes with valve function, or any other condition that might interfere with the face-to-facepiece seal such as jewelry or facial makeup. The user seal check must be used for all respirators on which such checks are possible. If a user seal check cannot be performed on a tight-fitting respirator, the OSHA standard prohibits that respirator from being used.

2. **CONTINUING RESPIRATOR EFFECTIVENESS**.

   - **Skin or Eye Irritation**. Skin or eye irritation can result from wearing a respirator in hot, humid conditions, as well as in contaminated environments. Such irritation can be distressing to workers, causing them to remove or adjust the respirator, or to refrain from wearing the respirator altogether. Therefore, to prevent skin or eye irritation associated with respirator use, employees must be permitted to leave the

respirator use area to wash their faces and respirator facepieces as needed.

- **Filter, Canister, and Cartridge Elements for Air-Purifying Respirators**. Whenever the respirator user can detect vapor or gas breakthrough (by odor, taste, and/or irritation effects), a change in breathing resistance or leakage of the facepiece, the worker must be allowed to leave the respirator use area to replace the respirator or the filter, cartridge, or canister elements. Similarly, employees must be permitted to leave the respirator use area if they are replacing cartridge or canister elements according to a change schedule, or when the end-of-service-life indicator shows that the canister or cartridge(s) must be changed.

- **Repair, Disposal, and Replacement of Respirators**. Since respirators must be in good working condition to function, it is imperative that they not be used if they have been impaired in any way. Impairments include a broken strap, loss of respirator shape, and a face seal that can no longer be maintained. Therefore, respirators that are not properly functioning must be replaced, repaired, or discarded. The respirator manufacturers can supply replacement parts for damaged parts on elastomeric respirators. Only when the respirator has been replaced or repaired can the employee return to the respirator use area.

3. **IMMEDIATELY DANGEROUS TO LIFE OR HEALTH (IDLH) ATMOSPHERES**. Atmospheres are IDLH when they pose an immediate threat to life, would cause irreversible adverse health effects, or would interfere with an individual's ability to escape from a dangerous atmosphere. Care must be exercised in these situations since failure of the respirator to provide the appropriate protection may result in serious injury or death. Consequently, the employer must develop and implement specific procedures for the use of respirators in IDLH atmospheres that include the following provisions:

    - At least one employee (referred to as the "standby employee") is to be located outside the IDLH atmosphere and maintain visual, voice, or signal line communication with the employee(s) in the IDLH atmosphere;

    - The standby employee(s) located outside the IDLH atmosphere must be trained and equipped to provide effective emergency rescue;

    - The employer or authorized designee is to be notified before the standby employees(s) enter the IDLH atmosphere to provide emergency rescue;

    - The employer or authorized designee, once notified of such entry, must provide the necessary assistance appropriate to the situation;

    - Standby employee(s) must be equipped with pressure demand or other positive pressure SCBA, or a pressure demand or other positive pressure supplied-air respirator with auxiliary SCBA; and

    - Standby employee(s) must be equipped with appropriate retrieval equipment for lifting or removing the employee from the hazardous atmosphere, or, when such retrieval equipment cannot be used because it

would increase the overall risk resulting from entry, ensure that equivalent provisions for rescue have been made.

4. **INTERIOR STRUCTURAL FIREFIGHTING**. In the ultra-hazardous situation of interior structural firefighting, firefighters must operate using a buddy system. Safeguards that may be adequate for well-controlled and well-characterized IDLH situations are not adequate in the uncontrolled and unpredictable situation characterized by a burning building. Therefore, in addition to the above safeguards for IDLH atmospheres, the following requirements apply to interior structural fire fighting:

    - Two or more firefighters must always be sent in together and remain in visual or voice contact with one another at all times;
    - At least two standby personnel are to be located outside the fire area; and
    - All personnel engaged in interior structural firefighting must use SCBA.

    The "two-in/two-out" requirement does not take effect until firefighters begin to perform interior structural fire fighting. While the fire is in the incipient stage (as determined by the commander or other person in charge), or when emergency rescue operations are required before the entire team has assembled, the standard does not require two-member teams inside and outside the structure.

XIV.

XV. **MAINTENANCE AND CARE**.

0. **REQUIREMENTS**. The OSHA standard requires that employers provide each respirator user with a respirator that is clean, sanitary, and in good working order. These requirements are a vital part of any successful respiratory protection program. To ensure that the respirator remains serviceable and delivers effective protection, a maintenance program must be in place prior to respirator use.

    The OSHA respirator standard strongly emphasizes the importance of a good maintenance program, but permits its tailoring to the type of facilities, working conditions, and hazards involved. However, all programs are required to include at least:

    - Cleaning and disinfecting procedures;
    - Proper storage;
    - Regular inspections for defects (including leak check); and
    - Repair methods.

    In addition to the OSHA requirements, the manufacturer's instructions for inspection, cleaning, and maintenance of respirators should be consulted to ensure that the respirator continues to function properly. A proper maintenance

program ensures that the worker's respirator remains as effective as when it was new.

1. **CLEANING AND DISINFECTING**.

   - Cleaning and sanitizing respirators are necessary to prevent skin irritation, dermatitis, and to encourage worker acceptance. Where the contaminant is a dust, mist, or fume, build-up on the respirator face-to-facepiece seal or within the respirator will reduce the protection provided by the respirator because the contaminant is in the breathing zone or has compromised the seal. In addition, the build-up of contamination on the respirator can contribute to the deterioration of the respirator's materials, which can lead to reduced protection. Full facepieces must be cleaned to ensure that employees can see through the facepiece.

   - Respirators that are issued for the exclusive use of an employee must be cleaned and disinfected as often as necessary to be maintained in a sanitary condition. Respirators used by more than one employee must be cleaned and disinfected prior to being used by a different individual. Respirators maintained for emergency use as well as respirators used in fit testing and training, must be cleaned and disinfected after each use. The employer must use either the OSHA cleaning and disinfecting procedures recommended in Appendix VIII:2-3 of this chapter or the procedures recommended by the respirator manufacturer, as long as they are equivalent in effectiveness to the OSHA method.

2. **STORAGE**.

   - All respirators must be stored so that they are protected against damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals. When respirators are packed or stored, the facepiece and exhalation valve must be stored in a manner that will prevent deformation. Each respirator should be positioned so that it retains its natural configuration. Synthetic materials and even rubber will warp if stored in an unnatural shape, thus affecting the fitting characteristics of the facepiece.

   - Respirators intended for emergency use must be kept accessible to the work area, but not in an area that might itself be involved in the emergency because such an area may become contaminated or inaccessible. Emergency-use respirators must be stored in compartments or covers that are clearly marked to indicate that they contain emergency respirators, and stored according to any applicable manufacturer instructions.

3. **INSPECTION**. To ensure the continued reliability of respiratory equipment, it must be inspected on a regular basis. The frequency of inspection and the procedures to be followed depend on whether the respirator is intended for non-emergency, emergency, or escape use only.

- The OSHA standard requires that all respirators used in *non-emergency situations* be inspected before each use and during cleaning. Respirators designated for use in an emergency situation are to be inspected at least monthly and in accordance with the manufacturer's instructions, and checked for proper function before and after each use. *Emergency escape-only* respirators must be inspected before being carried into the workplace.

- For all respirators, inspections must include a check of respirator function, tightness of connections, and the condition of the various parts including, but not limited to, the facepiece, head straps, valves, connecting tube, and cartridges, canisters, or filters. In addition, the elastomeric parts must be evaluated for pliability and signs of deterioration.

- For *SCBA's,* which require monthly inspections, the air and oxygen cylinders must be maintained in a fully charged state and recharged when the pressure falls to 90% of the manufacturer's recommended pressure level. In addition, the regulator and warning devices must be inspected to ensure that they function properly.

- For respirators that are maintained for use in emergencies, the OSHA standard requires certifying the respirator by documenting the date that the inspection was performed, the name or signature of the inspector, the findings of the inspection, any required remedial action, and a serial number or other means of identifying the inspected respirator. This information must be provided on a tag or label that is attached to the storage compartment for the respirator, is kept with the respirator, or is stored in the form of inspection reports (paper or electronic). The information must be maintained until it is replaced following a subsequent certification.

4. **REPAIR**. Respirators that fail to pass inspection or are otherwise found to be defective, must be removed from service, and discarded, repaired, or adjusted. Repairs or adjustments to respirators must be done only by appropriately trained personnel, using only the respirator manufacturer's NIOSH-approved parts designed for that respirator. The repairs also must be made in accordance with the manufacturer's recommendations and specifications regarding the type and extent of repairs to be performed. Because components such as reducing and admission valves, regulators, and alarms are complex and essential to the safe functioning of the respirator, they are required to be adjusted and repaired only by the manufacturer or a technician trained by the manufacturer.

XVI. **BREATHING AIR QUALITY AND USE**.

0. **STANDARDS AND SPECIFICATIONS**.

- Breathing air for atmosphere-supplying respirators must be of high purity, meet quality levels for content, and not exceed certain contaminant levels and moisture requirements. Compressed air, compressed oxygen, liquid air, and liquid oxygen used for respiration must be in accordance with the following requirements:

- Compressed and liquid oxygen must meet the United States Pharmacopoeia for medical or breathing oxygen.
- Compressed breathing air must meet at least the requirements for Grade D breathing air as described in the ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989.

- Compressed oxygen must not be used in atmosphere-supplying respirators, including open circuit SCBA's, that have previously used compressed air. This prohibition is intended to prevent fires and explosions that could result if high-pressure oxygen comes into contact with oil or grease that has been introduced to the respirator or the air lines during compressed-air operations. In addition, oxygen in concentrations greater than 23.5% can only be used in equipment designed for oxygen service or distribution.

- Breathing air may be supplied to respirators from cylinders or air compressors. Where cylinders are used, they must be tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR parts 173 and 178). Cylinders of purchased breathing air must have a certificate of analysis from the supplier stating that the air meets the requirements for Grade D breathing air. The moisture content of the compressed air in the cylinder cannot exceed a dew point of -50°F (-45.6°C) at 1 atmosphere pressure. This requirement will prevent respirator valves from freezing, which can occur when excess moisture accumulates on the valves. All breathing gas containers must be marked in accordance with the NIOSH respirator certification standard, 42 CFR part 84.

1. **OTHER SPECIFIC REQUIREMENTS**.

- Where compressors are used for supplying air, the compressor must be constructed and situated so contaminated air cannot enter the air-supply system. The location of the air intake is very important, and must be in an uncontaminated area where exhaust gases from nearby vehicles, the internal combustion engine that is powering the compressor itself (if applicable), or other exhaust gases being ventilated from the plant will not be picked up by the compressor air intake.

- In addition, compressors must be equipped with suitable in-line, air-purifying sorbent beds and filters to further ensure breathing air quality, and to minimize moisture content so that the dew point at 1 atmosphere pressure is 10°F (5.56°C) below the ambient temperature. Sorbent beds and filters must be maintained and replaced or refurbished periodically according to the manufacturer's recommendations, and a tag must be kept at the compressor indicating the most recent change date and the signature of the person authorized by the employer to perform the change.

- For compressors that are not oil-lubricated, the employer must ensure that carbon monoxide levels do not exceed 10 ppm. This requirement can be met by several different methods, including the use of continuous

carbon monoxide alarms, carbon monoxide sorbent materials, proper air intake location in an area free of contaminants, frequent monitoring of air quality, or the use of high-temperature alarms and automatic shutoff devices, as appropriate. Employers have flexibility in selecting the method(s) most appropriate for conditions in their workplace. Since no single method will be appropriate in all situations, several methods may be needed. For example, it may be necessary to combine the use of a carbon monoxide alarm with a carbon monoxide sorbent bed where conditions are such that a reliable carbon monoxide-free area for air intake cannot be found.

- Oil-lubricated compressors can produce carbon monoxide if the oil enters the combustion chamber and is ignited. This problem can be particularly severe in older compressors with worn piston rings and cylinders. Consequently, if an oil-lubricated compressor is used, it must have a high-temperature or carbon monoxide alarm, or both, to monitor carbon monoxide levels. If only a high-temperature alarm is used, the air from the compressor must be tested for carbon monoxide at intervals sufficient to prevent carbon monoxide in the breathing air from exceeding 10 ppm.

- Breathing air couplings must be incompatible with outlets for non-respirable plant air or other gas systems to prevent accidental servicing of air line respirators with non-respirable gases or oxygen. Also, no asphyxiating substance must be allowed in the breathing air lines.

XVII. **PROGRAM LOGISTICS**.

0. **IDENTIFICATION OF FILTERS, CARTRIDGES, AND CANISTERS**. The employer must ensure that all filters, cartridges, and canisters used in the workplace are labeled and color coded with the NIOSH approval label, and ensure that the label is not removed and remains legible.

1. **TRAINING AND INFORMATION**.

   - Employee training is an important part of the respiratory protection program and is essential for correct respirator use. The OSHA respiratory protection standard requires employers to provide training before the employee uses a respirator in the workplace. For the training to be effective, the training information must be comprehensive and presented in an understandable way.

   - Employers should develop training programs based upon the employees' educational level and language background. Such an approach will ensure that all employees receive training that enables them to maximize the effectiveness of the respirators they use. As a result of this training, the employee will be able to understand the operation of the respirator and demonstrate the ability to properly use the respirator.

   - Employee training must include a discussion of why the use of the respirator is necessary. Such training would address the identification of the hazards involved, the extent of employee exposures to those hazards, and the potential health effects of such exposures.

- Information regarding the consequences of improper fit, usage, or maintenance on respirator effectiveness must also be provided to employees. Inadequate attention to any of these program elements would obviously defeat the effectiveness of the respirator. Proper fit, usage, and maintenance of respirators are critical to ensure employee protection.

- Employees must also be provided with an explanation of the limitations and capabilities of the respirator selected for employee use. A discussion of the limitations and capabilities of the respirator must address how the respirator operates. This training would include, for example, an explanation of how the respirator provides protection by either filtering the air, absorbing the vapor or gas, or providing clean air from an uncontaminated source. Where appropriate, it should include limitations on the use of the equipment, such as prohibitions against using an air-purifying respirator in IDLH atmospheres and an explanation of why such a respirator should not be used in these situations.

- Employees must also know how to use the respirator effectively in emergency situations, including those in which the respirator malfunctions. Comprehensive training is necessary where respirators are used in IDLH situations, including oxygen-deficient atmospheres such as those that occur in fire fighting, rescue operations, and confined-area entry.

- Training must include the procedures for inspecting the respirator, donning and removing it, checking the fit and respirator seal, and actually wearing the respirator. Employees must also be capable of recognizing any problems that may threaten the continued protective capability of the respirator. The training must include the steps employees are to follow if they discover any problems during inspection, that is, who the problems are to be reported to and where they can obtain replacement equipment if necessary.

- Instructions must be given to respirator users regarding the proper procedures for maintenance and storage of respirators. The extent of training may vary according to workplace conditions. In some cases, where employees are responsible for performing some or all respirator maintenance and for storing respirators while not in use, detailed training in maintenance and storage procedures may be necessary. In other facilities, where specific personnel or central repair facilities are assigned to perform these tasks, most employees may need to be informed only of the maintenance and storage procedures without having to learn detailed technical information. By providing this training, respirator users will be able to identify respirator deficiencies that can result from improper maintenance and storage of respirators so that they will not use improperly functioning respirators.

- The training program must also provide employees with medical information that is sufficient for them to recognize the signs and symptoms of medical conditions (e.g., shortness of breath, dizziness) that may limit or prevent the effective use of respirators. Employee knowledge of this information is important to ensure implementation of a successful respirator program.

- In addition to specific training requirements regarding the proper use of respirators, employees must be informed of the general requirements of the OSHA respiratory protection standard. This discussion could simply inform employees that employers are obligated to develop a written program, properly select respirators, evaluate respirator use and correct deficiencies in use, conduct medical evaluations, provide for the maintenance, storage, and cleaning of respirators, and retain and provide access to specific records. Thus, employees will know in general what the employer's obligations are under the standard with respect to employee protection.

- At a minimum, annual training is required by the OSHA respiratory protection standard. With few exceptions, a new employee must be provided with respirator training prior to using a respirator in the workplace. OSHA believes that annual training is necessary and appropriate to ensure that employees know about the respiratory protection program and that they cooperate and actively participate in the program. Training and interaction with respirator instructors on at least an annual basis reinforces employee knowledge about the correct use of respirators and other pertinent elements of the respiratory protection program. It also builds employee confidence when using respirators.

- Under some conditions, additional training will be required to supplement the annual training. Circumstances which require additional training include situations where changes in the workplace (e.g., process changes, increase in exposure, emergence of new hazards) or the type of respirator used by the employee render previous training obsolete. Additional training is also required when the employee has not retained the requisite understanding or skill to use the respirator properly, or when any other situation arises in which retraining appears necessary.

2. **PROGRAM EVALUATION**.

- The employer must conduct evaluations of the workplace as necessary to ensure that the provisions of the current written respirator program are being properly implemented for all employees required to use respirators. In addition, evaluations must be conducted to ensure the continued effectiveness of the program. Evaluations of the workplace will determine whether the correct respirators are being used and worn properly, and will also serve to determine whether the training program is effective.

- The employer must regularly consult with employees wearing respirators to ascertain the employees' views on program effectiveness and to identify any problems. This assessment must determine if the respirators are properly fitted. It must also evaluate whether: employees are able to wear the respirators without interfering with effective workplace performance; respirators are correctly selected for the hazards encountered; respirators are being worn when necessary; and respirators are being maintained properly. The employer must correct any problems associated with wearing a respirator that are identified by employees, or that are revealed during any other part of this evaluation.

3. **RECORDKEEPING**. The OSHA respiratory protection standard requires the employer to establish and retain written information regarding medical evaluations, fit testing, and the respirator program. This information will promote employee involvement in the respirator program, assist the employer in auditing the adequacy of the program, and provide a record for compliance determinations by OSHA.

    - The employer must retain a medical evaluation record for each employee subject to medical evaluation. This record is to include the result of the medical questionnaire and, if applicable, a copy of the PLHCP's written opinion and recommendations, including the results of relevant medical examinations and tests. Records of medical evaluations must be retained and made available as required by 29 CFR 1910.1020, OSHA's Access to Employee Exposure and Medical Records rule.

    - Fit test records must be retained for respirator users until the next fit test is administered. These records consist of:

        - Name or identification of the employee tested;
        - Type of fit test performed (QLFT, QNFT -- irritant smoke, saccharin, etc.);
        - Make, model, and size of the respirator fitted;
        - Date of the fit test;
        - Pass/fail results if a QLFT is used; or
        - Fit factor and strip chart recording or other record of the test results if quantitative fit testing was performed.

    - If the employee's use of a respirator is discontinued (e.g., because of a change of duties or successful implementation of engineering controls), fit test records need not be retained for the employee. Fit test records must be maintained to determine whether annual fit testing has been done, and whether the employee who was tested passed the QLFT, or passed the QNFT with a fit factor that was appropriate for the type of respirator being used.

    - All written materials required to be maintained under the recordkeeping requirements must be made available, upon request, to the employee who is subject of the records and to the Assistant Secretary for OSHA or designee for examination and copying.

4. **NIOSH GUIDELINES FOR THE SELECTION AND USE OF PARTICULATE RESPIRATORS**. In June 1995, NIOSH updated and modernized the Federal Regulation for certifying air-purifying particulate respirators [42 CFR part 84]. As a consequence of this new regulation, NIOSH developed a User's Guide to familiarize respirator users with the new Part 84 certification regulations for particulate respirators, and to provide guidance for the selection and use of the new particulate respirators. The new regulation became effective on July 10, 1995, and replaces 30 CFR part 11 under which NIOSH and the Mine Safety and Health Administration (MSHA) jointly certified respirators before that date. The respirators certified under this new regulation are tested under much more demanding conditions than under the old regulation to provide increased worker

protection. See Appendix VIII:2-4 of this chapter for a summary of the NIOSH Guide to the Selection and Use of Particulate Respirators Certified Under 42 CFR 84.

APPENDIX VIII: 2-1. GLOSSARY.

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

Assigned protection factor (APF) [reserved]

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

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

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

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

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

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

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

Filtering facepiece (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.

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

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

Fit test the use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual. See also "Qualitative fit test (QLFT)" and "Quantitative fit test (QNFT)."

Helmet a rigid respiratory inlet covering that also provides head protection against impact and penetration.

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 and larger. The equivalent NIOSH 42 CFR part 84 particulate filters are the N100, R100, and P100 filters.

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) an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

Interior structural firefighting the physical activity of fire suppression, rescue or both, inside of buildings or enclosed structures that are involved in a fire situation beyond the incipient stage.

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

Maximum use concentration (MUC) [reserved]

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.

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

Physician or other licensed health care professional (PLHCP) an individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide, or be delegated the responsibility to provide, some or all of the health care services required by 29 CFR 1910.134(e), "Medical evaluation."

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

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 is reduced inside the facepiece by inhalation.

Qualitative fit test (QLFT) a pass/fail fit test to assess the adequacy of respiratory fit that relies on the individual's response to the test agent.

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

Respiratory inlet covering the portion of a respirator that forms the protective barrier between the user's respiratory tract and an air-purifying device or breathing air source, or both. It may be a facepiece, helmet, hood, suit, or a mouthpiece respirator with nose clamp.

Self-contained breathing apparatus (SCBA) 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.

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

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

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

APPENDIX VIII:2-2. USER SEAL CHECK.

A. Facepiece Positive and/or Negative Pressure Checks

Positive Pressure Check

Close off the exhalation valve and exhale gently into the facepiece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal. For most respirators, this method of leak testing requires the wearer to first remove the exhalation valve cover before closing off the exhalation valve, and then carefully replacing it after the test.

Negative Pressure Check

Close off the inlet opening of the canister or cartridge(s) by covering it with the palm of the hand(s) or by replacing the filter seal(s). Inhale gently so that the facepiece collapses slightly, and hold your breath for ten seconds. The design of the inlet opening of some cartridges cannot be effectively covered with the palm of the hand, which requires that the test be performed by covering the inlet opening of the cartridge with a thin latex or nitrile glove. If the facepiece remains in its slightly collapsed condition, and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

B. Manufacturer's Recommended User Seal Check Procedures

The respirator manufacturer's recommended procedures for performing a user seal check may be used instead of the positive and/or negative pressure check procedures, provided that the employer demonstrates that the manufacturer's procedures are equally effective in detecting seal leakage compared to the positive pressure and negative pressure checks described above.

APPENDIX VIII:2-3. RECOMMENDED PROCEDURES FOR CLEANING RESPIRATORS.

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

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

B. Wash components in warm (43°C/110°F maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.

C. Rinse components thoroughly in clean, warm (43°C/110°F maximum), preferably running, water. Drain the components.

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

- Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 43°C/110°F; or
- Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodine/100 cc of 45% alcohol) to one liter of water at 43°C/110°F; or
- Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.

E. Rinse components thoroughly in clean, warm (43°C/110°F maximum), preferably running, water. Drain the components. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on facepieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.

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

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

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

APPENDIX VIII:2-4. NIOSH GUIDE TO THE SELECTION AND USE OF PARTICULATE RESPIRATORS CERTIFIED UNDER 42 CFR 84.

Summary for Respirator Users

This summary presents a brief overview of what the respirator user needs to know about the new categories of particulate respirators certified by the National Institute for Occupational Safety and Health (NIOSH).

NIOSH has developed a new set of regulations in 42 CFR 84 (also referred to as "Part 84") for testing and certifying nonpowered, air-purifying, particulate-filter respirators. The new Part 84 respirators have passed a more demanding certification test than the old respirators (e.g., dust and mist [DM], dust, fume and mist [DFM], spray paint, pesticide, etc.) certified under 30 CFR 11 (also referred to as "Part 11").

Changes in the new regulations involve only nonpowered, air-purifying, particulate-filter respirators. Certification requirements for all other classes of respirators (e.g., chemical cartridges, self-contained breathing apparatus [SCBA], airlines, gas masks without a particulate filter, powered air-purifying respirators [PAPR's] equipped with high-particulate air [HEPA] filters, etc.) have been transferred to Part 84 without change. Until further notice, the Occupational Safety and Health Administration (OSHA) is allowing the continued use of Part 11 particulate-filter respirators. Under Part 84, NIOSH is allowing manufacturers to continue selling and shipping Part 11 particulate filters as NIOSH-certified until July 10, 1998.

The new Part 84 regulation provides for nine classes of filters (three levels of filter efficiency, each with three categories of resistance to filter efficiency degradation). The three levels of filter efficiency are 95%, 99%, and 99.97%. The three categories of resistance to filter efficiency degradation are labeled N, R, and P. The class of filter will be clearly marked on the filter, filter package, or respirator box. For example, a filter marked N95 would mean an N-series filter that is at least 95% efficient. Chemical cartridges that include particulate filter elements will carry a similar marking that pertains only to the particulate filter element.

Filter efficiency is the stated percentage of particles removed from the air. Filter efficiency degradation is defined as a lowering of filter efficiency or a reduction in the ability of the filter to remove particles as a result of workplace exposure.

The new classes of nonpowered particulate respirators require new decision logic for selection of the proper respirator. The selection process for using the new particulate classification is outlined as follows and is discussed in Section II of *NIOSH Guide to the Selection and Use of Particulate Respirators Certified Under 42 CFR 84:*

1. The selection of N-, R-, and P-series filters depends on the presence or absence of oil particles, as follows:

- If no oil particles are present in the work environment, use a filter of any series (i.e., N-, R-, or P-series).
- If oil particles (e.g., lubricants, cutting fluids, glycerine, etc.) are present, use an R-or P-series filter.
  Note: N-series filters cannot be used if oil particles are present.
- If oil particles are present and the filter is to be used for more than work shift, use only a P-series filter.
  Note: To help you remember the filter series, use the following guide:
  N for *Not* resistant to oil
  R for *Resistant* to oil
  P for oil-*Proof*

2. Selection of filter efficiency (i.e., 95%, 99%, or 99.97%) depends on how much filter leakage can be accepted. Higher filter efficiency means lower filter leakage.

3. The choice of facepiece depends on the level of protection needed -- that is, the assigned protection factor (APF) needed.

Call 1-800-35-NIOSH (1-800-356-4674) for additional information or for free single copies of the complete document **NIOSH Guide to the Selection and Use of Particulate Respirators Certified Under 42 CFR 84** [DHHS (NIOSH) Publication No. 96-101].

NIOSH is the National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Public Health Service, U.S. Department of Health and Human Services.

RESPIRATORY PROTECTION CONTROL PROGRAM

Company Name:_____ (name of shop)

Respirator Program Coordinator: The respirator program coordinator is responsible for ensuring that all the requirements of this program are fully implemented. The person designated as the coordinator is:

_____ (name of person responsible for this task)

1. Purpose

This program has been developed to assure appropriate respiratory protection for the employees of this facility. This program has been developed in accordance with the OSHA respiratory protection standard, 29 CFR 1910.134.

To protect the health of the employee, respirators shall be provided to employees when needed for respiratory protection. The respirator program coordinator will be responsible for ensuring that proper procedures are followed for selecting respiratory protection. Only NIOSH approved respirators will be used at this facility.

2. Respirator Usage

Where elastomeric facepiece respirators are to be used, the employees will be provided with a selection of respirators of at least three sizes for each type of facepiece, half-face or full-face. The selection for this facility will be:_____ (fill in types of respirators)

In addition, the following shall be determined by the respiratory protection program coordinator:

(1) the nature of the hazard

(2) the physical and chemical properties of the contaminant

(3) adverse health effects of the respiratory hazard

(4) hazardous exposure levels

(5) results of sampling of airborne concentrations of contaminants

(6) respirator fit test results

(7) warning properties of the hazardous chemical

(8) the physical characteristics, functional capabilities, and limitations of the various types of respirators

Respirators, when they are required by the employer to be worn, will be provided to the employees at no cost.

Employees who need to wear full face respirators and who need corrective glasses will be provided with insert glasses for fitting in the full face respirator.

3. Medical Evaluations

Medical evaluations will be provided to employees who are required to wear respirators. The medical evaluations will be conducted by employee's doctor.

Records of the evaluations will be maintained by_____ (name of person responsible for this task). The physician will provide the company with an opinion stating whether the employee may wear a respirator.

4. Fit Testing of Respirators

For all employees required to wear a respirator, a fit test will be conducted before initial use of the respirator and whenever a different make or size is used, then semi-annually thereafter. The fit test will be conducted in the following manner: *Qualitative Fit Test, or by a physician.*

In addition, employees will be refitted for respirators as necessary when visual changes have been noticed, such as facial scarring, weight gain or loss, and cosmetic surgery. The respirator program coordinator will assure that this is accomplished through surveillance of the workplace and consultation with supervisor(s).

Records of respirator fit-test results will be maintained by _____(name of person responsible for this task) for a period of ten years.

5. Training

Employees will be trained concerning the usage of respirators as well as the limitations of respirators. Training will consist of the following:

1) Providing employees the opportunity to handle the respirator, have it fitted properly, test its facepiece-to-face seal, wear it in normal air for a long familiarity period, and to wear it in a test atmosphere,

2) Demonstrations and practice concerning how the respirator will be worn, how to adjust it, and how to determine if it fits properly,

3) Providing an understanding concerning when the respirator is to be worn as well as the limitations of the respirator.

Employees will not wear respirators which require a face seal when there is interfering facial hair. Such employees will be provided with respirators which do not require a face seal, such as one with a hood or helmet.

Employees who must wear corrective glasses and a full face respirator will be provided with corrective glasses inserts for the full face respirator. Such corrective glasses inserts will be provided at no cost to the employee.

The following procedures are in place to ensure the periodic review of the effectiveness of the respirator program:

Bi-monthly, on Friday afternoons, respirators will be inspected by the Respirator Program Coordinator for wear and trear of the respirators along with mandatory weekly cleaning of the respirators. Coordinator will hold a meeting at the same time with the employee(s) as to mandatory wearing of the respirators in an hazardous environment. Meetings will be recorded in a log book that is maintained in the storage cabinet with the respirators.

Technical Data Bulletin

#150, September, 2001 — Reusable Respirators

Issue Date 11/01/01

Inspection, Cleaning and Storage Procedures for 3M Reusable Respirators

Inspection

3M™ 6000 and 7000 Series Respirators must be inspected before each use to ensure good operating condition. The facepiece must be repaired or replaced if there are damaged or defective parts. The following inspection procedure is suggested:

1. Check facepiece for cracks, tears and dirt. Be certain facepiece, especially faceseal area, is not distorted.

2. Examine inhalation valves for signs of distortion, cracking or tearing.

3. Make sure that head straps are intact and have good elasticity.

4. Examine all plastic parts for signs of cracking or fatiguing. Make sure filter gaskets or seal areas are in good condition.

5. Remove exhalation valve cover and examine exhalation valve and valve seat for signs of dirt, distortion, cracking or tearing. Replace exhalation valve cover.

6. Inspect lens of full facepiece for any damage that may impair respirator performance or vision.

Cleaning and Storage

Cleaning is recommended after each use. 3M™ Respirator Cleaning Wipes 504 may be used as an interim method in the cleaning schedule for individually assigned respirators, but they must not be the only method in place. During fit-testing, wipes may also be used between employees being tested. However, these respirators must be thoroughly cleaned at the end of each day, using procedures in appendix B-2 of 29 CFR 1910.134.

⚠ WARNING

Do not clean with solvents. Cleaning with solvents may degrade some respirator components and reduce respirator effectiveness. Inspect all respirator components before each use to ensure good operating condition. Failure to do so may result in sickness or death.

1. Remove cartridges and filters.

2. Clean facepiece (excluding filters and cartridges) by immersing in warm cleaning solution, water temperature not to exceed 120º F (49º C), and scrub with soft brush until clean. Add neutral detergent if necessary. Do not use cleaners containing lanolin or other oils.

3. Disinfect facepiece by soaking in a solution of quaternary ammonia disinfectant or sodium hypochlorite (1 oz [30 ML] household bleach in 2 gallons [7.5 L] of water), or other disinfectant.

4. Rinse in fresh, warm water and air dry in noncontaminated atmosphere.

5. Respirator components must be inspected prior to each use. A respirator with any damaged or deteriorated components must be repaired or discarded.

6. The cleaned respirator should be stored away from contaminated areas when not in use.

NOTE: The above information is also outlined in the users instructions. Additionally, see specific product user instructions packaged with each respirator facepiece for additional information.

3M Occupational Health and Environmental Safety Division
3M Center, Building 235-2W-70
St. Paul, MN 55144-1000

For more Information:

In the U.S., contact:

Technical Assistance
1-800-243-4630

Sales Assistance/Local Distributor
1-800-328-1667

Fax On Demand
1-800-646-1655

Internet
www.3M.com/occsafety

E-mail
occsafety@mmm.com

For other 3M products
1-888-3M HELPS

In Canada, contact:
3M Canada Company, OH&ESD
P.O. Box 5757
London, Ontario N6A 4T1

Technical Assistance (Canada only)
1-800-267-4414

Sales Assistance
1-800-265-1840, ext. 6137

Internet
www.3M.com/CA/occsafety

3M Canada E-mail
ohes@ca.mmm.com

Technical Assistance In Mexico
01-800-712-0646

Technical Assistance In Brazil
0800-550705

For all other OUS locations:
1-651-732-6530

Fit Testing Procedures (Mandatory). - 1910.134 App A

Regulations (Standards - 29 CFR) - Table of Contents

- **Part Number:** 1910
- **Part Title:** Occupational Safety and Health Standards
- **Subpart:** I
- **Subpart Title:** Personal Protective Equipment
- **Standard Number:** 1910.134 App A
- **Title:** Fit Testing Procedures (Mandatory).

Appendix A to § 1910.134: Fit Testing Procedures (Mandatory)

Part I. OSHA-Accepted Fit Test Protocols

A. Fit Testing Procedures -- General Requirements

The employer shall conduct fit testing using the following procedures. The requirements in this appendix apply to all OSHA-accepted fit test methods, both QLFT and QNFT.

1. The test subject shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.

2. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to determine an acceptable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subject's formal training on respirator use, because it is only a review.

3. The test subject shall be informed that he/she is being asked to select the respirator that provides the most acceptable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.

4. The test subject shall be instructed to hold each chosen facepiece up to the face and eliminate those that obviously do not give an acceptable fit.

5. The more acceptable facepieces are noted in case the one selected proves unacceptable; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in the following item A.6. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.

6. Assessment of comfort shall include a review of the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:
(a) Position of the mask on the nose

(b) Room for eye protection

(c) Room to talk

(d) Position of mask on face and cheeks
7. The following criteria shall be used to help determine the adequacy of the respirator fit:
(a) Chin properly placed;

(b) Adequate strap tension, not overly tightened;

(c) Fit across nose bridge;

(d) Respirator of proper size to span distance from nose to chin;

(e) Tendency of respirator to slip;

(f) Self-observation in mirror to evaluate fit and respirator position.
8. The test subject shall conduct a user seal check, either the negative and positive pressure seal checks described in Appendix B-1 of this section or those recommended by the respirator manufacturer which provide equivalent protection to the procedures in Appendix B-1. Before conducting the negative and positive pressure checks, the subject shall be told to seat the mask on the face by moving the head from side-to-side and up and down slowly while taking in a few slow deep breaths. Another facepiece shall be selected and retested if the test subject fails the user seal check tests.

9. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface, such as stubble beard growth, beard, mustache or sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed.

10. If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician or other licensed health care professional, as appropriate, to determine whether the test subject can wear a respirator while performing her or his duties.

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

12. Exercise regimen. Prior to the commencement of the fit test, the test subject shall be given a description of the fit test and the test subject's responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.

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

14. Test Exercises.
(a) Employers must perform the following test exercises for all fit testing methods prescribed in this appendix, except for the CNP quantitative fit testing protocol and the CNP REDON quantitative fit testing protocol. For these two protocols, employers must ensure that the test subjects (***i.e.***, employees) perform the exercise procedure specified in Part I.C.4(b) of this appendix for the CNP quantitative fit testing protocol, or the exercise procedure described in Part I.C.5(b) of this appendix for the CNP REDON quantitative fit-testing protocol. For the remaining fit testing methods, employers must ensure that employees perform the test exercises in the appropriate test environment in the following manner:
(1) Normal breathing. In a normal standing position, without talking, the subject shall breathe normally.

(2) Deep breathing. In a normal standing position, the subject shall breathe slowly and

deeply, taking caution so as not to hyperventilate.

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

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

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

Rainbow Passage

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

(6) Grimace. The test subject shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT)

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

(8) Normal breathing. Same as exercise (1).
(b) Each test exercise shall be performed for one minute except for the grimace exercise which shall be performed for 15 seconds. The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried. The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

B. Qualitative Fit Test (QLFT) Protocols

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

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

Note: This protocol is not appropriate to use for the fit testing of particulate respirators. If used to fit test particulate respirators, the respirator must be equipped with an organic vapor filter.
(a) Odor Threshold Screening

Odor threshold screening, performed without wearing a respirator, is intended to determine if the individual tested can detect the odor of isoamyl acetate at low levels.
(1) Three 1 liter glass jars with metal lids are required.

(2) Odor-free water (e.g., distilled or spring water) at approximately 25 deg. C (77 deg. F) shall be used for the solutions.

(3) The isoamyl acetate (IAA) (also known at isopentyl acetate) stock solution is prepared by adding 1 ml of pure IAA to 800 ml of odor-free water in a 1 liter jar, closing the lid and shaking for 30 seconds. A new solution shall be prepared at least weekly.

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

(5) The odor test solution is prepared in a second jar by placing 0.4 ml of the stock solution into 500 ml of odor-free water using a clean dropper or pipette. The solution shall be shaken for 30 seconds and allowed to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution shall be used for only one day.

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

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

(8) The following instruction shall be typed on a card and placed on the table in front of the two test jars (i.e., 1 and 2): "The purpose of this test is to determine if you can smell banana oil at a low concentration. The two bottles in front of you contain water. One of these bottles also contains a small amount of banana oil. Be sure the covers are on tight, then shake each bottle for two seconds. Unscrew the lid of each bottle, one at a time, and sniff at the mouth of the bottle. Indicate to the test conductor which bottle contains banana oil."

(9) The mixtures used in the IAA odor detection test shall be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.

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

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

(b) Isoamyl Acetate Fit Test

(1) The fit test chamber shall be a clear 55-gallon drum liner suspended inverted over a 2-foot diameter frame so that the top of the chamber is about 6 inches above the test subject's head. If no drum liner is available, a similar chamber shall be constructed using plastic sheeting. The inside top center of the chamber shall have a small hook attached.

(2) Each respirator used for the fitting and fit testing shall be equipped with organic vapor cartridges or offer protection against organic vapors.

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

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

(5) Upon entering the test chamber, the test subject shall be given a 6-inch by 5-inch piece

of paper towel, or other porous, absorbent, single-ply material, folded in half and wetted with 0.75 ml of pure IAA. The test subject shall hang the wet towel on the hook at the top of the chamber. An IAA test swab or ampule may be substituted for the IAA wetted paper towel provided it has been demonstrated that the alternative IAA source will generate an IAA test atmosphere with a concentration equivalent to that generated by the paper towel method.

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

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

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

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

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

The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.
(a) Taste threshold screening. The saccharin taste threshold screening, performed without wearing a respirator, is intended to determine whether the individual being tested can detect the taste of saccharin.
(1) During threshold screening as well as during fit testing, subjects shall wear an enclosure about the head and shoulders that is approximately 12 inches in diameter by 14 inches tall with at least the front portion clear and that allows free movements of the head when a respirator is worn. An enclosure substantially similar to the 3M hood assembly, parts # FT 14 and # FT 15 combined, is adequate.

(2) The test enclosure shall have a 3/4-inch (1.9 cm) hole in front of the test subject's nose and mouth area to accommodate the nebulizer nozzle.

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

(4) Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the threshold check solution into the enclosure. The nozzle is directed away from the nose and mouth of the person. This nebulizer shall be clearly marked to distinguish it from the fit test solution nebulizer.

(5) The threshold check solution is prepared by dissolving 0.83 gram of sodium saccharin

USP in 100 ml of warm water. It can be prepared by putting 1 ml of the fit test solution (see (b)(5) below) in 100 ml of distilled water.

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

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

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

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

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

(11) If the saccharin is not tasted after 30 squeezes (step 10), the test subject is unable to taste saccharin and may not perform the saccharin fit test.

Note to paragraph 3. (a): If the test subject eats or drinks something sweet before the screening test, he/she may be unable to taste the weak saccharin solution.

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

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

(14) The nebulizer shall be thoroughly rinsed in water, shaken dry, and refilled at least each morning and afternoon or at least every four hours.
(b) Saccharin solution aerosol fit test procedure.
(1) The test subject may not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.

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

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

(4) A second DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent is used to spray the fit test solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution nebulizer.

(5) The fit test solution is prepared by adding 83 grams of sodium saccharin to 100 ml of warm water.

(6) As before, the test subject shall breathe through the slightly open mouth with tongue

extended, and report if he/she tastes the sweet taste of saccharin.

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

(8) After generating the aerosol, the test subject shall be instructed to perform the exercises in section I. A. 14. of this appendix.

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

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

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

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

4. Bitrex™ (Denatonium Benzoate) Solution Aerosol Qualitative Fit Test Protocol

The Bitrex™ (Denatonium benzoate) solution aerosol QLFT protocol uses the published saccharin test protocol because that protocol is widely accepted. Bitrex is routinely used as a taste aversion agent in household liquids which children should not be drinking and is endorsed by the American Medical Association, the National Safety Council, and the American Association of Poison Control Centers. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

(a) Taste Threshold Screening.

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

(1) During threshold screening as well as during fit testing, subjects shall wear an enclosure about the head and shoulders that is approximately 12 inches (30.5 cm) in diameter by 14 inches (35.6 cm) tall. The front portion of the enclosure shall be clear from the respirator and allow free movement of the head when a respirator is worn. An enclosure substantially similar to the 3M hood assembly, parts # FT 14 and # FT 15 combined, is adequate.

(2) The test enclosure shall have a \3/4\ inch (1.9 cm) hole in front of the test subject's nose and mouth area to accommodate the nebulizer nozzle.

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

(4) Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the Threshold Check Solution into the enclosure. This Nebulizer shall be clearly marked to distinguish it from the fit test solution nebulizer.

(5) The Threshold Check Solution is prepared by adding 13.5 milligrams of Bitrex to 100 ml of 5% salt (NaCl) solution in distilled water.

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

(7) An initial ten squeezes are repeated rapidly and then the test subject is asked whether the Bitrex can be tasted. If the test subject reports tasting the bitter taste during the ten squeezes, the screening test is completed. The taste threshold is noted as ten regardless of the number of squeezes actually completed.

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

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

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

(11) If the Bitrex is not tasted after 30 squeezes (step 10), the test subject is unable to taste Bitrex and may not perform the Bitrex fit test.

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

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

(14) The nebulizer shall be thoroughly rinsed in water, shaken to dry, and refilled at least each morning and afternoon or at least every four hours.
(b) Bitrex Solution Aerosol Fit Test Procedure.
(1) The test subject may not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.

(2) The fit test uses the same enclosure as that described in 4. (a) above.

(3) The test subject shall don the enclosure while wearing the respirator selected according to section I. A. of this appendix. The respirator shall be properly adjusted and equipped with any type particulate filter(s).

(4) A second DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent is used to spray the fit test solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution nebulizer.

(5) The fit test solution is prepared by adding 337.5 mg of Bitrex to 200 ml of a 5% salt (NaCl) solution in warm water.

(6) As before, the test subject shall breathe through his or her slightly open mouth with tongue extended, and be instructed to report if he/she tastes the bitter taste of Bitrex.

(7) The nebulizer is inserted into the hole in the front of the enclosure and an initial concentration of the fit test solution is sprayed into the enclosure using the same number of squeezes (either 10, 20 or 30 squeezes) based on the number of squeezes required to elicit a

taste response as noted during the screening test.

(8) After generating the aerosol, the test subject shall be instructed to perform the exercises in section I. A. 14. of this appendix.

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

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

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

5. Irritant Smoke (Stannic Chloride) Protocol

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

(a) General Requirements and Precautions

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

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

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

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

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

(b) Sensitivity Screening Check

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

(1) The test operator shall break both ends of a ventilation smoke tube containing stannic chloride, and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute, or an aspirator squeeze bulb. The test operator shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.

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

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

determine that he/she can detect it.
(c) Irritant Smoke Fit Test Procedure
(1) The person being fit tested shall don the respirator without assistance, and perform the required user seal check(s).

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

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

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

(5) The exercises identified in section I.A. 14. of this appendix shall be performed by the test subject while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of six inches.

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

(7) Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.

(8) If a response is produced during this second sensitivity check, then the fit test is passed.

C. Quantitative Fit Test (QNFT) Protocols

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

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

(b) The employer shall ensure that QNFT equipment is kept clean, and is maintained and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.
2. Generated Aerosol Quantitative Fit Testing Protocol
(a) Apparatus.
(1) Instrumentation. Aerosol generation, dilution, and measurement systems using particulates (corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS] or sodium chloride) as test aerosols shall be used for quantitative fit testing.

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

(3) When testing air-purifying respirators, the normal filter or cartridge element shall be replaced with a high efficiency particulate air (HEPA) or P100 series filter supplied by the same manufacturer.

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

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

(6) The sampling port on the test specimen respirator shall be placed and constructed so that no leakage occurs around the port (e.g., where the respirator is probed), a free air flow is allowed into the sampling line at all times, and there is no interference with the fit or performance of the respirator. The in-mask sampling device (probe) shall be designed and used so that the air sample is drawn from the breathing zone of the test subject, midway between the nose and mouth and with the probe extending into the facepiece cavity at least 1/4 inch.

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

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

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

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

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

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

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

(14) Test respirators shall be maintained in proper working order and be inspected regularly for deficiencies such as cracks or missing valves and gaskets.
(b) Procedural Requirements.
(1) When performing the initial user seal check using a positive or negative pressure check,

the sampling line shall be crimped closed in order to avoid air pressure leakage during either of these pressure checks.

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

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

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

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

(6) Respirator restraining straps shall not be over-tightened for testing. The straps shall be adjusted by the wearer without assistance from other persons to give a reasonably comfortable fit typical of normal use. The respirator shall not be adjusted once the fit test exercises begin.

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

(8) Calculation of fit factors.
(i) The fit factor shall be determined for the quantitative fit test by taking the ratio of the average chamber concentration to the concentration measured inside the respirator for each test exercise except the grimace exercise.

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

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

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

(B) Maximum peak penetration method means the method of determining test agent penetration in the respirator as determined by strip chart recordings of the test. The highest peak penetration for a given exercise is taken to be representative of average penetration into the respirator for that exercise.

(C) Integration by calculation of the area under the individual peak for each exercise except the grimace exercise. This includes computerized integration.

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

$$\text{Overall Fit Factor} = \frac{\text{Number of exercises}}{1/ff_1 + 1/ff_2 + 1/ff_3 + 1/ff_4 + 1/ff_5 + 1/ff_6 + 1/ff_7 + 1/ff_8}$$

Where ff_1, ff_2, ff_3, etc. are the fit factors for exercises 1, 2, 3, etc.

(9) The test subject shall not be permitted to wear a half mask or quarter facepiece respirator unless a minimum fit factor of 100 is obtained, or a full facepiece respirator unless a minimum fit factor of 500 is obtained.

(10) Filters used for quantitative fit testing shall be replaced whenever increased breathing resistance is encountered, or when the test agent has altered the integrity of the filter media.
3. Ambient aerosol condensation nuclei counter (CNC) quantitative fit testing protocol.

The ambient aerosol condensation nuclei counter (CNC) quantitative fit testing (Portacount ™) protocol quantitatively fit tests respirators with the use of a probe. The probed respirator is only used for quantitative fit tests. A probed respirator has a special sampling device, installed on the respirator, that allows the probe to sample the air from inside the mask. A probed respirator is required for each make, style, model, and size that the employer uses and can be obtained from the respirator manufacturer or distributor. The CNC instrument manufacturer, TSI Inc., also provides probe attachments (TSI sampling adapters) that permit fit testing in an employee's own respirator. A minimum fit factor pass level of at least 100 is necessary for a half-mask respirator and a minimum fit factor pass level of at least 500 is required for a full facepiece negative pressure respirator. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.
(a) Portacount Fit Test Requirements.
(1) Check the respirator to make sure the sampling probe and line are properly attached to the facepiece and that the respirator is fitted with a particulate filter capable of preventing significant penetration by the ambient particles used for the fit test (e.g., NIOSH 42 CFR 84 series 100, series 99, or series 95 particulate filter) per manufacturer's instruction.

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

(3) Check the following conditions for the adequacy of the respirator fit: Chin properly placed; Adequate strap tension, not overly tightened; Fit across nose bridge; Respirator of proper size to span distance from nose to chin; Tendency of the respirator to slip; Self-observation in a mirror to evaluate fit and respirator position.

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

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

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

appendix.

(7) After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.
(b) Portacount Test Instrument.
(1) The Portacount will automatically stop and calculate the overall fit factor for the entire set of exercises. The overall fit factor is what counts. The Pass or Fail message will indicate whether or not the test was successful. If the test was a Pass, the fit test is over.

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

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

The CNP protocol provides an alternative to aerosol fit test methods. The CNP fit test method technology is based on exhausting air from a temporarily sealed respirator facepiece to generate and then maintain a constant negative pressure inside the facepiece. The rate of air exhaust is controlled so that a constant negative pressure is maintained in the respirator during the fit test. The level of pressure is selected to replicate the mean inspiratory pressure that causes leakage into the respirator under normal use conditions. With pressure held constant, air flow out of the respirator is equal to air flow into the respirator. Therefore, measurement of the exhaust stream that is required to hold the pressure in the temporarily sealed respirator constant yields a direct measure of leakage air flow into the respirator. The CNP fit test method measures leak rates through the facepiece as a method for determining the facepiece fit for negative pressure respirators. The CNP instrument manufacturer Occupational Health Dynamics of Birmingham, Alabama also provides attachments (sampling manifolds) that replace the filter cartridges to permit fit testing in an employee's own respirator. To perform the test, the test subject closes his or her mouth and holds his/her breath, after which an air pump removes air from the respirator facepiece at a pre-selected constant pressure. The facepiece fit is expressed as the leak rate through the facepiece, expressed as milliliters per minute. The quality and validity of the CNP fit tests are determined by the degree to which the in-mask pressure tracks the test pressure during the system measurement time of approximately five seconds. Instantaneous feedback in the form of a real-time pressure trace of the in-mask pressure is provided and used to determine test validity and quality. A minimum fit factor pass level of 100 is necessary for a half-mask respirator and a minimum fit factor of at least 500 is required for a full facepiece respirator. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.
(a) CNP Fit Test Requirements.
(1) The instrument shall have a non-adjustable test pressure of 15.0 mm water pressure.

(2) The CNP system defaults selected for test pressure shall be set at -- 15 mm of water (-0.58 inches of water) and the modeled inspiratory flow rate shall be 53.8 liters per minute for performing fit tests.

(**Note:** CNP systems have built-in capability to conduct fit testing that is specific to unique work rate, mask, and gender situations that might apply in a specific workplace. Use of system default values, which were selected to represent respirator wear with medium cartridge resistance at a low-moderate work rate, will allow inter-test comparison of the respirator fit.)

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

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

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

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

(7) The QNFT protocol shall be followed according to section I. C. 1. of this appendix with an exception for the CNP test exercises.
(b) CNP Test Exercises.
(1) Normal breathing. In a normal standing position, without talking, the subject shall breathe normally for 1 minute. After the normal breathing exercise, the subject needs to hold head straight ahead and hold his or her breath for 10 seconds during the test measurement.

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

(3) Turning head side to side. Standing in place, the subject shall slowly turn his or her head from side to side between the extreme positions on each side for 1 minute. The head shall be held at each extreme momentarily so the subject can inhale at each side. After the turning head side to side exercise, the subject needs to hold head full left and hold his or her breath for 10 seconds during test measurement. Next, the subject needs to hold head full right and hold his or her breath for 10 seconds during test measurement.

(4) Moving head up and down. Standing in place, the subject shall slowly move his or her head up and down for 1 minute. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling). After the moving head up and down exercise, the subject shall hold his or her head full up and hold his or her breath for 10 seconds during test measurement. Next, the subject shall hold his or her head full down and hold his or her breath for 10 seconds during test measurement.

(5) Talking. The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song for 1 minute. After the talking exercise, the subject shall hold his or her head straight ahead and hold his or her breath for 10 seconds during the test measurement.

(6) Grimace. The test subject shall grimace by smiling or frowning for 15 seconds.

(7) Bending Over. The test subject shall bend at the waist as if he or she were to touch his or her toes for 1 minute. Jogging in place shall be substituted for this exercise in those test environments such as shroud-type QNFT units that prohibit bending at the waist. After the bending over exercise, the subject shall hold his or her head straight ahead and hold his or her breath for 10 seconds during the test measurement.

(8) Normal Breathing. The test subject shall remove and re-don the respirator within a one-minute period. Then, in a normal standing position, without talking, the subject shall breathe

normally for 1 minute. After the normal breathing exercise, the subject shall hold his or her head straight ahead and hold his or her breath for 10 seconds during the test measurement. After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of a respirator shall be tried.
(c) CNP Test Instrument.
(1) The test instrument must have an effective audio-warning device, or a visual-warning device in the form of a screen tracing, that indicates when the test subject fails to hold his or her breath during the test. The test must be terminated and restarted from the beginning when the test subject fails to hold his or her breath during the test. The test subject then may be refitted and retested.

(2) A record of the test shall be kept on file, assuming the fit test was successful. The record must contain the test subject's name; overall fit factor; make, model, style and size of respirator used; and date tested.
5. Controlled negative pressure (CNP) REDON quantitative fit testing protocol.
(a) When administering this protocol to test subjects, employers must comply with the requirements specified in paragraphs (a) and (c) of Part I.C.4 of this appendix ("Controlled negative pressure (CNP) quantitative fit testing protocol"), as well as use the test exercises described below in paragraph (b) of this protocol instead of the test exercises specified in paragraph (b) of Part I.C.4 of this appendix.

(b) Employers must ensure that each test subject being fit tested using this protocol follows the exercise and measurement procedures, including the order of administration, described below in Table A-1 of this appendix.

Table A-1. -- CNP REDON Quantitative Fit Testing Protocol

Exercises[1]	Exercise procedure	Measurement procedure
Facing Forward	Stand and breathe normally, without talking, for 30 seconds.	Face forward, while holding breath for 10 seconds.
Bending Over	Bend at the waist, as if going to touch his or her toes, for 30 seconds.	Face parallel to the floor, while holding breath for 10 seconds
Head Shaking	For about three seconds, shake head back and forth vigorously several times while shouting.	Face forward, while holding breath for 10 seconds.
REDON 1	Remove the respirator mask, loosen all facepiece straps, and then redon the respirator mask.	Face forward, while holding breath for 10 seconds.
REDON 2	Remove the respirator mask, loosen all facepiece straps, and then redon the respirator mask again.	Face forward, while holding breath for 10 seconds.

[1] Exercises are listed in the order in which they are to be administered.
(c) After completing the test exercises, the test administrator must question each test subject regarding the comfort of the respirator. When a test subject states that the respirator is unacceptable, the employer must ensure that the test administrator repeats the protocol using another respirator model.

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

$$\text{Overall Fit Factor} = \frac{N}{\left[1/FF_1 + 1/FF_2 + \ldots\ 1/FF_N\right]}$$

Where:
N = The number of exercises;
FF1 = The fit factor for the first exercise;
FF2 = The fit factor for the second exercise; and
FFN = The fit factor for the nth exercise.

Part II. New Fit Test Protocols

A. Any person may submit to OSHA an application for approval of a new fit test protocol. If the application meets the following criteria, OSHA will initiate a rulemaking proceeding under section 6(b)(7) of the OSH Act to determine whether to list the new protocol as an approved protocol in this Appendix A.

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

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

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

C. If OSHA determines that additional information is required before the Agency commences a rulemaking proceeding under this section, OSHA will so notify the applicant and afford the applicant the opportunity to submit the supplemental information. Initiation of a rulemaking proceeding will be deferred until OSHA has received and evaluated the supplemental information.
[63 FR 20098, April 23, 1998; 69 FR 46993, August 4, 2004]

OSHA RESPIRATOR MEDICAL EVALUATION QUESTIONNAIRE

To the employer: Answers to questions in Section 1, and to question 9 in Section 2 of Part A, do not require a medical examination.

To the employee: Can you read (check one): Yes No

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

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

1. Today's date: _____ 2. Your name: _____

Date of Birth: ___/___/___ 4. Sex (check one): Male Female

Your height: _____ ft. _____ in. 6. Your weight: _____ lbs.

Your job title: _____

A phone number where you can be reached by the health care professional who reviews this

questionnaire (include this Area Code): (_____)_____

The best time to phone you at this number: _____ A.M. _____ P.M.

10. Has your employer told you how to contact the health care professional who will review

this questionnaire (check one): Yes No

11. Check the type of respirator you will use (you can check more than one category):

N, R, or P disposable respirator (filter-mask, non-cartridge type only).

b. Other type (for example, half- or full-facepiece type, powered-air purifying, supplied-air, self-contained breathing apparatus).

12. Have you worn a respirator (check one): Yes No

If "yes," what type(s): _____

Part A. Section 2. **(Mandatory)** Questions 1 through 9 below must be answered by every employee who has been selected to use any type or respirator (please check "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 of 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):
Never Used a Respirator

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

Questions 10 to 15 below must be answered by every employee who has been selected to use either a full-facepiece respirator or a self-contained breathing apparatus (SCBA). For employees who have been selected to use other types of respirators, answering these questions is voluntary.

10. Have you *ever lost* vision in either eye (temporarily or permanently): Yes No

11. Do you *currently* have any of the following vision problems?

a. Wear contact lenses: Yes No

b. Wear glasses: Yes No

c. Color blind: Yes No

e. Any other eye or vision problem: Yes No

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

13. Do you *currently* have any of the following hearing problems?

a. Difficulty hearing: Yes No

b. Wear a hearing aid: Yes No

c. Any other hearing or ear problem: Yes No

14. Have you *ever had* a back injury?: Yes No

15. Do you *currently* have any of the following musculoskeletal problems?

a. Weakness in any of your arms, hands, legs, or feet: Yes No

b. Back pain: Yes No

c. Difficulty fully moving your arms and legs: Yes No

d. Pain or stiffness when you lean forward or backward at the waist: Yes No

e. Difficulty fully moving your head up or down: Yes No

f. Difficulty fully moving your head side to side: Yes No

g. Difficulty bending at your knees: Yes No

h. Difficulty squatting to the ground: Yes No

i. Climbing a flight of stairs or a ladder carrying more than 25 lbs: Yes No

j. Any other muscle or skeletal problem that interferes with using a respirator: Yes No

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

1. In your present job, are you working at high altitudes (over 5,000 feet) or in a place that has lower

than normal amounts of oxygen?: Yes No

If "yes," do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you're working under these conditions: Yes No

2. At work or at home, have you ever been exposed to hazardous solvents, hazardous airborne chemicals (e.g., gases, fumes, or dust), or have you come into skin contact with hazardous chemicals: Yes No

If "yes,"name the chemicals if you know
them:_____
_____
_____
_____

3. Have you ever worked with any of the materials, or under any of the conditions, listed below?:

a. Asbestos: Yes No

b. Silica (e.g., in sandblasting): Yes No

c. Tungsten/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:
_____
_____

_____
_____
_____

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

_____
_____

5. List your previous occupations:_____
_____

_____
_____

6. List your current and previous hobbies:_____
_____

_____
_____

7. Have you been in the military services? Yes No

If "yes," were you exposed to biological or chemical agents (either in training or combat): Yes No

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

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

If "yes," name the medications if you know them:

_____

10. Will you be using any of the following items with your respirator(s)?

a. HEPA Filters: Yes No

b. Canisters (for example, gas masks): Yes No

c. Cartridges: Yes No

11. How often are you expected to use the respirator(s) (check "yes" or "no" for all answers that apply to you)?:

a. Escape only (no rescue): Yes No

c. Less than 5 hours *per week*: Yes No

d. Less than 2 hours *per day*: Yes No

e. 2 to 4 hours *per day*: Yes No

f. Over 4 hours *per day*: Yes No

12. During the period you are using the respirator(s), is your work effort:

a. *Light* (less than 200 kcal per hour): Yes No

If "yes," how long does this period last during the average

shift:_____hrs._____mins.

Examples of a light work effort are *sitting* while writing, typing, drafting, or performing light assembly work; or *standing* while operating a drill press (1 - 3 lbs.) or controlling machines.

b. Moderate (200 to 350 kcal per hour): Yes No

If "yes," how long does this period last during the average

shift:_____hrs._____mins.

Examples of moderate work effort are *sitting* while nailing or filing: *driving* a truck or bus in urban traffic; *standing* while drilling, nailing, performing assembly work, or transferring a moderate load (about 35 lbs.) at trunk level; *walking* on a level surface about 2 mph or down a 5-degree grade about 3 mph; or *pushing* a wheelbarrow with a heavy load (about 100 lbs.) on a level surface.

c. *Heavy* (above 350 kcal per hour): Yes No

If "yes," how long does this period last during the average

shift:_____hrs._____mins.

Examples of heavy work are *lifting* a heavy load (about 50 lbs.) from the floor to your waist or shoulder; *working* on a loading dock; *shoveling*; *standing* while bricklaying or chipping castings; *walking* up an 8-degree grade about 2 mph; *climbing* stairs with a heavy load (about 50 lbs.).

13. Will you be wearing protective clothing and/or equipment (other than the respirator) when

you're using your respirator?: Yes No

If "yes," describe this protective clothing and/or equipment:_____

_____
_____

14. Will you be working under hot conditions (temperature exceeding 77 F)?: Yes No

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

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

_____
_____
_____

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

_____
_____
_____

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

CHEMICAL/PRODUCT NAME	MAXIMUM EXPOSURE LEVEL	DURATION

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

_____
_____
_____

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

_____
_____

Helping make the coatings industry A better and safer place to work.

Prepared by: Mark Pfaff
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